GUIDELINES

FOR ASSESSING ICE OPERATIONAL RISK

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PREFACE

The *Arctic Shipping Safety and Pollution Prevention Regulations* (ASSPPR) incorporate by reference the *International Code for Ships Operating in Polar Waters* (Polar Code), with Canadian modifications.

In practical terms, these guidelines describe the application of parts of the ASSPPR and other regulations, incorporated documents, standards, and references relevant to reducing the risk for vessels navigating in Arctic waters under Canadian jurisdiction.

In particular, these guidelines set out the three methodologies for assessing a vessel's operational capabilities in ice:

- Zone Date System (ZDS)
- Polar Operational Limit Assessment Risk Indexing System (POLARIS)[1]
- Arctic Ice Regime Shipping System (AIRSS)

The information is intended for planning and operational purposes and is written for a diverse audience, including vessel designers, recognized organizations, vessel owners and operators, vessel management companies, communication and ice information agencies, the public at large and – most importantly – the crew on the bridge.

Readers should use these guidelines together with the official versions of the various regulations, references, and related publications such as:

- *Ice Navigation in Canadian Waters*, Canadian Coast Guard (CCG)
- *Manual of Standard Procedures for Observing and Reporting Ice Conditions (MANICE)*, Environment and Climate Change Canada (ECCC)
- *Guide for understanding and identifying old ice in summer*, National Research Council of Canada (NRC)

[1] the document can be found on the IMO website, however, a public account must be created (see MSC.1/Circ.1519).

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INTRODUCTION

The presence of ice increases risks to vessel operations. Starting in 1970, with the *Arctic Waters Pollution Prevention Act* (AWPPA), the federal government introduced certain measures to facilitate safe navigation in Arctic waters under Canadian jurisdiction north of 60°N.

The Zone Date System (ZDS), together with the Construction Standards Table (CST), has provided guidance and access since the 1970s on the entry and exit dates for all classes of vessels, whether built for open water (OW) or for heavy ice operations.

Gradually, new pollution prevention measures were put in place to improve safety and provide more flexibility for operators navigating in variable ice conditions. The Arctic Ice Regime Shipping System (AIRSS) was introduced in 1996, allowing vessels to operate outside the ZDS periods. AIRSS takes into account actual ice conditions observed from the bridge using expert observations of personnel on board. It was developed with the recognition that a qualified, competent, and experienced crew is a key component to safety. Voyage planning, adequate equipment, access to timely and accurate weather and ice information, clear communications, and detailed reporting are some of the other essential elements required for safe navigation.

The experience with AIRSS, Canada's shipping system, guided the development by the International Maritime Organization (IMO) of the Polar Operational Limit Assessment Risk Indexing System[1] (POLARIS) in 2016. Likewise, it is a risk based methodology to assess operational capabilities and limitations of vessels operating in ice for use with the *International Code for Ships Operating in Polar Waters* (Polar Code), and now forms part of the *Arctic Shipping Safety and Pollution Prevention Regulations* (ASSPPR).

Roles

The master is responsible for the safety of the vessel and persons onboard. The owner/operator is responsible for ensuring that the vessel is fit for purpose, and equipped with all necessary equipment, information, documentation, certification, and suitably trained and qualified crew to undertake its mission.

In Arctic waters under Canadian jurisdiction, any vessel owner, operator and master should be aware that these guidelines are not a comprehensive source of all the laws and policies that potentially apply. Multiple entities support safe operations and protection of the environment, such as:

- Canadian Coast Guard (CCG)
  - › *Northern Canada Vessel Traffic Service Zone Regulations* (NORDREG) communications
  - › Icebreaking/routing services
- Canadian Hydrographic Service (CHS)
  - › Nautical charts/publications
- Environment and Climate Change Canada (ECCC)
  - › Ice services/ice charts

- Entities established pursuant to Comprehensive Land Claim Agreements with application in Arctic waters
  - Nunavut Land Claims Agreement (NLCA), Inuvialuit Final Agreement (IFA), Labrador Inuit Land Claims Agreement (LILCA), Nunavik Inuit Land Claims Agreement (NILCA), Eeyou Marine Region Land Claims Agreement (EMRLCA), James Bay and Northern Quebec Agreement (JBNQA), Northeastern Quebec Agreement (NQA)
- Territorial/local authorities
- Transport Canada (TC)
  - Regulations/standards/guides
  - Monitoring/compliance/enforcement

Trawler SIVULLIQ of Baffin Fisheries Coalition

FURTHER INFORMATION

- *Arctic Shipping Safety and Pollution Prevention Regulations*
- *International Code for Ships Operating in Polar Waters*
- *Polar Operational Limit Assessment Risk Indexing System*
- *Arctic Ice Regime Shipping System Standard*, TP 12259
- *Shipping Safety Control Zones Order*
- *Charts and Nautical Publications Regulations, 1995*
- Transport Canada Website

CHAPTER 1: APPLICATION

The IMO Polar Code entered into force internationally on January 1, 2017, for new vessels and on January 1, 2018, for existing vessels, based on their periodic inspection schedule.

TC introduced the ASSPPR in 2017. The safety content of these regulations applies to:

- cargo vessels of 500 gross tonnage (GT) or more
- passenger vessels that comply with Chapter I of the *International Convention for the Safety of Life at Sea, 1974 and the protocol of 1988 relating to the Convention* (SOLAS)

In addition, to ensure the continuation of previously existing levels of safety and pollution prevention, the ASSPPR contain Canada specific content (s.7-10) applicable to:

- all vessels of 300 GT or more (including fishing vessels and pleasure craft)
- vessels carrying pollutants or dangerous goods or vessels towing or pushing a vessel that is carrying pollutants or dangerous goods
- vessels towing or pushing another vessel if the combined GT is 500 or more, regardless of cargo carried, and
- passenger vessels that comply with Chapter I of SOLAS

Other requirements that affect where a vessel may operate while within Arctic waters under Canadian jurisdiction are highlighted below:

Polar Class (PC) vessels must operate using:

- the ZDS **on the same periods** as for Type A (IA Super) vessels (see Table 2) or
- POLARIS **outside** the Type A (IA Super) ZDS periods

All other vessel categories (AC, CAC, Types A to E) must continue to use:

- the ZDS or
- AIRSS (or use POLARIS as an option) if operating **outside** the ZDS periods, provided they were constructed before January 1, 2017

All vessels constructed after January 1, 2017, must use POLARIS.

Evaluation of Ice Strengthening

If a vessel is not PC nor an ice class listed in the Dates of Entry Table (ASSPPR Sch.1) or in the CST (ASSPPR Sch.2), the owner may submit for consideration by TC sufficient details demonstrating ice strengthening that provides a level of safety at least equivalent to one of the listed ice classes.

Permission to navigate using the ZDS will be based on the vessel's Polar Code category (A, B or C) or the ice class assigned, whichever is the lowest, and when intending to operate **outside** the ZDS, the vessel will make use of POLARIS regardless of date of construction.

Under the ASSPPR, a Type E vessel includes all non-ice strengthened vessels up to and including those listed in Item 5 of Schedule 2 of the ASSPPR.

The IMO Polar Code requirements are grouped in three categories of vessels:

Category A may operate in Polar Waters in at least **medium** first-year ice, which may have old ice inclusions (nominally PC 1 to 5).

Category B may operate in Polar Waters in at least **thin** first-year ice, which may have old ice inclusions and is not a Category A vessel (nominally PC 6 and 7).

Category C may operate in open water or in ice conditions less severe than those in categories A and B (nominally all other vessels).

In contrast, the Canadian ZDS refers to vessels of **Type A, B, C, D** and **E**. These designations describe the Finnish-Swedish (Baltic) Construction Standards categories from IA Super (**Type A**) to a non-ice-strengthened vessel (**Type E**).

