2015년도 추계학술대회 논문집 pp. 130~132

Introduction to IMO Polar Code – From the perspective of class

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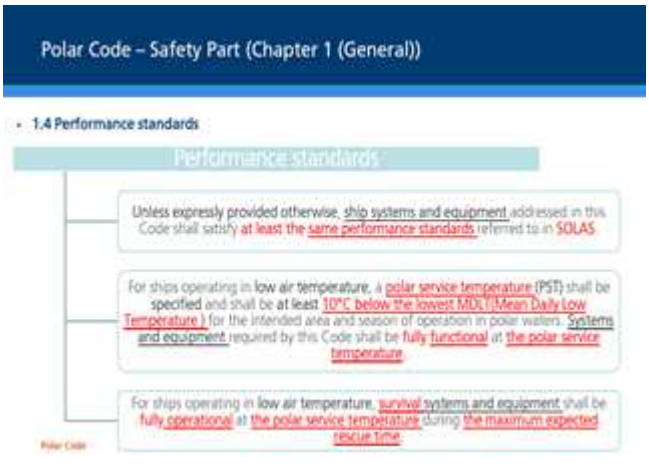
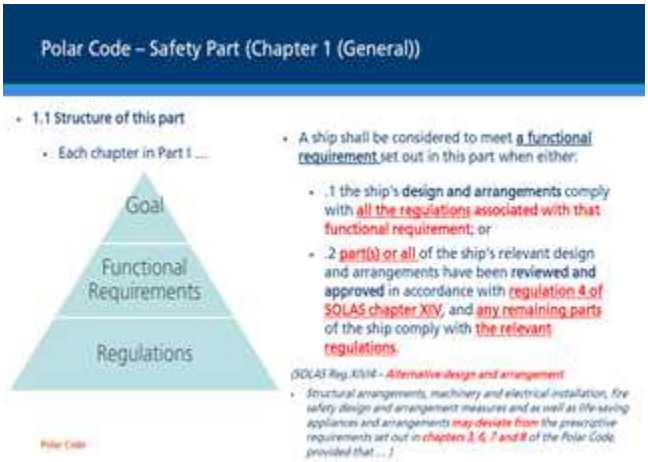
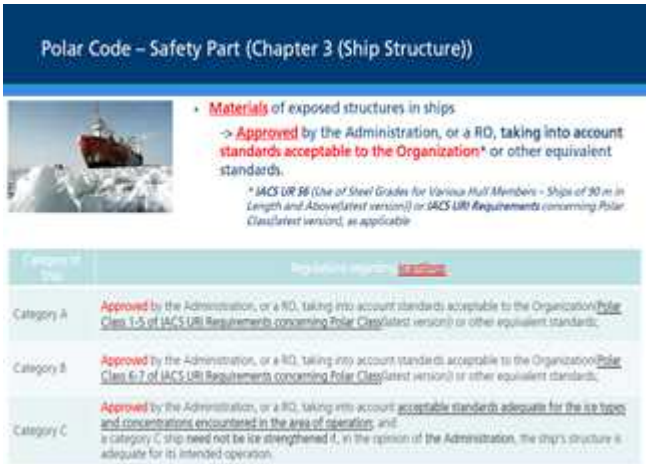
Abstract: The IMO Polar Code was adopted by Res.MSC.385(94) and Res.MEPC.264(68) and will enter into force on 1 January 2017. The Polar Code will affect design and equipment of ships intending to operate in polar areas. In this study, the requirements in the Polar Code are analysed from the perspective of class.

Key words: Polar Code, IMO, Polar Service Temperature, Polar Class, Polar Water







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Polar Code – Safety Part (Chapter 4 (Subdivision and Stability))

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

- Ships operating in areas and during periods where ice accretion is likely to occur shall be:
  - .1 designed to minimize the accretion of ice; and
  - .2 equipped with such means for removing ice as the Administration may require; for example, electrical and pneumatic devices, and/or special tools such as axes or wooden clubs for removing ice from bulwarks, rails and erections.

