GUIDANCE NOTES
GD34-2023

GUIDELINES FOR POLAR FISHING VESSELS

2023

Effective from 1 January 2024

INTRODUCTION

The polar regions, including the Antarctic and the Arctic, are the coldest regions on Earth, silent due to year-round ice and snow coverage and harsh climate. Due to global warming over the past 20 years, the coverage area of polar sea ice has gradually shrunk, and the exploitation of polar fishery resources has become possible. More and more international organizations and countries have begun to conduct research and development activities for polar fisheries. Due to resource reserves, environmental factors, economic costs, political ecology and other problems, the development level of fishery resources in the Arctic area is low, and the prospect is not clear. In contrast, the fishery exploitation activities in the Antarctic area have entered a period of rapid development. The root cause is that the Antarctic area contains huge resources of krill, whose biomass is conservatively estimated at 600 to 1000 million tons, which is the largest single species of recoverable biological resource in the global ocean and the largest animal protein bank in the world. On the other hand, Antarctic krill live in the unpolluted Antarctic waters for a long time, and are rich in nutrition, with great edible, medicinal and industrial value. In addition, under the legal framework of the Antarctic Treaty, the fishery exploitation activities in the Antarctic area become "legal". Therefore, in the context of the gradual decline of global traditional fishery resources and the increasingly serious trend, Antarctic krill have become an important resource for global fisheries.

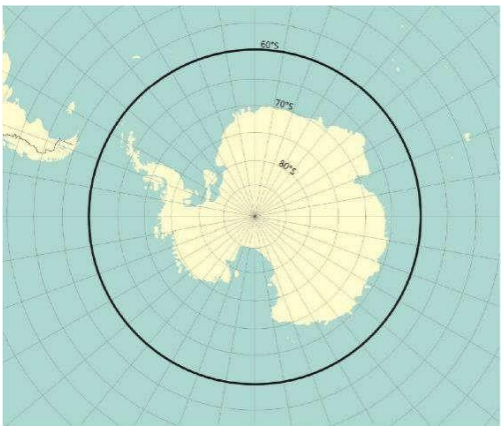

Figure1 Antarctic area

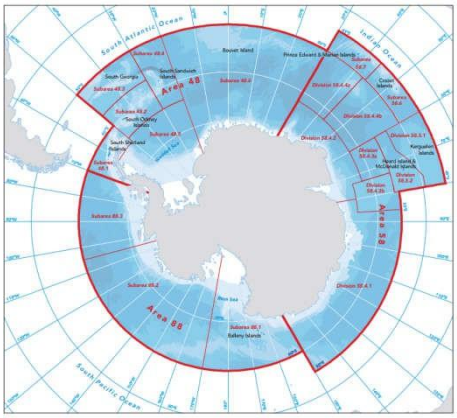

Figure2 Statistical areas of Commission for the Conservation of Antarctic Marine Living Resources (sourced from CCAMLR website)

Polar fishing vessels are the main carriers of the exploitation of polar fishery resources. However, the unique geographical location, adverse weather conditions and fragile environmental conditions in polar waters have brought many unpredictable additional risks to the navigation and operation of ships, and put forward higher requirements for the design, construction and management of ships. IMO (International Maritime Organization) issued the *International Code for Ships Operating in Polar Waters* (Polar Code) on 1 January 2017, which applies to all passenger ships and ships of 500 gross

tonnage and upwards operating in polar waters. Subsequently, in order to increase the safety of fishing vessels operating in polar waters and persons on board and to mitigate the impact on the people and environment in the remote, vulnerable and potentially harsh polar waters, IMO has formulated the *Guidelines for safety measures for fishing vessels of 24 m in length and over operating in polar waters*. It was approved for trial operation at the 103rd session of the Maritime Safety Committee (5-14 May 2021). Under the framework of the Polar Code, the Guidelines provide recommended enhanced safety measures for fishing vessels of 24 m in length and over operating in polar waters, covering the construction, equipment, operation, training, search and rescue, etc. These Guidelines are designed to align with the *Consolidated Text Of The Regulations Annexed To The Torremolinos Protocol Of 1993 Relating To The Torremolinos International Convention For The Safety Of Fishing Vessels, 1977, As Modified By The Cape Town Agreement Of 2012*(Cape Town Agreement), the entry into force of which is pending. In order to cope with the depletion of global fishery resources and combat IUU fishing[1], IMO has made great efforts to push the Cape Town Agreement into effect in recent years. The Cape Town Agreement is equivalent to the SOLAS Convention on fishing vessels in terms of implementation, and its entry into force is an inevitable trend. Therefore, when the Cape Town Agreement comes into force, the *Guidelines for safety measures for fishing vessels of 24 m in length and over operating in polar waters* is highly likely to be transformed from advisory measures into mandatory rules.

Figure3 Norwegian Antarctic Krill Factory Trawler "Antarctic Endurance"(sourced from *Development Status and Trend of Antarctic Krill Factory Trawler and Equipment*)

Since the implementation of our krill exploration program in 2009, there have been 2 to 3 fishing vessels involved in the fishing operations of Antarctic krill every year, but all the operating vessels are second-hand trawlers imported from abroad, which are modified to catch and process Antarctic krill. Under the guidance of national strategies such as "863 Plan", "Made in China 2025", "Three-year Action Plan for Enhancing Core Competitiveness of Manufacturing Industry (2018-2020)" and "13th Five-Year Plan for Fishery Science and Technology Development", more and more Chinese fishery enterprises have devoted themselves to the Antarctic krill industry in recent years. The demand for independent design and construction of professional antarctic krill factory trawler has increased rapidly. Since taking

[1] means the illegal, unregulated and unreported fishing.

over the inspection business of ocean-going fishing vessels and Marine products in 2018, ISC has issued the *Rules for Construction of Ocean-going Steel Fishing Vessels* 2018 and *Rules for Construction of Ocean-going Steel Fishing Vessels* 2021. Based on the standard system of merchant ships, the requirements of ice class and low temperature performance for polar fishing vessels are preliminarily formulated. However, with the trial operation of the *Guidelines For Safety Measures For Fishing Vessels Of 24 M In Length And Over Operating In Polar Waters* and the imminent entry into force of the Cape Town Agreement, our polar fishing vessels are bound to face new challenges. This guide is based on the requirements for the construction of professional krill factory trawler, in view of the special risks in polar waters, from the perspective of the design, construction and operation of fishing vessels, it provides technical services for the implementation of the relevant rules of ISC, IMO *Guidelines for safety measures for fishing vessels of 24 m in length and over operating in polar waters* and the Cape Town Agreement.

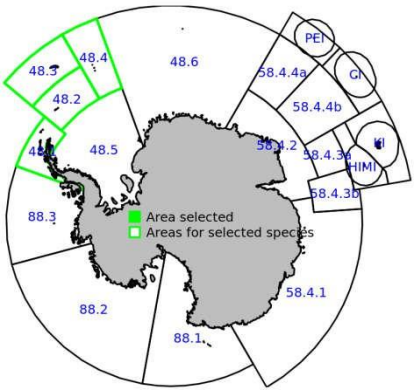

Figure4 The main fishing area for Antarctic krill (sourced from CCAMLR website)

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CHAPTER1 GENERAL

Section1 GENERAL PROVISIONS

1.1.1 Purposes

1.1.1.1 The Guidelines are intended to provide guidance for design, construction, provision of equipment, operation, survey and certification of polar fishing vessels.

1.1.2 Application

1.1.2.1 The Guidelines apply to steel classed fishing vessels of 24 m in length and over operating in polar waters (Antarctica).

1.1.2.2 The designed operational capability of polar fishing vessels depends on the purpose predetermined by shipowner, including geographical boundaries, ice conditions, seasons, etc.

1.1.2.3 This Guidelines provides additional functional requirements for fishing vessels operating in polar regions and guidelines contents on implementation of these requirements based on the relevant requirements of *Guidelines For Safety Measures For Fishing Vessels Of 24 M In Length And Over Operating In Polar Waters* (MSC.1/Circ.1641) and applicable rules for polar fishing vessels.

1.1.2.4 The recommended requirements and measures of this Guidelines are applied for polar fishing vessels to adapt to the operating environment in polar waters, in addition to meeting the mandatory rules and regulations related to polar fishing vessels.

1.1.3 Quoted standard

1.1.3.1 Where no version or date is indicated for the relevant standards referenced in this Guidelines, the latest version applies to this Guidelines.

1.1.4 Definitions

1.1.4.1 The definitions used in this guide are as follows. Other terms used in this Guide that are not defined in the provisions below shall have the same meaning as defined in *Technical Regulations for Statutory Surveys of Ocean fishing vessel* and *Rules for Construction of Ocean-going Steel Fishing Vessels*.

1.1.4.2 Polar waters means Arctic waters and/or Antarctic area. This guide mainly refers to the Antarctic area.

1.1.4.3 Antarctic area means the sea area south of latitude 60° S.

1.1.4.4 Fishing vessel means any vessel used for commercially catching fishes or other living resources of the sea.

1.1.4.5 Polar fishing vessel means all fishing vessels engaged in fishing in polar waters.

1.1.4.6 Length of vessel means the length as defined in the General of *Technical Regulations for Statutory*

Surveys of Ocean fishing vessel.

1.1.4.7 Terms related to sea ice

(1) Sea ice[1] means any form of ice found at sea which has originated from the freezing of sea water.

(2) Ice concentration means the proportional of floating ice covering sea level within field of vision, measured by in-tenth method.

(3) Ice regime means a description of different types of ice within a certain range, including the relatively consistent ice conditions formed by the mixed distribution of different types of ice and open water.

(4) Ice condition means the degree to which of sea ice exists in water area, generally indicated by features of one or more ice types and corresponding thickness, ice concentration and scantling of floating ice, etc.

(5) Bergy waters means an area of freely navigable water in which ice of land origin is present in concentrations of less than 1/10. There may be sea ice present, although the total concentration of all ice is not to exceed 1/10.

(6) Ice-covered waters means polar waters where local ice conditions pose a structural risk to a ships.

(7) Open water means a large area of freely navigable water in which sea ice is presentin concentrations of less than 1/10. No ice of land origin[1] is present.

1.1.4.8 Terms related to operation in ice

(1) Ice Class Notation means the class notation assigned to the ship by the Classification Society showing that the ship has been designed for navigation in waters covered by sea ice.

(2) Ice draught means the ship draught corresponding to the upper ice water line and lower ice water line defined in the design of ice class ships navigating in ice-covered waters. The upper ice waterline (UIWL) is to be the envelope of the highest points of the waterlines at which the ship is intended to operate in ice. The lower ice waterline (LIWL) is to be the envelope of the lowest points of the waterlines at which the ship is intended to operate in ice. The upper ice waterline and the lower ice waterline may be a broken line.

(3) Escorted operation means any operation in which a ship’s movement is facilitated through the intervention of an icebreaker.

(4) Safe speed means the maximum possible ship speed under certain ice conditions when the hull and ice interaction does not result in hull and machinery damage.

(5) Ice navigator means a properly certificated Officer who holds documentary evidence of having satisfactorily completed an approved training programme in ice navigation

(6) Ice accretion means the process by which a layer of ice builds up on solid objects which are exposed to freezing precipitation or to super-cooled fog or cloud droplets. It is most likely during time periods when surface air temperatures are between zero and -15°C. Below this threshold spray tends to freeze directly in the air so that it does not adhere to surfaces.

[1] Definition of various ice types can be found in the WMO SEA ICE NOMENCLATURE.

(7) Sticking means the adhesion of small pieces of broken ice to the vessel's hull as it proceeds and breaks large ice formations.

(8) Beset means the situation of a ship to be surrounded and trapped by ice so that movement of the ship is not possible.

(9) Maximum expected time of rescue means the time adopted for the design of equipment and system that provide survival support. It is never to be less than 5 days or it is calculated according to the estimation method provided by MSC.1/Circ.1614[1].

(10) Machinery Installations means equipment and machinery and its associated piping and cabling, which is necessary for the safe operation of the ship.

1.1.4.9 Terms related to low temperature operation

(1) Mean Daily Low Temperature (MDLT) means the mean value of the daily low temperature for each day of the year over a minimum of 10-year period. A data set acceptable to the Administration may be used if 10 years of data is not available.

(2) Low temperature means the temperature of which the Lowest Mean Daily Low Temperature (LMDLT) is lower than -10°C.

(3) Polar Service Temperature (PST) means a temperature specified for a ship which is intended to operate in low air temperature, which is to be set at least 10℃below the lowest MDLT for the intended area and season of operation in polar waters.

(4) Design Service Temperature (DST) means a temperature index set for a designed ship to measure service performances of material, equipment and system in low air temperature, which is to be determined by the shipowner according to the purpose and working condition of the ship, and generally to be set at least 10℃ below the lowest MDLT for the intended area and season of operation in polar waters. The DST is to be equal to PST.

(5) Minimum Anticipated Temperature (MAT) means the lowest ambient temperature that may be anticipated in the intended navigation areas of the ship during the voyage and is in general to be taken as at least 20℃ lower than LMDLT.

(6) Fishing vessel intended to operate in low air temperature means a fishing vessel which is intended to undertake voyages to or through areas where the lowest Mean Daily Low Temperature (MDLT) is below -10℃.

(7) Cold soaking means the process of the steelwork of a vessel gradually getting colder so that it acts as a 'soak' and then retains the cold, even if there is a temperature increase. It can result in the formation of ice when liquid water, either as condensation or rain, comes into contact with the affected surface.

(8) Winterization means the measures ensuring that a vessel is capable of, and suitably prepared for,

[1] Refer to the MSC.1/Circ.1614 《 REVISED INTERIM GUIDELINES ON LIFE-SAVING APPLIANCES AND ARRANGEMENTS FOR SHIPS OPERATING IN POLAR WATERS 》

operations in low temperature. This is provided for by setting functional requirements to functions, systems and equipment considered important to safety and which are intended to be in operation in cold-climate conditions. Winterization includes but is not limited to:

① Anti-freezing Systems are the devices that to prevent the freezing of ballast tanks and equipment as well as the icing of weather decks and equipment on weather decks, including using anti-freezing medium, low condensation point hydraulic oil/ lubricating oil and grease. Measures for preventing the freezing of ballast tanks are to use heating devices/systems, continuous circulating agitating system and air bubbling systems, etc

② Anti-icing Systems are the systems that prevent icing by heating devices using water or steam, including fixed or removable covers made of steel and waterproof low temperature materials (e.g. PVC).

③ Deicing Systems are the systems that remove ice, including hammers without sharp edges, wooden mallets, axes, steam/hot water jets and heating system, etc.

Section2 ENVIRONMENTAL RISKS

1.2.1 General

1.2.1.1 The polar fishing vessel is to be designed, equipped and constructed to have the operational capability in polar waters in order to withstand the environmental risks, such as anticipated ice condition, low air temperature, icing, high latitude, polar day/night, harsh climate, remoteness, etc., taking into consideration the applicable operational limitations in polar waters.

1.2.1.2 Shipowners are to confirm that the polar fishing vessel has the operational capability best fit for their demands. The Master is to be responsible for evaluating the actual ice and temperature conditions during operation of fishing vessel and ensure that the fishing vessel is operated within the designed range of operational capability.

1.2.2 Sea ice conditions

1.2.2.1 Sea ice environment is the most important hazard affecting ship navigation and operation in polar waters. The most common extensive form of floating ice encountered at sea is that which results from the freezing of the sea surface, but masters may also be concerned with ice of land origin (Glacier Ice) – icebergs, ice islands, bergy bits and growlers. Both icebergs and sea ice can be dangerous to navigation. Common hazards include ice collision, ice squeezing, ice friction, trapped in ice, and suctioning brash ice, resulting in major damage to hulls, equipment, and systems.

Figure1.2.2.1 Bergy bits and growlers of the glacier ice originating from the Antarctic continent

1.2.2.2 Refer to Table 1.2.2.2 for the ice types likely to be encountered in polar waters. In most cases, the following ice characteristics are interpreted on ice charts or satellite imagery:

(1) Ice concentration

(2) Stages of development

(3) Forms of floating ice

(4) Openings in the ice

(5) Ice-surface features

(6) Terms related to shipping

(7) Ice of land origin

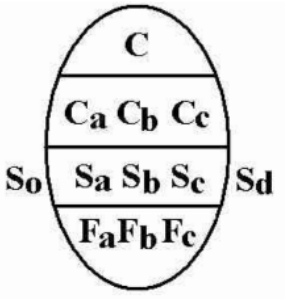
Ice Types **Table1.2.2.2**

Ice terms	Description	
Floating Ice Types: Ice Concentration		
Consolidated Pack Ice	Floating ice in which the concentration is 10/10 and the floes are frozen together	
Compact Ice	Floating ice in which the concentration is 10/10 and no water is visible	
Very Close Pack Ice	Floating ice in which the concentration is 9/10 to less than 10/10	
Close Pack Ice	Floating ice in which the concentration is 7/10 to 8/10, composed of floes mostly in contact	
Open Pack Ice	Floating ice in which the ice concentration is 4/10 to 6/10, and the floes are generally not in contact with one another	
Very Open Pack Ice	Floating ice in which the concentration is 1/10 to 3/10 and water preponderates over ice	
Open Water	A water area in which sea ice is present in concentrations of less than 1/10; no ice of land origin is present	
Bergy Water	No sea ice present; ice of land origin is present	
Ice-Free	No ice of any kind is present	
Ice Massif	A variable accumulation of close or very close ice covering hundreds of square kilometres which is found in the same region every summer	
Ice Field	An area of floating ice of any size, which is greater than 10km across. The characteristics, position and sizes of fields are described as separate zones.	
Stages of Development		
New Ice	Recently formed ice, including frazil ice, grease ice, etc.	
Nilas	Dark Nilas	Thickness ≤5cm
	Light Nilas	Thickness 5-10cm
Young Ice	Grey Ice	Thickness 10-15cm
	Grey-WhiteIce	Thickness 15-30cm

First-Year Ice	First-Year Thin Ice	Thickness 30-70cm
	First-Year Medium Ice	Thickness 70-120cm
	First-Year Thick Ice	Thickness 120-200cm
Old Ice	Second-Year Ice	Old ice which has survived only one summer's melt; typical thickness up to 2.5 m and sometimes more
	Multi-Year Ice	Old ice up to 3m thick or more thick which has survived at least two summers' melt.
Forms of Floating Ice		
Brash Ice	Fragments not more than 2m across; the wreckage of other forms of ice	
Pancake Ice	Predominantly circular pieces of ice 30cm - 3m across	
Ice Cake	Up to 20m across	
Small Ice Cake	Up to 2m across	
Floe	Piece of sea ice 20m or more across	
Small Floe	20-100m	
Medium Floe	100-500m	
Big Floe	500-2000m	
Vast Floe	2-10km	
Giant Floe	>10km	
Fast Ice	Sea ice which forms and remains fast along the coast, where it is attached to the shore	
Openings in the Ice		
Fracture	Any break or rupture through compact ice	
Crack	Any fracture ranging from a few centimeters to 1 m.	
Lead	Any passage-way through sea ice which is navigable	
Polynya	Any non-linear shaped opening enclosed in ice	
Ice Surface Features		
Level Ice	Sea ice which is unaffected by deformation	
Deformed Ice	Sea ice which has been squeezed together and forced upwards and downwards	
Rafted Ice	Deformed ice formed by one piece of ice overriding another	
Ridge	A line or wall of broken ice forced up by pressure	
Rubble Field	Composed of refrozen broken ice pieces	
Terms Related To Shipping		
Ice Under Pressure	Ice affected by wind current that presses against the ship	
Beset	The situation of a ship surrounded by ice and unable to move	
Nip	Ice which forcibly presses against a ship	
Ice Bound	A harbour, inlet, etc. where navigation is prevented on account of ice, except possibly with the assistance of an icebreaker.	

Note: Terminology in the table can be found in the WMO SEA ICE NOMENCLATURE.

1.2.2.3 Information about ice regime adopts the standards and code rules made by WMO, namely the EGG CODE. Information about ice concentration, ice formation stage and ice type is displayed in an elliptical coding system, as shown in Figure 1.2.2.3.



Note：
C — The total concentration of sea ice over a given area, (0~10) percent;
Ca、*Cb*、*Cc* — Concentration of ice of different thicknesses, (0~10) percent;
Sa、*Sb*、*Sc* — Formation stage of ice of different thicknesses;
So — Thicker than *Sa,* but the concentration of sea ice is less than one tenth of the ice formationt stage
Sd — Formation stage of other sea ice;
Fa、*Fb*、*Fc* — Ice forms corresponding to *Sa*、*Sb*、*Sc.*

Figure1.2.2.3 Diagram of EGG CODE

Note：Quoted from Ice Chart Colour Code Standard by WMO (WMO/TD-No.1215 2004).

1.2.2.4 Sea ice properties affecting a vessel's navigation performance in ice

(1) There are many sea ice properties that can affect a vessel's navigation performance. The most obvious is the thickness of the ice but other properties, such as hardness, are also important. Multi- year ice is normally harder than first-year ice owing to the amount of salt that will have leached out during warmer periods. There can also be differences in the hardness of first-year ice, depending on the formation process and source. The type and amount of snow cover on the ice adversely impacts the friction against the hull of a vessel.

(2) Another impediment to navigation is ice deformation. Drifting sea ice is continually in motion, under the influence of wind, current and internal stresses, and where it becomes subjected to pressure the surface often becomes deformed. Pressure can be caused by a number of factors but can be expected where drifting sea ice comes into contact with stationary fast ice, coastline features, cyclonic weather events and converging currents. Where the ice is thinner, it may raft with ice sheets or floes riding over each other. Where the ice is thicker, pressure is likely to cause ridging or hummocks.

(3) Normally, the visible top of a ridge, known as the sail, is significantly smaller than the downward extension below, known as the keel. As ridges form, more ice is forced downwards than upwards in order to support the weight of the ice above the water surface. In deep water a typical ratio of keel to sail may be four or five to one. The consolidated ice in a ridge is not as strong as level ice. However the dimensions can be considerable and may present a significant navigational obstacle to vessels.

(4) A significant impediment to ice navigation is pressure itself. Due to deformed ice is under pressure in its development, when a vessel encounters pressure, its ability to break ice and clear ridges is diminished, as is its ability to manoeuvre. The hulls, rudders and propellers of vessels beset in ice may be subject to pressure forces that can become significant.

(5) When land fast ice forms over shallow waters and there are defined port approach channels, continual breaking of the ice can lead to the eventual blocking of the ice channel by refreezing of broken submerged ice chunks.

1.2.2.5 Polar navigation should avoid hazardous ice conditions. In the Antarctic, the waters around the

Antarctic continent form the sea ice belt. In winter, the sea ice belt extends far away to the Southern Ocean and the sea ice area is 50% bigger than sea ice cover area of the Arctic in winter. However, around 85% of the ice of the Antarctic continent ice belt melts in summer and some floes still exist. Some regions of the Antarctic are completely ice-free for less than a month throughout the year.

1.2.3 Low air temperature environment

1.2.3.1 For polar ship operating in low air temperature areas and/or seasons, consideration is to be given to ambient temperature the surfaces of exposed structures, equipment and systems are subject to, and proper protection and/or anti-cold climate measures for operational control are to be taken so as to ensure the ships and equipment have the operational capabilities in PST.

1.2.3.2 Polar service temperature is to be taken 10℃ below the lowest MDLT for the intended area and season of operation in polar waters. The diagram of definition of air temperature is indicated in Figure 1.2.3.2, of which:

(1) “Mean” means the mean value over a minimum of 10 year period;

(2) “Low temperature” means the lowest temperature within a day of 24 hours period;

(3) “Lowest” means the lowest temperature within a year period;

(4) “MDHT” means the mean daily highest temperature;

(5) “MDAT” means the mean daily average temperature;

(6) “MDLT” means the mean daily lowest temperature.

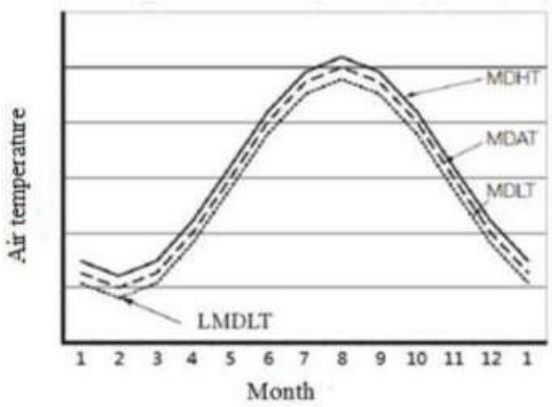


Figure1.2.3.2 Definitions of air temperature

1.2.3.3 PST of polar ship is to be determined by shipowners or designers according to the MDLT in the intended area of operation in polar waters. If reliable ambient temperature records are available for such area, PST could be obtained by statistics after deducting all recorded values with the probability of occurrence lower than 2.5%. For ships operating with seasonal limitation, the lowest value during the operating period may be taken.

1.2.3.4 PST

(1) DST of materials for hull structure and equipment, deck machinery, fire protection equipment and system, life-saving appliances are to be taken as PST determined by shipowners or designers.

(2) For the heating arrangement of structures, equipment and piping, as well as anti-freezing protection for tanks and compartment heating system, consideration is to be given to anticipated MAT of ship operation, and the temperature is determined by shipowners and designers. If the anticipated MAT data is unavailable, it is to be taken at least 10℃ below the lowest PST.

1.2.3.5 The temperature in the Antarctic waters is between +1℃ and -30℃. See Figure 1.2.3.5 for the monthly temperature trend of different regions. Shipowner and designer still need to determine the design temperature according to the actual operation.

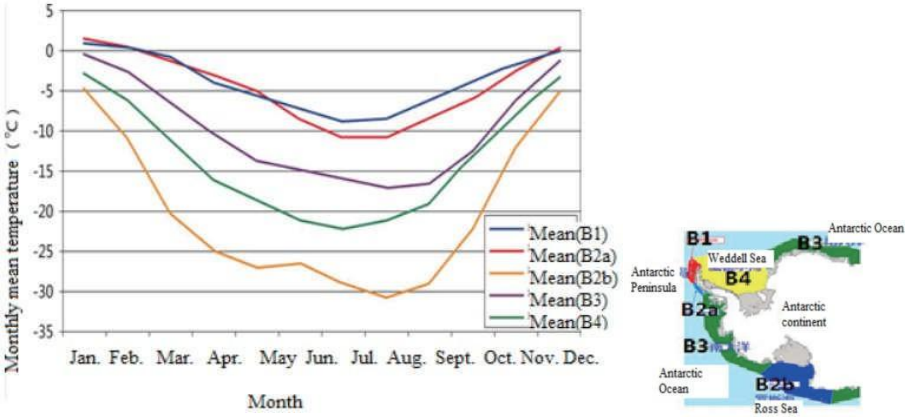


Figure1.2.3.5 Monthly mean temperature in the Antarctic waters

1.2.3.6 LMDLTs in the Arctic and Antarctic waters are indicated in Figures 1.2.3.6 for reference.

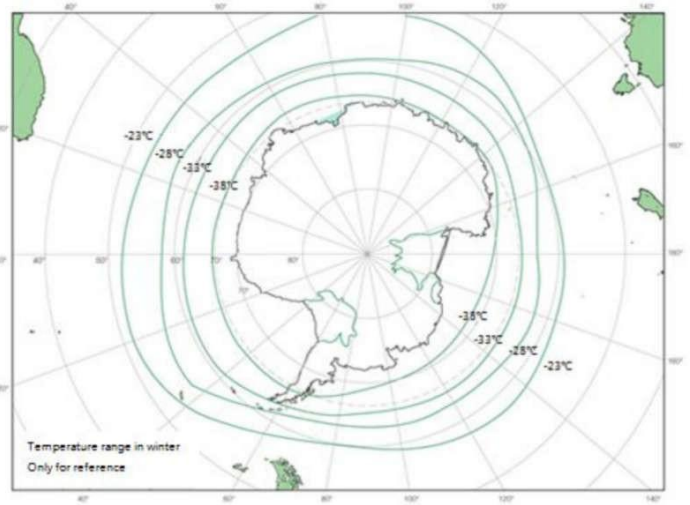


Figure1.2.3.6 LMDLT of Winter in the Antarctic Waters

1.2.4 Icing

1.2.4.1 Sea ice accumulation on the hull of the vessel, or sticking, can typically occur when the ambient air temperatures fall just below zero. The main dangers of the vessel are:

(1) The most serious form of ice accretion is usually formed by sea spray and the most obvious danger of

ice accretion from sea spray is that of vessel instability and, in extreme cases, capsizing;

(2) Ice accretion from fog, rain or sea fog can cause radar, aerial and insulator failures as well as rigging damage and consequential danger to those on deck;

(3) There are other dangers and operational problems to consider including malfunctioning machinery, blocked vents and the physical dangers to crew members trying to work or rectify problems in such conditions.