CHAPTER 2: SAFETY OF NAVIGATION

Few Arctic communities have facilities and infrastructure comparable to those found in southern waters. Vessels engaged in Arctic voyages must therefore have:

- a crew that is qualified, well-trained and sufficient in number
- vessel equipment and supplies that can handle challenges that inevitably arise in remote areas during normal operations or in an emergency

Crew Qualification and Training

The Polar Water Operational Manual (PWOM) is kept onboard vessels subject to the Polar Code (ASSPPR s.6). It contains comprehensive information based on operational limitations described in the Polar Ship Certificate (PSC), which also includes the limiting drafts for ice operations. All crew members need to know the procedures and equipment described in the PWOM relevant to their assigned duties.

For additional training and certification requirements from the Polar Code Part I-A, Chapter 12 refer to the *International Convention on Standards of Training, Certification and Watchkeeping for Seafarers* (STCW). The Canadian *Marine Personnel Regulations* will be amended accordingly to reflect this Polar Code content. In the meantime, Ship Safety Bulletin 20/2023 explains the process for masters, officers and other crew members to obtain a Certificate of Proficiency (CoP) for Polar Waters.

Table 1: Crew Training

ICE CONDITIONS	TANKERS*	PASSENGER VESSELS	OTHER
Ice Free Waters	Not applicable	Not applicable	Not applicable
Open Waters (Less than 1/10th ice concentration)	Basic training for master, chief mate and officers in charge of a navigational watch	Basic training for master, chief mate and officers in charge of a navigational watch	Not applicable
Other Waters (Ice / Open Water Regime)	Advanced training for master and chief mate. Basic training for officers in charge of a navigational watch	Advanced training for master and chief mate. Basic training for officers in charge of a navigational watch	Advanced training for master and chief mate. Basic training for officers in charge of a navigational watch

* oil tankers, chemical tankers and gas carriers as defined in SOLAS

Qualified persons other than the master or deck officers may fulfill the training requirements for the navigational watch in Polar Waters under certain conditions and if they hold a CoP for Polar Waters.

FURTHER INFORMATION

- STCW Code, Chapter V
- *Marine Personnel Regulations*
- Ship Safety Bulletin 20/2023

Certificate of Proficiency and Ice Navigators

Vessels engaged in international voyages carrying more than 12 passengers, and cargo vessels of 500 GT or more must have on board personnel trained and qualified as required by the Polar Code (see Table 1).

Vessels that are not subject to the Polar Code that are of 300 GT or more (including fishing vessels and pleasure craft) and wishing to operate **outside** the access periods in the Shipping Safety Control Zones (SSCZ) must have on board an ice navigator (ASSPPR s.10). The ice navigator can be someone who has served on a vessel as either:

- the master
- a person in charge of the deck-watch
- a person qualified and certified in accordance with the STCW Convention and Code for advanced training in international Arctic waters and the Antarctic area

Having qualified persons or ice navigators on board does not absolve the master and officers of the navigational watch of their duties and obligations for the safety of the vessel and protection of the environment.

Voyage Planning

One can never have too much well-presented, quality information. The vessel owner, operator, master and crew must be prepared for the entire voyage. Often, there are only short periods of time to operate in remote northern waters, but there are long lists of items to consider along the route, such as:

- aids to navigation
- air temperatures and ice conditions
- historical patterns and weather forecasts
- local travel over ice
- places of refuge
- protected areas and marine mammals migration
- search and rescue (SAR) capabilities

The most recent nautical charts and publications (paper/electronic) must be available and used when planning to operate in the SSCZ.

The CHS publishes sailing directions and tides and current tables. The CCG publishes annual *Notices to Mariners*, *National Warnings*, and lists of aids to navigation and radio features where applicable.

FURTHER INFORMATION

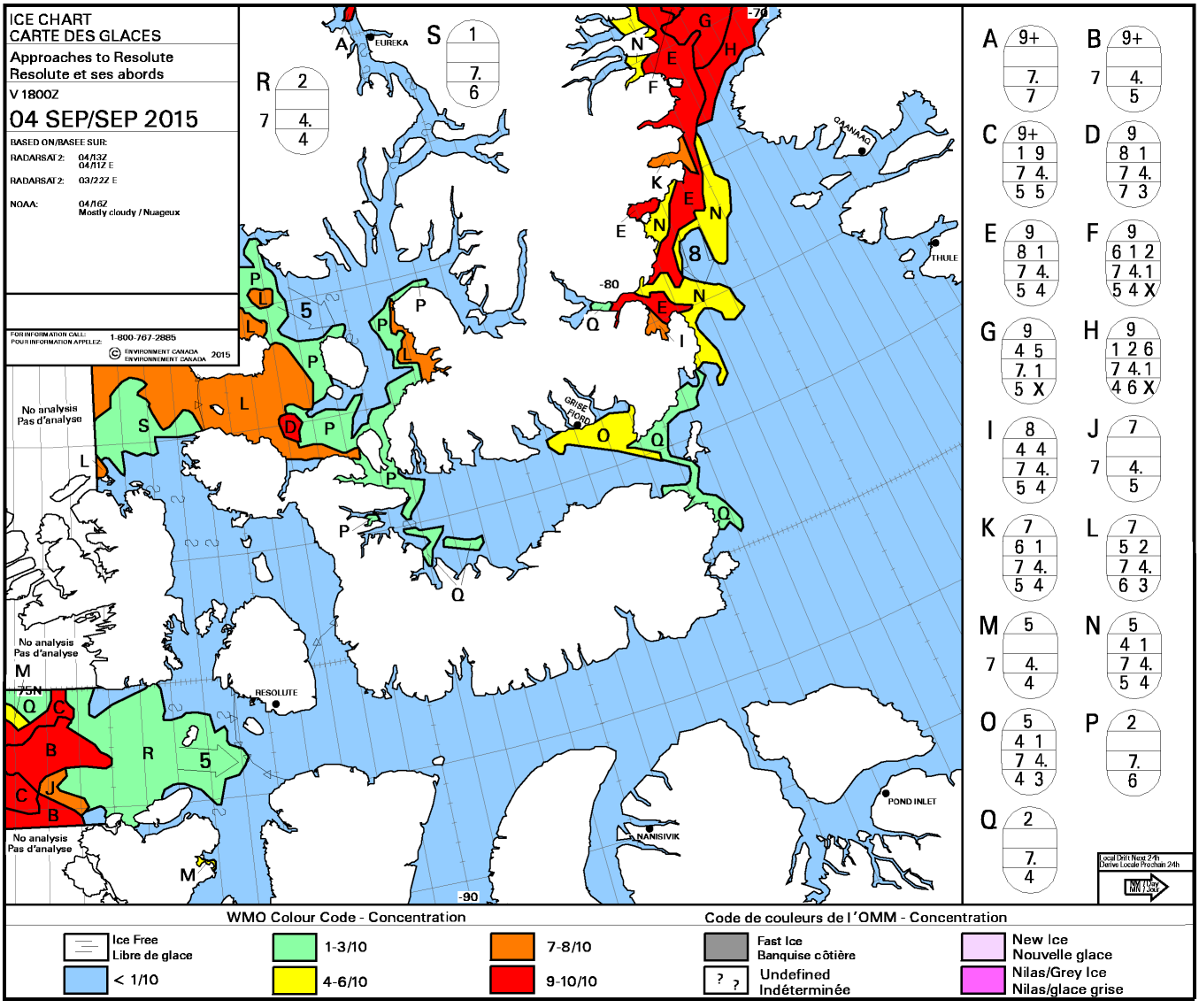
- Shipping Through Sea Ice: Impacts on Marine Habitats and Best Practices (WWF)
- Marine Mammals of Hudson Strait (WWF)
- Marine Environment Handbook – Arctic and Northwest Passage (DFO)

The PWOM and the PSC inform the master and crew of the vessel's operational capabilities, limitations, and procedures for the anticipated route, which may include severe ice conditions.