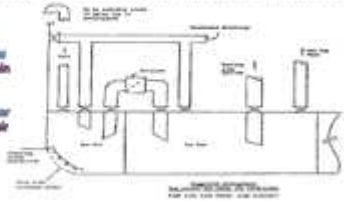
Polar Code – Safety Part (Chapter 6 (Machinery Installations))

- Machinery installations and associated equipment 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;
- Working liquids shall be maintained in a viscosity range that ensures operation of the machinery; and
- Seawater supplies for machinery systems shall be designed to prevent ingestion of ice,* or otherwise arranged to ensure functionality.

** Refer to MSC/Circ.504, Guidance on design and construction of sea inlets under slush ice conditions.*

Blockage of the seawater cooling intakes => Loss of cooling water to the ship's main engine and/or generators

Continued operation of water pumps after vent blockage => Structural damage to air vents or tank



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Polar Code – Safety Part (Chapter 4 (Subdivision and Stability))

- Ships of categories A and B, constructed on or after 1 January 2017, shall be able to withstand flooding resulting from hull penetration due to ice impact.
- The ice damage extents to be assumed when demonstrating compliance with paragraph 4.3.2.1 shall be such that:

Ice damage	Ice damage extents (assumption)
Longitudinal extent	4.5% of the upper ice waterline length if centred forward of the maximum breadth on the upper ice waterline, and 1.5% of upper ice waterline length otherwise, and shall be assumed at any longitudinal position along the ship's length;
Transverse penetration extent	760 mm, measured normal to the shell over the full extent of the damage; and
Vertical extent	the lesser of 20% of the upper ice waterline draught or the longitudinal extent, and shall be assumed at any vertical position between the keel and 120% of the upper ice waterline draught.

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Polar Code – Safety Part (Chapter 6 (Machinery Installations))

- Exposed machinery and electrical installation and appliances shall function at the polar service temperature
- 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
- Materials of exposed machinery and foundations => Approved by the Administration, or a RO, taking into account standards acceptable to the Organization* or other standards offering an equivalent level of safety based on the polar service temperature.

** Refer to Polar Class 1–5, Class 6–7 of IACS UR Requirements concerning Polar Class (2011).*

Category of ship	Regulations [illegible] scantlings, propeller blades, propulsion line, steering equipment, ... other appendages of ships
Category A	Approved by the Administration, or a RO, taking into account standards acceptable to the Organization/Polar Class 1–5 of IACS UR) Requirements concerning Polar Class (2011)) or other equivalent standards;
Category B	Approved by the Administration, or a RO, taking into account standards acceptable to the Organization/Polar Class 6–7 of IACS UR) Requirements concerning Polar Class (2011)) or other equivalent standards;
Category C (ice-strengthened)	Approved by the Administration, or a RO, taking into account acceptable standards adequate with the ice types and concentration encountered in the area of operation

Polar Code – Safety Part (Chapter 5 (Watertight and Weathertight Integrity))

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

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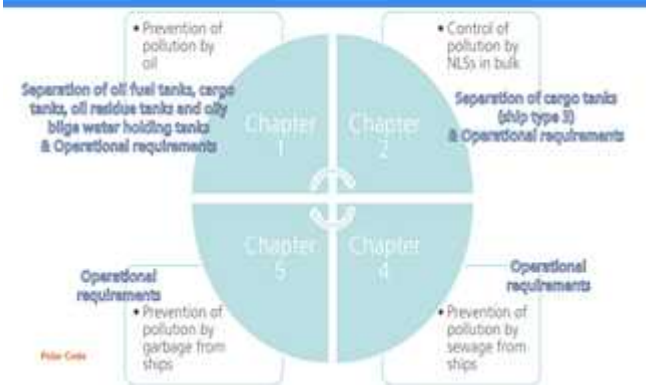
Polar Code – Safety Part (Chapter 7 (Fire Safety/Protection))