1.2.4.2 Ice accretion from sea spray occurs when wind and wave-generated spray comes into contact with cold exposed surfaces and the air temperature is below freezing. There are two general factors to be considered:

(1) Environmental factors which contribute to ice accretion from ship sea spray include:

① Wind speed, e.g. typically above 18 knots or 9 m/s but sometimes lower;

② Air temperature, e.g. -2˚C or lower;

③ Water temperature, e.g. near freezing;

④ Wind direction, relative to the ship;

⑤ Swell and wave characteristics:

a Wave size

b Wave length

c Wave propagation direction

(2) Vessel characteristics which affect the severity of ice accretion from sea spray include the following:

① Speed;

② Heading (with respect to wind, waves and swell);

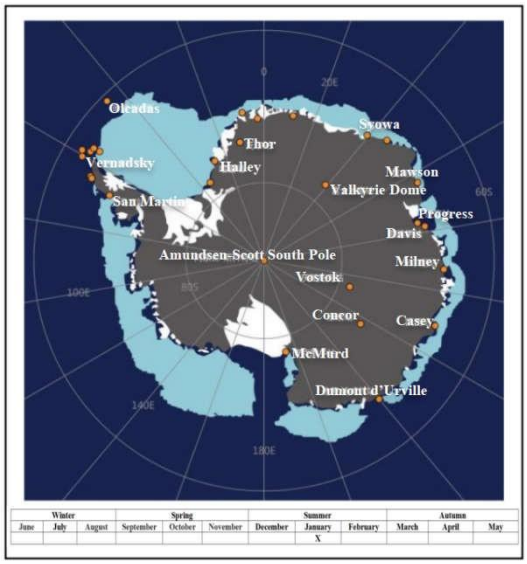
③ Bow design;

④ Ship length;

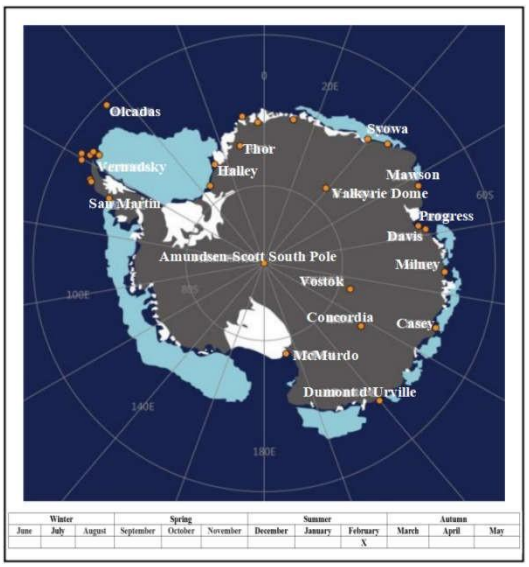
⑤ Freeboard;

⑥ Cold soaking (surface area of exposed steelwork). When a vessel has been in cold temperatures for a long time, for example two or three weeks, the body of the ship will remain cold even if the air temperature rises above zero. This cold soaking may result in icing being more severe than expected given the prevailing environmental conditions.

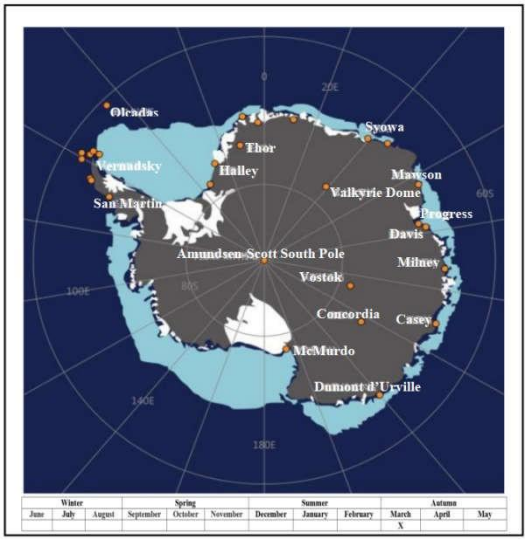
1.2.4.3 The effects of ice accumulation should be minimized for polar fishing vessel operating in areas and during periods where ice accretion is likely to occur. The maximum icing allowance is to be determined by stability calculation so as to provide the parameters of monitoring icing conditions of vessel to the master and crew, and measures are to be taken to reduce and remove the ice accumulation so as to ensure that the icing condition is maintained within the extent of design. If the accumulated ice could not be controlled or removed, the vessel is to navigate to a sheltered or warm area as practicable as possible. The average extents of sea ice in the Antarctic waters in each month are shown in the following figures:



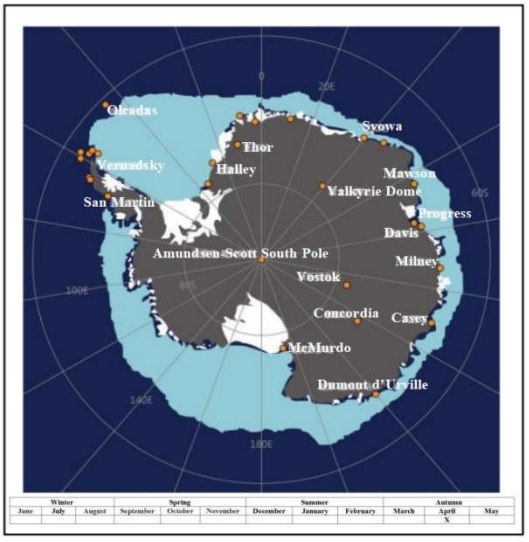
Winter			Spring			Summer			Autumn		
June	July	August	September	October	November	December	January	February	March	April	May
							X				



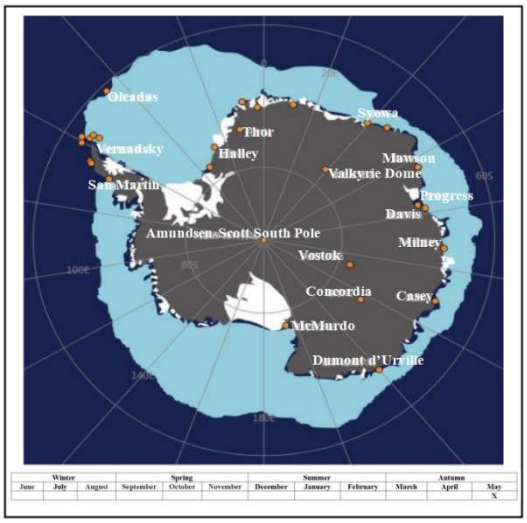
Winter			Spring			Summer			Autumn		
June	July	August	September	October	November	December	January	February	March	April	May
								X			



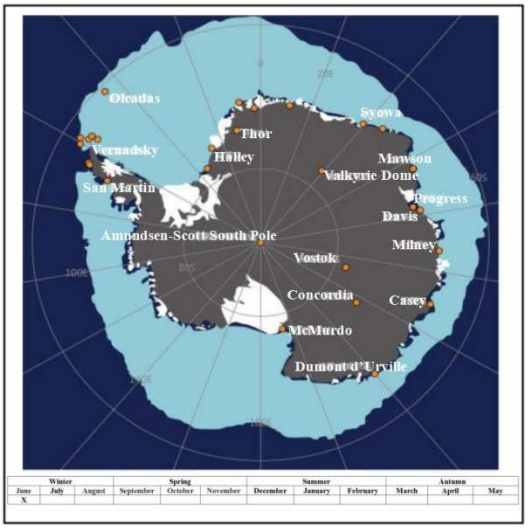
Winter			Spring			Summer			Autumn		
June	July	August	September	October	November	December	January	February	March	April	May
									X		



Winter			Spring			Summer			Autumn		
June	July	August	September	October	November	December	January	February	March	April	May
										X	



Winter			Spring			Summer			Autumn		
June	July	August	September	October	November	December	January	February	March	April	May
											X



Winter			Spring			Summer			Autumn		
June	July	August	September	October	November	December	January	February	March	April	May
X											

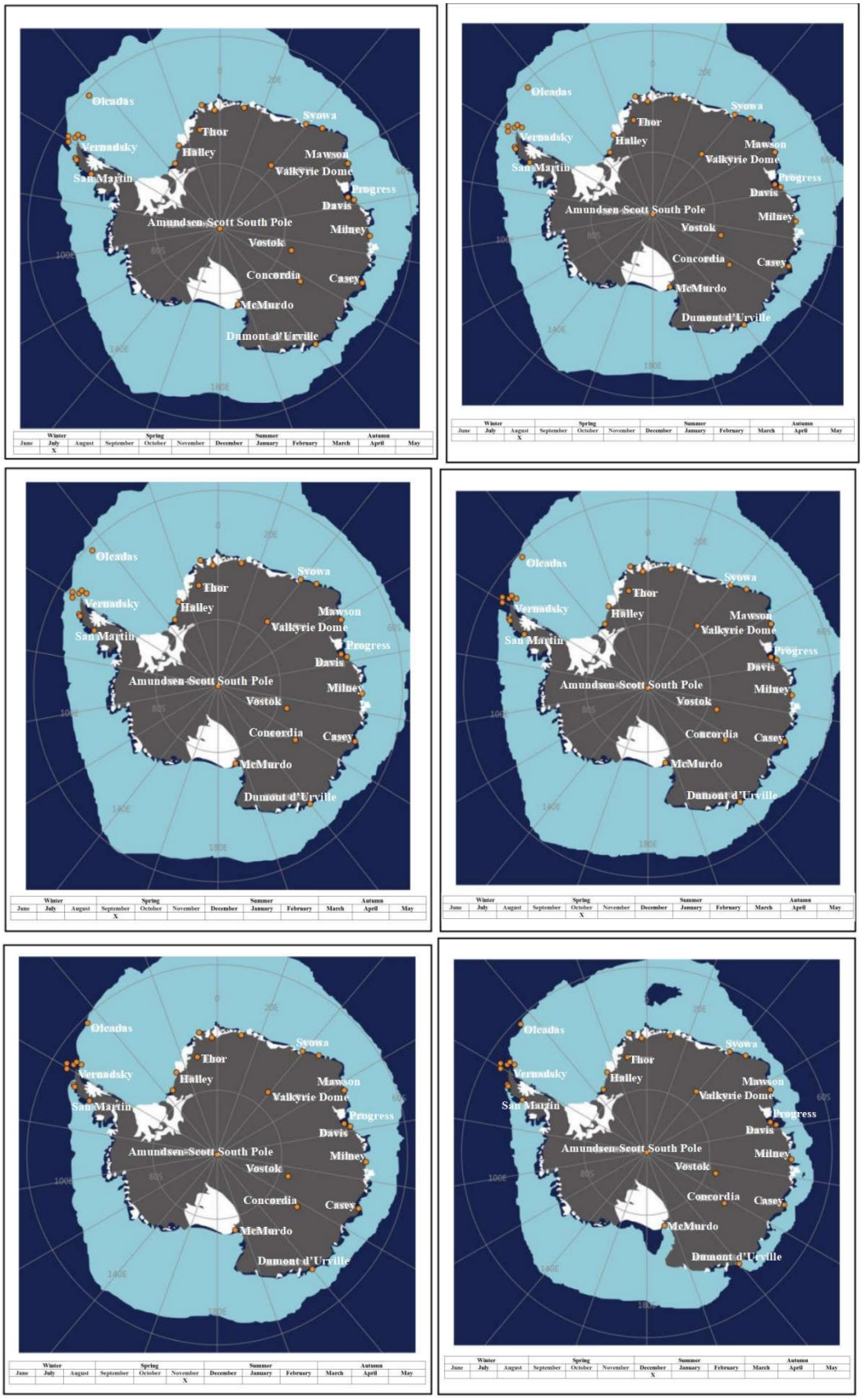


Figure1.2.4.3 Example of the average extent of sea ice in Antarctic waters for each month

1.2.5 Strong wind

1.2.5.1 To the south of the subtropical high in the Southern Hemisphere, around 40°S to 60°S, there is a low pressure belt around the earth. The prevailing wind direction is west all year round. Consequently the belt is also named the Roaring Forties. In the westerly belt, cyclones occur very frequently. One cyclone passes every two or three days. Strong cyclones, in particular, bring strong wind and snowstorm as well as huge waves more than 10 m high.

1.2.5.2 In addition, in the westerly belt force 6 to 7 westerly and swells of 4 to 5 m are present all year round. In the latitude band around 45°S to 58°S, affected by cyclones, there are on average more than 7 days monthly when the force 7 and above wind is present.

1.2.6 High latitude

1.2.6.1 Currently, the signals of communication equipment related to global maritime digital communication satellite are unstable and/or interrupted in the areas with the latitude of 80° and above due to the fact that the communication satellite system has not covered the polar waters. In addition, horizontal component of magnetic field at high latitude is very small, magnetic compass force is very weak, and error of magnetic compass at the latitude above 80° is greater due to the effect of local magnetic and magnetic storms, and/or aurora magnetic interference. In the high latitude areas, it is also very difficult to identify celestial constellations, and there is less opportunity for observing celestial bodies. Therefore, ship's operation at high latitude areas will influence the quality of navigational system, communication system and ice condition imagery information.

1.2.6.2 Polar ship operating in the waters with latitude of 80 ° and above is to be provided with communication and navigational equipment fit for use at high latitude.

1.2.7 Miscellaneous

1.2.7.1 Polar day or night occurs in the Arctic and Antarctic with high latitude:

(1) Long darkness duration in winter months leads to the constant poor visibility and has influence on safety of navigation. Additional lighting, e.g. searchlights are to be equipped onboard the polar ship, and additional watch is to be arranged for navigation in ice-covered waters so as to reduce the crew's fatigue caused by observation of ice regime.

(2) Long day duration in summer months causes crew fatigue and affects ice zone watchkeeper's eye. Measures are to be taken to avoid the influences on crew's efficiency.

1.2.7.2 Due to remoteness and possible lack of accurate and complete hydrographic data and information, reduced availability of navigational aids and seamarks, limited readily deployable SAR facilities with increased potential for groundings compounded, limited emergency communications capability and delays in emergency response, polar ship is to be strengthened in terms of provision of emergency response capabilities.

1.2.7.3 Due to potential lack of ship crew experience in polar operations, with potential for human error,

polar ship is to be manned with crew with sufficient training and experience.

1.2.7.4 The climate conditions in polar waters are harsh and variable, and there is a possibility of incident escalation. Polar ship is to conduct sufficient voyage planning and is to have sufficient channels for collecting and analyzing climate forecasts.

1.2.7.5 Polar waters are sensitive to harmful substances and other environmental impacts, and once a pollution event occurs, the restoration time of the water environment is longer. Polar ship is to be constructed, operated and controlled to maintain zero emission.

Section3 RULES AND REGULATIONS

1.3.1 General

1.3.1.1 The polar waters are characterized by a sensitive environment. Based on the goal of sustainable safety of navigation and environmental protection for polar waters, it is required in the relevant conventions, codes and rules that polar ship and its equipment are to be designed and provided to have sufficient operational capabilities in polar waters so as to withstand anticipated environmental risks which include:

(1) Hull structure and propulsion system being in compliance with the proper ice class requirements;

(2) Propulsive power and machinery equipment having shifting capability in waters covered by ice;

(3) Equipment onboard ship having the capabilities to withstand low air temperature and icing condition;

(4) Communication and navigational equipment being fit for intended voyage at high latitude;

(5) Emergency equipment and system having the emergency response capabilities in remote areas.

1.3.1.2 The vessel should not be operated outside the worst intended conditions and design limitations, measures that could be taken to this end include:

(1) Operational assessment of vessels and equipment is to be undertaken;

(2) Specialized manual related to polar water operations is to be provided;

(3) Voyage planning of polar waters is to be carried out and a scheme is to be developed;

(4) Ship training is to be conducted, and crew with proper operational qualification in polar waters is to be manned onboard.

1.3.1.3 The main challenges for fishing vessels navigating in polar waters are ice and low temperature. The exact ice load resulting from impacts are difficult to determine for every vessel in all conditions due to the varied ice conditions. Hence, many rules are based on service experience and damage statistics.

1.3.1.4 The design and operation of polar fishing vessels should take into account relevant international conventions, codes, regulations of the Administration of the flag State and relevant shipping industry standards. At the same time, attention should be paid to the requirements of international organizations related to resource conservation.

1.3.2 International conventions, codes, guidelines

1.3.2.1 The main international conventions, codes and guidelines to be considered in the design and operation of polar fishing vessels are as follows:

(1) International Convention for the Prevention of Pollution from Ships (MARPOL Convention)

(2) Consolidated Text Of The Regulations Annexed To The Torremolinos Protocol Of 1993 Relating To The Torremolinos International Convention For The Safety Of Fishing Vessels, 1977, As Modified By The Cape Town Agreement Of 2012 (Cape Town Agreement)

(3) Guidelines For Safety Measures For Fishing Vessels Of 24 M In Length And Over Operating In Polar Waters

(4) Conservation of Antarctic Marine Living Resources(CCAMLR Convention)

(5) International Code For Ships Operating In Polar Waters (Polar Code) II-A Pollution Prevention Measures

1.3.2.2 Polar fishing vessels shall meet the requirements of the MARPOL Convention.

1.3.2.3 Cape Town Agreement：

(1) The International Maritime Organization (IMO) adopted The 1977 Torremolinos International Convention on The Safety Of Fishing Vessels at its diplomatic conference in 1977 in Torremolinos, Spain. The Cape Town Agreement, its most recent version, was adopted in 2012 at the International Fishing Vessel Security Diplomacy Conference in Cape Town, South Africa;

(2) At present, the Cape Town Agreement has not yet met the conditions for entry into force and our country has not signed the Convention;

(3) Cape Town Agreement applies to ocean-going fishing vessels of 24 m in length and over, except for those operating in the exclusive economic zone or common fishing zone of the State and those operating in the exclusive economic zone of another State;

(4) Cape Town Agreement provides the requirements of survey and certification, construction, watertight integrity and equipment, stability and seaworthiness, machinery installations, fire-protection, life-saving appliances, navigation safety, communication and emergency procedures, musters and drills for fishing vessels so as to supplement the system of IMO Convention.

1.3.2.4 Guidelines For Safety Measures For Fishing Vessels Of 24 M In Length And Over Operating In Polar Waters:

(1) International Maritime Organization (IMO) Maritime Safety Committee, at its 103rd session (5 to 14 May 2021), approved the Guidelines for safety measures for fishing vessels of 24 m in length and over operating in polar waters (MSC.1/Circ.1641). These Guidelines are designed to align with the Cape Town Agreement of 2012, the entry into force of which is pending. These Guidelines are recommendatory and are intended to provide guidance to fishing vessels of 24 m in length and over operating in polar waters;

(2) *Guidelines For Safety Measures For Fishing Vessels Of 24 M In Length And Over Operating In Polar Waters* provide for the enhanced safety of fishing vessels of 24 m in length and over and persons on board by addressing risks specific to their operation in polar waters, including navigation, communications, life-saving, main and auxiliary machinery, environmental protection and damage control, beyond those normally encountered, supplement the system of International Code For Ships Operating In Polar Waters;

(3) *Guidelines For Safety Measures For Fishing Vessels Of 24 M In Length And Over Operating In Polar Waters* also emphasizes safe operation in polar specific environmental conditions, including crewing arrangements, training operational assessment and operational procedures in emergency to ensure that fishing vessel systems are capable of functioning effectively under anticipated operating conditions and to provide adequate levels of safety in accident and emergency situations.

1.3.2.5 CCAMLR Convention:

(1) The CCAMLR Convention is based on the Antarctic Treaty framework and entered into force on 7 April 1982, established the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). China acceded to the CCAMLR Convention on 19 October 2006, which entered into force for China on 18 November 2006, and became a member of CCAMLR on 12 October 2007;

(2) The main purpose of the CCAMLR is to conserve Antarctic Marine living resources, the living resources under its jurisdiction are “fish, mollusks, crustaceans and all other species, including birds, south of the Antarctic convergence zone”. As a key species to maintain the Antarctic ecosystem, krill is the main conservation target of CCAMLR Convention;

(3) The CCAMLR Convention sets out regulations for fishing vessels based on the goal of conserving ecosystems CCAMLR. It mainly covers fishery access measures and fishery activity control, including assessing whether the fishing gear adopted by fishing vessels conforms to the objectives of resource conservation, whether the equipment of fishing vessels conforms to the safety and environmental protection requirements of the region, and whether the vessel position monitoring system (VMS) is equipped and the vessel position information is reported at any time. And whether there are IUU fishing problems in onboard observer, boarding inspection and port state inspection.

1.3.3 Requirement of the Administration

1.3.3.1 The fishing vessel with Chinese flag shall meet the Technical Regulations for Statutory Surveys of Ocean fishing vessel issued by Maritime Administration of the People's Republic of China.

1.3.3.2 Technical Regulations for Statutory Surveys of Ocean fishing vessel shall apply to ocean-going vessels of 24m in length and over, which are registered or to be registered in the People's Republic of China. It mainly provides the relevant provision for general provisions, survey and certification, load line, tonnage measurement, ship construction, ship stability (integrity stability and damage stability), machinery and electrical installations, fire protection, life-saving appliances, navigation equipment, radio communication, crew cabin

equipment, structures and equipment to prevent pollution caused by fishing vessels and lifting appliances, etc.

1.3.4 Rules of classification society

1.3.4.1 Rules for ship type

(1) ISC *Rules for Construction of Ocean-going Steel Fishing Vessels* (hereinafter referred to as "rules of fishing vessels") applies to steel ocean-going fishing vessels of 24m in length and over. It covers requirements for construction, machinery equipment, electrical equipment, refrigerated systems, lifting appliances and alarm, monitoring and control systems of ocean-going fishing vessels;

(2) For steel ocean-going vessels of 90m in length[1] and over, the hull structure and ice reinforcement requirements shall be in accordance with the requirements of Chapter 1, Chapter 2, Chapter 3 and Chapter 4 of ISC *Rules for Classification of Sea-going Steel Ships* (hereinafter referred to as "rules of steel ships");

(3) Fishing vessels intended to apply for ISC classification is to be assigned notation Fishing Vessels after meeting the relevant requirements of ship type.

1.3.4.2 Rules for ice class

(1) Based on the risks of sea ice conditions to the navigation operations for polar fishing vessels, the design of polar fishing vessels should take into account the requirements for strengthening of hull structure and machinery installations for navigation in ice in Part 2 Chapter 4 and Part 3 Chapter 14 of rules of steel ships, to ensure that the design of polar fishing vessels is suitable for the environment of polar waters;

(2) Except for ice class B, ISC ice class rules are directly incorporated into Finnish-Swedish Ice Class Rules (FISCR), which are applicable to ships operating in first-year ice waters. The appropriate ice notation in Table 1.3.4.2 is to be assigned for fishing vessels after in accordance with the above requirements are met;

(3) The correlation of ISC ice class and FSICR ice class is given in Table 1.3.4.2:

The correlation of ISC ice class and FSICR ice class **Table1.3.4.2**

ISC	FSICR
B1*	IA Super
B1	IA
B2	IB
B3	IC
B	—

Note：B1* is the highest class.

(4) It is the responsibility of shipowner to select the most suitable ice class for polar fishing vessels. Generally, it can be determined according to the environmental conditions of the expected operating sea area and the requirements of the relevant management organization.

1.3.4.3 Special features requirements of fishing vessels for polar operations:

[1] Length of vessel means the length as defined in Section 1, Chapter 1, Part1 of Rules for Construction of Ocean-going Steel Fishing Vessels.

(1) Based on environmental factors such as low air temperature in polar waters, which pose risks to the navigation operations of polar fishing vessels, polar fishing vessels should be designed with equipment which are suitable for the intended environment and necessary winterization to ensure that polar fishing vessels meet the functional requirements of polar operations;

(2) The special features that should be considered for fishing vessel polar operations should be based on the design service temperature (DST). It is the responsibility of shipowner to determine the design service temperature of a polar fishing vessel based on the temperature of the expected operating area;

(3) The provisions in Chapter 3-6 of this Guidelines is based on the functional requirements of *Guidelines For Safety Measures For Fishing Vessels Of 24 M In Length And Over Operating In Polar Waters*, covering the performance of polar fishing vessels that should be achieved at design service temperature (DST) and winterization measures that should be taken. The special features notation for polar operations（Polar-SP(DST) is to be assigned for fishing vessels after the above requirements are met.

1.3.5 Other conventions, codes, guidelines

1.3.5.1 Other relevant standards that should be considered for the design and operation of polar fishing vessels are listed below:

(1) IMO MEPC.264(68) —International Code For Ships Operating In Polar Waters

(2) International Labour Organization(ILO)Work in Fishing Convention, 2007(C188)

(3) KRILL LICENSING of South Georgia & the South Sandwich Islands

(4) Resolution MSC.191(79)—Performance Standards for the Presentation of NavigationRelated Information on Shipborne Navigational Displays

(5) MSC/Circ.504—Guidance of Design and Construction of Sea Inlets under Slush Ice Conditions

(6) Resolution MEPC.207(62)—2011 Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species

(7) Relevant international and national standards and ship industry standards

1.3.5.2 Additional information for reference can be found in Appendix 1 of this Guidelines.

CHAPTER2 SURVEY AND CERTIFICATION

Section1 GENERAL PROVISIONS

2.1.1 General

2.1.1.1 Polar fishing vessels shall complete statutory surveys as required by the Administration of the flag State. The fishing vessel with Chinese flag shall conduct statutory surveys in accordance with Technical Regulations for Statutory Surveys of Ocean fishing vessel issued by Maritime Administration of the People's Republic of China, the International Fishing Vessel Safety Certificate and relevant environmental protection certificates shall be issued after confirming that they meet the statutory requirements of the flag State.

2.1.1.2 Polar fishing vessels intend to apply for ISC classification shall conduct relevant surveys in accordance with the requirements of ISC classification provisions, and a Classification certificate shall be issued after confirming that they meet the requirements of ISC rules and standards.

2.1.2 Application

2.1.2.1 This chapter applies to the plan approval and survey of ice class and special features notation for polar operations of polar fishing vessels.

2.1.2.2 The correspondence between the notation survey items and the functional requirements of *Guidelines For Safety Measures For Fishing Vessels Of 24 M In Length And Over Operating In Polar Waters* is shown in Table 2.1.2.2

2.1.3 Assignment of notation

2.1.3.1 Polar fishing vessels may choose one of the ice class in Table 1.3.4.2 according to the conditions of the waters in which they intend to operate. An appropriate ice class notation is to be assigned after plan approval and survey, confirming that they meet the requirements of ice strengthening Chapter 4 of Part 2 and Chapter 14 of Part 3 of rules of steel ships.

2.1.3.2 An special features notation for polar operations(Ploar-SP(DST)) to be assigned for polar fishing vessels after plan approval and survey in accordance with the Design Service Temperature, confirming that they meet the requirements of Chapter 3-6 of this Guideline.