Accurate and timely ice and weather information for planning and operational purposes can be obtained from a variety of sources, including:

- CCG ice offices and daily updates
- direct satellite and airborne radar imagery
- helicopter and Autonomous Underwater Vehicle reconnaissance
- ice charts from the Canadian Ice Service (CIS)
- NORDREG
- reports from shore stations and from other vessels in the area
- view from the bridge

The *Ice Navigation in Canadian Waters* publication is **mandatory** for vessels operating in all ice regimes



Typical Ice Chart

The CIS has information on interpreting ice charts and egg codes (ice codes depicted in oval form). The World Meteorological Organization (WMO) has its own colour code.

FURTHER INFORMATION

- Manual of Standard Procedures for Observing and Reporting Ice Conditions (MANICE), Environment and Climate Change Canada
- Guide for understanding and identifying old ice in summer, National Research Council of Canada (NRC)

Preparation

As part of the design and certification process, the Polar Code (Part I-A, 1.5) requires an operational assessment of the vessel and its equipment taking into consideration potential hazards, potential abandonment onto ice or land, and anticipated operations in:

- variable ice conditions
- high latitude locations
- low air temperature conditions

For information on operational assessments and preparation of the PWOM, see the IMO Polar Code. These guidelines focus on vessel operations in Canadian Arctic ice conditions.

When considering the potential for abandonment into ice or land the following publications may have useful information:

- *Cold Weather Marine Survival Guide*, TP 11690
- *Marine Survival Handbook for Cold Regions*, TP 11969

Communications

High latitudes, lack of shore stations, limited coverage by some satellites, and low temperatures can impair the performance of communications equipment. It is essential to understand shortcomings and have effective communication for vessels and survival craft during normal operations and emergency situations.

NORDREG, which covers all Arctic waters under Canadian jurisdiction, serves as the CCG point of communication for all vessels prior to entering, and while operating within a SSCZ.

CHAPTER 3: REPORTING

When navigating in Arctic waters under Canadian jurisdiction, NORDREG applies to all vessels:

- of 300 GT or more
- that engage in towing or pushing, if the combined tonnage of the vessel and the vessel being towed is 500 GT or more
- that carry as cargo pollutants or dangerous goods, or tow or push a vessel carrying pollutants or dangerous goods

All vessels regardless of tonnage are encouraged to comply.

Any incident involving the spillage of oil or petroleum lubricating products into the marine environment must be reported immediately to NORDREG. **CCG toll-free: 1-800-265-0237 (24 hours)**

In addition, the operator should report the incident to the appropriate 24-hour Spill Line. **Nunavut and Northwest Territories: (867) 920-8130; Yukon: (867) 667-7244**.

Depending on the transfer location, specific requirements for crew and equipment may apply on voyages involving bulk oil transfers to or from vessels. Details are given in Arctic Waters Oil Transfer Guidelines, TP 10783.

Messages

When vessels plan to operate **outside** their entry periods for the SSCZ, the master is required to send timely messages to TC via NORDREG. TC will acknowledge receipt.

The information requested is detailed in Table 2 of the *AIRSS Standard* (TP 12259). This information is also used for POLARIS messages and in general includes a description of:

- the proposed route and final destination
- each ice regime anticipated on the route, and the Ice Numeral (IN) or the Risk Index Outcome (RIO) for the regime
- crew certification, call letters, type of vessel and name of any escorting vessel
- the name of the master, ice navigator, or qualified person, as applicable

Where vessels transit more than one zone to reach their final destination, a comprehensive message sent before entering the first zone will suffice.

Where any ice or weather conditions become hazardous to safe navigation, the master must send a new message in the prescribed manner.

Emergency

In the course of an emergency or rescue, a vessel may enter SSCZs outside the periods of access for the purpose of saving life or preventing the loss of a vessel (ASSPPR 8(3)). The master must send a message to NORDREG before entering the Zone.

NORDREG, as a radio station, may receive reports of occurrences in accordance with the *Transportation Safety Board* (TSB) *Regulations*. Among other requirements, you must report an occurrence when the vessel:

- makes unforeseen contact with the bottom without going aground
- is anchored, grounded, or beached to avoid an occurrence
- sustains a total failure of the main or auxiliary machinery
- sustains a total failure of the navigation equipment or the propulsion, steering or deck machinery if the failure threatens the safety of any person, property or the environment

In your report to the TSB, you must include:

- the name of the authorized representative as per subsection 14 (1) of the *Canada Shipping Act, 2001* (CSA)
- the ice conditions at the time of the occurrence, and
- the location of the occurrence (regardless of whether the vessel is missing or not)

Tanker with Ice damage

CHAPTER 4: MONITORING

Vessels that operate in the SSCZs are monitored in various ways, mainly by:

- Automatic Identification System
- Long Range Identification and Tracking
- National Aerial Surveillance Program
- NORDREG daily position report at 1600 UTC
- authorized personnel that may intervene, including:
  - › Pollution Prevention Officers (PPO)
  - › Marine Safety Inspectors (MSI)

A TC PPO or MSI may board the vessel to determine compliance with standards under Canadian regulations. The officer may direct the vessel to proceed or remain **outside** the zone depending on prevailing conditions, if:

- reasonable grounds exist to suspect that the vessel does not comply with the official regulations
- for reasons of weather, visibility, ice or sea conditions, the condition of the vessel, or the nature or condition of its cargo, and/or
- a substantial quantity of waste has been deposited in Arctic waters under Canadian jurisdiction or the officer is satisfied that there is a grave and imminent danger of a substantial deposit of waste in Arctic waters under Canadian jurisdiction

The MSI/PPO have their own authority to verify compliance with the regulations and issue administrative penalties, as appropriate.

When operating **outside** the entry periods of the ZDS, complete and correct messages will be quickly acknowledged, confirming that the reporting requirements are being met to the satisfaction of TC.

If a message is delayed for unforeseen operational reasons, or force majeure, no enforcement action should be considered if the information eventually received is accurate, complete and reasonably timely.

When ice conditions deteriorate for vessels operating **inside** the ZDS access periods, the PPO may require the use of POLARIS and/or AIRSS systems to assess operational risk when considering the issuance of a direction to the vessel.

FURTHER INFORMATION

- *Arctic Waters Pollution Prevention Act*
- *Canada Shipping Act, 2001*

CHAPTER 5: ZONE DATE SYSTEM

Arctic waters under Canadian jurisdiction are divided into 16 zones. The *Shipping Safety Control Zones Order* prescribes these zones.

The ZDS is a schedule of the earliest and latest entry dates for each zone. The data corresponds to the specific category of vessel based on its structural capability.

Zone 1 historically has the most severe ice conditions, and zone 16 the least. The higher ice-strengthened vessels are able to operate for longer periods in the higher severity zones.

Table 3 of these guidelines lists various vessel categories or ice classes that, when used with Table 2, form the ZDS as described in the ASSPPR.

Although simple and predictable, this system has a major drawback: it is rigid and static. Ice conditions vary significantly from year to year, while average conditions have changed over the decades. In a severe year, an inexperienced operator might attempt a voyage well beyond the capabilities of the vessel. For a light ice year, the rigidity of the regulatory system may prevent vessels from transiting areas that may be completely free of ice. Voyage planning is essential at all stages.