Item	Regulation
Isolating and pressure/vacuum valves in exposed locations	Protected from ice accretion and remain accessible at all time
All two-way portable radio communication equipment	Operable at the polar service temperature
Fire pumps including emergency fire pumps, water mist and water spray pumps	Located in compartments maintained above freezing
The fire main	Arranged so that exposed sections can be isolated and means of draining of exposed sections shall be provided
Fire hoses and nozzles	Need not be connected to the fire main at all times, and may be stored in protected locations near the hydrants
Firefighter's outfits	Stored in warm locations on the ship
Fixed water-based firefighting systems using their own independent sea suction	where fixed water-based firefighting systems are located in a space separate from the main fire pumps and use their own independent sea suction, this sea suction is to be also capable of being cleared of ice accumulation.
Portable and semi-portable extinguishers	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
Materials of exposed fire safety systems	Approved by the Administration, or a RO, taking into account standards acceptable to the Organization* or other equivalent standards

Polar Code – Safety Part (Chapter 8 (Life-Saving Appliances and Arrangements))

Topic	Regulations
Escape	Means to remove or prevent ice and snow accretion from escape routes, muster stations, embarkation areas, survival craft, its launching appliances and access to survival craft
	(Ships keel-laid on or after 1 January 2017): exposed escape routes shall be arranged so as not to hinder passage by persons wearing suitable polar clothing
	For ships intended to operate in low air temperatures, adequacy of embarkation arrangements shall be assessed, having full regard to any effect of persons wearing additional polar clothing
Evacuation	Means to ensure safe evacuation of persons, including safe deployment of survival equipment, when operating in ice-covered waters, or directly onto the ice, as applicable
	where the regulations of this chapter are achieved by means of adding devices requiring a source of power, this source shall be able to operate independently of the ship's main source of power
Survival	(Passenger ships): a proper sized immersion suit or a thermal protective aid for each person on board
	Immersion suits shall be of the insulated type
	For ships intended to operate in extended periods of darkness, searchlights suitable for continuous use to facilitate identification of ice shall be provided for each lifeboat
	Lifeboat shall be of partially or totally enclosed type
	Taking into account the operational assessment, appropriate survival resources shall be provided as follows: .1 life-saving appliances and group survival equipment that provide effective protection against direct wind chill for all persons on board; .2 personal survival equipment in combination with life-saving appliances or group survival equipment that provide sufficient thermal insulation to maintain the core temperature of persons; and .3 personal survival equipment that provide sufficient protection to prevent frostbite of all extremities

Polar Code – Pollution Prevention Part



Polar Code – Safety Part (Chapter 9 (Safety of Navigation))

Topic	Regulations
Nautical information	Means of receiving and displaying current information on ice conditions in the area of operation
Navigational equipment functionality	(Ships keel-laid on or after 1 January 2017): ice strengthened, shall have either two independent echo-sounding devices or one echo-sounding device with two separate independent transducers
	Ships shall comply with SOLAS regulation V/22.1.9.4 (A clear view through the navigation bridge front windows) irrespective of the constructed date / the size and, depending on the bridge configuration, a clear view astern
	Means to prevent the accumulation of ice on antennas required for navigation and communication
	Where equipment required has sensors that project below the hull, such sensors shall be protected against ice
	(Category A and B ships keel-laid on or after 1 January 2017): The bridge wings shall be enclosed or designed to protect navigational equipment and operating personnel
	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
	(Ships proceeding to latitudes over 80 degrees): At least one GNSS compass or equivalent, which shall be connected to the ship's main and emergency source of power
Additional navigational equipment	Two remotely rotatable, narrow-beam search lights controllable from the bridge to provide lighting over an arc of 360 degrees, or other means to visually detect ice, except for those solely operating in areas with 24 hours daylight
	(Ships involved in operations with an icebreaker escort): A manually initiated flashing red light visible from astern to indicate when the ship is stopped. This light shall have a range of visibility of at least 2 nautical miles, and the horizontal and vertical arcs of visibility shall conform to the dim light specifications required by the International Regulations for Preventing Collisions at Sea