2.1.3.3 Examples of characters of classfication and class notations for polar fishing vessels are as follows:
★CSA Fishing Vessel；B2；Polar-SP(-30 ºC)；CRS

List of notation survey items for polar fishing vessel **Table2.1.2.2**

No	survey items	function requirements of Guidelines For Safety Measures For Fishing Vessels Of 24 M In Length And Over Operating In Polar Waters	Guidelines For Safety Measures of Polar Fishing Vessels	Survey after Construction			Remark
				AS	IS	SS/RS	
1	Scantlings of ice strengthened	2.1	Plans of midship section, shell expansion and other relevant plans indicated with ice class and ice belt area, and marked with scantlings; review compliance with Rules. Confirm compliance of fitting on board				The survey items of ice notation
2	Materials of exposed structures of hull	2.2	All relevant plans and documents of hull structure marked with DST or PST and steel grades; Confirm compliance with Rules				The survey items of ice notation and special features notation for polar operations
3	Means shall be provided to remove or prevent ice and snow accretion around hatches and doors	2.3.2	Plans and documents marked with the ice-accretion proof measures and de-icing measures taken together with their positions; Confirm fitting and/or provision on board	X	X	X	
4	If the hatches or doors are hydraulically operated, means shall be provided to prevent freezing	2.3.3	Plans of relevant hatches, doors and hydraulic system and the purchasing order list marked with DST or PST and anti-freezing measures taken; marked with pour-point temperature of low-temperature hydraulic oil if used; Confirm fitting on board	X	X	X	
5	Watertight and weathertight doors, hatches and closing devices shall be designed to be operated by personnel wearing heavy winter clothing including thick mittens	2.3.4	Plans of watertight and weathertight doors, hatches and closing devices marked with DST or PST;confirm effectiveness of design function in product inspection; product certificate marked with DST or PST; Confirm fitting on board	X	X	X	
6	Icing allowance shall be made in the intact stability	3.1	Stability information contains the required calculation of icing allowance, or else operation is limited to area and season of 0℃ and above				
7	Information on the icing allowance to be given in the stability information or supplementary manual (If carried)	3.2.1	Examine stability information or supplementary manual containing icing allowance				
8	Ice accretion shall be monitored	3.2.2	Examine ice accretion monitoring procedures and measures on board				
9	Stability calculation of each loading condition	3.2.3	Examine stability calculation information meet the requirement of IS Code				

No	survey items	function requirements of Guidelines For Safety Measures For Fishing Vessels Of 24 M In Length And Over Operating In Polar Waters	Guidelines For Safety Measures of Polar Fishing Vessels	Survey after Construction			Remark
				AS	IS	SS/RS	
10	Machinery installations and associated equipment and system shall be protected against the effect of ice accretion and/or snow accumulation, ice ingestion from sea water, freezing and increased viscosity of liquids, seawater intake temperature and snow ingestion	4.1.1	Examine plans, documents and lists of equipment marked with protective measures, marked with DST or PST. if meeting the need of operation in low air temperature is considered. confirm there are installed in a sheltered position on board or have appropriate protective measures	X	X	X	
11	Exposed machinery and electrical installation and appliances shall function at the polar service temperature	4.1.2	Plans of main and auxiliary machinery,exposed or low temperature space machinery, piping and electrical installation and appliances, the purchasing order lists of components and the documents, such as product inspection/audit certificates marked with DST or PST; Confirm fitting on board	X	X	X	
12	Means shall be provided to ensure that combustion air for internal combustion engines driving essential machinery is maintained at a temperature in compliance with the criteria provided by the engine manufacturer	4.1.2.1	Examine the plans, instructions and certificates relevant to internal combustion engines marked with DST or PST; and include means of maintaining combustion air at a temperature for preheating of internal combustion engines	X	X	X	
13	Materials of exposed machinery	4.1.3 4.3.2.2	Plans and documents of exposed machinery and foundations marked with DST or PST and the used steel grade; Confirm compliance with the requirements of Rules				The survey items of ice notation and special features notation for polar operations
14	Scantlings of propeller blades, propulsion line, steering equipment and other appendages of ice strengthening vessles	4.1.4	Plans of propeller blades, propulsion line, steering equipment and other appendages marked with ice class and the scantlings of relevant components; examine compliance with Rules; Confirm compliance of safety on board				The survey items of ice notation
15	Auxiliary machinery systems	4.3.1	Examine the plans of auxiliary machinery systems to confirm installation in sheltered space. confirm there are installed in a sheltered position or other measures to protect personnel exposure to cold temperatures and other environmental hazards; Confirm fitting on board	X	X	X	
16	Essential equipment or systems required for	4.3.2.1	Examine the plans related with equipment or system, confirm				

No	survey items	function requirements of Guidelines For Safety Measures For Fishing Vessels Of 24 M In Length And Over Operating In Polar Waters	Guidelines For Safety Measures of Polar Fishing Vessels	Survey after Construction			Remark
				AS	IS	SS/RS	
	safe operation shall provided with an independent source of heat		designs, and an appropriate independent heat sources installed on board				
17	Exposed components of the fire-fighting system and appliances shall be protected from ice accretion and snow accumulation	5.1.2	Examine plans of arrangement of fire-fighting system and appliances marked with measures of preventing ice accretion and snow accumulation, Confirm fitting on board	X	X	X	
18	Local equipment and machinery controls should be arranged so as to avoid freezing, snow accumulation and ice accretion and to remain accessible at all times	5.1.3	Examine plans of arrangement of fire-fighting system and appliances marked with the ice accretion and snow accumulation measures, confirm fitting on board, and it is readily available, Confirm fitting on board	X	X	X	
19	Fire extinguishing agents are to be rated for operation at the design service temperature	5.1.6	Confirm the purchasing order lists of fire extinguishing agents and product inspection/audit certificates marked with DST or PST, or certificate of experience in similar low temperature environment carried on board; Confirm fitting on board	X	X	X	
20	Closing apparatus for ventilation inlets and outlets should be positioned to protect from ice or snow accumulation	5.2	Examine plans of arrangement of fire-fighting system and appliances to confirm taken the measures of preventing ice accretion and snow accumulation; Examine fitting on board	X	X	X	
21	Water or foam extinguishers should not be located in any position that is exposed to freezing temperatures	5.3.2	Examine plans of arrangement of fire-fighting system to confirm that the locations of the water or foam extinguishers meet the requirement; Confirm fitting on board	X	X	X	
22	Measures of anti-freezing, anti-clogging for main fire pumps sea chests	5.4.1	Examine relevant plan and documents marked with prevention of ice ingestion at water intakes and insulation measure; Confirm fitting on board	X	X	X	
23	Fire pumps, including emergency fire pumps, water mist and water spray pumps should, be installed in heated compartment(s) and protected from freezing	5.4.2	Examine relevant plans of fire-fighting system marked with the arrangement of fire pumps, including emergency fire pumps, water mist and water spray pumps, and confirm the conformity; Confirm the environmental conditions and relevant controls on board where such equipment is installed	X	X	X	
24	The isolating valves in exposed locations are to be located in areas where it is easily accessible and provided with anti-icing protection	5.4.3	Examine relevant plans of fire-fighting system marked with the isolating valves located in easily accessible shelter areas, or other measures of preventing ice accretion and snow accumulation; Reviewed and confirmed fitting on board	X	X	X	
25	Fire main is to be arranged so that exposed sections can be isolated and means of draining of exposed sections shall be provided	5.4.3	Confirm by plan approval the compliance of fire main isolated and means of draining; Confirm by survey on board the compliance of fitting	X	X	X	

No	survey items	function requirements of Guidelines For Safety Measures For Fishing Vessels Of 24 M In Length And Over Operating In Polar Waters	Guidelines For Safety Measures of Polar Fishing Vessels	Survey after Construction			Remark
				AS	IS	SS/RS	
26	Hydrants should be positioned or designed to remain operable under all anticipated temperatures. Ice accumulation and freezing should be taken into account	5.4.4	Confirm arrangement of hydrantsby, fire hoses and nozzles, and their Anti-freezing protection measures; Confirm by survey on board the compliance of fitting	X	X	X	
27	Hydrants should be equipped with an efficient two-handed valve handle	5.4.5	Examine the plan to confirm the equipment with hydrant valve handle. Confirm by survey on board the compliance of fitting	X	X	X	
28	Portable and semi-portable extinguishers shall be located in positions protected from freezing temperatures, as far as practical. Locations subject to freezing are to be provided with extinguishers capable of operation under the polar service temperature	5.4.6	Relevant product inspection/audit certificates marked with PST or DST; or certificate of experience in similar low temperature environment. Confirm anti-freezing measures fitting on board	X	X	X	
29	Sufficient firefighter's outfits shall be stored in warm locations on the ship	5.5	Confirm by survey onboard the compliance of fitting position	X	X	X	
30	Anti-icing and de-icing measures of emergency routes, exposed decks, gangways, ramps, overhead structures, and handrails, railings, exits on escape routes and etc.	6.1.1 6.5.1 6.5.2	Examine the plan and documents of anti-icing and de-icing measures, and confirm fitting on board	X	X	X	
31	The bulwarks or guard rails are to be fitted on all exposed parts of the working deck and on superstructure decks if they are working platforms should be designed so as to provide adequate protection of persons	6.2	Examine relevant plan and documents to certify installation of bulwarks or guard rails, to verify the size meeting the rules, and to confirm fitting on board				
32	To assess the impact of the size of escape routes such as stairways and ladders on personnel wearing polar clothing	6.3 6.5.2	Examine plan and documents related to the arrangement of escape routes to reflect consideration of the impact of personnel wearing polar clothing; Confirm the arrangement of the vessel				
33	The arrangement of accommodation	6.4	Examine plan and documents related to the accommodation to confirm that it is located in the sheltered space. The relevant documents show that there is heating equipment in the room. Confirm arrangement and equipment on board				
34	Escape routes of accommodation and working spaces shall be taken anti-icing and de-icing measure	6.5.1	Examine the plan and documents related to the accommodation to indicate that there are de-icing and anti-icing measures in the internal passageway; Confirm the arrangement and installation on board	X	X	X	

No	survey items	function requirements of Guidelines For Safety Measures For Fishing Vessels Of 24 M In Length And Over Operating In Polar Waters	Guidelines For Safety Measures of Polar Fishing Vessels	Survey after Construction			Remark
				AS	IS	SS/RS	
35	Survival craft should have sufficient space to accommodate persons equipped with polar clothing suitable for the environment	7.1.6 7.3.2	Examine the plan and documents related to survival craft to reflect consideration of the impact of personnel wearing polar clothing; Confirm compliance of equipment	X	X	X	
36	Survival craft should carry adequate emergency rations	7.1.8	Examine plans and documents of life-saving appliances indicated with maximum expected rescue time, and confirm the compliance of the amount of emergency ration.	X	X	X	
37	Insulated immersion suits should be carried	7.1.9	Plans and documents of life-saving appliances indicated with applying insulated type immersion suits which have type approval certificates	X	X	X	
38	Adequacy of embarkation arrangements shall be assessed, having full regard to any effect of persons wearing additional polar clothing	7.2.1	Consider any effect of persons wearing additional polar clothing in the plans of areas of embarkation arrangements; Confirm embarkation arrangements on board				
39	A source of power for survival equipment should be able to operate independently of the vessel's main source of power	7.2.3	Examine plans and documents of arrangement of survival equipment indicated with the arrangement of adding devices requiring a source of power; confirm fitting on board	X	X	X	
40	Lifeboat of partially or totally enclosed type shall be provided	7.3.1	Examine plans and documents of life-saving appliances indicated with lifeboat of partially or totally enclosed type; confirm provision on board	X	X	X	
41	Any ice accretion should be regularly removed from the lifeboats, liferafts, launch area and launching equipment. An icing removal mallet should be available in the vicinity of the survival craft	7.3.3 7.4.1	Examine arrangement plans and documents of life-saving appliances indicated with de-icing measures of survival craft, launch area and launching equipment, and confirmed an icing removal mallet equipped with near survival craft; Confirm equipment on board	X	X	X	
42	Cooling water, fuel and lubricating oils for engines of lifeboats and rescue boats are to be suitable for engine function and operation at the design service temperature	7.3.4 7.3.5	Product inspection to confirm the effectiveness of design function, product certificate indicating DST or PST; Confirm fitting on board	X	X	X	
43	Searchlights should be provided for each lifeboat	7.3.6	Examine arrangement plans of life-saving appliances indicated that searchlights should be provided for each lifeboat(for vessels intended to operate in extended periods of darkness), and confirmed equipment on board	X	X	X	
44	Means to mitigate the freezing of drinking water supplies	7.3.7	Examine arrangement plans of life-saving appliances for the anti-freezing methods in drinking water storage locations and confirmed equipment on board	X	X	X	

No	survey items	function requirements of Guidelines For Safety Measures For Fishing Vessels Of 24 M In Length And Over Operating In Polar Waters	Guidelines For Safety Measures of Polar Fishing Vessels	Survey after Construction			Remark
				AS	IS	SS/RS	
45	Manual inflation pumps that are proven to be effective in PST should be carried in a warm space in the vicinity of the liferafts	7.4.2	Examine arrangement plans of life-saving appliances for the provision and arrangement of manual inflation pumps and confirmed equipment on board	X	X	X	
46	Survival resources which address both individual and shared needs shall be provided	7.5	Examine plans and documents of life-saving appliances indicated with maximum expected rescue time, lists of provision of personal survival equipment and group survival equipment; confirm provision of approved personal survival equipment and group survival equipment, and compliance of storage	X	X	X	
47	The capabilities for ship-to-ship and ship-to-shore communication	9.1.1	Examine plans and documents of communication equipment marked with DST or PST and the application scope of latitude; confirm compliance of fitting on board	X	X	X	
48	Two-way portable radio communication equipment shall be operable at the polar service temperature	9.1.2	Confirm the equipped two-way portable radio communication equipment having type approval certificates onboard marked with DST or PST, or similar documents of usage experience in low air temperature	X	X	X	
49	Communications with rescue coordination centres	9.1.3	Examine the list of provision of communication equipment, assess appropriateness of the expected operation; confirm compliance of fitting on board	X	X	X	
50	Communications with aircraft on 121.5 and 123.1 MHz	9.1.3		X	X	X	
51	Communication with a Telemedical Assistance Service	9.1.4		X	X	X	
52	Rescue boats and lifeboats communications (1 device for transmitting ship to shore alerts, 1 one device for transmitting signals for location, 1 device for transmitting and receiving on-scene communications)	9.2.1	Examine plans and documents of life saving appliance marked with DST or PST and the lists of provision of communication equipment; confirm provision on board	X	X	X	
53	Other survival craft (1 one device for transmitting signals for location, 1 device for transmitting and receiving on-scene communications)	9.2.2	Examine plans and documents of life saving appliance marked with DST or PST and the lists of provision of communication equipment; confirmprovision on board	X	X	X	
54	Ships shall have means of receiving and displaying current information on ice conditions	10.1.2	Examine plans and documents of navigational equipment marked with functions of receiving and displaying information on ice conditions and confirm fitting on board	X	X	X	

No	survey items	function requirements of Guidelines For Safety Measures For Fishing Vessels Of 24 M In Length And Over Operating In Polar Waters	Guidelines For Safety Measures of Polar Fishing Vessels	Survey after Construction			Remark
				AS	IS	SS/RS	
55	Means to prevent the accumulation of ice on antennas required for sensors, navigation and communication shall be provided	10.1.3	Examine means to prevent the accumulation of ice on antennas in plans and documents of navigation and communication; confirm fitting on board	X	X	X	
56	Two non-magnetic means to determine and display their heading. Both means shall be independent and shall be connected to the ship's main and emergency source of power	10.2.1	Examine plans and documents of navigational equipment, confirm compliance of fitting on board	X	X	X	
57	At least one appropriate speed and distance measuring system	10.2.2		X	X	X	
58	Two independent echo-sounding devices	10.2.3		X	X	X	
59	Two functionally independent radar systems	10.2.4 10.2.5 10.2.6		X	X	X	
60	A Global Navigation Satellite System (GNSS)	10.2.7		X	X	X	
61	Automatic identification system (AIS)	10.2.8		X	X	X	
62	Separate rudder angle indicators should be provided for each rudder	10.2.9		X	X	X	
63	The searchlights should be installed to provide all-round illumination and should be fitted with an adequate means of de-icing to ensure proper directional movement	10.2.10 10.2.11		X	X	X	
64	Sensors that project below the hull shall be protected against ice	10.2.3	For sensors that project below the hull, examine means of protection against ice in the plans of arrangement and assess their appropriateness, confirm fitting on board	X	X	X	
65	Helm position windows should be fitted with means of clearing ice and mist, and the operating mechanisms should be protected	10.2.12 10.3.1	Examine relevant plans and documents confirmed protective measures and compliance of fitting on board	X	X	X	
66	All persons engaged in navigating the vessel should be provided with adequate protection from direct and reflected glare from the sun	10.3.2		X	X	X	
67	Anchoring systems should be provided with an independent means of securing the anchor	11.1.2	Examine relevant plans and documents of anchoring and towing arrangements, confirm compliance of fitting on board	X	X	X	
68	Equip with line-throwing apparatus, a quick-	11.1.4		X	X	X	

No	survey items	function requirements of Guidelines For Safety Measures For Fishing Vessels Of 24 M In Length And Over Operating In Polar Waters	Guidelines For Safety Measures of Polar Fishing Vessels	Survey after Construction			Remark
				AS	IS	SS/RS	
	release system, close-coupled device, receiving appliance that are used for towing operations	11.1.5 11.1.6 11.1.7 11.1.8					
69	Equip with an adequate number of first aid kits and equipment	11.3.1 11.3.2	Examine relevant plans and documents, confirm compliance of fitting on board	X	X	X	
70	Reserve supply of fuel and lubricants	11.3.4		X	X	X	
71	Carry spare parts and equipment in remote areas	11.3.5		X	X	X	
72	Carry portable gas welding and cutting equipment and portable electro-submersible pump	11.3.6		X	X	X	
73	Fishing vessels not required to have a safety management system should carry on board a supplementary operating manual	1.5.1 1.6	For fishing vessel required to be equipped with the manual, confirm the manual available on board and the information contained in the manual applicable to the operating features of the ship	X	X	X	
74	Arrangements for crewing should take account of anticipated ice conditions and requirements for ice navigation	11.4	Examine Polar Waters Supplementary Operating Manual including the procedure for crew provision and management				
75	All persons on board should be made familiar with the relevant procedures and equipment in the Polar Waters Supplementary Operating Manual, should one be carried	11.5.5					
76	Voyage planning for polar water	11.6	Examine operating manual includes all informations necessary for voyage planning if a supplementary operating manual is provided, otherwise confirm the management regulations on board include this content	X	X	X	
77	Fishing vessels should consider carrying a training manual covering relevant aspects of operations in polar waters	Chapter 8 11.5.6	Confirm the training manual available on board, and examine the manual including emergency procedures and drill, as well as other necessary crew training information	X	X	X	
78	The vessel's skipper, deck and engine officers and officers in charge of a navigational should have appropriate training and experience in operations in ice-covered waters	11.5.1 11.5.2 11.5.3 11.5.4	Examine training manual contains training informations and arrangements for the crews operating in polar waters				

Note:① AS —— Annual survey； IS —— Intermediate survey； SS —— Special survey； RS —— Renewal survey.

② If the remarks column in the table is not specifically specified, it is an survey items of ice notation and special features notation for polar operations.

Section2 PROCEDURE FOR SURVEY AND CERTIFICATION

2.2.1 General provisions

2.2.2.1 The owner and/or designer are(is) to determine the design features based on the purpose, expected operating area and environmental condition, operating mode and other operating conditions of a polar fishing vessels, including the following:

(1) selection of ice class;

(2) determination of PST;

(3) highest latitude for operation;

(4) maximum expected rescue time.

2.2.2.2 The design features of a polar fishing vessel is to be clarified in the application or the contract of plan approval and/or survey, to determine the basis of the vessel's plan approval and survey.

2.2.2.3 Any strengthening and winterization taken by polar fishing vessels based on environmental conditions in polar waters do not conflict with statutory requirements, and have adverse effects on vessel and equipment systems, including weaken function and not easy to operate normally.

2.2.3 Submission of plans and documents

2.2.3.1 Polar fishing vessel applying for ice class notation is to submit the following plans and documents for approval:

(1) plans of structure indicating the materials and scantling used at the exposed structure in ships;

(2) plans of the attachment to the hull and scantlings;

(3) plans and documents of main propulsion machinery, including the operational limitations of main propulsion, steering gear, emergency and important auxiliary machineries, and the documents of load-control functions of the important main propulsion;

2.2.3.2 Polar fishing vessel applying for special features notation for polar operations is to submit the following plans and documents for approval:

(1) lists of provision and relevant plans of arrangement of life saving, fire fighting, survival (where applicable), navigational and communication equipment;

(2) General arrangement highlighting anti-cold climate features and design service temperatures;

(3) List of anti-cold climate equipment and systems;

(4) Details of main/auxiliary engines arrangements (including heating arrangement);

(5) Details of materials specification/heating arrangements for exposed pipes/components;

(6) Details of materials specification/heating arrangements for exposed cabling/components;

(7) Details of anchoring lifting appliance anti-cold arrangements;

(8) Details of anti-cold climate for fire-fighting appliances;

(9) Details of anti-cold climate for life-saving appliances;

(10) Details of heating arrangements for cabins;

(11) Details of cabin and escape route arrangements;

(12) Details of anti-freezing arrangements for tanks;

(13) Inventory and locations of de-icing measures;

(14) Calculations of ice accretion stability;

(15) Anti-cold climate arrangements for crew's working passageways;

(16) Piping diagram of steam or heating fluids, if provided;

(17) Evidence of the performance of eposed equipment and system to operate under expected environmental conditions.

2.2.3.3 Polar fishing vessel applying for special features notation for polar operations is to submit the following plans and documents for information:

(1) anti-cold climate design instructions;

(2) anti-cold climate operational and maintenance procedures, for example:

① continuous circulation of fluids and/or heating media;

② use of heating arrangements in low air temperature environments;

③ application of lubricants in exposed and low temperature spaces;

④ applicable locations and application procedures of antifreeze;

⑤ use of oil fuel for emergency generators and lifeboat/rescue boat engines in low air temperature environments;

⑥ applicable antifreeze and cleaning solutions for bridge windows;

⑦ draining and/or drying of pipelines prone to freezing;

⑧ characteristics and application procedures of de-icing tools.

2.2.4 Plan approval and assessment

2.2.4.1 For ice class notation, the material and strength of the ship structure and equipment and propulsion machinery are to be checked according to the plans and documents submitted in 2.2.3.1 of this chapter, to ensure that they are compliance with the applicable requirements for the ice class of the Rules.

2.2.4.2 For special features notation for polar operations, the design evaluation of the vessel shall be carried out according to the plans and documents submitted in 2.2.3.2 and 2.2.3.3 of this chapter, and it shall be confirmed that winterization design of the vessel meets the functional requirements of Chapter 3 ～ 6 of this Guideline, such as:

(1) the safety equipment of the life saving, fire fighting, survival (where applicable), navigational and communication is to be examined, for ensuring compliance with the requirements for environmental conditions within polar water, taking into consideration the requirements of the Administration of the flag State and/or the Administration which has jurisdiction over the ship's expected operational areas;

(2) the contents of the winterization design are to be explicit, ensuring compliance with the functional

requirements of operation in polar waters and to the satisfaction of plan approval surveyors;

(3) verify that the winterization do not conflict with the statutory requirements, and pay attentions to the requirements of the national regulations;

(4) verify that DST of the equipment, systems, and components exposed to low temperatures is to be specified， and the temperature is to be included in all the relevant lists of order and the plans.

2.2.5 Survey during construction

2.2.5.1 The survey during construction of ice notation and special features notation for polar operations are to cover the applicable items and requirements listed in Table 2.1.2.2.

2.2.5.2 For the survey of special features notation for polar operations:

(1) verify that the exposed equipment and system have the evidences of the performance at PST, including Marine Product Certificate issued by the Society, or Manufacturer's document, or the document of use experience at similar environmental temperature etc.

(2) the structure, equipment, system and outfitting are to be fitted or tested in accordance with the agreed plan to the satisfaction of the surveyor. Such fitting and test are to verify activation and operation of the system, equipment and outfitting, however, it is not necessary to confirm the performance at PST.

2.2.6 Periodical/annual survey

2.2.6.1 Periodical/annual survey for ice class and special features notation for polar operations is to be carried out in conjunction with the periodical/annual survey for maintaining validity of statutory certificates.

2.2.6.2 The scope of periodical/annual survey is to cover the applicable items and requirements listed in Table 2.1.2.2.

2.2.6.3 For polar fishing vessel to be assigned for an special features notation for polar operations, the survey of winterization is to be carried out annually. The surveyor is to confirm the arrangement and equipment in compliance with the Rules, and based on the winterization, to verify as far as possible the function of the fitted equipment and relevant system of control and alarm to the satisfaction of the surveyor.

2.2.7 Product inspection

2.2.7.1 The use conditions of the products expected to be used in the polar fishing vessel operating in low air temperature , including fitting position, applicable lowest environmental temperature, anti-cold climate measures etc. are to be clarified in the relevant plans, the document of purchase, the notification of survey or the application.

2.2.7.2 The effects of low temperature on the exposed equipment and system are to be considered in relation to the following aspects (when applicable) to verify the integrity of the function at PST.

(1) structural material and welding, including low-temperature-resistant brittle material and welding requirements;

(2) packing material, with low-temperature-resistant performance;

(3) lubrication medium, applying with the grease of low temperature performance;

(4) warm-keeping means, including heat tracing (power), covers;

(5) de-icing method, including limitations and requirements of the de-icing method;

(6) moving parts, low temperature effect;

(7) work medium, applying with the hydraulic oil of the low temperature performance;

(8) driving: hydraulic motor, electric motor, hydraulic pump etc. relating to the above measures;

(9) Control box: effect of the low temperature.

2.2.7.3 Effects of the low temperature on the overall performance and function of the lifesaving equipment and the exposed communication equipment, navigational equipment, fire fighting equipment are to be considered, and type test of the applicable items is to be carried out at the polar service temperature (PST). If the Manufacturer provides the evidence of use experience at relevant environmental temperature, the type test may be omitted.

2.2.7.4 Marine Product Certificate is to be marked with Polar Service Temperature (PST) or Design Service Temperature (DST).

2.2.8 Document of vessel

2.2.8.1 This section is not a requirement for assigned the notation.

2.2.8.2 In addition to the ship's Certificates and documents, fishing vessels should consider carrying relevant reports or manuals covering relevant aspects of operations in polar waters.

2.2.8.3 At the beginning of the design of a polar fishing vessel, operators or shipowners should first undertake operational assessment and develop a Polar fishing vessel Operational Assessment report (Appendix 2) to identify risks, establish procedures or operational limitations and ensure that the polar fishing vessel and its equipment are fit for the intended purpose.

2.2.8.4 Based on the limitations of operational assessment, for fishing vessels that are not required to have a safety management system, operators or shipowners should develop a Polar Waters Supplementary Operating Manual containing information directly related to operations in polar waters to provide decision guidance for master and crew on safe operation in polar waters.

2.2.8.5 In addition to the Polar Waters Supplementary Operating Manual, fishing vessels should should consider carrying a training manual covering relevant aspects of operations in polar waters to provide training guidance for master and crew on safe operation in polar waters.

CHAPTER3 HULL ARRANGEMENT AND EQUIPMENT

Section1 MATERIAL AND COATING

3.1.1 General provisions

3.1.1.1 One of the main consequences for vessels navigating in polar waters is the effect on hull structures and components due to ice loads and/or low air temperature. The hull structure of polar fishing vessel is to select the adequate toughness material so as to avoid brittle fracture.

3.1.1.2 Due to toughness of carbon steel reducing with the temperature drop, risk of brittle fracture is increased for the ships operating in low air temperature environments to use A class low carbon steel. A class steel is unsuitable to select for exposed structures at the temperature below −18℃.

3.1.2 Material selection

3.1.2.1 For polar fishing vessels applying for ice notation, the materials of hull structures located in ice belt zone for polar fishing vessels are to be in accordance with the relevant requirements of Section 3, Chapter 1, PART TWO for rules of steel ships.

3.1.2.2 For polar fishing vessels applying for the class notation of special features for polar operations, hull structural materials are to be in compliance with the requirements of Section 2, Chapter 23, PART EIGHT for rules of steel ships, and the steel grade is to be selected in accordance with PST or DST, grade of structural member material and plate thickness.