FURTHER INFORMATION

- *Shipping Safety Control Zones Order*
- *Arctic Shipping Safety and Pollution Prevention Regulations*

Figure 1: Shipping Safety Control Zones

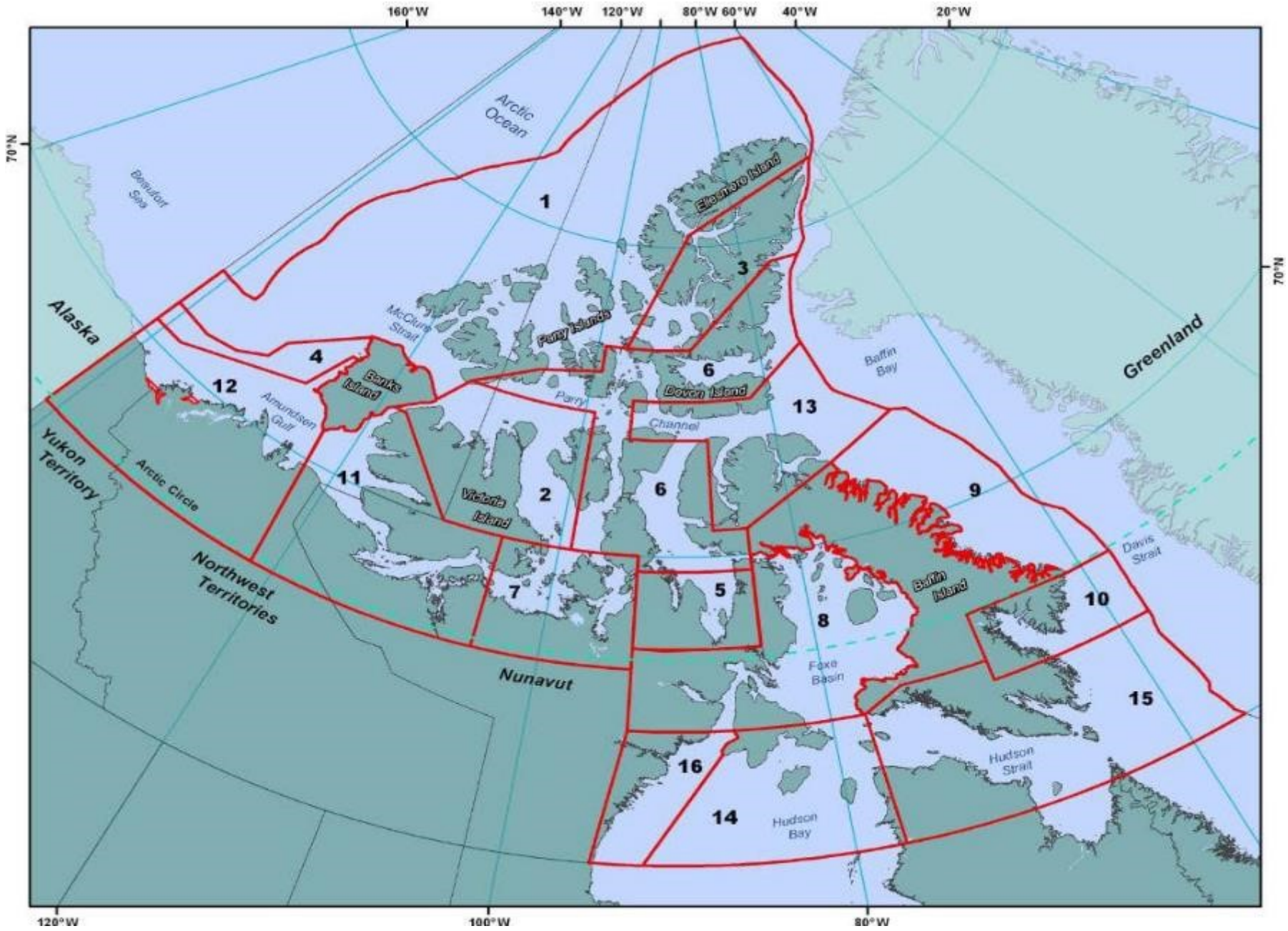


Table 2: Dates of Entry

Zones	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Categories																
AC 10, CAC 1	ALL YEAR															
AC 8, CAC 2	Jul. 1 to Oct. 15	ALL YEAR														
AC 7	Aug. 1 to Sept. 30	Aug. 1 to Nov. 30	Jul. 1 to Dec. 31	Jul. 1 to Dec. 15	Jul. 1 to Dec. 15	ALL YEAR										
AC 6, CAC 3	Aug. 15 to Sept. 15	Aug. 1 to Oct. 31	Jul. 15 to Nov. 30	Jul. 15 to Nov. 30	Aug. 1 to Oct. 15	Jul. 15 to Feb. 28	Jul. 1 to Mar. 31	Jul. 1 to Mar. 31	ALL YEAR		Jul. 1 to Mar. 31.	ALL YEAR				
AC 4	Aug. 15 to Sept. 15	Aug. 15 to Oct. 15	Jul. 15 to Oct. 31	Jul. 15 to Nov. 15	Aug. 15 to Sept. 30	Jul. 20 to Dec. 31	Jul. 15 to Jan. 15	Jul. 15 to Jan. 15	Jul. 10 to Mar. 31	Jul. 10 to Feb. 28	Jul. 5 to Jan. 15	June 1 to Jan. 31	June 1 to Feb. 15	June 15 to Feb. 15	June 15 to Mar. 15	June 1 to Feb. 15
AC 3, CAC 4	Aug. 20 to Sept. 15	Aug. 20 to Sept. 30	Jul. 25 to Oct. 15	Jul. 20 to Nov. 5	Aug. 20 to Sept. 25	Aug. 1 to Nov. 30	Jul. 20 to Dec. 15	Jul. 20 to Dec. 31	Jul. 20 to Jan. 20	Jul. 15 to Jan. 25	Jul. 5 to Dec. 15	June 10 to Dec. 31	June 10 to Dec. 31	June 20 to Jan. 10	June 20 to Jan. 31	June 5 to Jan. 10
AC 2	NO ENTRY		Aug. 15 to Sept. 30	Aug. 1 to Oct. 31	NO ENTRY	Aug. 15 to Nov. 20	Aug. 1 to Nov. 20	Aug. 1 to Nov. 30	Aug. 1 to Dec. 20	Jul. 25 to Dec. 20	Jul. 10 to Nov. 20	June 15 to Dec. 5	June 25 to Nov. 22	June 25 to Dec. 10	June 25 to Dec. 20	June 10 to Dec. 10
AC 1A	NO ENTRY		Aug. 20 to Sept. 15	Aug. 20 to Sept. 30	NO ENTRY	Aug. 25 to Oct. 31	Aug. 10 to Nov. 5	Aug. 10 to Nov. 20	Aug. 10 to Dec. 10	Aug. 1 to Dec. 10	Jul. 15 to Nov. 10	Jul. 1 to Nov. 10	Jul. 15 to Oct. 31	Jul. 1 to Nov. 30	Jul. 1 to Dec. 10	June 20 to Nov. 30
AC 1	NO ENTRY		NO ENTRY		NO ENTRY	Aug. 25 to Sept. 30	Aug. 10 to Oct. 15	Aug. 10 to Oct. 31	Aug. 10 to Oct. 31	Aug. 1 to Oct. 31	Jul. 15 to Oct. 20	Jul. 1 to Oct. 31	Jul. 15 to Oct. 15	Jul. 1 to Nov. 30	Jul. 1 to Nov. 30	June 20 to Nov. 15
PC 1-7	NO ENTRY		Aug. 20 to Sept. 10	Aug. 20 to Sept. 20	NO ENTRY	Aug. 15 to Oct. 15	Aug. 1 to Oct. 25	Aug. 1 to Nov. 10	Aug. 1 to Nov. 20	Jul. 25 to Nov. 20	Jul. 10 to Oct. 31	June 15 to Nov. 10	June 25 to Oct. 22	June 25 to Nov. 30	June 25 to Dec. 5	June 20 to Nov. 20
Type A (IA super)	NO ENTRY		Aug. 20 to Sept. 10	Aug. 20 to Sept. 20	NO ENTRY	Aug. 15 to Oct. 15	Aug. 1 to Oct. 25	Aug. 1 to Nov. 10	Aug. 1 to Nov. 20	Jul. 25 to Nov. 20	Jul. 10 to Oct. 31	June 15 to Nov. 10	June 25 to Oct. 22	June 25 to Nov. 30	June 25 to Dec. 5	June 20 to Nov. 20
Type B (IA)	NO ENTRY		Aug. 20 to Sept. 5	Aug. 20 to Sept. 15	NO ENTRY	Aug. 25 to Sept. 30	Aug. 10 to Oct. 15	Aug. 10 to Oct. 31	Aug. 10 to Oct. 31	Aug. 1 to Oct. 31	Jul. 15 to Oct. 20	Jul. 1 to Oct. 25	Jul. 15 to Oct. 15	Jul. 1 to Nov. 30.	Jul. 1 to Nov. 30	June 20 to Nov. 10
Type C (IB)	NO ENTRY		NO ENTRY		NO ENTRY	Aug. 25 to Sept. 25	Aug. 10 to Oct. 10	Aug. 10 to Oct. 25	Aug. 10 to Oct. 25	Aug. 1 to Oct. 25	Jul. 15 to Oct. 15	Jul. 1 to Oct. 25	Jul. 15 to Oct. 10	Jul. 1 to Nov. 25	Jul. 1 to Nov. 25	June 25 to Nov. 10
Type D (IC)	NO ENTRY					NO ENTRY	Aug. 10 to Oct. 5	Aug. 15 to Oct. 20	Aug. 15 to Oct. 20	Aug. 5 to Oct. 20	Jul. 15 to Oct. 10	Jul. 1 to Oct. 20	Jul. 30 to Sept. 30	Jul. 10 to Nov. 10	Jul. 5 to Nov. 10	Jul. 1 to Oct. 31
Type E (Non Ice-Strengthened)	NO ENTRY					NO ENTRY	Aug. 10 to Sept. 30	Aug. 20 to Oct. 20	Aug. 20 to Oct. 15	Aug. 10 to Oct. 20	Jul. 15 to Sept. 30	Jul. 1 to Oct. 20	Aug. 15 to Sept. 20	Jul. 20 to Oct. 31	Jul. 20 to Nov. 5	Jul. 1 to Oct. 31