Polar Code – Pollution Prevention Part (Chapter 4 (Prevention of pollution by sewage from ships))

- (New ships) Discharge of sewage into the sea is prohibited from category A and B ships constructed on or after1 January 2017, and all passenger ships constructed on or after1 January 2017, except when such discharges are in compliance with paragraph 4.2.1.3 of this chapter(discharge using an approved sewage treatment plant).
- Notwithstanding the requirements of paragraph 4.2.1, category A and B ships that operate in areas of ice concentrations exceeding 1/10 for extended periods of time, may only discharge sewage using 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. Such discharges shall be subject to the approval by the Administration.

	Comminuted and disinfected sewage	Not comminuted or disinfected sewage	Approved sewage treatment plant
Disposal from any ice-shelf or fast ice	At a distance of more than 3 nautical miles	At a distance of more than 12 nautical miles	As far as practicable from the nearest land, any ice-shelf, fast ice or areas of ice concentration exceeding 1/10
Disposal from areas of ice concentration exceeding 1/10	As far as practicable	As far as practicable	

Polar Code – Safety Part (Chapter 10 (Communication))

Topic	Regulations
Ship communication	Communication equipment on board having the capabilities for ship-to-ship and ship-to-shore communication, taking into account the limitations of communications systems such as high latitudes, and the anticipated low temperature
	(Ships intended to provide icebreaking escort): A sound signaling system mounted to face astern to indicate escort and emergency manoeuvres to following ships as described in the International Code of Signals
	Two-way on-scene and SAR coordination communication capability in ships including: .1 voice and/or data communications with relevant rescue coordination centres; and .2 equipment for voice communications with aircraft on 121.5 and 123.1 MHz
	The communication equipment shall provide for two-way voice and data communication with a Telemedical Assistance Service (TMAS)
Survival craft and rescue boat communications capabilities	(Ships intended to operate in low air temperature): all rescue boats and lifeboats shall carry one device for transmitting ship to shore distress alerts, one device for transmitting signals for location and one device for transmitting and receiving on-scene communications
	(For ships intended to operate in low air temperature): all other survival craft shall carry one device for transmitting signals for location and one device for transmitting and receiving on-scene communications
	Recognizing the limitations arising from battery life, procedures shall be developed and implemented such that mandatory communication equipment for use in survival craft, including liferafts, and rescue boats are available for operation during the maximum expected time of rescue

Polar Code – Pollution Prevention Part (Chapter 5 (Prevention of pollution by garbage from ships))

Type of garbage	MARPOL Annex V	Polar Area
Food waste passed through a comminuter or grinder (through a screen with openings no greater than 25 mm)	As far as practicable from the nearest land, but not less than 12 nautical miles from the nearest land or the nearest ice shelf	- 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 land, nearest ice shelf, or nearest fast ice - Not discharged onto the ice
Food waste not treated	Not permitted	Not permitted
Cargo residues contained in hold washing water (not harmful to the marine environment)	As far as practicable from the nearest land or the nearest ice shelf (not less than 12 nautical miles from the nearest land or the nearest ice shelf)	As far as practicable from areas of ice concentration exceeding 1/10 (not less than 12 nautical miles from the nearest land, nearest ice shelf, or nearest fast ice)
Cargo residues not contained in hold washing water (not harmful to the marine environment)	Not permitted	Not permitted
Animal carcasses	Discharge of introduced avian products, including poultry and poultry parts, is not permitted in the Antarctic area unless it has been treated to be made sterile	Not permitted
Cleaning agents or additives contained in hold washing water (not harmful to the marine environment)	As far as practicable from the nearest land or the nearest ice shelf (not less than 12 nautical miles from the nearest land or the nearest ice shelf)	As far as practicable from areas of ice concentration exceeding 1/10 (not less than 12 nautical miles from the nearest land, nearest ice shelf, or nearest fast ice)
Cleaning agents or additives not contained in hold washing water (not harmful to the marine environment)	Not permitted	Not permitted