3.1.3 Coating

3.1.3.1 Low temperature performance coating may be applied to the external or internal surface of boundaries directly adjacent to exposed areas in low air temperature environments. Such coating is to maintain its original property in low air temperature so as to prevent the coating peeling off the protected surfaces in low air temperature.

3.1.3.2 Where the ship is intended to operate in a potential severe icing area or season for a long period, anti-ice/snow accumulation coatings are to be applied on the exposed surface, such as deck, both ends and side bulkheads of deckhouse and superstructure, rails, bulwarks and deck machinery, etc. in order to reduce the effects of ice and snow accumulation on hull structures and equipment.

3.1.4 Polyurethane foam plastics of refrigerated fish tank

3.1.4.1 The refrigerated fish tank of fishing vessel generally uses rigid polyurethane foam plastics insulation. The polyurethane insulation formed by the mixed foaming of the following two raw materials:

(1) Combination polyether (A mixture of polyether polyols and various additives)

(2) Isocyanate

Foaming agents should be selected as foaming agents that do not destroy the ozone layer and have low greenhouse effect. Alane foaming agents with low boiling point should be prohibited in site construction.

3.1.4.2 The insulants used for the refrigerated fish tanks are to be tested according to the recognized standards[1], and provided the work approval certification.

Section2 STRUCTURES AND ARRANGEMENT

3.2.1 General provisions

3.2.1.1 For the structural type and arrangement of polar fishing vessels, due consideration is to be given to its intended purposes in polar waters so as to ensure the ship effectively adapts to the operational conditions of cold climate, remoteness, sea ice, etc.

3.2.1.2 For the general arrangement of polar fishing vessel, consideration is to be given to the following:

(1) Needs to provide tank capacities and storage for spares and provisions due to the strict environmental protection requirements in polar waters and appropriate ship's endurance ability;

(2) Needs to provide appropriate measures in interior access ways and equipment operating spaces and living facilities, i.e. heating, insulation, air conditioning, extra lighting, etc. due to low air temperature operation;

(3) The ship is to have an appropriate arrangement to prevent the surfaces in ballast tanks, fresh water tanks and other relevant tanks from freezing over considering the minimum anticipated temperature;

(4) Equipment and areas that require anti-icing/anti-freezing measures are as far as possible to be situated in protected locations, such as enclosed spaces, semi-enclosed spaces or covered by curtains;

(5) Needs to arrange a clear vision in all directions for bridge.

3.2.2 Anti-freezing protection for tanks

3.2.2.1 If ballast tanks and/or fresh water tanks of polar fishing vessels are partially or all located above light weight waterline or LIWL and adjacent to shell or exposed deck, in general 10% of void capacity is to be considered so as to reduce the effects of expansion of ballast water and fresh water due to freezing.

3.2.2.2 In general, ballast tanks all located below light weight waterline or LIWL (whichever is the less) is not to be heated, however, the piping serving these tanks (including venting pipes) are to be protected against blockage due to freezing.

3.2.2.3 For the ballast tanks and fresh water tanks mentioned in 3.2.2.1, suitable anti-freezing system and temperature monitoring system are to be provided so as to prevent structural damage by negative pressure when discharging due to freezing of ballast water and fresh water in tanks, if the polar ship is operated in low air temperature for a long period. Measures are to be taken for equipment and system in tanks to prevent surface damage due to ice dropping.

3.2.2.4 Anti-freezing system mainly includes heating, circulating and air bubbling systems, etc.

[1] Such as GB 8624-2012 "Classification for burning behavior of building materials and products", GB/T 20219-2015 "Rigid cellular plastics-spray-applied polyurethane foam for thermal insulation" and other relevant standards.

(1) The most effective and commonly used is steam heating coils. The heating coils are usually to be fitted above the ballast waterline, adjacent to the ships side shell. When the heating exchange is calculated for determining the number of heating coils, the temperature of ballast water is to be maintained about 2℃. If the PST is less than -40℃, such anti-freezing system is to be provided;

(2) Sufficient drainage is to be employed on both steam lines and condensate lines to prevent freezing of lines when not employed;

(3) Circulating the ballast water is considered as an efficient alternative in a short period of time because of the natural differences in temperatures between the bottom and surface of ballast tank;

(4) Air bubbling system achieves the anti-freezing effect through continuous turbulence of the ballast water to circulate internally. However, the low temperature in tank leads to freezing in local regions within tank, the piping may be damaged by ice falling down and coating and structural members in tanks were also damaged. It also has the disadvantage of possible under-cooling of the water and the formation of ice crystals by the cold air. Ballast water containing ice crystals makes the water have a consistence like porridge which is difficult to pump. Air-bubbling system is not fit to use in climates below -40 ℃.

3.2.3 Forward region and their arrangement

3.2.3.1 Fishing vessels of the length below 150 m operating in low air temperature are to be provided with a forecastle in order to reduce the green seas and spray on main deck areas after the forward part. If it is impossible to provide, shell plating could be designed to flare so as to achieve the same effects. The forward part may also be enclosed or provided with a sheltering space to protect anchor equipment and operators. The sheltering space is generally to be designed to have a shelter in top and three directions and facing towards stern.

3.2.3.2 Vents are not to be provided in the exposed location of forward region of superstructure as practical as possible. If it is impossible, suitable protection is to be recommended, such as anti-exposure arrangement, protective shielding is provided, etc.

3.2.4 Accommodation space

3.2.5.1 The accommodation space onboard polar fishing vessel operating in low air temperature is to be designed by considering that:

(1) The heating and ventilation systems are to be designed for satisfactory distribution of heating at the minimum anticipated temperature;

(2) Supplementary electric heaters may be used in cabins and other manned spaces provided they are permanently installed. High amperage permanently installed heaters are not to be wired to the same circuit breakers as vital electronic equipment. Portable electric heaters are not permitted;

(3) The relative humidity is to be maintained in the range from 30% to 70%, and it is capable of regulating the humidity of accommodation compartments;

(4) Accommodation compartments are to be able to be heated to 18℃ at the minimum anticipated temperature, and continuously maintained;

(5) Recirculation of air in the accommodation spaces is to be in accordance with a recognized standard;

(6) Air ventilation ducting is to be insulated with non-combustible insulation;

(7) The closing apparatus for all ventilation inlets and outlets are to be provided with protective means.

3.2.4.2 Doors or passageways extending to accommodation space are to be designed to meet the passing demand by a person wearing polar suit, and heat tracing device or other anti-icing measures are to be taken.

3.2.4.3 Bathrooms and toilets are not to be located adjacent to the external exposed boundaries as practical as possible to prevent icing, otherwise, the external exposed boundaries are to be provided with insulation and heating device, and drainage tray or drainage channel is to be provided to collect condensate water.

3.2.4.4 Protective vapour layer, i.e. aluminium foil or other equivalent measures is to be taken for external insulation on bulkheads and top deck of accommodation compartments, so as to reduce damage of moisture freeze to insulation on external exposed boundaries.

3.2.4.5 Ventilation system is easily to accumulate ice, and suitable heating device may be provided or the following alternative measures could be taken:

(1) Ventilation inlets are to be arranged in a space not affected by seawater spray, i.e. leeward or recessed position of superstructure;

(2) Each ventilation inlet is provided at both port and starboard, and arranged in opposite direction to effectively withstand the adverse effects of spray ice.

3.2.4.6 The internal units within air inlet channel (such as wind damper) is to be designed to be capable of draining accumulated ice or water after ice melting and condensate water caused by temperature change to prevent rust or bacterial growth in the pipes due to accumulated water of condensate water in air inlet channel.

3.2.4.7 Exterior stairs and railings not forming the escape routes are to be provided with anti-icing or de-icing protection.

3.2.5 Anti-icing and anti-freezing arrangements

3.2.5.1 Deicing and anti-freezing measures depend on the intended operational requirements for ships. For the ships operating at a low air temperature (i.e. in the Arctic) for a long period, permanent deicing and anti-freezing measures are to be recommended to provide, but for ships occasionally operating in low air temperature, portable deicing and anti-freezing equipment may be employed.

3.2.5.2 For sheltering arrangement, hard mobile shield or canvas hood may be generally employed, or sheltering arrangement is to be provided. For the specific application onboard the ships, such as craft, winch or other exposed deck machinery are employed.

3.2.5.3 Critical areas to ship safety, including navigation, steering, propelling, anchoring, fire-protection, life-saving, etc., are recommended to be heated or provided with shield to maintain an ice-free state, with at least the necessary deicing tools. These areas are to include the followings as a minimum:

(1) gangway and stairway giving safe access to forward region, lifeboat, rescue boat, etc.;

(2) exit of escape route;

(3) lifeboat, davit, liferaft and launching area;

(4) storage facility of life-saving equipment;

(5) water supply distribution system of fire-protection system;

(6) navigational equipment (such as radar);

(7) windows of bridge room;

(8) anchoring area on deck, including windlass, chain and hawse pipe.

3.2.5.4 If electric heat tracing or steam is set, the heating cable or pipeline is to be fixed with proper intervals so as to transmit the heat to equipment and structure and prevent excessive heat stress. The related arrangement is generally to be based on heat balance calculation to ensure the effectiveness of heating measures at anticipated lowest ambient temperature. For the specific application board the ships, such as hydraulic control device for exposed deck machinery, piping easily icing, exposed accesses and stairways, etc. are employed.

3.2.5.5 For the manual deicing, special attentions are to be paid to the damage of equipment in the process of deicing. For the specific application onboard ships, such as steam blowing or pouring hot water, or swaying of sling/pillar/antenna are taken to prevent ice accumulation, and knocking off ice on shield by mallet, deicing by use of hammer/stick/scraper/similar tools, etc.

3.2.5.6 Low temperature grease protection is to be taken to prevent freezing of movable components of deck machinery, i.e. windlass, door hinge and fairlead, etc., but this may cause the components being inflexible or overloading, moisture beneath the coating is to be avoided.

3.2.5.7 Bubble generating device is to be provided, which may be supplied by dedicated compressed air device, or combined air system of which air bubbling amount has been calculated. Sufficient number of air nozzles is to be arranged in bilge and the air supply system is not to cause the pressure to exceed the design one of the tank. For the specific application board the ships, such as ballast tank, tank, etc. are employed.

Section3 RUDDER EQUIPMENT AND APPENDAGES

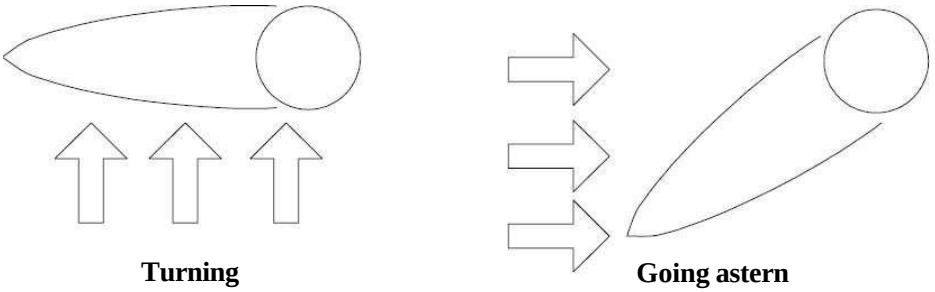
3.3.1 General provisions

3.3.1.1 Unless expressly provided otherwise, the requirements in this section apply to polar fishing vessels applying for ice notation.

3.3.1.2 Rudder equipment and outfitting of hull appendages for polar fishing vessels are to meet the relevant requirements of Chapters 4, PART TWO in Rules of steel ships, so as to ensure that the ship has sufficient strength to withstand the effects of ice load.

3.3.2 Rudder equipment

3.3.2.1 Two working modes are considered for rudder, turning for going ahead mode and direct astern mode. In the turning for going ahead situation, the ice load acts on the side and due consideration is given to ice load acting on the rudder horn. In the direct, astern mode, the ice load directly acts on the stern, and due consideration is given to ice load acting on the rudder blades.



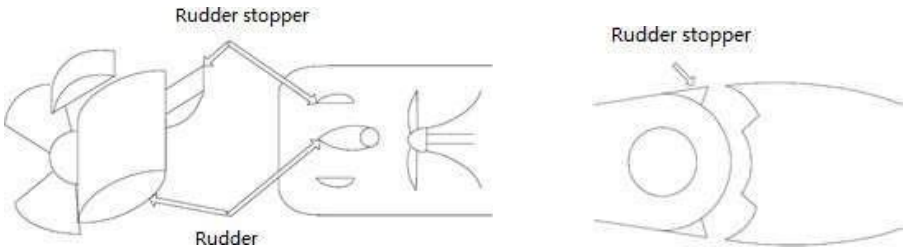
Turning **Going astern**

Figure3.3.2.2 Ice Loads Acting on Rudder Structure

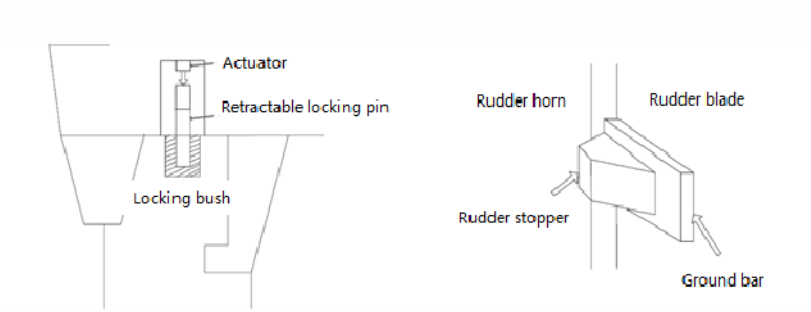
3.3.2.2 In low air temperature environments, ice may be accumulated on the exposed part of rudder to affect the connection zone between rudder stock and fixed ring or the zone between the surfaces of fixed rudder protector and rudder blade. For polar fishing vessel applying for special features notation for polar operations, the regular inspection is to be carried out to check if ice is accumulated on rudder, and deicing may be performed by rotating. The exposed sealings of rudder stock are to be designed by taking into consideration icing and low air temperature.

3.3.2.3 In order to reduce the damage on steering gears for the astern operation in ice areas, draught position of a ship is to be adjusted to make the easily damaged parts immerse in the water. When the rudder blades are deflecting from amidship due to effect of ice load, huge load will be generated in the whole rudder system. For ships with ice class, working pressure and setting value of safety valve will be higher due to greater steering gear power because of the greater service speed being selected for design calculation. In such a case, the setting values of safety valve are to be adjusted to prevent ineffective offloading when the effect of ice load exceeds the design torque of rudder stock.

3.3.2.4 For ice classes B1*and B1, the appropriate fixed device (such as rudder stopper/locking pin) is to be provided for rudder blades to ensure the blades are located in the amidship when the ship is going astern. The design torque of fixed device is to be taken as the design yield torque of the rudder stock in Chapter 3, PART TWO for Rules of steel ships, the criteria of stress is to be taken 95% yield stress of materials used. The diagram of rudder stopper and locking pin is shown in Figure 3.3.2.4.



(a) Locking pintle (b) Rudder stopper fitted to rudder blade



(c) Rudder stoppers fitted to hull structure (d) Integrated rudder stopper

Figure3.3.2.4 Diagram of Rudder Stopper and Locking Pintle

3.3.3 Appendages

3.3.3.1 The appendages of polar fishing vessels are to be strengthened according to the anticipated ice loads.

3.3.3.2 In order to reduce the damage arising from a bilge keel being partly torn off, it is preferable that the bilge keels are cut into several shorter independent lengths and of box type construction.

CHAPTER4 SHIP'S STABILITY AND WEATHERTIGHT INTEGRITY

Section1 INTACT STABILITY

4.1.1 General Provisions

4.1.1.1 In addition to the requirements of the Administration of the flag State, the intact stability of fishing vessel is to have adequate intact stability when the vessel is subject to ice accretion.

4.1.1.2 The polar water is an ice area defined by International Code on Intact Stability.

4.1.1.3 The icing condition to be considered for the intact stability calculation for fishing vessel is not to be less than the following requirements:

(1) 30 kg/m^2 on exposed weather decks and gangways;

(2) 7.5 kg/m^2 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 are to be computed by increasing the total projected area of continuous surfaces by 5% and the static moments of this area by 10%.

4.1.1.4 Information on the icing allowance included in the stability calculations is to be given in the Polar Waters Supplementary Operating Manual, if carried or stability manual.

4.1.1.5 The polar ship is to be designed to minimize the accretion of ice, and equipped with such means for removing ice, e.g. electrical and pneumatic devices, and/or special tools such as axes or wooden clubs for removing ice from bulwarks, rails and erections.

4.1.1.6 During the ship's operation in ice areas, the ice accretion is to be monitored by crew in accordance with the procedures of Polar Waters Supplementary Operating Manual, if carried or other relevant program document and appropriate measures is to be taken to ensure that the ice accretion does not exceed the values given in supplementary operating manual, if carried or stability manual.

Section2 DAMAGE STABILITY

4.2.1 General Provisions

4.2.1.1 Polar fishing vessel stability in damaged conditions shall meet the requirement of the Administration of the flag State. The fishing vessel with Chinese flag shall in accordance with Technical Regulations for Statutory Surveys of Ocean fishing vessel issued by Maritime Administration of the People's Republic of China.

Section3 WEATHERTIGHT INTEGRITY

4.3.1 General Provisions

4.3.1.1 For fishing vessels intended to operate in low air temperature, All closing appliances and doors relevant to watertight and weathertight integrity should be operable in polar conditions.

4.3.1.2 When operating in areas and during periods where ice accretion is likely to occur, means should be provided to remove or prevent ice and snow accretion around hatches and doors.

4.3.1.3 If the hatches or doors are hydraulically operated, means should be provided to prevent freezing or excessive viscosity of liquids.

4.3.1.4 Watertight and weathertight doors, hatches and closing devices which are not within a habitable environment and require access should be capable of being operated by persons wearing heavy winter clothing including thick mittens.

CHAPTER5 MACHINERY AND ELECTRICAL INSTALLATIONS

Section1 GENERAL PROVISIONS

5.1.1 General

5.1.1.1 All machinery, equipment and systems, including pipes and cabling, are to be located inside spaces as far as practicable to minimize exposure to low air temperature environments where ice and snow accretion are likely to occur.

5.1.1.2 Main and auxiliary machinery and exposed essential machinery equipment are to be capable of operating satisfactorily under the minimum anticipated temperature.

5.1.1.3 Each machinery and system on board ships are to be provided with the following appropriate protection methods to prevent effects of low temperatures and ice accretion:

(1) heating (for space and/or dedicated arrangements for equipment/systems);

(2) de-icing equipment;

(3) covers (where PVC covers or other water resistant materials are used, they are to be fixed firmly to prevent unintended removal in severe weather conditions);

(4) drainage;

(5) insulation;

(6) selection of materials;

(7) selection of lubricants, oils, hydraulics and greases, etc.

5.1.1.4 Where heating arrangements are provided, they are to be fitted with the following:

(1) means for ascertaining the temperature;

(2) for systems where heating arrangements could result in excessively high temperatures or pressures being generated, that may cause damage, malfunction or braking of equipment, there are to be arrangements provided for cutting off the heating;

(3) appropriate control arrangements;

(4) indication of the system(s) operation;

(5) where failure of a heating arrangement could result in a hazardous situation, an alarm is to be activated.

5.1.2 Materials

5.1.2.1 Deck machinery materials are to comply with the requirements for steels for machinery structures in Section 6, Chapter 3, PART 1 of ISC Rules for Materials and Welding. The materials for lifting appliances are to be in accordance with ISC Rules for Lifting Appliances of Ships and Offshore Installations, and the materials not covered in that Rules are to comply with the requirements of Section 2, Chapter 23, PART 8 for rules of steel ships.

5.1.2.2 The material classes of members/components of machinery installations exposed to low air

temperature environments are to be in accordance with the requirements of Section 2, Chapter 23, PART 8 for rules of steel ships.

Section2 MAIN PROPULSION PLANT

5.2.1 General provisions

5.2.1.1 Main propulsion plant is to be sufficient to ensure safe navigation of polar fishing vessel in polar waters, and avoid ship being jammed or beset by ice due to system failure under severe conditions such as low temperature as far as possible, which will further lead to sea damage or pollution accident.

5.2.1.2 The propulsion system (including prime mover, gearing, shafting and propeller) of polar fishing vessel is to be designed so as to take into account the environmental characteristics of polar waters covered by sea ice all year round.

(1) designed for loads and vibrations resulting from propeller/hull/rudder-ice interactions;

(2) located to provide protection from freezing spray, ice and snow;

(3) designed to operate when the vessel is inclined at any combined angle of heel or trim that may be expected during operations in ice; and

(4) designed to be protected from a direct hit by ice.

5.2.1.3 Piping and intake systems associated with the main propulsion plant and auxiliary machinery essential to the propulsion system should be designed to withstand frost so as not to be affected by the impact of the polar environment.

5.2.2 Performance of main engine in low temperature environment

5.2.2.1 Polar fishing vessel is to ensure normal and adequate supply of cooling water and combustion air so as to improve performance of main engine.

5.2.2.2 Vessels that cannot maintain the engine room temperature may well be subject to the combustion air coming in at -30 ℃. At that time, heating elements may be required in the engine room. In addition, one efficient way of controlling the engine room temperature is to modify the funnel vent fire damper, e.g. installing closable and adjustable fire damper. The damper can be gradually closed to a small circulation area in order to prevent excessive loss of hot air in tank when the temperature difference between the engine room and outside is up to 60℃ (e.g. temperature inside engine room is 25℃ but temperature outside engine room is -35℃). For vessels operating in polar waters for a long time, main engine inlet is to avoid direct facing main engine turbine inlet as far as possible, but sufficient air is necessary.

5.2.2.3 Temperature drop of engine combustion air will help to reduce oil consumption, but if air inlet temperature is too low, engine may suffer overload. Usually, main engine intakes combustion air from engine room and inlet temperature will not be too low. But if ambient temperature is lowered to -30℃ or below, lower inlet temperature of combustion air in internal combustion engine may lead to failure of self-ignition of compressed mixed gas and thus failing to start engine. Higher specific gravity of low temperature air may cause

surging of turbocharger, and excessive combustion air may cause overpressure of cylinder and overload of engine.

Preventive measures include:

(1) preheating intake air;

(2) inhaling heated air in engine room;

(3) scavenge air bypass;

(4) exhaust turbine bypass.

5.2.2.4 For vessels s operating in polar waters for a long time, matching of the turbochargers to the cold temperatures may be taken into account.

5.2.3 Compressed air system

5.2.3.1 For polar fishing vessels, increasing storage of starting compressed air may help to improve reliability and maneuverability of propulsion engine, thus avoiding ship accident due to power loss caused by insufficient air.

5.2.3.2 For vessels operating under severe cold condition, not only control compressed air is to be dry enough, but also utility air in exposed and low-temperature spaces is to be dry enough to prevent air pipe from freezing due to condensate water.

5.2.4 Cooling water system

5.2.4.1 Polar fishing vessels are prone to blockage of sea water cooling intakes unless special arrangements are made.

5.2.4.2 Measures to prevent seawater from blocking may be considered from three aspects, i.e. arrangement, construction and heating.

(1) Sea chest (or sea box) and sea bay are to be arranged at lower part of ship and far away from ice belt waterline. Water is to be separated from ice by filter and other measures;

(2) The volume of the sea chest is to be determined according to the total power of engines which may operate simultaneously and require sea water cooling;

(3) The arrangement of sea chest is to consider hull line and ship size. The effect of sea ice is to be considered, and anti-icing and deicing may be achieved by heating or circulating cooling water;

(4) Sea chest top is to be high enough. Manual deicing measures are to be provided, e.g. opening filter or entering sea chest from opening above waterline to deice;

(5) Sea chest shall be equipped with air pipe with stop valve; Block due to ice is to be avoided for air pipe head;

(6) Deicing measures are to be taken into account for sea chest and cooling water suction inlet. Steam deicing system may be adopted, and steam system is to be provided with effective isolating valve, filter and pressure gauge to ensure sufficient steam supply. Deicing by hot water is also effective. As an alternative, thermal oil heating coil may be arranged in sea chest and sea bay, but it is to be noted that:

① heating coils are to be thickened pipes of which wall thickness is to be at least meet equivalent requirements for steam heating coils in tank in Table 2.2.2.6, Chapter 2, PART 3 of Rules of fishing vessels;

② heating coils are to be connected by welded joints;

③ heating coils are to be arranged to absorb expansion and contraction due to temperature difference change;

④ inlet and outlet of heating coils are to be provided with isolating valves which are readily accessible.

5.2.4.3 The overboard cooling such as box cooler has been applied as an alternative to ship's cooling system , and forced circulation of cooling water is by means of a bunch of U pipes arranged in sea chest with flowing sea water. During navigation, cooling water is cooled by free overboard sea water when passing through U pipe. However, under cold conditions, sea chest is also possible to be blocked due to ice accumulation, it is recommended that at the beginning of starting cooling system, heat medium circulating for ice melting are used in combination with steam/hot water/air to purge accumulated frazil ice.

5.2.5 Lubricating oil system

5.2.5.1 For engines of polar fishing vessel are to be provided with lubricating oils suitable for low temperature, it is to be noted that lubricating oil is to be kept at suitable temperature for normal starting of machinery according to manufacturer's recommendation.

5.2.5.2 It is not suitable to fit steam heating coils in oil sump of engine itself, when necessary, external pipes may be used for heat cycling to ensure suitable lubricating oil temperature.

5.2.5.3 Under the anticipated seawater temperature condition, oil-lubricated bearings are to be provided with means to heat the lubricating oil to maintain viscosity in accordance with the bearing manufacturer's requirements; water-lubricated bearings are to be suitable for continuous operation in low temperatures.

Section3 STEERING GEAR

5.3.1 General provisions

5.3.1.1 In order to ensure fluidity of oil in steering gear of polar ship in low temperature condition, a permanent electric heater is to be fitted adjacent to each power unit.

5.3.1.2 Steering gear components are to be provided with greases or lubricating oils suitable for low temperature unless they are arranged in positive temperature spaces.

Section4 DECK EQUIPMENT

5.4.1 General provisions

5.4.1.1 For arrangement and function of deck equipment of polar ship, adverse effects of low temperature and icing in polar waters are to be taken into account.

5.4.1.2 Good function of exposed deck equipment (including rail, bow passageway, anchoring and mooring equipment, lifting equipment, emergency towing plant, gangway, etc.) under polar service temperature

are to be ensured by selecting material and taking suitable winterization measures.

5.4.2 Deck machinery

5.4.2.1 Exposed control panels of deck machinery are to be provided with protective covers or other effective measures (such as heating) for anti-freezing protection.

5.4.2.2 Windlass arranged on deck may be frozen due to sea water spray, therefore, heating or sheltering measures are to be taken or windlass is to be arranged within forecastle or below deck. If windlass is arranged on the deck, emergency release device is to be provided at navigation bridge as far as possible. During design, prospective minimum environmental temperature is to be taken into account for parts with larger stress, and moving parts (e.g. reduction gear and brake) are not to be frozen.

5.4.2.3 The hawse pipes are to be provided with anti-freezing protection or de-icing protection by steam or hot water.

5.4.2.4 Hawse pipe wash lines are to be provided with continuous circulation or heating arrangements for anti-freezing protection of water in the pipes.

5.4.2.5 Mooring winches are recommended to be provided with suitable covers or equivalent measures for anti-icing protection. De-icing measures are to be arranged in the vicinity of mooring winches.

5.4.2.6 Where the foundations of deck machinery may be cast by epoxy resin, the minimum anticipated temperature is to be taken into account.

5.4.2.7 Rails acting as handrails (e.g. in way of stairway or escape route) are to be protected from icing, e.g. ice proof coating. Rails only acting as guardrail may only be provided with deicing measures.

5.4.3 Deck piping systems

5.4.3.1 The possibility of ingress of ice/snow and the adverse impacts of low air temperature and ice accretion are to be taken into account for piping systems located in exposed or low temperature spaces. Exposed piping systems are to be suitable for the minimum anticipated temperature.