Based on Schedule 1 of the *Arctic Shipping Safety and Pollution Prevention Regulations* with added row PC 1-7

Table 3: Construction Standards for Type Vessels

TYPE OF VESSEL	ABS	BV	CCS	CLASSNK	DNV-GL	FSICR	KR	LR	PRS	RINA	RMRS
Type A	Ice Class IAA	ICE CLASS IA SUPER	Ice Class B1*	NS (Class 1A Super Ice Strengthening)	Ice (1A*) or ICE-1A or E4	IA Super	IA Super	Ice Class 1AS FS or Ice Class 1AS FS (+)	L1A	ICE CLASS 1A SUPER	UL or LU5 or Arc5
Type B	Ice Class IB	ICE CLASS IA	Ice Class B1	NS (Class 1A Ice Strengthening)	Ice (1A) or ICE-1A or E3	IA	IA	Ice Class 1A FS (+) or Ice Class 1A FS	L1	ICE CLASS 1A	L1 or LU4 or Arc4
Type C	Ice Class IC	ICE CLASS IB	Ice Class B2	NS (Class 1B Ice Strengthening)	Ice (1B) or ICE-1B or E2	IB	IB	Ice Class 1B FS (+) or Ice Class 1B FS	L2	ICE CLASS 1B	L2 or LU3 or Ice 3
Type D	Ice Class D0	ICE CLASS IC	Ice Class B3	NS (Class 1C Ice Strengthening)	Ice (1C) or ICE-1C or E1	IC	IC	Ice Class 1C FS (+) or Ice Class 1C FS	L3	ICE CLASS 1C	L3 or LU2 or Ice 2
Type E (See Note)	Ice Class E0	ID	Ice Class B	NS (Class 1D Ice Strengthening)	ICE-C or E	Category II	ID	Ice Class 1D or Ice Class 1E	L4	1D	L4 or LU1 or Ice 1

Based on Schedule 2 of the Arctic Shipping Safety and Pollution Prevention Regulations minus the column for the PC categories, which are set out in the IACS Unified Requirements for Polar Ships.

FSICR categories are based on HELCOM Rec 25/7.

Note: Type E includes the identified ice class and any class below it, as well as vessels without an assigned class of ice strengthening.

Table 4: Polar Class Descriptions

POLAR CLASS	GENERAL DESCRIPTION
PC 1	Year-round operation in all Polar Waters
PC 2	Year-round operation in moderate multi-year ice conditions
PC 3	Year-round operation in second-year ice which may include multi-year inclusions
PC 4	Year-round operation in thick first-year ice which may include old ice inclusions
PC 5	Year-round operation in medium first-year ice which may include old ice inclusions
PC 6	Summer/autumn operation in medium first-year ice which may include old ice inclusions
PC 7	Summer/autumn operation in thin first-year ice which may include old ice inclusions

PC descriptions suit a variety of scenarios and their relationships are set to provide a smooth gradation of capability. PC vessels may operate inside the ZDS on the same dates allowed for Type A (IA Super) vessels and make use of POLARIS when outside those access dates.

Ice accretion in Arctic waters

CHAPTER 6: ICE REGIMES

An ice regime is an area composed of a relatively even distribution of any mix of ice types, including open water (OW). It considers the ices':

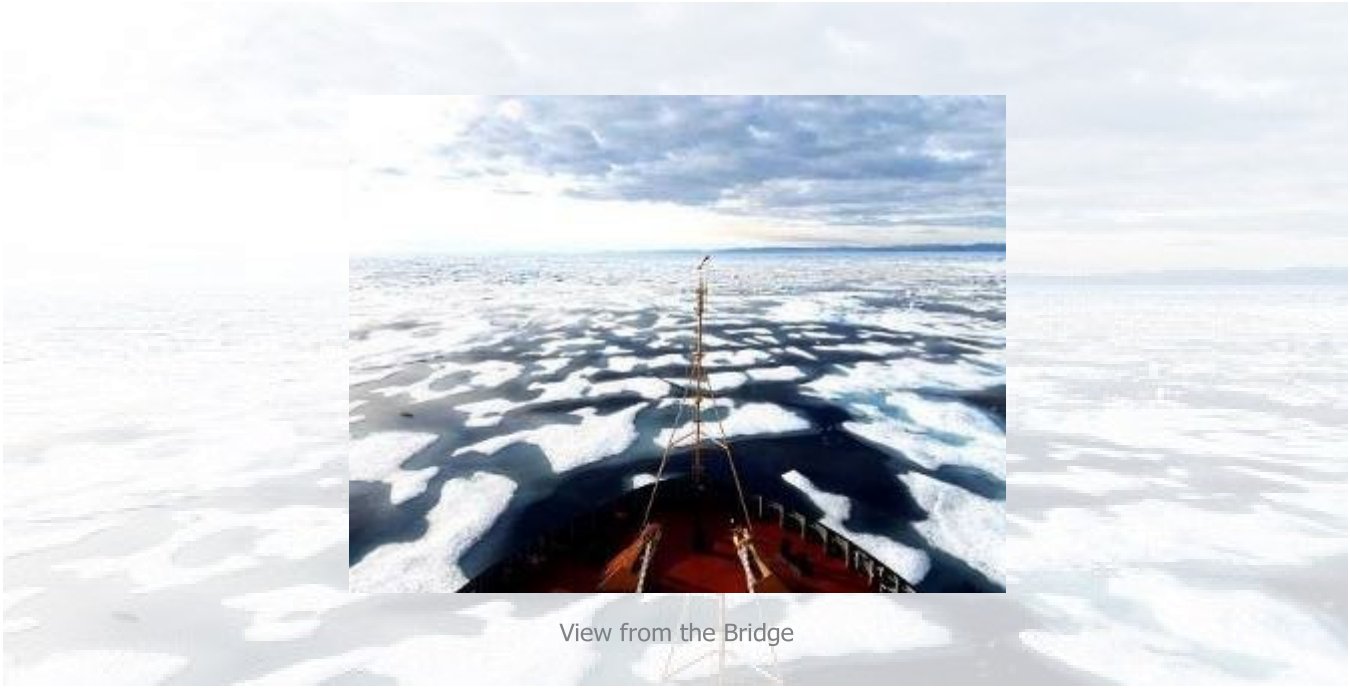
- concentration
- stage of development (thickness and age)
- state of decay
- roughness

From a navigational standpoint, it is an area in which there is the likelihood of encountering certain ice types, while moving continuously (and cautiously) through the surrounding ice conditions.

Characterizing Ice Regimes: Operating

Ice charts are no substitute for real-time observations (eye/radar) made from the bridge**.** Under operating conditions, POLARIS and AIRSS use visual information by the crew on the bridge, supplemented by other sources of available information.

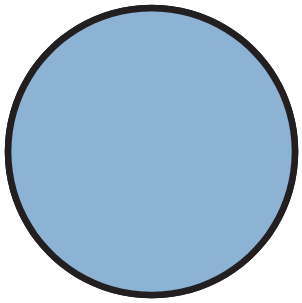
To assess the navigational risk presented by operating through a particular ice regime, trained and experienced personnel must identify the ice types present in a given area, and how much of each type is present. Some illustrations of ice types and concentrations are depicted on the following pages.



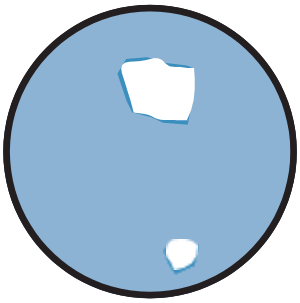
View from the Bridge

Figure 3. Ice Concentration

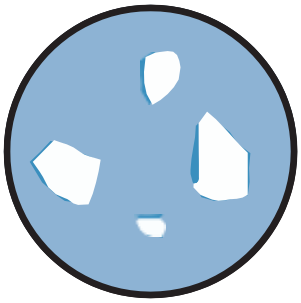
Ice coverage in an area is expressed by its total concentration (in tenths).



No ice present – ice free

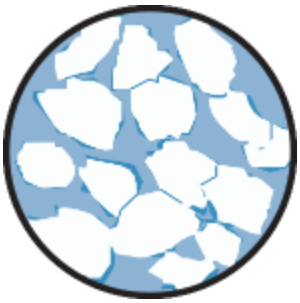


Less than 1/10th – open water

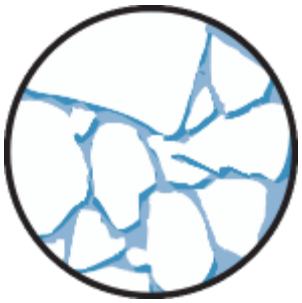


1/10th to 3/10^{ths} – very open drift

4/10^{ths} to 6/10^{ths} – open drift



7/10^{ths} to 8/10^{ths} – close pack/drift



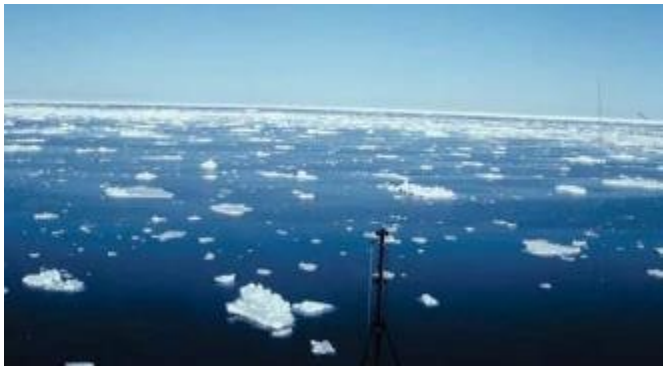
9/10^{ths} – very close pack

9+/10^{ths} – very close pack

10 /10^{ths} – compact/consolidated ice

Ice free
no ice present

Less than 1 tenth
open water



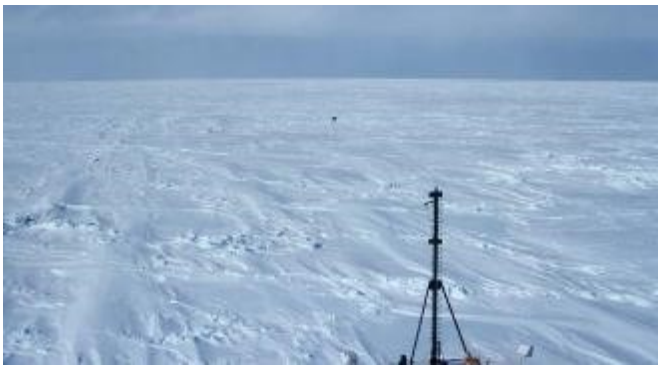
1 - 3 tenths
very open drift

4 - 6 tenths
open drift

7 - 8 tenths
close pack/drift

9 tenths
very close pack

9+ tenths
very close pack



10 tenths
compact/consolidated ice

Stages of Development

Ice has the following stages of development:

1. **New Ice (N)** (less than 10 cm thick)

Sea ice that is in early stages of formation. This ice is less than 10 cm thick and in small platelets or lumps, or ice in a soupy-looking layer. New ice is usually subdivided into frazil, grease ice, slush or shuga.

2. **Nilas** (less than 10 cm thick)

A thin elastic crust of floating ice that easily bends from waves and swells. It has a matte surface appearance.

3. **Young Ice** (10 to 30 cm thick)

Young ice is subdivided into the following sub-stages:

a. ***Grey (G)*** - Young ice, 10 to 15 cm thick, which is less elastic than Nilas. It often breaks from swells.

b. ***Grey White*** (GW) - Young ice, 15 to 30 cm thick

4. **Thin First-year Ice (TnFY)** (30 to 70 cm thick)

Sea ice that grows from young ice and is 30 to 70 cm thick. This is separated into **stage 1** (30 to 50 cm thick) and **stage 2** (50 to 70 cm thick).

5. **Medium First-year Ice (MFY)** (70 to 120 cm thick)

Sea ice that is 70 to 120 cm thick.

6. **Thick First-year Ice (TkFY)** (more than 120 cm thick)

Sea ice that is greater than 120 cm (1.2 m) thick.

7. **Second-year Ice (SY)**

Sea ice that has survived one melt season. It stands higher out of the water than first-year ice. Summer melting has often smoothed and rounded it. Melt water puddles in the summer are often greenish-blue. Appears in CIS charts on October 1.

8. **Multi-year Ice (MY)**

Sea ice that has survived at least two melt seasons. This ice can be more than 3 m thick and is very strong. It has a characteristic bluish colour and usually has a higher freeboard than first-year ice. It usually has a weathered, undulating surface.

9. **Glacial Ice**

Ice that originated from a glacier that calved and drifted into the sea.

FURTHER INFORMATION

- *Ice Navigation in Canadian Waters*, CCG
- *Guide for understanding and identifying old ice in summer*, NRC
- Ice Glossary, CIS

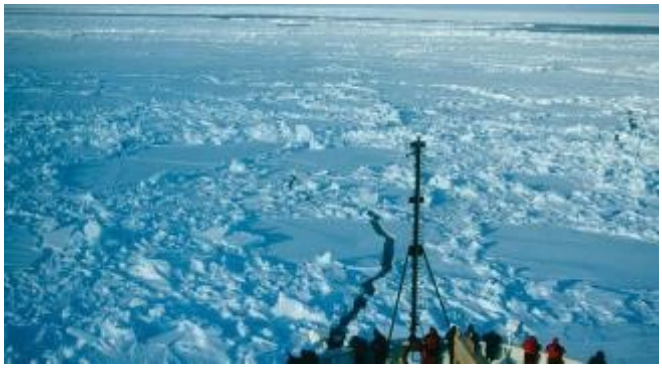
New (N)
First-year sea ice, small floes less than 10 cm thick