(1) Hoses in low air temperature environments are to maintain their flexibility and tightness;

(2) Exposed valves are to avoid freezing of fluids on either side of the valve and to prevent the accumulation of snow and spray ice;

(3) Piping components located in exposed or low temperature spaces, such as valve control units, manifolds, vents, gasket seals, and thermal instruments such as indicators, sensors and other fittings, are to be provided with anti-icing, anti-freezing protection or other means to provide for continued functionality;

(4) Pipes in which fluids are liable to freezing are to be so arranged as to be drained effectively, otherwise means are to be provided for anti-freezing protection;

(5) Overboard discharge outlets are normally to be arranged below the waterline;

(6) Overboard discharge valves arranged in low temperature spaces or above the waterline are to be provided with low pressure steam connections for clearing purposes, unless other anti-freezing measures are provided;

(7) Due consideration is to be given to the thermal expansion and cold contraction impacts on pipes due to temperature difference for piping arrangements in exposed and low temperature spaces.

5.4.3.2 Vent piping systems and sounding pipes are to maintain functionality in low air temperature environments.

(1) For air pipes and pipe heads arranged in exposed or low temperature spaces, measures are to be taken to prevent blockage due to internal humidity freezing;

(2) Exposed air vent pipe heads are to be provided with anti-icing measures against blockage, such as protective cover; where protective covers are provided against icing, the covers are not to interfere with the free flow of air through the vent openings;

(3) Sounding pipes of tanks are to be provided with anti-freezing measures for ready availability;

(4) Where the tank is provided with heating arrangements, anti-freezing measures may be exempted for the vent piping system and sounding pipe upon calculation.

5.4.3.3 Ballast water piping systems are to maintain functionality in low air temperature environments.

(1) The use of gray cast iron material for piping, valves and fittings is prohibited;

(2) Where local freezing of ballast tanks is unavoidable, GRP piping and other system components in the tanks likely to be damaged by fallen ice hitting are to be suitably protected;

(3) Where sea chests are provided for ballast water piping system separately, direct steam connections to the sea chests are to be provided for de-icing purposes, or further arrangement measures such as sea water compartments should be adopted;

(4) Sea inlet valves are to be provided with low pressure steam connection for clearing purposes;

(5) Overboard discharge outlets are generally not to be above the waterline; where they must be above the waterline, suitable heating arrangements are to be provided for ballast water discharge pipes;

(6) Where the design service temperature is below -40℃ , suitable heating arrangements are to be provided for ballast water discharge pipes.

5.4.3.4 Fresh water piping systems in low air temperature environments are to be provided with suitable anti-freezing arrangements.

(1) Fresh water pipes are to be arranged in positive temperature spaces as far as practicable and are to be thermally insulated or taken other effective measures(such as heat traced) when running through low temperature spaces;

(2) Exposed sections of fresh water lines are to be fitted with an isolating valve located inside a positive temperature space such that the exposed length can be drained, and in general a dry air blow connection is to be provided at the most forward end.

5.4.3.5 Drainage piping systems are to maintain functionality in low air temperature environments. Drainage pipes are to be arranged in positive temperature spaces as far as practicable or taken other effective measures(such as heat traced).

5.4.3.6 Hydraulic piping systems are to maintain functionality in low air temperature environments.

(1) Hydraulic oil is to either be of a type that maintains an acceptable viscosity, or the hydraulic system is to have heating or circulation arrangements to keep fluids at an appropriate temperature to ensure the operability of the essential systems they serve;

(2) As far as practicable, hydraulic oil power packs are to be sited in positive temperature spaces. Where this is not practicable, the hydraulic oil and piping system are to be suitable for operation under the minimum anticipated temperature;

(3) Exposed control stand valves for hydraulic oil lines used for remote control are to be provided with arrangements for anti-freezing protection of the mechanism;

(4) Where the design service temperature is lower than -25 ℃ , heating arrangements are to be provided under the bottom of hydraulic oil tank in low temperature spaces; where the design service temperature is lower than -40℃, hydraulic pipes in low temperature spaces are also to be thermally insulated or heated.

5.4.3.7 Steam piping systems are to maintain functionality in low air temperature environments. Means are to be provided for anti-freezing protection of condensate in exposed steam pipes, by thermal insulation or by compressed air blow when not in use.

Section5 ELECTRICAL EQUIPMENT

5.5.1 General provisions

5.5.1.1 The electrical installations of polar fishing vessels should be adapted to their operating conditions of expected ice conditions, high latitudes and remoteness (if relevant), low temperatures and icing to ensure safe navigation.

5.5.2 Rotating motor

5.5.2.1 Generators and motors installed on open deck and in low temperature space are to be provided with anti-condensation equipment. If compulsory lubrication or prelubrication is required for bearing, lubricating oil suitable for work under design service temperature is to be provided. For generators and motors, additional heating elements can be installed to maintain winding protection from extremes of low temperature and condensation, either by a heating element separate from the generator, or by phase injection whereby a low voltage is supplied into the windings.

5.5.2.2 Emergency generator is to be readily available in low temperature condition. In emergency generators, the jackets can be provided with thermostatically controlled electric heaters to ensure that the engine can deliver load immediately. Additional space heating is also to be provided within the emergency generator compartment as a result of cold air coming from the ventilating system.

5.5.3 Power distribution and control equipment

5.5.3.1 Electric distribution box, switchboard and control equipment installed on open deck and in low temperature space are to be provided with anti-condensation equipment, and this can be achieved by providing

heating elements.

5.5.4 Accumulator

5.5.4.1 For polar fishing vessel expected to navigate in ice region, accumulators need to be secured in a position where excessive movement is prevented during ice transiting operations.

5.5.4.2 Accumulation of ice or snow is not to hinder ventilation pipe in battery room so as to ensure dispersion of explosive gas released by accumulator.

5.5.4.3 If the battery room is heated by electrical equipment, it is to be noted that the explosion group and temperature class for electrical equipment are not to be lower than IIC T1. Battery room can also be heated by mechanical ventilation with heated air, steam-heated equipment or heating adjacent room.

5.5.5 Electric cables

5.5.5.1 Cables located on open deck, where the ambient temperature is likely to be low, are to be checked they are made of suitable materials to endure without damage. If it is not specially indicated, sheath and insulation of marine cable is suitable for the environment with lowest temperature -25 ℃ , therefore, it is expected that cable used under lower temperature environment may require sheath and/or insulation made of special material.

5.5.5.2 Electric cables on the open deck are to be protected by metal pipes, conduits or trunking with draining facilities.

Section6 OTHERS

5.6.1 General provisions

5.6.1.1 When the plate freezing machine uses R717 refrigerant and the refrigerant inlet and outlet pipe meets the following requirements, the non-metal hose that meets the relevant requirements of "rules of fishing vessels" can be partially used and with the consent of ISC:

(1) The hose shall be used only for fixed connection between the refrigerant fixing line and the mechanical parts, and the length of the hose used on each plate machine shall not exceed 1.5m;

(2) It shall be proved that the material of the hose matches the characteristics of the refrigerant without causing corrosion, aging, etc. The gasket material of the pipe joint shall be aluminum sheet or PTFE;

(3) The ammonia gas detection system where the flat plate freezing machine is located, the set value of the detector level 1 alarm shall not be higher than 25ppm.

CHAPTER6 SAFETY EQUIPMENT

Section1 FIRE SAFETY SYSTEM

6.1.1 General provisions

6.1.1.1 Components of fire safety systems and appliances should be designed to ensure availability and effectiveness under PST.

6.1.1.2 The following measures is to be tanken, but not limited to components of the fire-fighting system and appliances which may be exposed to ice and snow accumulation that could interfere with the proper functioning of that component should be adequately protected.

(1) located in a heated passageway; or

(2) provided with heat tracing; or

(3) arranged as a dry system.

6.1.1.3 Local equipment and machinery controls should be arranged so as to avoid freezing, snow accumulation and ice accretion and to remain accessible at all times.

6.1.1.4 Fire safety systems and appliances should be capable of being operated normally by persons wearing bulky and cumbersome polar clothing.

6.1.1.5 Means should be provided to remove or prevent ice and snow accretion from accesses.

6.1.1.6 Extinguishing media should be suitable for the intended operation.

6.1.2 Closing apparatus for ventilation

6.1.2.1 Closing apparatus for ventilation inlets and outlets should be designed and located to protect them from ice or snow accumulation that could interfere with the effective closure of such systems.

6.1.3 Fire pipe and fire pump

6.1.3.1 The fire main should be arranged so that exposed sections can be isolated, for piping system is located on open deck, drain plug or valve may be installed at lower position to drain pipe.

6.1.3.2 The fire hydrant is to be installed in protected position, or heating covers are to be provided to prevent ice snow accumulation and freezing. All hydrants should be equipped with an efficient two-handed valve handle. The stowage positions for fire hoses and nozzles are to be provided with anti-icing and anti-freezing protection, the hoses and nozzles are to be dried immediately after use.

6.1.3.3 For isolating valve and vacuum valve on open deck, cover and other measures may be adopted for effective prevention of failure due to ice snow freezing.

6.1.3.4 Fire pumps (including emergency fire pump, water spray pump and injection pump) are to be installed in space with positive temperature. Any independent sea suction of main fire pump and fixed water-based fire-fighting system, measures are to be taken to prevent prevent ice floes from clogging sea inlet gratingsand and sea suctio. Sea chests of emergency fire pumps are to be provided with means for heating,

insulation or low pressure steam connection to prevent the blockage by floating ice.

6.1.4 Automatic sprinkler system and a water spraying system

6.1.4.1 For an automatic sprinkler system and a water spraying system, attention is to be paid that the spray nozzle is to be fully drained after use to ensure normal operation of system.

6.1.5 Fire appliance

6.1.5.1 Portable fire extinguishers are to be provided in protected position. If it must be exposed to low temperature environment, approved fire extinguishers suitable for polar service temperature are to be provided.

6.1.5.2 Dry powder fire extinguishers are to be capable of preventing nozzle from blockage under polar service temperature and releasing fire-extinguishing agent effectively.

6.1.5.3 Two-way portable radio communication equipment for fire purpose on board ship is to be approved for fitting polar service temperature.

6.1.5.4 Fire-fighter's outfits are to be stowed in easily accessible positive temperature spaces. It may be placed in navigation bridge, fire control station or other spaces with positive temperature.

6.1.6 Passageway

6.1.6.1 Essential emergency routes, such as escape routes, muster areas, lifeboat embarkation areas, are to be provided with anti-icing protection. Where exposed decks of the ship have no anti-icing requirements, de-icing tools to remove ice and snow accretion are to be provided to ensure the safety of persons onboard. Gangways and ramps are to be provided with de-icing arrangements.

6.1.6.2 Overhead structures are to be provided with de-icing or other arrangements to prevent injuries to persons or damages to essential safety equipment/structures by fallen ice.

6.1.6.3 Escape routes are to be provided with anti-icing protection to ensure that the escape routes are ice-free or providing a minimum ice-free width of 700 mm, enabling the use of at least one railing. Railings that are important as hand-holds (stairs, escape ways) are to have anti-icing protection. Railings that function only as barriers, but are not intended as handholds, may be provided with de-icing arrangements only.

6.1.6.4 External handrails on routes, stairways and ladders, if provided with heating arrangements for anti-icing protection, are to be fitted with arrangements to cut off automatically in the event of excessively high temperatures to prevent injuries to persons when in contact.

6.1.6.5 Escape routes are to be so dimensioned as not to hinder passage for persons wearing polar clothing. Passageway breadth may be increased to 1.25 times breadth of means of escape required.

6.1.6.6 Exits forming escape routes are to be provided with anti-icing measures and door seals are to be suitable for the design service temperature.

Section2 LIFE-SAVING APPLIANCES

6.2.1 General provisions

6.2.1.1 Polar fishing vessel shall provide adequate life-saving appliances, and personal and group survival equipment based on the effects of shore-based emergency response capability in expected operation area and season, ice condition, air temperature and climate condition as well as survival needs of personnel on board who may evacuate to ice or land after abandonment within maximum expected time of rescue (MaxETR).

6.2.1.2 Life-saving appliances provided for polar fishing vessel are to have all functions under polar service temperature (PST).

6.2.1.3 Polar fishing vessel shall be equipped with life-saving appliances and survival equipment that meet the requirements of the Administration of the flag State. The adequate anti-icing and deicing measures for life-saving appliances and arrangements are to be taken.

6.2.2 Maximum expected time of rescue (MaxETR)

6.2.2.1 For polar fishing vessel, maximum expected time of rescue is to be determined according to the range of expected operation area in polar waters, taking into account following factors (not limited to these factors), but at least 5 daysor according to the estimation method provided by MSC.1/Circ.1614[1]:

(1) distance to Rescue Coordination Center (RCC) that may be contacted;

(2) capacity of rescue facilities of rescue center;

(3) providing ice breaker escort service;

(4) providing ice region pilot service.

6.2.2.2 Rescue Coordination Centers in Antarctic waters are located in such countries as Argentina, Chile, Australia, New Zealand and South Africa. For details, see Figure 6.2.2.2 and Table 6.2.2.2.

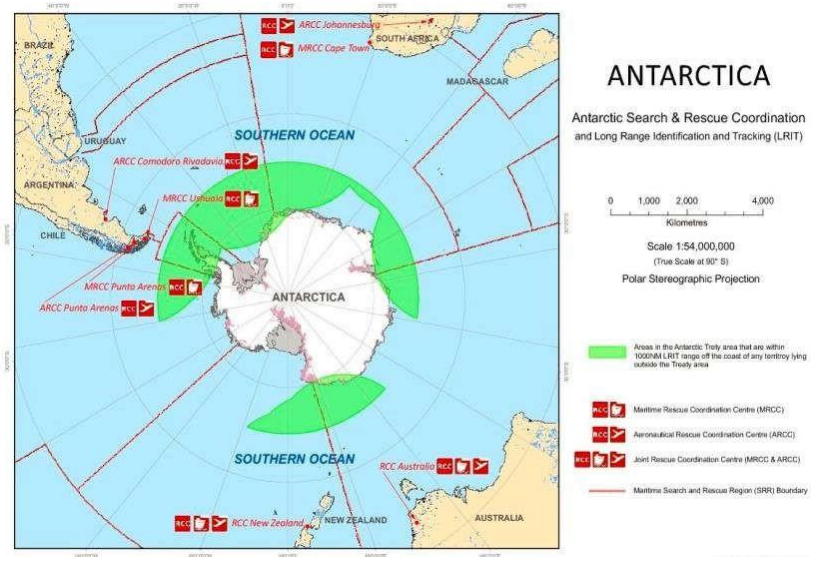


Figure6.2.2.2 Arrangement of search and rescue (SAR) facilities in Antarctic Area

Arrangement of search and rescue (SAR) facilities in Antarctic Area **Table6.2.2.2**

Antarctic area	Rescue Coordination Center（RCC）distance（nm）				
	Argentina MRCC	Chile ARCC	New Zealand RCC	Australia RCC	South Africa MRCC

[1] Refer to the MSC.1/Circ.1614 《 REVISED INTERIM GUIDELINES ON LIFE-SAVING APPLIANCES AND ARRANGEMENTS FOR SHIPS OPERATING IN POLAR WATERS 》

North West Antarctic Peninsula	590	720			
South West Antarctic Peninsula	710	820			
Ross Sea			2300	2800	
South Pacific	770	860		3100	2800
Wedel Sea	1100	1200			

(Source: CLIA, DE 54/INF.2)

6.2.3 Escape arrangements

6.2.3.1 Deicing and anti-slip measures are to be taken for all escape arrangements for fishing vessel, including escape route and embarkation station, unless the vessel is limited to operation in areas and/or seasons without ice accretion.

6.2.3.2 For polar fishing vessel operating in low air temperature, escape routes are to be clearly marked. For external escape route, heating measures are recommended. Escape routes passing dangerous area are to be clearly marked and displayed. Nonslip coating may be considered.

6.2.3.3 For polar fishing vessel operating in low air temperature, adequacy of embarkation arrangements are to be assessed, having full regard to any effect of persons wearing additional polar clothing/heat-insulated immersion suit or cold protective clothing. The size of immersion suit or cold protective clothing can be considered as 1.25 times immersion suit.

6.2.3.4 For polar fishing vessel operating all year round, indoor arrangements of embarkation station are to be considered to prevent personnel from catching cold during evacuation and embarkation under severe cold climate.

6.2.3.5 For polar fishing vessel operating in low air temperature, deicing measures are to be taken for all life boats, life rafts, launching appliances and passageway entering survival crafts, including that steam or hot water heating arrangements or such tools as mallet can be used in the vicinity of life-saving appliances.

6.2.4 Life-saving appliances and arrangements

6.2.4.1 Polar fishing vessel is to be provided with partially or totally enclosed life boats. For life boats provided on polar fishing vessel of operating in low air temperature, in addition to complying with requirements of the International Life-saving Appliance Code (LSA), following aspects are to be taken into account:

(1) For the volume and access size of survival crafts, embarkation of personnel wearing swollen polar clothing/ heat-insulated immersion suit or cold protective clothing is to be taken into account. The size of immersion suit or cold protective clothing can be considered as 1.25 times immersion suit;

(2) The engine of lifeboat is to be capable of cold start and continuous operation under polar service temperature. Two separate power sources are to be provided for the start-up of lifeboat engines. Lifeboat engine batteries are to be suitable for low temperature conditions;

(3) Cooling water, fuel oil and lubricating oil are to suit boat engine to operate under polar service temperature;

(4) The boat engine power is to be considered sufficient to pass through thin ice with lower ice intensity.

Protective measures are to be taken for propellers and keels to prevent damage due to ice contact. The boat strength is to be sufficient to withstand ice and snow accumulation;

(5) The life boats are to provide radio equipment and batteries suitable for operating under maximum expected temperature;

(6) Measures are to be taken for the observation window of lifeboat maneuvering position so that it can have clear vision under design service temperature, e.g. providing windscreen wiper and electric heating for glass;

(7) Heating arrangements are to be provided in way of the lifeboat doors.

6.2.4.2 Rescue boats provided onboard are to be rigid rescue boats. Cooling water, fuel and lubricating oils for engines are to be suitable for engine operation at the design service temperature (DST).

6.2.4.3 Fishing vessels should carry the effective manual inflation pumps, andthe pumps are to be stowed in positive temperature spaces in the vicinity of the liferafts.

6.2.4.4 The power supply of any releasing gear of survival craft and rescue boat is to be capable of being dependent of main power supply of the vessel.

6.2.4.5 Survival crafts are to provide adequate emergency rations and fresh water for the maximum expected time of rescue, with an increase of 30% recommended over the requirements of the International Life-saving Appliance Code (LSA). Measures are to be taken to ensure non-freezing fresh water and storage of equivalent edible fresh water ice chips.

6.2.4.6 For vessels intended to operate in extended periods of darkness, searchlights suitable for continuous use to facilitate identification of ice should be provided for each lifeboat.

6.2.4.7 Polar fishing vessels should provide appropriate thermal clothing or appliances to cover each person on board in a recommended amount based on the risks in the operating waters. Where immersion suits are required, they are to be of the insulated type.

6.2.5 Survival equipment

6.2.5.1 Personal survival kits (PSK) should be carried whenever a voyage is anticipated to encounter mean daily temperatures below 0°C, with the recommended amount covering at least 110% of the persons on board the vessel.

6.2.5.2 The types of PSKs considered for polar fishing vessels are listed in Table 6.2.5.2.

Sample of applicable PSKs **Table6.2.5.2**

Protective clothing (hat, gloves, socks, face and neck protection, thermal underwear, etc.)
Skin protection cream
Insulated immersion suit
Handwarmers
Sunglasses
Survival candle
Signal mirror
Personal Locator Beacon
Drinking mug
Emergency food
Penknife

Handbook (Polar Survival)
Carrying bag

6.2.5.3 Group survival kits (GSK) should be carried whenever a voyage is anticipated to encounter ice conditions which may prevent the lowering and operation of survival craft, potentially involving abandonment onto ice or land, with the recommended amount covering at least 110% of the persons on board the vessel.

6.2.5.4 The types of GSKs considered for polar fishing vessels are listed in Table 6.2.5.4.:

Sample of applicable GSKs **Table6.2.5.4**

Shelter – tents or storm shelters or equivalent – sufficient for maximum number of persons
Foam sleeping mats or similar – sufficient for at least one between two persons
Sleeping bags – sufficient for at least one between two persons
Shovels – at least 2
Sanitation (e.g. toilet paper)
Stove and fuel – sufficient for maximum number of persons ashore and maximum anticipated time of rescue
Emergency food – sufficient for maximum number of persons ashore and maximum anticipated time of rescue
One first aid kit in a waterproof case
Flashlights – one per shelter
Waterproof and windproof matches – two boxes per shelter
Whistle
Signal mirror
Emergency Position Indicating Radio Beacon
Appropriate communications equipment, separate from that carried on the vessel or survival craft
Water containers and water purification tablets
Spare set of personal survival equipment
Snow saw and snow knife
Tarpaulin
Group survival equipment container (waterproof and floatable)

6.2.5.5 Sufficient personal and group survival kits should be considered to meet the following requirements:

(1) Stowed in easily accessible locations, as close as practical to the muster or embarkation stations;

(2) Containers for GSKs are to be designed to be easily movable over the ice and be flotable;

(3) If carried in addition to persons, in the survival craft, the survival craft and launching appliances are to have sufficient capacity to accommodate the additional equipment;

(4) The crew is to be trained in the use of the PSK and GSK, and consideration should be given to bringing additional equipment for training;

(5) PSK and GSK inspections should be carried out no less frequently than on an annual basis.

Section3 NAVIGATIONAL EQUIPMENT

6.3.1 General provisions

6.3.1.1 Navigational equipment for polar fishing vessel is to be suitable for its operating conditions such as expected ice condition, high latitude, remoteness, low temperature and icing (if relevant) to ensure safe navigation.

6.3.1.2 The navigational equipment and systems are to be designed, constructed and installed to retain their functionality under the expected environmental conditions in the area of operation. Antennas, sensors and

other navigational equipment should be protected from ice accretion [1].

6.3.1.3 A clear view through at least two of the navigation bridge front windows and, depending on the bridge configuration, an additional number of clear-view windows shall be provided at all times, regardless of weather conditions. At the same time, provide unimpaired forward and astern vision according to the form of navigation bridge, and be fitted with:

(1) a suitable means to de-ice sufficient conning position windows to provide unimpaired forward and astern vision from conning positions; and

(2) an efficient means of clearing melted ice, freezing rain, snow, mist and spray from outside and accumulated condensation from inside. A mechanical means to clear moisture from the outside face of a window is to have operating mechanisms protected from freezing or the accumulation of ice that would impair effective operation.

6.3.2 Nautical information

6.3.2.1 Polar fishing vessels are to have means of receiving and displaying current inforamtion on ice conditions in the area of operation, which can be realized by following means:

(1) meteorological fax receiver capable of receiving ice regime or equivalent equipment;

(2) radar system capable of identifying ice target.

6.3.3 Navigational equipment

6.3.3.1 Polar fishing vessels are to have either two independent echo-sounding devices which provide an indication of the depth of water under the keel or one echo-sounding device with two separate independent transducers. Due account should be taken of the potential for ice interference or damage to any device designed to operate below the waterline.

6.3.3.2 For vessels operating in areas, and during periods, where ice accretion is likely to occur, means to prevent the accumulation of ice on antennas required for navigation and communication are to be provided. For motor/gear of radar antennas, suitable heating measures are to be considered.

6.3.3.3 Where equipment of polar fishing vessels have sensors that project below the hull, such sensors are to be protected against ice.

6.3.3.4 All polar fishing vessels are to have two non-magnetic means to determine and display their heading, e.g. GNSS (global navigational satellite system) compass, fiber optic gyrocompass and electric gyrocompass. Both means are to be independent and connected to the ship’s main and emergency source of power.

6.3.3.5 Fishing vessels should be fitted with a total of at least two functionally independent radar systems. One of these should operate in the 3 GHz (10 cm, S-band) frequency range. The use of radars equipped with enhanced ice detection capability is recommended.

[1] See Guidance for navigation and communication equipment intended for use on ships operating in polar waters (MSC.1/Circ.1612).

6.3.3.6 Radar plotting systems that may be installed should have the capability of operating in both the sea and the ground-stabilized mode.

6.3.3.7 A Global Navigation Satellite System (GNSS) should be fitted on any vessel intending to navigate in areas outside of reliable coverage by a terrestrial hyperbolic system.

6.3.4 Additional navigational equipment

6.3.4.1 Vessels, with the exception of those solely operating in areas with 24 hours daylight, are to be equipped with two remotely reotating , narrow-beam search lights controllable form the bridge to provide lighting over an arc of 360 degrees, or other means to visually detect ice; and should be fitted with an adequate means of de-icing to ensure proper directional movement.

6.3.4.2 Fishing vessels should be fitted with a suitable means to de-ice sufficient helm position windows to provide sufficient watchkeeping capability.

6.3.4.3 All indicators providing information to the helm positions should be fitted with means of illumination control to ensure readability under all operating conditions.

6.3.4.4 Polar fishing vessels that may apply for icebreaker escort are to be equipped with a manually initiated flashing red light visible from astern to indicate when the ship is stopped. This light is to have a range of visibility of at least two nautical miles, and the horizontal and vertical arcs of visibility are to conform to the stern light specifications requried by the International Regulations for Preventing Collisions at Sea.

Section4 COMMUNICATION EQUIPMENT

6.4.1 General provisions

6.4.1.1 For the provision of communication equipment for polar fishing vessels, limits of communication system under high latitude and expected low temperature condition are to be considered, so as to be met to suit its operating conditions such as expected high latitude, low temperature and icing, and have ship-to-ship, ship-to-shore and emergency operation communication capability.

6.4.1.2 Emergency power for communications equipment provided by battery should be provided with a means whereby the batteries are protected from extreme low temperatures.

6.4.2 Ship communication

6.4.2.1 Polar fishing vessels intended to provide icebreaking escort are to be equipped with a sound signaling system mounted to face astern to indicate escort and emergency manoeuvers to following ships as described in the International Code of Signals.

6.4.2.2 All polar fishing vessels are to be provided with following communication equipment with the following functions:

(1) voice and/or data communications with relevant rescue coordination centers;

(2) voice communications with aircraft on 121.5 and 123.1 MHz; and

(3) providing a Technical Assistance Service (TMAS).

6.4.3 Survival craft and rescue boat communiation capabilities

6.4.3.1 For polar fishing vessels intended to operate in low air temperature, all rescue boats and lifeboats, whenever released for evacuation, are to carry:

(1) one device for transmitting ship to shore alerts;

(2) one device for transmitting signals for location; and

(3) one device for transmitting and receiving on-scene communications.

6.4.3.2 For polar ship intended to operate in low air temperature, all other survival crafts are to carry:

(1) one device for transmitting signals for location; and

(2) one device for transmitting and receiving on-scene communications.

CHAPTER7 POLAR WATER OPERATION

Section1 GENERAL PROVISIONS

7.1.1 General

7.1.1.1 The Chapter are intended to provide guidance for the operation of polar fishing vessels, including operational assessment method, establish Polar Waters Supplementary Operating Manual and Polar Waters Operating Training Manual, as well as the operational requirements for pollution prevention. The requirements in this chapter are not a requirement for assigning notations.

7.1.1.2 The owner and/or designer are(is) to carry out an operational assessment of the polar fishing vessel and its equipment to ensure that they are fit for the intended purpose and support the establish of relevant operating procedures that make up t Polar Waters Supplementary Operating Manual.

7.1.1.3 Fishing vessels not required to have a safety management system are advised to carry on board a Polar Waters Supplementary Operating Manual containing information directly relevant to operations in polar waters. The supplementary manual is intended to provide persons on board with sufficient information regarding the vessel's operational capabilities and limitations, and to provide the owner, operator, master and crew with training and decision guidance on safe.

7.1.1.4 In addition to Polar Waters Supplementary Operating Manual, fishing vessels should consider carrying a training manual covering relevant aspects of operations in polar waters to provide guidance for the training of personnel on board with specialized skills in safe operating in polar waters.

7.1.1.5 In order to protect the fragile ecological environment in the polar regions, polar fishing vessels should not only operate with caution to avoid accidents, but also take appropriate measures to control the discharge of pollutants in accordance with the MARPOL Convention and the pollution prevention measures of Polar Code.

Section2 OPERATIONAL ASSESSMENT

7.2.1 Basic procedure

7.2.1.1 Steps for an operational assessment are as follows:

(1) Step 1: identify hazards considering:

① relevant hazards of section 3 of Introduction of IMO *Guidelines For Safety Measures For Fishing Vessels Of 24 M In Length And Over Operating In Polar Waters*;

② other hazards based on a review of the intended operations;

(2) Step 2: develop a model to analyse risks considering:

① development of accident scenarios;

② probability of events in each accident scenario; and

③ consequence of end states in each scenario;

(3) Step 3: assess risks and determine acceptability:

① estimate risk levels in accordance with the selected modelling approach; and

② assess whether risk levels are acceptable; and

(4) Step 4: in the event that risk levels determined in steps 1 to 3 are considered to be too high, identify current or develop new risk control options that aim to achieve one or more of the following:

① reduce the frequency of failures through better design, procedures, training, etc.;

② mitigate the effect of failures in order to prevent accidents;

③ limit the circumstances in which failures may occur; or

④ mitigate consequences of accidents; and

⑤ incorporate risk control options for design, procedures, training and limitations, as applicable.

7.2.2 Identification of hazards

7.2.2.1 In accordance with the ship's designed operational capabilities, environmental information of the intended operational area of polar ship is to be collected and assessed, where applicable, including:

Assessment information **Table7.2.2.1**

Operational conditions	Operational capabilities	Operational and environmental Conditions
Operation in ice	Ice class	Information about ice condition, including ice type, ice thickness and ice concentration, crew experience, and service institutions of ice area
Operation in Low air temperature	Polar service temperature (PST)	Information about meteorology and sea condition, including air temperature, fog, wind, wave height, sea water temperature etc.
Operation at high latitude	Designed operation at high latitude	Information about coverage of digital wireless communication, nautical chart and hydrology, time of day and night, etc.
Abandonment onto ice or land	Maximum expected rescue time	Except for the above information, the nearest distance from the emergency search and rescue institute

7.2.2.2 The risk levels within polar waters may differ depending on the geographical location, time of the year with respect to daylight, ice-coverage, etc. Thus, the hazards of polar ship are to be identified in accordance with the expected operational and environmental conditions. sources of hazards which may relate to polar fishing vessels are listed as in the Table 7.2.2.2 for consideration:

Relationship of Polar fishing vessels with Sources of Hazards in Polar Waters **Table7.2.2.2**

Hazards of Section 3 of Introduction of IMO *Guidelines For Safety Measures For Fishing Vessels Of 24 M In Length And Over Operating In Polar Waters*		**level of risk**
Paragraph No.	**Type of hazards**	
3.1	Ice, as it may affect hull structure, stability characteristics, machinery systems, navigation, the outdoor working environment, maintenance and emergency preparedness tasks and malfunction of safety equipment and systems.	L
3.2	Icing, experiencing topside icing, with potential reduction of stability and equipment functionality.	M
3.3	Low temperature, as it affects the working environment and human performance, maintenance and emergency preparedness tasks, material properties and equipment efficiency, survival time and performance of safety equipment and systems.	L
3.4	Extended periods of darkness or daylight as it may affect navigation and human performance	M

3.5	High latitude, as it affects navigation systems, communication systems and the quality of ice imagery information.	H
3.6	Remoteness and possible lack of accurate and complete hydrographic data and information, reduced availability of navigational aids and seamarks with increased potential for groundings compounded by remoteness, limited readily deployable SAR facilities, delays in emergency response and limited communications capability, with the potential to affect incident response.	L
3.7	Potential lack of ship crew experience in polar operations, with potential for human error.	H
3.8	Potential lack of suitable emergency response equipment, with the potential for limiting the effectiveness of mitigation measures.	M
3.9	Rapidly changing and severe weather conditions, with the potential for escalation of incidents.	H

Note: H—high probability; M—medium probability; L—Low probability; N—Not available

7.2.3 Accident scenarios and risk assessment

7.2.3.1 For identified hazards, the polar ship is to identify the possible accident scenarios, considering operational conditions, environmental conditions, fish-catch conditions, crew experience, capabilities of the ship and equipment. The typical accident scenarios include, but not limited, as follows:

(1) The typical accident scenarios of the ship operating in ice zones include:

① The ship encounters the ice condition which exceeds the design operational capability, thus causing the damage of the hull structure, thruster and steering gear;

② The ship enters the ice condition which exceeds the design operational capability, thus causing besetting;

③ Ice ingestion occurs in the sea water system when the ship navigates in the ice area, thus causing failure of the machinery equipment and malfunction of the fire fighting system;

④ Abandonment of the ship onto ice or land results in malfunction of lifesaving equipment, thus affecting survival of personnel;

⑤ The ship navigates near icebergs/glaciers, falling of ice results in damage of the ship and equipment;

⑥ Improper operation of the ship results in collision with the escort ship and the ship which manages the ice areas;

⑦ The ship rides up onto the ice block or fixed ice, thus causing a reduced stability.

(2) The typical accident scenarios of the ship operating in low air temperature include:

① Brittleness/breaking of the material in low air temperature results in flooding and sinking of the ship, release of pollutants, malfunction of the equipment;

② ice/snow accumulation on the surface of the structure and equipment above the hull waterline results in a reduced stability;

③ Icing on the surfaces of the exposed machinery installations, equipment and the system, freezing of hydraulic agent or increased viscosity, freezing of grease oil, result in loss of function;

④ Too low environmental temperature at work and accommodation spaces results in loss of work ability, hypothermia and death to crew personnel;

⑤ Expansion of ballast water, fresh water, cargo due to freezing results in damage of the structure;

⑥ Falling down of the ice blocks when the ballast water is discharged while icing on the upper part of the ballast water occurs results in damage of the structure/system;

⑦ Activities of personnel in low air temperature , wind, ice environment result in frostbite of all extremities, hypothermia and death.

(3) The typical accident scenarios of the ship operating at high latitude include:

① Loss or instability of electronic navigational signals results in yawing, causing grounding, collision with ice floes;

② Malfunction of magnetic compass and deviation of gyro compass result in yawing, causing grounding, collision with ice floes;

③ Loss or instability of wireless communication, thus unable to provide emergency response, causing escalation of accident;

④ Extended periods of darkness and continuous poor visibility cause collision with ice floes;

⑤ Extended periods of daylight causes the eye hurt and work fatigue to the persons on watch;

⑥ Deficiency of aid equipment and deficiency or inaccuracy of hydrographic information cause grounding and collision with ice;

⑦ Deficiency of shore-based emergency response service and lack of repair result in delay in rescue, causing escalation of accident.

7.2.3.2 Based on the design operational capability of the fishing vessel and equipment, each identified accident scenario is to be risk assessed, qualitative analysis of possibility and consequence is to be carried out and risk level is to be determined having regard to the following factors:

(1) the design ice class;

(2) performance of the equipment and system;

(3) anti-cold climate measures;

(4) training and experience of the crew;

(5) operational experience of polar fishing vessel.

7.2.3.3 The assessment of the risk levels of the accident scenarios is to be carried out by a qualitative risk matrix in Table 7.2.3.3.

Qualitative Risk Matrix **Table7.2.3.3**

Frequency	High	L=3	Medium	High	High
	Medium	L=2	Low	Medium	High
	Low	L=1	Low	Low	Medium
R(*e*)=2 or 3, low risk; *R*(*e*)=4, medium risk; *R*(*e*)=5 or 6, high risk			C=1	C=2	C=3
			Minor	Medium	severe
			Severity		

The risk index (*e*) of accident scenarios *R*(*e*)is ro be calculated as follows:

$$R(e)=L(e)+C(e)$$

where：

(1) L is frequency index, the definition of which is in the following Table 7.2.3.3(1)；

Definition of Frequency Index of Accident Scenarios Table7.2.3.3(1)

Frequency	L	Definition
Low	1	Likely to occur once in the lifetime of a ship
Medium	2	In the operation time of a ship, unlikely to occur frequently, but likely to occur several times
High	3	Likely to occur once a year in the operation time of a ship

(2) C is severity index, the definition of which is in the following Table 7.2.3.3(2)；

Severity Index Table7.2.3.3(2)

Consequence	C	Definitions			
		Effects on human safety	Effects on equipment	Effects on ship	Effects on environment
Minor	1	Single or minor injuries	After malfunction, it can re-operates by itself or is repaired in time	Local equipment damage, however, the overall safety and environmental protection of the ship is not affected	pollutant① of the accidental leakage disappears naturally within a week
Medium	2	Multiple or severe injuries	It can not be repaired, however, the malfunction does not affect the ship's navigation	Severe damage, causing the ship unable to navigate, however, no pollutant① leaks	The pollutant① of the accidental leakage needs to be removed actively, and the environment restoration takes not more than a year
Severe	3	Single fatality or multiple severe injuries	Malfunction makes the ship unable to continue navigation	Total loss or the pollutant① leaks seriously	The pollutant① of the accidental leakage needs to be removed actively, and the environment restoration takes more than a year

Note: ① Pollutants include the accidental loss of fishing nets and gear, waste from the processing of fish-catch, and environmentally harmful waste from vessel, etc.

7.2.4 Development of risk control measures

7.2.4.1 The appropriate risk control measures are to be taken for the accident scenario with a medium risk, which may include:

(1) developing the operational procedure for ship and equipment system;

(2) providing the crew with the training of operating in polar waters;

(3) providing protective measures.

7.2.4.2 For the accident scenario with a high risk, the following risk control measures are to be considered in addition to the above 7.2.4.1:

(1) developing operational limitations, for ensuring the ship is operated within the scope of the design operational capabilities;

(2) optimizing the design and arrangement of the system, improving the operational capabilities, eliminating the effect of human factors.

7.2.5 Report of operational assessment

7.2.5.1 After completion of the operational assessment of the ship, a clear and explicit report of assessment is to be prepared, the content of which includes:

(1) summary of implementation of the ship's operational assessment;

(2) a list of identified hazards and their associated accident scenarios;

(3) the risk level of each accident scenario;

(4) applied risk control measures required.

7.2.5.2 For the text of the report of operational assessment, see appendix 2 of the Guidelines (the report of operational assessment)

7.2.5.3 The results of operational assessment may vary with the change of the ship's navigating environment and operational conditions. The operational assessment is to be re-carried out when necessary, to avoid a new risk due to the change the navigational conditions.

(1) change of navigating area and navigating time;

(2) change of the ship management and operation, such as major adjustment of the crew, change of the ship purpose, major change of the loaded cargo etc.;

(3) major change of ship structure, navigational equipment and system.

Section3 POLAR WATER SUPPLEMENTARY OPERATING MANUAL

7.3.1 General

7.3.1.1 The following Information of polar waters supplementary operating manual might include:

(1) vessel's capabilities and operating limitations procedures relevant to normal operations in anticipated ice conditions and temperatures, including:

① System design for low temperature operation(systems susceptible to damage or loss of functionality by exposure to low temperatures and measures to avoid malfunction);

② information on limitations on vessel endurance;

③ information on the icing allowance;

(2) operating procedures to be followed in normal conditions and in order to avoid encountering ice conditions that exceed the vessel's capabilities, including:

① procedures for voyage planning (navigation plan and operation plan)to avoid ice and/or temperatures that exceed the vessel's design capabilities or limitations;

② procedures to establish requirements for supplies and appropriate safety levels for safety margins;

③ guidance for human resources management;

④ arrangement for receiving forecasts of the environmental conditions;

⑤ arrangement for addressing any limitations of the hydrographic, meteorological and navigational information available;

⑥ special measures to maintain equipment and system functionality under low temperatures, topside icing and the presence of sea ice, as applicable;

(3) risk management procedures, including:

① procedures to mitigate risk in adverse ice conditions;

② procedures to increase the effectiveness of emergency response measures （damage control、

evacuation procedures, etc.);

③ contact information and procedures of emergency response agency providers for salvage, search and rescue (SAR), spill response, etc.;

④ procedures for maintaining life support and vessel integrity in the event of prolonged entrapment by ice.

7.3.1.2 Model for polar waters supplementary operating manual is provided in Appendix 3. Based on common situations, the mode lists the basic measures and operations for the information involved. The fishing vessel manager can directly select or edit the content in the model according to the actual situation of the fishing vessel.

7.3.1.3 Where appropriate procedures or plans also exist in other ship documents, the manual itself does not need to repeat these materials and may instead refer to relevant references.

7.3.2 Operational capability and limitation

7.3.2.1 System design for low temperature operation

(1) If the ship is designed to operate in air temperature environment whose lowest mean daily low temperature (LMDLT) is below -10 ℃, the manual is to describe polar service temperature (PST) consistent with Polar Ship Certificate. Polar service temperature is set by the shipowner according to ship operation demands, as ship and equipment/system design parameter and/or input information of operation evaluation.

(2) The manual is to list shipboard equipment and system liable to damage or failure in low air temperature as well as measures to avoid failure.

(3) For shipboard equipment and system exposed to low air temperature environment and liable to being affected, following category may be taken into account:

① low-temperature-resistant material is not applied or not determined;

② with grease lubricating, hydraulic liquid equipment;

③ using such liquid as oil, sea water and fresh water.

(4) Measures are as follows, but not limited to this： For the following (but not limited to), measures against low-air-temperature failure of shipboard equipment and system are to be taken into account:

① Navigation and communication equipment:

a applicable search light;

b radar;

c whistle installation heating system;

d bridge window deicing and windscreen wiper window deicing equipment.

② Fresh water tank and ballast tank:

a discharge to less than 90% to allow freezing expansion;

b providing heating equipment.

③ Exposed deck piping system (including service, washing and cooling pipes):

a providing drain plug;

b isolating, draining and opening valve.

④ Deck equipment and system:

a using anti-freezing parts, low-temperature lubrication oil and hydraulic liquid;

b providing heat tracing (electricity or steam);

c providing protective cover;

d thermal insulation layer;

⑤Indoor machinery equipment and system:

a machinery space heating;

b closing external ventilation.

7.3.2.2 information on limitations on vessel endurance

Any information on limitations on vessel endurance such as fuel tankage, freshwater capacity, provisions stores, etc.

7.3.2.3 Icing allowance information

manual Icing allowance included in the stability calculations is provided in the manual, including the area of ice allowance under consideration, the amount of ice allowance, etc

7.3.3 Operating procedures of polar fishing vessel

7.3.3.1 Voyage planning procedures

(1) In order to avoid ice condition and/or temperature exceeding operational capability and/or limitation for fishing vessels during navigating and operating in polar waters, the shipowner and master are to conduct navigation and operational planning based on acceptable standard navigation practice, taking expected ice condition, ship maneuvering capability as well as shipboard equipment and system into account, including limitation for navigation and communication equipment and animal protection area;

(2) When planning the route plan in ice, the personnel in charge of the department of the company and/or the master are to follow the basic principle of route planning in the Guidelines for voyage planning (IMO Resolution A. 893 (21)), and continuous assessments are to be carried out throughout the voyage;

(3) Planning has four steps including appraisal, plan, execution and monitoring. The manual shall contain the complete steps and related elements of voyage planning.

7.3.3.2 Procedures of supply requirements and safety levels

The manual might be base on expecte ice condition of intended polar waters and planned operation mode according to voyage planning, and establish procedure required by ship supply to ensure safe margin of voyage endurance, taking following factors into account:

(1) slower than expected speed;

(2) course alterations due to adverse climate and ice condition, and finding places of refuge;

(3) difficult refueling during navigation.

7.3.3.3 Guidance on human resource management

The manual provides following guidance on human resource management, consider expected ice condition and ice navigation requirements, improve watch level, rest time and fatigue, and ensure compliance with these procedures.

7.3.3.4 Arrangement for receiving forecasts of the environmental conditions

(1) The manual might set out the means and frequency for provision of ice and weather information, as well as when weather and ice information is required and the format for the information, so that the ship can take refuge or use other methods of avoiding the hazard if the conditions are forecast to exceed its capabilities;

(2) methods for receiving and using ice information, including:

① how radar is used to identify ice floes, how to tune the radar to be most effective, instructions on how to interpret radar images;

② other technologies are used to provide ice information.

7.3.3.5 Arrangement for addressing any limitations of the hydrographic, meteorological and navigational information available, including:

(1) category and channel of information available;

(2) limitations of information; and

(3) matters needing attention.

7.3.3.6 Special measures to maintain equipment and system functionality:

(1) The manual is to establish procedures for maintaining the functionality of critical equipment and systems on board, including:

① Providing operational measures on against or mitigate icing and other anti-freezing measures, to eliminate the effects of the polar environment on equipment and systems;

② Providing guidelines on monitoring, preventing and alleviating ice intake of sea water system during operation in ice region in low temperature.

(2) The Manual is to establish and implement following procedures so that mandatory communication equipment for use in survival crafts and rescue boats is capable of operation during the maximum expected time of rescue, and battery time is to be extended as far as possible.

7.3.4 Risk management procedures

7.3.4.1 Procedures to mitigate risk in adverse ice conditions

The manual is to provide the master and officer in charge of a navigational watch with measures to be considered and taken under adverse ice condition according to operation evaluation resul, including:

(1) Special consideration should be given to operating ice domains;

(2) An ice field containing glacial ice;

(3) Poor visibility conditions.

7.3.4.2 Procedures to increase the effectiveness of emergency response measures:

The manual might provide guidance on procedures that will increase the effectiveness of emergency response measures, including but not limited to:

(1) Procedures for abandon ship;

(2) Firefighting Emergency response procedures for fire accidents;

(3) Procedures for damage control;

(4) Measures to get rid of ice block;

(5) Treatment of severe icing;

(6) Procedures for navigation measures in heavy seas.

7.3.4.3 Procedures for coordinating emergency response service procedures

The manual may include procedures for voyage preparation and incident handling to identifying the information of relevant Rescue Coordination Centers for any intended route.

7.3.4.4 Procedures for maintaining life support and ship integrity in the event of prolonged entrapment by ice.

Where any ship incorporates special features to mitigate safety or environmental risks due to prolonged entrapment by ice, the manual is to provide information on how these are to be set up and operated. This may include, for example, adding additional equipment to be run from emergency switchboards, draining systems at risk of damage through freezing, isolating parts of HVAC systems, etc.

Section4 POLAR WATER OPERATING TRAINING MANUAL

7.4.1 General

7.4.1.1 The following Information of polar waters operating training manual might include:

(1) relevant characteristics of ice;

(2) ice region maneuvering;

(3) escorted operation;

(4) cold weather surviva skills.

7.4.1.2 Operators of polar fishing vessels shall be trained to operate safely in conditions specific to polar waters, in particular:

(1) The vessel's skipper, deck and engine officers should have appropriate training and experience in operations in ice-covered waters;

(2) Officers in charge of a navigational watch should have appropriate training and/or experience in recognizing navigational dangers specific to polar ice-covered waters;

(3) All persons should have training in cold environment survival skills.

7.4.1.3 The training manual can ensure that the personnel on polar fishing vessels are familiar with the relevant procedures and equipment in the supplementary manual for operations in polar waters, as well as the for safe operation in polar waters and basic skills for survival in the cold environments through the development of a corresponding learning plan.

7.4.2 Relevant characteristics of ice

7.4.2.1 Using relevant information to correctly determine the ice conditions facing the vessel is one of the

most important abilities for polar fishing operators. Therefore, the training manual should include training materials to identify the relevant characteristics of ice, so that the relevant personnel can skillfully use the ice information to judge the current condition of the vessel.

7.4.2.2 Training on ice related characteristics may include the following

(1) ice composition characteristics and identification knowledge as well as ice condition diagram and limitation of ice regime forecast[1];

(2) physical property as well as forming, growing and melting process of ice;

(3) ice conditions of different area and season and under rapid change of climate conditions;

(4) difference between floating ice group and iceberg as well as floating principles of floating ice;

(5) effect of ice friction force and ice pressure on hull stress as well as effect of deck ice and snow accumulation due to splashing wave and accumulated snow on ship stability, and

(6) methods for receiving and analyzing ice data on board.

7.4.2.4 The information on sea ice and the potential risks to fishing vessels in polar waters are provided in section 2 of chapter 1 for training referenc.

7.4.3 Ice region maneuvering

7.4.3.1 Training on ice operations usually may include the at least following:

(1) Take appropriate measures first to ensure that responsible crew members are familiar with the procedures set out in the Polar Waters Supplementary Operating Manual. It includes low-temperature protection and operation of vessel's system and equipment, vessel's material carrying situation, sailing speed and maneuvering techniques in ice region of different density, rescue forces around navigating/operating areas, emergency response, etc;

(2) Training is required for relevant international conventions, rules and special local regulations of coastal states or relevant regions. If necessary, the relevant requirements can be attached to the training manual to organize regular learning;

(3) Basic information on the special performance of fishing vessels navigating/operating in ice region should be included，such as ice structure strengthened the level、low temperature performance of equipment and system, etc., ensure that vessel operators are familiar with the ship's basic conditions.

7.4.3.2 The training manual may also cover the operation of equipment specific to polar waters，as well as information on the high latitude limitations of communication and navigation equipment commonly used on boat. Usually, please refer to the equipment operation instructions or operation instructions in SMS documents of the ship company.

(1) communication equipment：Iridium satellite telephone, air VHF, GMDSS A4 area, VHF/HF/MF, AIS、GMDSS, etc.;

(2) navigation equipment： Sounding devices, GNSS compass, Search light, Radar, Electronic charts,, Gyrocompass, Magnetic compass, GPS, etc.

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[1] see relevant requirements in Appendix 2, Chapter 2, Section 4 and Section 5.

7.4.3.3 It is recommended that the training manual include related content of environmental protection, including:

(1) polar navigation-forbidden, navigation-avoiding and sensitive areas as well as pollution-preventing special area;

(2) pollution-prevention provisions and keeping sewage, bilge water, oily water and any garbage on board ship;

(3) limitation of pollution-preventing equipment in ice waters.

7.4.3.4 As ice navigation may face many unexpected difficulties and risks, the company and the ship must pay high attention and raise awareness, hope for the best and prepare for the worst when carrying out safe navigation in the ice region. The following measures can be used as a reference for training:

(1) Before a ship enters an ice field, the master is to take the following operation measures:

① Evaluating the necessity to change course based on the latest available ice and meteorological information and Masters are advised to adjust their course accordingly if changes are recommended during the passage by the relevant reporting system;

② Extra lookouts must be posted and the bridge watch may be increased, depending on the visibility;

③ Transiting the ice field in daylight as far as possible. If the vessel is equipped with sufficient high-powered searchlights, transiting in dark is also possible;

④ Reducing speed to a minimum to receive the initial impact of the ice;

⑤ The vessel is to be at right angles to the edge of the pack ice at entry at low speed and the point of entering the ice must be in an area of the lowest ice concentration;

⑥ The engine room personnel are to be briefed fully that it may be necessary to go full astern at any time;

⑦ The ship is to be ballasted down to ice draft to protect the bulbous bow, rudder, or propeller;

⑧ The ship is to be fitted with an internal cooling system for use in the event that the main engine cooling water intake becomes clogged with slush ice.

(2) When the ship sails in ice, the master and the chief engineer must arrange the inspection and preparation of equipment and systems to ensure that:

① the propulsion plant and steering gear of any ship intending to operate in ice must be reliable and must be capable of a fast response to maneuvering orders;

② the navigational and communication equipment must be equally reliable and particular attention is to be paid to maintaining radar at peak performance;

③ light and partly loaded ships are to be ballasted as deeply as possible, but excessive trim by the stern is not recommended, to avoid decrease in maneuverability and increases in the possibility of ice damage;

④ engine room suction strainers are to be able to be removed easily and to be kept clear of ice and snow;

⑤ good searchlights are to be available to aid in visibility during night navigation;

⑥ the ship is to avoid contact with ice ridges or passage through pressured pack ice;

⑦ bear in mind maneuverability performance of the ship (see 1.3 of Chapter 1). If possible course changes

are to be carried out in an area of open water or in relatively light ice so as to reduce the power needed for turning in ice and avoid contact with ice on the ship’s side or stern causing damages due to underestimation of the swing of the ship.

7.4.4 Escorted operation

7.4.4.1 In voyage planning, companies and masters are to give considerations to the necessity of escorting operations or assistance of icebreakers and reflect them in the scheme and the specialized emergency plans , ensure that icebreaker services are available according to the voyage plan or when necessary.

7.4.4.2 In the Antarctic waters, icebreakers only serve state research stations seasonally. For merchant ships in need of regular icebreaker escorting services, the search and rescue center is to coordinate icebreakers performing tasks around the Antarctic waters to provide the corresponding service only when the ship gives out such a demand in emergency search and rescue. Therefore, the training manual may also list specific provisions for application for icebreaker escort in laws and regulations and procedures of coastal states.

7.4.4.3 Generally, escort operation training may cover the following content:

(1) Correspondence contact information, the master or watch operator shall establish a VHF custom channel communication as directed by the icebreaker master and maintain listen to and familiarize The command and information of VHF among ships, sound, visual and radiotelephony signals to contact between ship the icebreaker, etc.;

(2) Implement instructions of icebreaker, the master and officer in charge of a navigational watch are to be aware of ice maneuvering performance, follow the icebreaker's instructions and steer carefully, maintain the position within the ice convoy, speed and/or distance to any other ship in the ice convoy, closely monitor the trash ice and changes round the ship and trend of the previous ship, and keep a safe distance;

(3) Inform the icebreaker of the ship's information in time, the ship is to immediately notify the icebreaker of any difficulties to maintain the position within the ice convoy, speed and/or distance to any other ship in the ice convoy, and Any damage to the ship.

7.4.5 Cold-environment survival skills

7.4.5.1 Every crew member on a polar fishing vessel will need to master cold-environment survival skills, including:

(1) survival knowledge: familiar with survival knowledge, measures and means under cold climate;

(2) life-saving appliances: using life-saving appliances properly in low temperature condition;

(3) first aid in low temperature: first aid treatment and treatment procedure for cold shock, decreasing body temperature and too low body temperature;

(4) evacuation on ice: identifying ice and snow composition and characteristics as well as safe evacuation on ice.

7.4.5.2 In addition to providing written materials and equipment, cold-environment survival training can also be conducted in conjunction with abandon ship drills.

Section5 POLLUTION PREVENTION OPERATION

7.5.1 General

7.5.1.1 Polar area is environment-sensitive waters, and it is difficult to recover environment and ecology due to pollutant leakage caused by ice and cold climate. Therefore, polar fishing vessel operating in polar waters is to follow Polar Water Operational Manual and operate carefully to avoid accident.

7.5.1.2 During operation in polar waters, in addition to MARPOL Convention, polar fishing vessel should also comply with the pollution prevention measures of Part II-A of Polar Code.

7.5.2 Prevention of pollution by oil

7.5.2.1 In polar waters, any discharge into the sea of oil or oily mixtures from any ship is prohibited.

7.5.2.2 Operation in polar waters is to be taken into account, as appropriate, in the Oil Record Books, manuals and the shipboard oil pollution emergency plan or the shipboard marine pollution emergency plans as required by MARPOL Annex I.

7.5.3 Prevention of pollution by sewage from ships

7.5.3.1 Discharges of sewage within polar waters are prohibited except when performed in accordance with MARPOL Annex IV and the following requirements:

(1) the ship is discharged comminuted and disinfected sewage in accordance with regulation 11.1.1 of MARPOL Annex IV at a distance of more than 3 nautical miles from any ice-shelf or fast ice and is to be as far as practicable from areas of ice concentration exceeding 1/10; or

(2) the ship is discharged sewage that is not comminuted or disinfected sewage in accordance with regulation 11.1.1 of MARPOL Annex IV at a distance of more than 12 nautical miles from any ice-shelf or fast ice and is to be as far as practicable from areas of ice concentration exceeding 1/10; or

(3) the ship has in operation an approved sewage treatment plant certified by the Administration to meet the operational requirements in either regulation 9.1.1 or 9.2.1 of MARPOL Annex IV, and discharges sewage in accordance with regulation 11.1.2 of Annex IV and is to be as far as practicable from the nearest land, any ice-shelf, fast ice or areas of ice concentration exceeding 1/10.