Grey White Ice (GW)
First-year ice that is 15 to 30 cm thick

Nilas
First-year sea ice sheet less than 10 cm thick

Thin First-year Ice (TnFY)
First-year ice that is 30 to 70 cm thick

Grey Ice (G)
First-year ice that is 10 to 15 cm thick



Medium First-year Ice (MFY)
First-year ice that is 70 to 120 cm thick

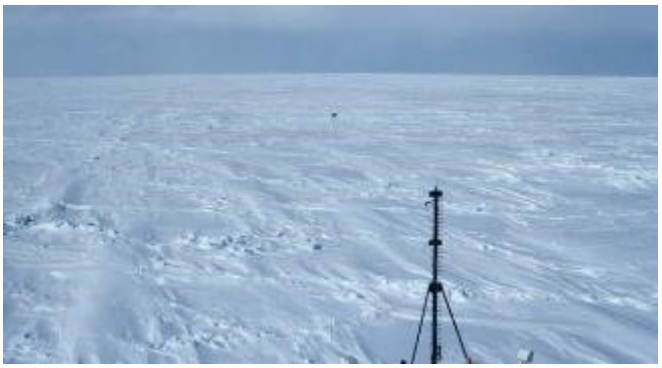
Thick First-year Ice (TkFY)
First-year ice that is greater than 120 cm thick

Multi-year Ice (MY)
Sea ice that has survived more than one melt season

Second-year Ice (SY)
Sea ice that has survived one melt season

Glacial Ice
Ice of glacial origin

Stages of Decay



No Melt (winter conditions)

Thaw Holes

Snow Melt

Rotten

Ponding

Regimes with Multi-year Ice and Glacial Ice

The presence of multi-year ice and glacial ice represent additional risks to the vessel. Areas containing multi-year and glacial ice must be approached with caution.

Before operating in ice, the master and officers in charge of a navigational watch must receive appropriate training to:

- identify and avoid multi-year ice and glacial ice
- understand the consequences of collision

Measures to avoid glacial ice should be documented in a vessel's PWOM.

Where glacial ice is encountered, in addition to the RIO or IN, the vessel should observe a safe stand-off distance. It is recommended that this stand-off distance be recorded in the PWOM.

Bergy waters deserve special attention by mariners, especially in poor visibility or darkness. Radars may not clearly show large icebergs, and less so for bergy bits and growlers. Ice charts/reports usually only show bergy waters where there is no significant concentration of sea ice in the vicinity.

Mariners navigating through OW leads are urged to do so with extreme caution and anticipate the effect of wind and currents.

Seasonal Changes in Ice Conditions

Early-Season Voyages

Early-season voyages (late May, June or early July, depending on the area) are voyages where the vessel intends to enter Arctic waters under Canadian jurisdiction:

- prior to the main onset of melt
- expects to actively break ice to reach its destination

Conditions for early-season voyages generally improve as the days get longer and the sea ice undergoes its decay process. While transit delays on an early-season voyage may be undesirable, situations may still arise where detouring or waiting for conditions to improve may be the safest and most efficient option.

Late-Season Voyages

Late-season voyages (October to December) deserve special attention because ice conditions will very likely worsen during the voyage. This may include rapidly deteriorating conditions. Severe, late-season storms can cause pressure events and move large quantities of multi-year ice from high latitudes into shipping channels.

For example, multi-year ice moves from the Kane Basin/Smith Sound to the western shore of Baffin Bay. A north/south barrier of ice forms, which may block the entrance to Lancaster Sound.

CCGS LOUIS S. ST.-LAURENT in 4/10ths FY Ice and 6/10ths OW

Normally, CCG icebreakers are in the region from mid-June to mid-November. See the CCG website for more information.

Before departing, a vessel planning either an early- or late-season voyage may contact the CIS to obtain a copy of the *Seasonal Outlook and the Thirty Day Forecast*.

Methodologies for Access to Arctic Waters under Canadian Jurisdiction

The ZDS provides good guidance based on historical data of ice conditions. Rapidly changing weather patterns and climate change emphasize the need for operators and mariners to exercise caution at all times, particularly in remote areas and where ice conditions may change rapidly due to wind or current.

All PC vessels and all vessels built after January 1, 2017, that operate **outside** the ZDS, may **only** use POLARIS. All other vessels intending to operate **outside** the ZDS access periods must use either POLARIS or AIRSS, as interpreted by qualified personnel on board. **Regardless of dates, where ice conditions are persistent or varying, use of either system is recommended at all times**.

MS BREMEN, CRYSTAL SERENITY, RRS ERNEST SHACKLETON, in convoy with CCGS DES GROSEILLIERS in Larsen Sound, 2017

CHAPTER 7: APPLYING POLARIS

Vessels constructed after January 1, 2017, vessels evaluated and granted ice-strengthening equivalency, and PC vessels must use POLARIS when operating **outside** the ZDS access periods. Existing vessels must use AIRSS (Chapter 8) or opt for POLARIS when operating outside the ZDS access periods.

The basis of POLARIS is an evaluation of the risks posed to a vessel by ice conditions in relation to a vessel's assigned ice class. It uses WMO nomenclature with some additions, as well as the ice class (or equivalency) shown in the Polar Ship Certificate (PSC).

POLARIS has been developed incorporating experience from Canada's AIRSS system, and the Russian Ice Passport system, supplemented by best practices in ice navigation.

POLARIS uses a Risk Index Value (RIV) table, whereby numerical values are assigned to each vessel category. The RIVs may be used to evaluate the limitations of the vessel operating in an ice regime with input either from historic or current ice charts for voyage planning or in real time from observations made on the bridge of the vessel.

POLARIS uses the RIO as an assessment of the limitations for operation in ice. The RIVs are used to determine the RIO, which sets out the limitation of operations.

1. The user characterizes the ice regime
2. The class-dependent RIVs are obtained from Table 5
3. Information about the Ice Regime and the RIVs is combined to determine the RIO (see POLARIS calculation flowchart for an example)
4. The RIO is used to decide whether or not the vessel can proceed, whether mitigating measures are needed to proceed, or whether an alternate route should be taken

Table 5: POLARIS Risk Index Values

		ICE FREE / OPEN WATER	NEW	GREY	GREY WHITE	THIN FY, 1ST STAGE	THIN FY, 2ND STAGE	MEDIUM FY (< 1 M)	MEDIUM FY	THICK FY ICE	SECOND YEAR ICE	LIGHT MULTI YEAR (< 2.5 M)	HEAVY MULTI YEAR
VESSEL CATEGORY	ICE TYPE SYMBOL	IF/OW	N	G	GW	TNFY1	TNFY2	MFY-1	MFY	TKFY	SY	LMY-2.5	HMY
	EGG CODE	1 OR 2		4	3 OR 5	8	7 OR 9		1•	6 OR 4•	8•		
PC1		3	3	3	3	2	2	2	2	2	2	1	1
PC2		3	3	3	3	2	2	2	2	2	1	1	0
PC3		3	3	3	3	2	2	2	2	2	1	0	-1
PC4		3	3	3	3	2	2	2	2	1	0	-1	-2
PC5		3	3	3	3	2	2	1	1	0	-1	-2	-2
PC6		3	2	2	2	2	1	1	0	-1	-2	-3	-3
PC7		3	2	2	2	1	1	0	-1	-2	-3	-3	-3
IA Super (Type A)		3	2	2	2	2	1	0	-1	-2	-3	-4	-4
IA (Type B)		3	2	2	2	1	0	-1	-2	-3	-4	-5	-5
IB (Type C)		3	2	2	1	0	-1	-2	-3	-4	-5	-6	-6
IC (Type D)		3	2	1	0	-1	-2	-3	-4	-5	-6	-7	-8
Not Ice Strengthened (Type E)		3	1	0	-1	-2	-3	-4	-5	-6	-7	-8	-8

The Risk Value Index can be adjusted for ice decay (yellow highlight) by +1

Discriminating Between Ice Types

Ice types in POLARIS generally conform to the WMO nomenclature (WMO/OMM/BMO No. 259) used on ice charts, with some important variations.