7.5.4 Preention of pollution by garbage from ships

7.5.4.1 In the Antarctic area, discharge of garbage into the sea permitted in accordance with regulation 6 of MARPOL Annex V, is to meet the following additional requirements:

(1) discharges under regulation 6.1 of MARPOL Annex V is to be as far as practicable from areas of ice concentration exceeding 1/10, but in any case not less than 12 nautical miles from the nearest fast ice; and

(2) food waste is not to be discharged onto ice.

7.5.4.2 Operation in polar waters is to be taken into account, as appropriage, in the Garbage Record Book, Garbage Management Plan and the placards as required by MARPOL Annex V.

7.5.5 Ballast water and invasive aquatic species control

7.5.5.1 Polar fishing vessels should comply with the requirements of 2004 International Convention for the Control and Management of Ships' Ballast Water and Sediments and Guidelines for ballast water exchange in the Antarctic treaty area (resolution MEPC.163(56)).

7.5.5.2 In selecting the ballst water management system, attention is to be paid to limiting conditions specified in the appendix of the Type Approval Certificate and the temperature under which the system has been tested, in order to ensure its suitability and effectiveness in polar waters.

7.5.5.3 In order to minimize the risk of invasive aquatic species transfers via biofouling, measures are to be considered to minimize the risk of more rapid degradation of anti-fouling coatings associated with polar ice operations. Reference is made to the 2011 Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species (resolution MEPC.207(62)). For application of anti-fouling coatings, reference may be made to Table 7.5.6.3.

ANTI-FOULING COATINH **Table7.5.5.3**

Ship type or operation duration	Hull	Sea chest
Year round operation in ice-covered polar waters	Abrasion resistant low friction ice coating without anti-fouling system	Abrasion resistant coating Thicknes of anti-fouling system to be determined by shipowner
Intermittent operation in ice-covered polar waters	Abrasion resistant low friction ice coating. In sides, above bilge keel, maximu thickness of anti-fouling system 75 μm, to protect hull between applciation of anti-fouling system and next anticipated voyage to ice-covered waters. In bottom area, thickness to be decided by shipowner. Composition of anti-fouling system is to be determined according to International Convention on the Control of HarmfulAnti-fouling System on Ships (AFS Convention).	Thickness of anti-fouling system to be determined by shipowner

APPENDIX1 LIST OF REFERENCES

No.	Name of document
1	United Nations Convention on the Law of the Sea
2	Antarctic Treaty
3	Rules of Navigation on the Water Area of the Northern Sea Route (2013) (Northern Sea Route Administration)
4	Ice Navigation in Canadian Waters (2012) (Canadian Coast Guard)
5	Offshore Vessel Operations in Ice and/or Severe Sub-zero Temperatures in Arctic and Sub-Arctic Regions (2014) (OCIMF)
6	International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel(STCW-F convention)
7	Guidelines for A Structure of an Integrated System of Contingency Planning for Shipboard Emergencies(IMO Res. A.852(20))
8	Guidelines for Voyage Planning (IMO Res. A.893(21))
9	Guidance on Methodologies for Assessing Operational Capabilities and Limitations in Ice (IMO/ MSC.1/1519)
10	Guidelines for Ships Operating in Polar Waters (IMO A.1024 (26))
11	Manual of Standard Procedures for Observing and Reporting Ice Conditions (MANICE) (Canada)
12	Statistical Data on Temperature in Polar and Sub-polar Regions (IMO/DSC1/INF.12)
13	International Medical Guide for Ships (WHO02)
14	Guide for Cold Water Survival(MSC.1/Circ.1185)
15	Sea Ice Nomenclature Code (WMO No.259)
16	Ice Chart Colour Code Standard(WMO/TD-No.1215)
17	Classification Codes And Maplegends For Sea Ice Elements(HY/T 230-2018)
18	Guidelines for Polar Ships (2016) (ISC)
19	Guidelines for Polar Water Operational Manual(2017) (ISC)
20	Revised Guidelines for Formal Safety Assessment for Use in The IMO Rule-Making Process (IMO MSC-MEPC.2/Circ.12)
21	Operating rule of foaming for insulating layer on fishing vessel (SC/T 8059)
22	Guidelines for Ballast Water Exchange in the Antarctic Treaty Area(MEPC.163(56))
23	Guidance Document for Minimizing the Risk of Ship Strikes with Cetaceans (MEPC.1/Circ.674)

APPENDIX2 POLAR FISHING VESSEL OPERATION ASSESSMENT REPORT SAMPLE

1.1 Basic information of vessel

Name of ship		Flag	
Type of ship		Nationality of crew	
Port of registry		Category of ship	
Registration number		Polar service area	
Call letters		Polar port of call	
IMO Number		Class of ship	
Gross tonnage		Class registration number	

Date of ship operation assessment		
Assessment personnel	Name	Technical background
Assessment approval personnel		
Date of assessment approval		

1.2 Description of ship operation assessment method

Stage	step	Requirements for report	Output worksheet
Preparation stage		Introducing background information (environmental information, accident statistics, etc.) and working method	
Assessment stage	Step 1: Identifying hazards	Making the list of hazards and identifying relevant accident scenarios including causes and initiating events	POLAR-01
	Step 2: Developing a risk analysis model	Defining the frequency index and severity index of accident scenario and finally determining the risk matrix	Table 7.2.2.2 and 7.2.3.3 of Chapter 7
	Step 3: Risk analysis and determining the acceptability	Qualitatively analyzing the probability and consequence of accident and determining the frequency index and severity index of accident scenarios; Listing the accident scenarios with relatively high risk index	POLAR-02
	Step 4: Developing risk control measures	For the accident scenarios with relatively high risk index, identifying the possible risk control measures and assessing the effectiveness on risk reduction of various control schemes	POLAR-03

Polar Ship Potential Hazard Identification Worksheet (FORM：POLAR-01)

Category of hazard	Trigger condition of accident	Potential Hazard				Description of accident scenarios
		Crew	Equipment	Hull	Environment	
Ice regime						
Icing						
Low temperature						
Polar day and polar night						
High latitude						
Lack of effective navigation data and information						
Lack of crew experience						
Lack of suitable emergency response equipment						
Extreme weather and and sensitivity of environment to harmful substances						

Accident Scenarios and Risk Assessment Worksheet (FORM：POLAR-02)

No.	Accident Scenarios	Risk Assessment			Risk level
		L	C	R	

Risk Control Measure and Assessment Worksheet(FORM：POLAR-03)

No.	Accident Scenarios	Risk control measure	Effectiveness on risk reduction			Recommended action
			ΔL	ΔC	ΔR	

APPENDIX3 MODEL FOR POLAR WATER SUPPLEMENTARY OPERATING MANUAL

CHAPTER1 OPERATIONAL CAPABILITY AND LIMITATION

Section1 System design for low temperature operation

1.1.1 Purpose

1.1.1.1 This section describes the polar service temperature and anti-cold climate measures for equipment and systems subject to low temperature to ensure operational capability and limitation of ship in in low temperature.

1.1.2 Polar service temperature

1.1.2.1 The ship design service temperature(PST) is【X】℃.

1.1.3 System design

1.1.3.1 The anti-cold climate measures have been designed/taken for equipment, systems and accommodations subject to low temperature according to polar service temperature so as to avoid malfunction in low temperature environments. Anti-cold cimate measures for equipment and systems design see table 1.1.3.1.

Node：Table 1.1.3.1 only gives the basic format, and specific measures have been developed according to the ship's actual conditions or related standards of Anti-cold cimate design (such as Additional Requirements for Ships Operating in Low Temperature Environments in Chapter 23, PART EIGHT of rules of steel ships).

List of Anti-cold Climate Measures for Equipment and Systems Design Table1.1.3.1

No.	Equipment and system	Anti-cold Climate Measures	Design temperature
1	Machinery installations		
1.1	Essential main and auxiliary machinery and equipment on open deck including emergency equipment and navigational equipment	1. Low temperature type test, or	PST
		2. To provide heating arrangements such as heating-tracing belt	
1.2	Fixed essential main and auxiliary machinery and equipment in spaces including emergency equipment and navigational equipment	1. Operating in the expected indoor temperature,or	PST
		2. To provide heating arrangements	
2	……	……	……
2.1	……	……	……
		……	……
……			

Section2 Information on limitations on vessel endurance

1.2.1 Purpose

1.2.1.1 This section describes the information regarding ship endurance limitations which are provided to the company and/or master for consideration when making navigation planning and voyage plan in polar waters, so as to ensure enough fuel oil, fresh water and food for the planned voyage and to ensure enough sewage storage ability.

1.2.2 Fuel oil and fresh water capacity

1.2.2.1 Marine fuel oil and fresh water tanks are shown in Table 1.2.2.1 below. The maximum voyage endurance is【XX】days.

Arrangement and capacity of fuel oil and fresh water tanks **Table1.2.2.1**

Name of fuel oil tank	Capacity (m^3)	Name of fresh water tank	Capacity (m^3)

1.2.2.2 The sea water desalting plant is to be provided on the ship (type【XXX】) (if any), with water production capacity XX tons/day.

1.2.3 Stores

1.2.3.1 The marine provision store capacity is shown in Table 1.2.3.1 below. The maximum capacity is 【XX】days.

Arrangement and capacity of provision store **Table1.2.3.1**

Name of dry provision room	Capacity (m^3)	Name of refrigerating chamber	Capacity (m^3)

1.2.3.2 Other special important materials necessary for safety navigation of vessels are to be listed, such as fishing operations, processing on board must etc.

Arrangement and capacity of XXX **Table1.2.3.2**

XXX（Name）	Capacity（m^3）	……	……

1.2.4 Pollutant disposal or storage power

1.2.4.1 The ship is to be provided with sewage tanks, slop tanks and bilge tanks. The tank capacities and positions are shown in table 1.2.4.1 below. The capacity of tanks used for storing slop is to hold the slop generated throughout the navigation /operation in polar waters.

Arrangement and capacity of sewage storage tank **Table1.2.4.1**

Name of tank	Position of tank	Capacity of tank (m^3)

1.2.4.2 The measures used by ships to dispose of other prohibited wastes are shown in Table 1.2.4.1, such as byproducts of fish-catch processing, plastic packaging, fishing nets and gear, etc.

Arrangement and capacity of disposing of prohibited wastes **Table1.2.4.1**

wastes types	storage measure	Capacity (m^3)

Section3 Information on the icing allowance

1.3.1 Purpose

1.3.1.1 This section describes icing allowance included in the stability calculations to ensure that fishing vessels have adequate stability where ice accretion is likely to occur at the minimum anticipated temperature.

1.3.2 Icing allowance in the stability calculations

1.3.2.1 The ice accretion area and the icing allowance are shown in Table 1.3.2.1.

Ice accretion area and icing allowance **Table1.3.2.1**

area or equipment	icing allowance kg/m^2

CHAPTER2 SHIP OPERATION

Section1 Procedures for voyage planning

2.1.1 Purpose

2.1.1.1 This section describes the voyage planning procedures in polar waters to ensure that the fishing vessels operates within the navigation/operation period does not exceed the designed operational capacity and limitations.

2.1.1.2 The guidance given or procedure followed in this section will neither replace the master's rights nor reduce the normal responsibilities of the officer on duty and the principle of good seamanship.

2.1.2 Planning

2.1.2.1 Planning includes (but is not limited to) voyage planning and real time planning in ice. The voyage planning is to be completed before navigation. The real time planning in ice is to be carried out when the vessel navigates/operates in polar waters.

2.1.2.2 The voyage planning is to follow the following basic procedures:

(1) Appraisal:

Collecting all the materials required for voyage/operation and confirming the availability and reliability of data; Data types include but are not limited to:

① Meteorological information, such as ice conditions and temperatures, as well as historical and latest forecast data, in the vicinity of the intended route and operation area;

② ice service organization, including supply ports, places of refuge, meteorological information department, etc;

③navigation data, chart, route and pilot guidelines as well as limitations of hydrographic information and aids to navigation;

④ communication resources.

(2) Plan:

Develop a detailed navigation/operation plan that ensures safety of human life, navigation and operational efficiency based on the most comprehensive assessment of all possible information collected. For the plan, besides the weather forecast, ice condition forecast（history, present, forecast）, standard nautical publications, special provisions or requirements of the coastal states or CCAMLR and icebreaker escort service(if applicable), the following are to be taken into account:

① any limitations of the hydrographic information and aids to navigation available;

② distribution of supply ports and places of refuge;

③ current information and measures to be taken when marine mammals are encountered relating to known areas with densities of marine mammals, including seasonal migration areas;

④ current information on relevant ship's routing systems, speed recommendations and vessel traffic services relating to known areas with densities of marine mammals, including seasonal migration areas[1];

⑤ national and international designated protected areas along the route;

⑥ operation in areas remote from search and rescue capabilities;

⑦ ship handling characteristics, speed selection and other operational measures; and

⑧ other factors to be considered for navigation/ operation in polar waters.

(3) Execution:

After completion of voyage planning, the plan will be implemented according to the estimated departure time or changed. During the execution period, the voyage plan is to:

① forecast navigation and operation time;

② delays in waiting for information, expected reduction in speed or deviations in course;

③ adjusting ship's floating condition to ice draught;

④ strengthening watch;

⑤ use aid to navigation;

⑥ icebreakers supporting;

[1] Refer to Guidance document for minimizing the risk of ship strikes with cetaceans (MEPC/Circ.674)

⑦ in the event that marine mammals are encountered, any existing best practices is to be considered to minimize unnecessary disturbance; and

⑧ Planning to minimize the impact of the ship's voyage where ships are navigating near areas of cultural heritage and cultural significance.

(4) Monitoring:

The master is to continue monitoring the ice conditions of route before the ship reaches the ice-covered waters. And accepting updated ice regime and meteorological information from the route and operating area at any time to obtain more accurate information on ice conditions, timely assess the accuracy of estimates for times of arrival and determines perhaps for a change in route.

2.1.2.3 The ship is to be carried out according to the voyage plan if the information on the ice conditions is consistent with the forecast before the ship reaches the ice-covered waters. The company and ship should make all efforts to obtain the real-time information on ice conditions. The real time planning in ice is to be carried out particularly when consolidated ice is likely to be encountered, where high concentrations of old ice are expected or in highly mobile ice. The basic procedures are as follows:

(1) Appraisal: These procedures are to accept and appraise the following information on ice conditions (if applicable):

① Reception of ice observation and analysis charts provided by national ice services involved in the route or ice charts downloaded from their web sites;

② Marine radar (X and S-bands), visual observations and processed radar imagery;

③ Helicopter reconnaissance.

(2) Plan：

① The route plan is to consider choosing the best route with the least or lightest ice condition,including:

a finding open water leads;

b finding first-year ice leads in close ice or old ice fields;

c avoiding areas of ridging; and

d avoiding areas of ice pressure or potential ice pressure.

② Once the track has been laid out, it has to be transferred to large-scale charts and checked for adequate water depth so as to ensure that the best route is also the safest route. It is to indicate the need for further information.

(3) Execution: The estimated times of arrival are to be revised and reported based on the determined route. Any change in weather conditions, particularly visibility or wind direction and speed, are to be considered before executing the plan so as to estimate ice pressure areas or where open water leads may be located.

(4) Monitoring: Progress is to be monitored on the chart by conventional means and ice navigation continues.

2.1.2.4 Voyage planning should pay special attention to avoid worst weather and ice conditions, including

hazardous ice, hazardous temperature and hazardous wind. It is essential to receive detailed and accurate information on weather and ice conditions. If the information obtained is limited or uncertain, it should be noted as a risk on navigation planning.

Section2 Procedures to requirements and safety levels for supplies

2.2.1 Purpose

2.2.1.1 This section describes the procedure to establish requirements for supplies, and prescribes appropriate safety levels for safety margins to ensure the vessel's endurance in expected polar water ice conditions and planned operating patterns.

2.2.1.2 The master is to arrange for the supply of fuel oil, freshwater and materials before entering the polar waters and make arrangement in the voyage plan.

2.2.2 Navigation duration and endurance ability

2.2.2.1 The master is to determine supply quantities of fuel oil, freshwater and materials when developing the voyage plan based on navigation distance, mode, anticipated speed in conjunction with the following factors to ensure safe allowance:

(1) during icebreaker piloting, the ship is not sailing at the same speed; (if applicable);

(2) expected ship speed in the ice region;

(3) deviations in course due to adverse weather and ice conditions;

(4) no docking during the voyage and difficulty of bunkering fuel oil;

In particular the followings are to be considered:

(5) the actual ice condition is more severe than the forecast condition so that the navigation duration is increased;

(6) the longest anticipated duration waiting for salvage (5 days).

Section3 Guidance for human resources management

2.3.1 Purpose

2.3.1.1 This section describes the procedures for human resource management, considering expected ice condition and ice navigation requirements, improve watch level, rest time and fatigue, and give guidance on crew staffing and human resource management during ice navigation operations.

2.3.1.2 The master is to determine whether to apply for an ice navigator as well as the location and time for extra lookout in the voyage plan in advance.

2.3.2 Personnel management

2.3.2.1 As the ship may collide with ice floes when navigating in ice-covered waters, the master is to arrange extra lookout based on the actual working conditions of the crew when sailing in or near the ice region.

2.3.2.2 When the ship sails in the ice region, the master is to consider the following personnel arrangement

so as to avoid work fatigue during operation in ice:

(1) when the ship is escorted by an icebreaker and/or guided by an ice navigator, two steering mariners with ice region experience are to be arranged for each shift;

(2) when the ship sails independently, two officers in charge of a navigational watch and mariners with ice region experience are to be arranged for each shift;

(3) arrange personnel on duty in the engine room to operate machinery in the engine room and wash sea suctions;

(4) when the ship is sailing in the ice region, the master is to be on duty or monitor at the bridge.

Section4 Arrangement for receiving forecasts of the environmental conditions

2.4.1 Purpose

2.4.1.1 This Section describes the means and frequency of receiving ship's environmental condition forecasts and real-time information as well as the formats of such information. The information is to include forecasts that will identify weather and ice patterns/regimes that could expose the ship to adverse conditions in the ship's navigation areas and/or intended navigation areas.

2.4.2 Ice information

2.4.2.1 The receiving modes of ice information

Means of obtaining ice information onboard depends on the capability of the ship's communication equipment and the ice information analytical capability of the master/officer in charge of a navigational watch. Ice information may be received by onboard communication equipment, analyzed and provided by the company, provided by entrusted land-based professional service agencies. Consequently, the contents of the manual may be prepared according to the actual arrangement to describe the means of ice information, the frequency, and the format of such information.

2.4.2.2 The content of ice information

(1) The planning of ship's intended polar water operations is to be based on evaluation and analysis of historical data of ice and sea climate conditions in appropriate periods relating to the following aspects:

① navigation area;

② intended operation season (time in a year);

③ availability of operation support (ice management, ice breaker escort, ice region piloting);

④ operation synopsis: rare or periodical operation;

⑤ relevant regulations of IMO, coastal states and flag states;

⑥ ice region navigation system, guidelines and recommendations.

(2) For fishing vessels operating areas, the company and the master are to grasp and understand the ice region features and the possibility that ice regimes are changing every year. As a result, the statistic range for ice regimes is to cover appropriate time cycle suitable for evaluating possible effects, and be updated per

voyage if possible.

2.4.2.3 The use of ice information:

(1) When evaluating data on ice charts published by different agencies, the company and the master are to pay attention to the slight variations in data representation, such as, sea ice terminology definition and code rules for sea ice parameter;

(2) Although Russia uses also standard terminologies of WMO, it seems that ice charts provided by Russia are different from those provided by other agencies, mainly due to round symbols used to describe pack ice dimension. The same ice regime is represented by different codes and symbols.

2.4.2.4 When means of receiving weather information and ice regimes onboard are limited, or the quality of the received information is not good:

(1) the company and the master can directly contact or visit website of relevant service agencies, and download the required history and latest ice image data and carry out analysis; and/ or

(2) the company arranges land-based support information providers (such as meteorological pilot companies, national marine environment forecast centers) to provide effectively filtered and analyzed relevant information to the ship, reducing demands on the ship's communications systems.

2.4.3 Real-time detection of ice conditions

2.4.3.1 When the ship sails near ice or operates in it, the officer in charge of a navigational watch is not only to look out carefully to avoid collision with dangerous ice such as icebergs, but also to use auxiliary equipment such as searchlights, telescopes and radars to detect dangerous ice at close distance, in particular bergy bits and old ice floes.

2.4.3.2 Radar is the most effective equipment for ice detection. However, in different sea and weather conditions, the radar's capability of detecting floating ice of different characteristics has certain limitations. In actual application, the officer in charge of a navigational watch is to differentiate carefully and avoid over-confidence. In summary, do not rely solely on radar to detect ice, particularly glacier ice. When the radar is used to identify floating ice, the operation and setting of the radar are to comply with the following requirements:

(1) When the ship sails independently, 10-centimeter S-band radar and 3-centimeter X-band radar are to be activated simultaneously. S-band radar is used to detect ice targets from a longer distance with its range set at 12 or 24 nautical miles; X-band radar is used to detect ice targets from a shorter distance with its range set at 3 or 6 nautical miles;

(2) In high pack, fast flow or smooth pack ice, X-band radar is more suitable for finding and tracking ice thanks to its stronger target identification capability;

(3) When detecting ice presence in open water, S-band radar has better sea wave suppressing effect and iceberg recognition result;

(4) Radars set according to Table 2.4.3.2 can operate smoothly.

Table of Contrast for Radar Application **Table2.4.3.2**

Average ship speed	Radar	Wavelength	Scan range (nautical mile)	Whether shown eccentrically
8～13 knots	X	Short wave	1～5	Yes
	S	Short wave	6	Yes
Over 14 knots	X	Short wave	3	Yes
	S	Short wave	12	Where necessary

(5) cautions for radar monitoring ice: just because there are no targets in view does not mean that there is no ice around; when ship navigates near the expected pack ice, the possibility of radar detecting ice may be greatly reduced due to the blind zone.

2.4.3.3 While recognizing the limitations of radars in application, it is recommended to use the enhanced radar, if fitted, in so much as practical. In the enhanced radar, the coastline is more clearly defined; icebergs are visible at greater distances; ice features are more easily identified.

2.4.3.4 The key points for radar image interpretations for floating ice:

(1) iceberg detection (iceberg)

Depending upon their size, aspect and attitude, icebergs may be detected at ranges between 4 and 15 nautical miles. Detection ranges will diminish in fog, rain, and other conditions affecting the attenuation of radar return.

Iceberg radar targets will sometimes cause a “radar shadow” on the far side, in which other targets will not show. Icebergs may not appear as clearly defined targets but the sector of the radar display directly behind the iceberg may be free of clutter. A large iceberg with a long and gently sloping aspect may not provide enough reflective surfaces to show at all on radar, so it is never to be assumed that just because there are no targets in view there are no icebergs around.

As the vessel gets closer to the iceberg, the size of the radar target reduces and may in fact disappear when very close to the iceberg. For this reason it is important to set alarm, until the point of nearest approach has passed.

(2) bergy bits detection(bergybits)

Pieces of ice break off, or calve, from an iceberg. The larger pieces are known as bergy bits, and the smaller pieces are known as growlers. Whereas the iceberg moves in a direction that is primarily the result of current because of its large keel area, the growlers and bergy bits are primarily wind driven, and will stream to leeward of the iceberg. While this is the general case, the effects of strong tidal currents may alter this pattern.

The differentiation of bergy bits (in waters where they are present) from open water or from a smooth first-year ice cover is relatively easy with radar, if the height of the bergy bit is sufficient. The radar display is to be checked carefully for radar shadows which may identify bergy bits with less height differential, or when the ice or water background is more cluttered.

Detection of bergy bits by radar is difficult in pack ice, especially if there is any rafting, ridging, or hummocks.

(3) growlers detection(growlers)

Growlers, because of their low freeboard and smooth relief, are the most difficult form of glacial ice to detect (both visually and on radar) and, therefore, are the most hazardous form of ice. In open or bergy water with good weather conditions visual detection of growlers is possible at two or three nautical miles from the vessel. In rough weather and heavy swells, a growler may remain submerged through the passage of two or more swells passing over it, making detection by any method even more difficult. Detection (on radar or visually) can be as little as 0.5 nautical miles from the vessel, if at all. It sometimes helps to sight a growler visually then tune the radar for maximum return.

For a growler in an ice cover, it may be possible to detect it visually in clear conditions (because it is often transparent, green, or dark in appearance), but it is often not possible to discriminate it from surrounding ice clutter on marine radar. As the exact location of each growler cannot be identified for certain amongst ice floes, care must be taken to determine a safe speed through the ice-covered area when navigating by radar.

In summary, growlers are almost impossible to detect by radar. They pose an immense threat to ships. Constant visual and radar monitoring must be maintained in any area where growlers are expected.

(4) old ice floes detection(old ice floes)

Detection of old ice floes is primarily visual, because differentiation between first-year and old ice on marine radar is not possible. Travel through old ice can be reduced by using ice analysis charts to avoid areas of high concentrations of old-ice. However, mariners must watch for old ice even in areas where it is not identified on ice charts. Old ice can be distinguished from first-year ice by more rounded and weathered surface, light blue colour, higher freeboard, and a well-defined system of melt-water channels. Visual identification is possible up to one to two nautical miles from the ship in good weather.

2.4.3.5 All possible effort must be made to minimize the chances of collision with ice in poor visibility either because of precipitation, fog or darkness, and the requirements of the regulation for preventing collisions at sea also apply. These efforts are to include:

(1) maintenance of a constant visual and radar lookout;

(2) use of searchlights at night (which may be counter-productive in fog or precipitation through reflected glare);

(3) reduction of speed and keeping navigation in a safe speed;

(4) locating icebergs, bergy bits, and growlers on marine radar, and tracking of these targets on ARPA (Automatic Radar Plotting Aid);

(5) switching between ranges to optimize the radar for iceberg detection when navigating in pack ice.

2.4.3.6 Detecting icebergs and ice floes by sight/sound or other means:

(1) Visual observation. Icebergs can be spotted at a greater distance in good visibility. At night searchlights help to spot icebergs and ice floes at a greater distance more clearly;

(2) In fog, with sunlight, icebergs are luminous white objects; without sunlight, icebergs appear to be black

upon approaching. At clear moonless nights, icebergs can be spotted in one or two nautical miles as black or white objects. When there is moon and the moon is behind the observer, icebergs can be easily spotted with the help of moonlight. However, when the sky is cloudy or the moonlight appears on and off, it is rather difficult to spot icebergs;

(3) Thunderous sound when icebergs break or fall into sea after breakage can be used to identify the presence of icebergs;

(4) Ice blink (i.e. abnormal reflection of light in the sky) is a reliable indication that an ice field is in the vicinity;

(5) Abrupt moderation of the sea and swell occur when approaching an ice field from leeward;

(6) The onset of fog often indicates the presence of ice in the vicinity;

(7) If wild animals, such as walruses, seals and birds, are spotted far from the land, there may be ice in the vicinity;

(8) When the AIS signal is used to identify icebergs or ice floes, echo on the radar screen without AIS triangular symbol is a possible sign of icebergs;

(9) Water sky. Dark patches on low clouds or a dark bank on a cloud at high altitude indicate disappearance of icebergs or ice floes and are signs of open water in the immediate vicinity.

2.4.4 The collection of hydrography and meteorology information

2.4.4.1 The master is to collect hydrographic, meteorological information from various channels, including:

(1) looking up relevant hydrographic, meteorological information of polar waters and knowing about seasonal climate features including current, rainfall, visibility and fog, etc.;

(2) receiving meteorological information by ship's communication equipment (radio station, meteorological fax, telegraph, NAVTEX, telephone and telex) during navigation, carefully signed and read by personnel in charge of a navigational watch;

(3) inquiring ships nearby through VHF on meteorological information in relevant sea waters during sea navigation;

(4) In case of abnormal meteorological changes, the personnel in charge of ship operation (the master) are to ask for additional ice and meteorological information from the national marine environment forecast center and/or meteorological pilot company.

Section5 Methods for addressing any limitations of the hydrographic, meteorological and navigational information

2.5.1 Purpose

2.5.1.1 This section describes to provide limitations and usage guidance of hydrographic, meteorological and navigational information of polar waters.

2.5.2 Sea chart usage

2.5.2.1 The master and the officer in charge of a navigational watch must realize many sea charts in polar waters, including paper charts, Electronic Navigational Charts (ENC) and Raster Navigational Charts (RNC), are of poor quality and have the following limitations:

(1) such charts contain areas that are inadequately surveyed;

(2) they are based on old surveys where only spot soundings were collected;

(3) data was collected only along a single track.

2.5.2.2 During polar navigation, the master is to pay attention to different projections used and the accuracy of the surveys as well as chart horizontal basis difference.

2.5.2.3 The master and the officer in charge of a navigational watch are to pay attention to data accuracy of new charts. When polar charts are used, the following precautions are to be taken:

(1) checking the projection and understanding its limitations;

(2) checking the date of the hydrographic survey and reviewing the Source Classification Diagram;

(3) paying attention to the range and bearing for usage and positions of transfer from chart to chart;

(4) checking for evidence of reconnaissance soundings;

(5) using the largest scale chart available;

(6) checking for the method of measuring distances and taking bearings; and

(7) updating charts and nautical publications by checking for Notices to Mariners, Notices to Shipping and any other sources for chart corrections.

(8) RNC is one form of ENC and generally does not add accuracy.

2.5.3 Navigation operation

2.5.3.1 Many areas covered by polar water charts may not be suitable for coastal navigation currently. The master and the officer in charge of a navigational watch are to proceed with due caution and prudent seamanship when navigating in polar zones especially in poorly charted areas or when planning voyages along new routes, and are to:

(1) cautiously and carefully plan route and course, monitor during navigation, and take into consideration the information and guidance of relevant navigational publications;

(2) familiarize themselves with the availability and accuracy of hydrographic survey information and chart information in the ship’s intended operation area;

(3) constantly check GPS and radar positioning information, particularly potential chart datum difference of GPS positioning;

(4) plan the route/course through areas marked on charts and known shoals as the goal and follow the set route/course at any possible time.

2.5.3.2 The master is to cautiously plan any deviation from the planned course. For example, when navigating on the continental shelf, the master is to:

(1) activate and monitor echo detector to detect signs of any unexpected change in water depth, especially when the sea chart is not based on comprehensive survey and charting of the sea bottom; and

(2) make use of all opportunities to use independent information source and cross-reference ship's position, such as radar and satellite positioning.

2.5.3.3 The polar waters lack accurate hydrographic, meteorological and navigational information. The master is to check the information reviewed and received to make sure the hydrographic, meteorological and navigational information is updated to the latest version.

Section6 Special measures to maintain equipment and system functionality

2.6.1 Purpose

2.6.1.1 This section describes measures to maintain on-board critical equipment and system functionality to ensure that when the ship:

This Section specifies anti-freezing, anti-cold climate operation measures to ensure that when the ship:

(1) sails in in polar environments, the effects of low temperatures and freezing on equipment and system function are prevented or eliminated;

(2) sails in water with ice, the seawater system is prevented from suctioning brash ice;

(3) is within the maximum expected time of rescue, the mandatory communication equipment for use in survival crafts and rescue boats is capable of operation.

2.6.1.2 Onboard personnel of all levels are to take anti-freezing, anti-cold climate measures or equivalents for their responsible scope, equipment and systems in advance according to meteorological forecasts and ice conditions to ensure safe navigation.

2.6.2 Measures of anti-cold climate, anti-freezing and de-icing

2.6.2.1 When the temperature drops to 0℃ or lower, the crew are to check icing conditions of key systems and equipment according to the cycles and remove ice in a timely manner so as to maintain their intended functions and ensure that the icing conditions do not exceed the maximum icing density 【XX】 in the stability information. The frequency may be increased where necessary.

2.6.2.2 Table 2.6.2.2 lists the icing prevention, de-icing and anti-cold climate maintenance monitoring measures of vessle's fire-fighting, communications and navigational equipment, and provides format reference. Other systems and equipment have been developed according to the actual situation of equipment and system equipment on board and anti-cold climate design. For details, refer to the equipment operation instructions, operating instructions in SMS documents of the ship company and anti-cold climate design manual or drawing book of ship.

Ice and snow prevention measures and cycle of key systems and equipment on boat Table2.6.2.2

No.	Area and equipment	Measures	Timing and cycle
1	**fire-fighting systems and equipments**		
1.1	fire-fighting systems and	Refer to the information provided by the	below 0℃

	equipments	manufacturer. Check the performance limits under the operation temperature	
		arrange in a sheltered and protected area as far as possible	
1.2	all external fire-fighting appliances	check ice and snow accumulation	every day
		Remove ice and snow accumulation on the appliances by means of steam ,compressed air or activate heating so that the appliances are readily operable	every month or when deicing is needed
1.3	fire main	The fire mains are to be provided with additional layer against freezing, drained or heat traced so as to avoid freezing	below 0℃
		Drain and dry them immediately after use or store them in frost-free positions	while in use
1.4	Portable fire extinguishers	For unprotected foam extinguishers, add glycol	below -10℃
1.5	Fixed foam fire-fighting system	Drain the foam pipelines on the deck so that they are readily usable	below -20℃
		Hoses suitable for the operation temperature	
1.6	fire dampers	check all fire dampers exposed to the open deck and carry out functional test	below 0℃, every day
1.7	Water curtain, sprinkling and misting systems	Drain the pipelines	below 0℃
1.8	Foam storage cabinet	Heat so that the temperature of such space is above 0℃. Temporary heaters may be used	0℃ or below,
1.9	Fire hose box	The lock catch, lock, door hook and hinge are to be kept ice-free.	below 0℃, every day
		The water spray nozzle and the connector are to be greased and kept dry	every month
		All hoses are to be drained completely	below 0℃
2	**communications and navigational equipment**		
2.1	communications and navigational equipment	Refer to the information provided by the manufacturer. Check the performance limits under the operation temperature.	below 0℃
		arrange in a sheltered and protected area as far as possible	
		check devices that rely on battery power	below 0℃, every day
2.2	external equipment	check for snow and ice accumulation and remove snow and ice accumulation from equipment by manual deicing or heating	below 0℃, every day
		set protective cover	below 0℃
		where facilities to de-ice equipment are provided, these should result in the performance criteria being met within two hours from power on	after de-icing
2.3	emergency battery and battery room	provide indoor heater	below 0℃
		set protective cover	
		carry plenty of supplementary pow	
……	……	……	……

2.6.2.3 When the crew are de-icing, safety measures are to be taken, including：

(1) personnel are to wear cold protective clothing and antiskid shoes;

(2) personnel are to avoid working under adverse weather and the working hours are to be shortened;

(3) when removing ice from structures above (mast or covering), use some cushion to avoid the deck below from being broken through, such as wooden cargo pallets or canvas cushion;

(4) when working on the deck, take care to avoid ice fallen from rigging and mast and wear safety helmet.

2.6.2.4 When the icing condition onboard is uncontrollable or reach the maximum icing density to guarantee ship’s stability, the master is to take the emergency measures specified in Chapter 3 of risk management procedures in a timely manner.

2.6.3 Operation of seawater systems

2.6.3.1 When the ship navigates in waters where the seawater temperature is lower than 0 ℃ , the top priority is to keep an effective cooling system. As the ingestion of strainers of seawater filters causes the flow to slow down, ice rapidly forms inside the strainers. As a result, all seawater filters must be cleaned.

2.6.3.2 The personnel on duty in the engine room are to be familiar with the position of seawater inlets as well as measures to prevent blockage of the seawater chest by ice. When the ship navigates in ice areas, lower seawater inlets are to be used.

2.6.3.3 The chief engineer is to ensure the heating installations for the cooling water seawater chest are in their best working efficiency. The steam heating system of the seawater chest is to be inspected regularly to confirm its good working order when the ship is navigating in waters with ice. Before the ship operating in ice or in low water temperatures, steam hoses are to be connected to the seawater inlets.

2.6.3.4 When the ship is provided with a recycling cooling system, and before the ship enters waters below 0℃, the chief engineer is to have the cooling water volume checked and the conditions of all valves and pumps verified. Before the ship enters the ice area, the chief engineer is to run the system.

2.6.3.5 When the ship sails in waters with a lot of brash ice, the personnel on duty in the engine room is to closely monitor the working condition and seawater inlet pressure of the seawater pump and clean the filters in case of abnormality.

2.6.4 Effective operation of communication equipment for lifeboats and rescue craft

2.6.4.1 In order to extend the battery time as far as possible, so that the communication equipment for use in survival crafts and rescue boats is capable of operation during the maximum expected time of rescue, the following measures may be considered:

(1) When survival crafts are in close proximity, not more than two alerting or locating devices are activated to preserve battery life, enable extended periods of time for the transmission of alerting or locating signal and avoid potential interference;

(2) It is not to activate multiple satellite distress beacons, unless the survival craft operating the beacons are widely dispersed, as this can cause interference on direction-finding equipment;

(3) In determining the equipment to be carried for transmitting signals for location, the capabilities of the search and rescue resources likely to respond are to be borne in mind. Responding ships and aircraft may not be able to home to 406/121.5 MHz, in which case other locating devices (e.g. AIS-SART) are to be considered.

CHAPTER3 RISK MANAGEMENT

Section1 Procedures to mitigate risk in adverse ice conditions

3.1.1 Purpose

3.1.1.1 This section describes the high risks ice conditions faced by ships and provides guidance to the

master and crew to keep the vessel navigable and operating within its designed operational capabilities.

3.1.2 Measures to be considered in adverse ice conditions

3.1.2.1 During voyage planning, the company and/or the master are to avoid known potential high- risk areas as much as practicable, i.e. waters containing multi-year ice, ice ridges and glacier ice, and avoid areas where special operations need to be considered. Where the voyage planning identifies and includes navigation in high-risk areas, the company and/or the master are to establish, implement and record the relevant emergency plans.

3.1.2.2 When the ship sails near ice or operates in it, the master/officer in charge of a navigational watch is to calculate a Risk Index Overall value (RIO) of the ice field the ship is in or intended to pass according to Polar Operational Limit Assessment Risk Indexing System (POLARIS)[1]. And, take appropriate action according to the risk indication value.

3.1.2.3 According to the POLARIS system, when RIO<0, a polar fishing vessel is in an ice region that operations requiring special consideration, and the master and the officer in charge of a navigational watch are to take the following precautious measures:

(1) notify the master to give orders at the bridge;

(2) reduce speed and sail within the speed limits, and be prepared to slow further to a stop speed. The vessel must stop when necessary. If the vessel is stopped, the propeller(s) are to be kept turning at low revolutions to prevent ice from building up around the stern.

Note: List the maximum speed taken by the ship under different risks as【X】knob[2];

(3) reducing maneuver, the following principles are for reference:

① Amidship when being astern, and keeping to next steering command;

② If it is unavoidable to encounter floating ice impact, slowing down and ensuring vertical impact of bow stem post with ice edge;

③ Avoiding approaching thick floating ice to decrease shell plating impacting ice;

④ Avoiding sudden turning in thick ice, using small rudder angle (less than 10 °) in ice turning, 5-10° each time;

⑤ Rudder turning to thick ice to avoid shell plating impacting thick ice due to bow turning to thin ice.

(4) evaluate the ship's maneuverability in ice. Where low speed may impair the ship's maneuverability, such operation is to be avoided. In such case, icebreaker escort is to be applied for in a timely manner;(voyage stage);

(5) when the ship is in ice under pressure, where there are no other routes, the ship must stop in the ice until the pressure in pack ice is gone;

(6) arrange extra lookouts in the bow region or other appropriate locations when approaching icebergs,

[1] Refer to Appendix MSC.1/Circ.1519
[2] Refer to Appendix 1.4 of MSC.1/Circ.1519 for determination of maximum speed and calibration

during night navigation or in poor visibility and double watches at the bridge for navigation and steering;

(7) a frequent check is to be made for any signs of the track closing behind the ship to avoid being trapped;

(8) evaluate and/or change course based on meteorological and ice conditions and change tendency provided by the land-based support;

(9) report to the company in addition to measures specified above.

3.1.2.4 Where the ship may contact hazardous ice when in the ice area, responsible crew is to gauge the liquid level of compartments and tanks below the hull's waterline at least once an hour according to the master's requirements. For easily accessible compartments, check the leakage and deformation of hull's shell plating and inner members. When in doubt, increase the frequency of gauging and inspection.

3.1.2.5 When the ship is navigating in an ice field containing glacier ice, the ship will face additional risks. Under any circumstances the master and the officer in charge of a navigational watch are to ensure that the ship is far away from glacier ice and pack ice of all forms and take the following measures:

(1) arrange the master, officer in charge of a navigational watch and chief engineer who have been trained to identify and avoid glacier ice and know the consequences of collision with glacier ice, and arrange for an ice navigator when necessary;

(2) when sailing in waters where there may be glacier ice, the officer in charge of a navigational watch is to carefully detect and closely monitor and avoid glacier ice according to the hazardous ice detection methods specified in 2.4.3, Chapter 2;

(3) where glacier ice is detected in the route, the ship is to maintain a safe distance in addition to the risk index result. It is to be noted that the underwater portion of glacier ice is larger and the safe distance is to be greater than three times the height of the glacier ice above the water and records are to be made in the logbook.

3.1.2.6 The master is to make all possible effort to minimize the chances of collision with ice when in or near ice-covered waters or in poor visibility either because of precipitation, fog or darkness, and the requirements of the regulation for preventing collisions at sea also apply. These efforts are to include:

(1) maintenance of a constant visual and radar lookout;

(2) use of searchlights at night (which may be counter-productive in fog or precipitation through reflected glare);

(3) reduction of speed before entering any ice field in poor visibility and not increasing speed before the threat has been determined;

(4) reduction of speed in any ice situation where the ratio of glacial and old ice to first-year ice indicates a significant increase in the chance of collision with hazardous ice;

(5) location of icebergs, bergy bits, and growlers on marine radar, and tracking of these targets on ARPA (Automatic Radar Plotting Aid);

(6) switching between ranges to optimize the radar for iceberg detection when navigating in pack ice;

(7) when following the icebreaker, the ship is to maintain the required minimum distance by radar and

maintain VHF radio contact and constant monitoring of the radar distance between vessels. If the icebreaker suddenly slows or its position is lost on the radar screen, a collision may occur.

Section2 Procedures to increase the effectiveness of emergency response measures

3.2.1 Purpose

3.2.1.1 This section describes the emergency response in polar waters to supplement existing ship's emergency response procedures and improve the effectiveness of emergency response to polar waters accidents.

3.2.2 General requirements

3.2.2.1 The company and the master are to carry out risk evaluation of the intended voyage in polar waters and develop necessary contingency plans.

3.2.2.2 Before the ship enters polar waters or at the initial stage of the navigation, the master is to organize emergency exercises, drills and training and be familiar with the specific contingency plans, emergency response procedures to improve the crew's response; the master is also to check the crew's familiarity with the equipment and emergency procedures.

3.2.2.3 After emergency incidents, the master is to initiate relevant specific contingency plans (see Section 3 Coordinating emergency response) according to the dangerousness of the emergency situations and the impacts of the incidents, organize the crew to implement the emergency deployment so as to avoid or reduce financial loss, environmental pollution, personnel injuries and social impacts to the greatest extent.

3.2.2.4 The personnel on duty in the company are to initiate the emergency procedures in accordance with the company's response management regulations.

3.2.3 Damage control

3.2.3.1 Before the ship enters polar waters and engaged in voyages in ice, the master is to evaluate additional resource demands for damage control onboard so as to carry out temporary repairs for minor damages of the hull or take precautions measures to prevent damages or worsening of flooding and guarantee that the ship can sails to locations where substantial repairs can be carried out.

3.2.3.2 Additional resource for damage control generally includes the following:

(1) portable gas welding and cutting equipment and relevant materials and spares, including steel plates, welding consumables, acetylene and oxygen, etc.;

(2) a portable electrical diving pump the capacity of which is 100 ton/h and one set of hoses suitable for PST.

3.2.3.3 In case of damage incidents, the master is to close the watertight doors of relevant compartments and check stability and adjust floating condition according to the contingency plans. The master is also to arrange temporary repairs provided that the personnel safety can be guaranteed.

3.2.3.4 Where oil or other pollutant spillage is involved in the damage incidents, the master is to take the

following measures provided that the ship and personnel safety can be guaranteed:

(1) the pollutants in the damaged tanks are to be transferred to other tanks onboard (specific tank name, listed as per the actual conditions of the ship, illustration may be included) and/or measures to enter tanks and spaces during external SAR;

(2) in case of pollution accidents, implement according to SOPEP (SOPEP is to consider measures that taking into account characteristics of polar waters such as remoteness, ice, low-temperature environment, wildlife protection, etc.).

3.2.3.5 The master is carry out damage control exercises every week. Each exercise is to select different emergency scenario to simulate different damage conditions that may occur during polar water operations.

Node: list the specific exercise scenario according to the structural arrangement and operation modes, etc.

3.2.4 Firefighting

3.2.4.1 Before the ship enters polar waters, the master is to arrange the development or adjustment of deployment table, taking into consideration the impacts of the low-temperature environment on the effectiveness of emergency response to fire and explosion. Additional tasks are to be determined according to the routine anti-cold and anti-icing measures of the fire-fighting equipment and systems, including:

(1) open the isolation valve of the fire mains and close the drainage valve;

(2) the fire pump is to include temporary heating of the space where the emergency fire pump is located; change to low seawater suctions;

(3) carriage of spare hoses or hoses stowed indoors;

(4) carriage of de-icing tools;

(5) inspect heating arrangements for the fixed fire-fighting system and carry temporary heating appliances.

3.2.4.2 Fire drills should be varied so that emergency conditions are simulated for different compartments of the vessel, with appropriate emphasis on those changes to standard procedures made necessary by operations in polar waters and low temperatures.

Node: list the specific exercise scenario according to the structural arrangement and operation modes, etc.

3.2.5 Abandon ship

3.2.5.1 When the ship is engaged in voyages in waters far away from SAR facilities, the master is to develop or adjust contingency deployment table, taking into consideration factors of evacuation onto ice or land and/or in low-temperature environment and adding contingency tasks, such as:

(1) carriage of PSK and GSK (where personnel are evacuated to lifeboats, the impacts of carriage of PSK and GSK on the lifeboat loads are to be considered);

Node: List the type and quantity of PSK and GSK to be equipped on board according to the needs assessment.

(2) de-icing of survival crafts;

(3) carriage and operation of positioning and communication equipment of survival crafts and rescue boats;

(4) carriage of lifeboat goods that are stowed on the ship to prevent from being frozen, such as fresh water;

(5) carriage and operation of heating devices for lifeboat cabins;

(6) carriage and operation of antifreeze for fuel oil of the boat engine;

(7) special arrangement for ice evacuation.

3.2.5.2 When the ship is engaged in voyages in waters far away from SAR facilities, the ship-abandonment drill is to consider scenarios of evacuation to water, ice/land, or a combination thereof. Each ship-abandonment drill is to include the following, where applicable:

(1) check that all personnel are properly dressed;

(2) wear immersion suits or heat-insulation suits;

(3) testing the emergency lighting for mustering and abandonment;

(4) instructions for life-saving and survival equipment as well as for survival in the sea and/or on the ice.

3.2.5.3 Given the dangerousness of lowering rescue boats in waters near polar caps, the master is to carry out rescue boat exercises as much as practicable where necessary.

3.2.5.4 The usage training and drills of the life-saving equipment onboard are to include the usage of PSK and/or GSK. Each training and drill can cover part of the equipment and appliances, but all equipment and appliances must be covered within two months (for cargo ships)/one month (for passenger ships), and each crew member is to be provided with the following training:

(1) emergency treatment of cold shock, too low body temperature and other emergency treatment procedures;

(2) special precautions for using life-saving appliances on ice or in ice-covered waters under adverse weather and sea conditions.

3.2.5.5 When an evacuation is required in waters with ice, the master is to organize an orderly and safe evacuation considering the actual ice and meteorological conditions. The methods are as follows:

(1) if there are adverse ice conditions at locations where the ship abandonment is carried out and the survival crafts cannot be lowered, use helicopter to lower personnel onto safe ice or land; or if the ship condition permits, personnel are evacuated onto safe ice by rope ladder, gangway in an orderly manner and wait for rescue;

(2) if the location where the ship abandonment is carried out has sufficient open water for survival crafts to be lowered, survival crafts may be lowered to evacuate personnel. However, launching survival crafts by throwing them overboard is to be avoided in case that the crafts are damaged by the ice.

3.2.5.6 Due to the limits of battery life of the communication equipment/installations, after the ship abandonment, commanders of survival crafts and rescue boats are to coordinate with each other and muster survival crafts as much as practicable or make them close to each other. When several survival crafts are very close to each other, keep no more than two alarms or positioning devices (EPIRB) in operation so as to save battery life of the communication equipment, prolong the duration for sending alarms or EPIRB and avoid

interference with lateral equipment.

3.2.6 Freeing a Ship Beset

3.2.6.1 When a ship is beset by ice, the master is to report to the company immediately and take the following measures to free the ship:

(1) Go ahead and astern at full power while alternating the helm from port to starboard, which has the effect of levering the ice aside. Care must be taken when going astern to ensure that no ice goes through the propeller(s), or if the vessel frees itself that it does not make sternway into any heavy ice. In vessels with twin propellers, they are to be alternated with one ahead and one astern for a few minutes, then each changed to the opposite direction, slewing the stern from side to side to create a wider opening in the ice astern.

(2) Alternate filling and emptying of the fore and after peak tanks is effective in changing the trim for the bow to get a better angle of attack on the ice ahead, or for the propellers to be given a better grip by greater submersion. It can also be effective in extracting from a ridge, by raising the bow so that the ship slides backwards as the bow is raised.

(3) Alternate the ballast to port and to starboard to list the ship and change the underwater shape. This method is only to be done with knowledge of the possible consequences of an exaggerated list if the ship comes free quickly.

3.2.6.2 Propellers and rudders are to be kept turning when the ship is trapped in ice no matter when it is taking freeing measures or waiting for the icebreaker or for the weather to turn fine so that the waterway behind the stern is not closed by ice. Meanwhile, the master is to pay attention to the adverse impacts of the lateral wind on the ship.

3.2.6.3 When self-freeing the ship, the master is to keep in contact with the company, evaluate and report the effects and progress of self-freeing and apply for external assistance in a timely manner.

3.2.6.4 Where the ship cannot free itself, the master is to follow the Procedures for maintaining life support and ship integrity while waiting for external assistance; see Section 4 of this Chapter.

3.2.7 reatment of severe icing

3.2.7.1 When the ship is experiencing icing exceeding or almost exceeding the maximum icing allowance, the master is to take the following control measures:

(1) take anti-icing and de-icing measures (see contents in Table 2.6.2) to reduce ice accumulation so that the ship’s icing condition does not exceed the maximum designed icing allowance;

(2) when icing is anticipated to be too severe to control or remove, the ship is to sail to sheltered or warm areas as much as practicable;

(3) where it is impossible to find shelters or sail to warm areas, the ship is to run with the bow heading sea and slow down as much as practicable so as to reduce immersion of the deck by wave.

3.2.8 Navigation measures in heavy seas

3.2.8.1 When the ships sails in heavy seas, the following measures are to be taken:

(1) change course and speed, use brake and rudder to keep the course in head wind at 15 degrees right or left of the wind (current, wave) direction and minimize roll angle or avoid synchronous rolling as much as practicable; the ship may be maneuvered to sail in head or following seas, broach and surf-ride;

(2) intensify inspection to ensure that the main engine, auxiliary engine, rudder can function;

(3) where the stability is not satisfactory and the rolling period is long, the double bottom is to be sufficiently ballasted if applicable to improve the stability; however, the impacts of the free surface are to be minimized as much as practicable;

(4) intensify inspection of bonding of deck equipment and cargoes. For articles that may be moved or collapsed due to insufficient bondage, effective measures must be taken to eliminate safety hazards;

(5) guarantee the watertightness of the closing appliances of all openings on the deck. Check the drainage pump, pipings and bypass valve to ensure that they are in good working order. Check and clean the bilge tank so that the water can be drained in a timely manner. Check the scuppers of each deck to ensure good drainage.

3.2.9 Emergency medical accident handling on shipboard

3.2.9.1 In case of sudden injury or illness on board, the Company and the Master shall assess the emergency medical resources carried on board, taking into account factors including but not limited to the intended navigation route, communication capabilities, available medical assistance resources, etc.

Node: List the type and quantity of emergency medical equipment and medicines to be equipped on board according to the needs assessment.

3.2.9.2 In the event of an emergency on board requiring medical treatment, the following measures is considered:

(1) assign personnel with relevant training and experience to use onboard medical resources for temporary disposal;

(2) to promptly contact institutions that can provide medical assistance through telemedicine service communication systems to obtain information on medical treatment and to confirm the means of assistance that can be provided;

(3) confirm available evacuation equipment on board and cooperate with rescue agencies to evacuate personnel in need of medical assistance.

Section3 Coordinate emergency response service procedures

3.3.1 Purpose

3.3.1.1 This section describes procedures for coordinating emergency response service to be followed in preparing for a voyage and in the event of an incident arising.

3.3.2 Supplementary procedure of ship emergency response

3.3.2.1 When sailing in polar waters, the ship is generally to follow the existing emergency response procedures in the safety management system of the company and ship. In general, when the ship is intended to navigate in polar waters or has voyage plans, both the company and the ship are to carry out appropriate risk evaluations, develop or supplement contingency plans. describe The following supplementary procedures of this section is considered:

(1) voyage preparation, including complying mandatory warnings of laws and regulations of coastal States of polar waters; identify and verify the salvage service arrangement and the SAR coordination center information available on the route based on risk evaluations;

(2) during navigation in polar waters, in case of emergency, the communication channel and means between the ship and the company, operation for the company and the ship, as well as the designated agencies and means of contact for the company and the master to acquire services such as consultancy on ice conditions, meteorology, route selection, icebreaker escort, ERS, etc.; verify and update the contact information and procedures of the SAR coordination center;

(3) list and update the selectable salvage facilities and their service categories in different areas of the intended routes, as well as the contactable SAR coordination centers and their relevant facilities, if any.

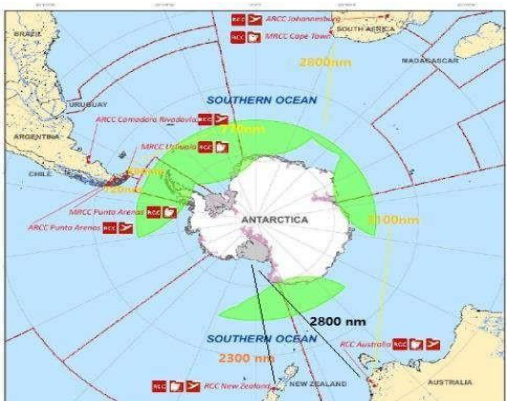

Figure3.3.2 SAR coordination area in Antarctic area

Section4 Procedures for maintaining life support and vessel integrity in the event of prolonged entrapment by ice

3.4.1 Purpose

3.4.1.1 If the risk of prolonged besetment by ice is considered, ship design is to be provided with special equipment and systems that can eliminate the s environmental risks, such as:

(1) adding additional equipment power supplied by emergency switchboard to satisfy demands for lighting, heating, ventilation, fresh water and food supply during the longest duration waiting for salvage;

(2) anti-icing of the drainage system;

(3) isolation parts of the HVAC system.

3.4.1.2 This section describes specific equipment, systems, and procedures for operations designed to

maintain life support and vessel integrity in the event of prolonged entrapment by ice.

3.4.2 System configuration

3.4.2.1 To list specific systems based on the actual conditions of the ship.

3.4.3 System operation

3.4.3.1 To describe system operation procedures based on the actual conditions of the system.