Medium first-year ice is subdivided into Stage 1 and Stage 2:

- Where the operator can confidently determine that the ice in a regime is first-year ice less than 1 metre thick, the RIV for the ice category medium first-year ice less than 1 m thick may be used
- Otherwise, the operator should use the higher RIV for medium first-year ice, that is, Stage 2 POLARIS also gives the option of subdividing multi-year ice into two ice categories:
- Where the operator can confidently determine that the ice in a regime is multi-year ice and that it is less than 2.5 metres thick, the ice category light multi-year ice may be used
- When the ice cannot be confidently identified as multi-year ice that is less than 2.5 metres thick, the ice category heavy multi-year ice should be used

The operator should also be aware that neither medium first-year ice less than 1 metre thick, light multi-year ice, nor heavy multi-year ice will appear on ice charts, as they do not align with standard WMO terminology. In addition, even experienced mariners find it difficult to distinguish second-year ice from multi-year ice. Therefore, while RIVs for these three ice categories are available to the operator, making use of them is challenging.

When using the egg code, the operator must always select the higher ice type when unsure and be aware that ice concentrations for a given area vary, where strings and patches of ice of higher concentrations may be present.

Calculating Risk Index Outcomes

For each ice regime encountered, the RIVs from the table are used to determine the RIO that forms the basis of the decision to operate or the limitation of operations.

The RIO is determined by a summation of the RIVs for each ice type present in the ice regime multiplied by its concentration (expressed in tenths):

$$RIO = (C_1 \times RIV_1) + (C_2 \times RIV_2) + (C_3 \times RIV_3) + \ldots (C_n \times RIV_n)$$

Where:

RIO = Risk Index Outcome

$C_1 \ldots C_n$ are the concentrations (in tenths) of ice types within the ice regime

$RIV_1 \ldots RIV_n$ are the corresponding Risk Index Values for each ice type

Every regime is composed of an aggregate 10/10^{ths} concentration of various ice types. If all partial concentrations of ice do not sum to 10/10^{ths}, the remaining must be accounted for as **ice free.** That is, recheck if it does not add up to 10.

Modifications to Risk Index Values

During the spring, the sea ice begins to melt and decay, with a resultant decrease in strength. The stages of decay of sea ice are:

- no melt (winter)
- snow melt
- ponding
- thaw holes (drainage)
- rotten

POLARIS takes into account ice decay, depending upon the ice type. Ice decay is not currently reported on a consistent basis, therefore, only when ice decay is confirmed by ice information/visual observation by qualified personnel on board may the RIVs for decayed ice be used.

As can be seen in the RIVs in Table 5, +1 (plus one) can be added to the normal operation values as highlighted in yellow.

Examples of the application of adjustments to the RIVs in POLARIS and the results are shown on the following pages.

FURTHER INFORMATION

- *Guide for understanding and identifying old ice in summer*, NRC

Operational Limitations

POLARIS, as developed by the IMO, addresses three levels of operation based on the RIO:

- normal operation
- elevated operational risk and
- operation subject to special consideration.

The Canadian modifications apply to all vessels operating in the SSCZ when using POLARIS and combines the special considerations into the elevated operational risk assessment.

Table 6: Application of POLARIS in the SSCZs

RIO vessel	PC3-PC7	ICE CLASS OTHER THAN POLAR CLASS OR NO ICE CLASS
RIO ≥ 0	Normal operation	Normal operation
-10 ≤ RIO < 0	Elevated operational risk – operate only if measures in PWOM allow it and are followed	No entry
RIO < -10	No entry	No entry

Normal Operation

Normal operation indicates that the ice regime risk is relatively low, however it is important to note that this may give a false sense of the ice conditions, or the ability of the vessel. Speed reductions are left to the discretion of the master and ice navigator.

While PC 1-2 vessels will always have a RIO greater than zero, these vessels may still encounter risky ice. **Operators must proceed with due caution**.

Elevated Operational Risk

Ships operating in an **elevated risk** ice regime are only allowed entry upon employing the mitigating measures detailed in their PWOM. It is the responsibility of the vessel owner/operator to develop and document mitigation measures in the PWOM, where applicable. These measures may involve speed reduction, the provision of additional watchkeeping and/or use of icebreaker support.

For voyage planning, potential areas of **elevated risk** operations should be avoided. Contingency plans must be in place and documented in the PWOM if it is anticipated that these routes are to be taken.

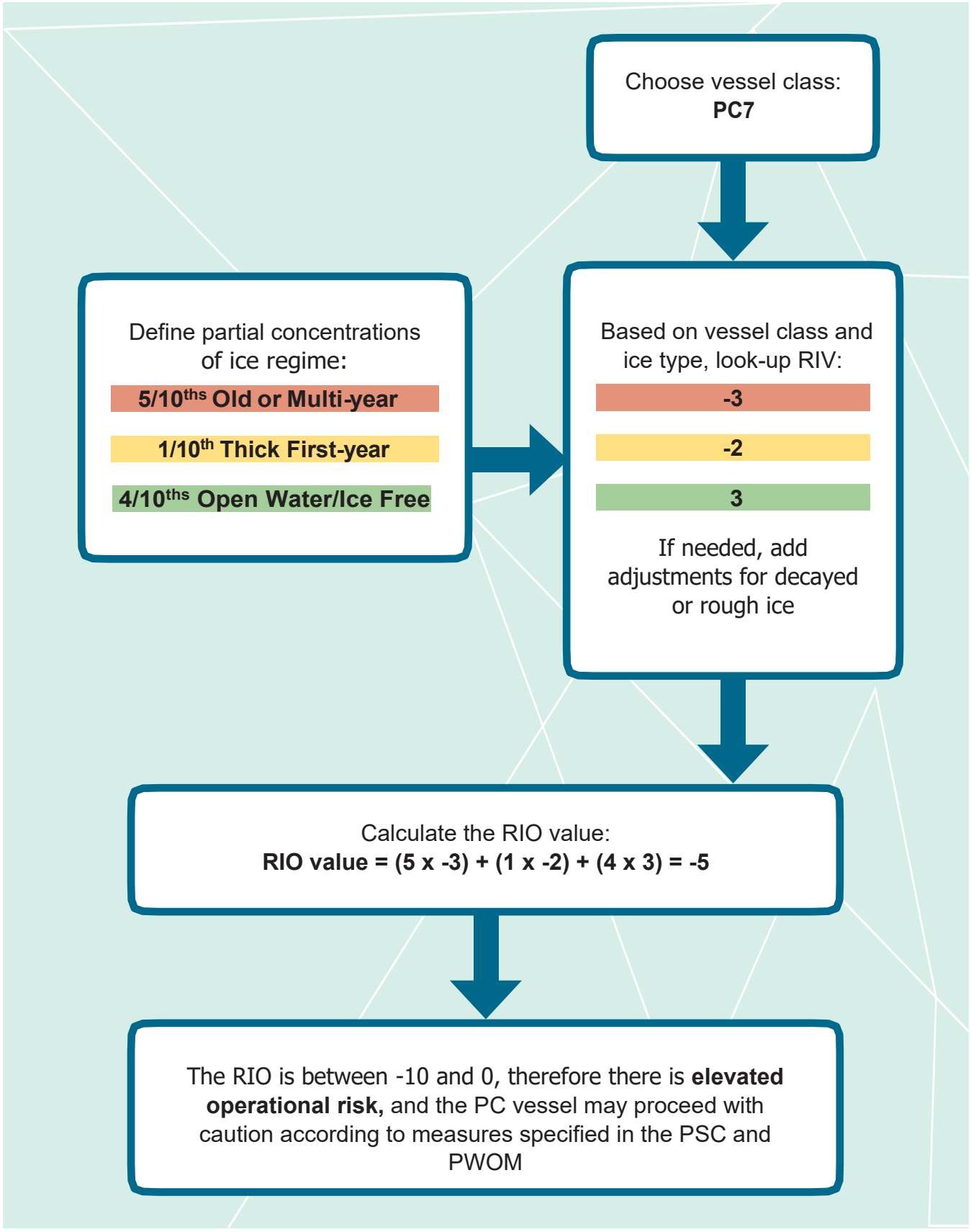
No Entry

In the SSCZ, vessels are **prohibited from entering** an ice regime where the RIO is less than -10 for PC 3-7 ice classes and where the RIO is less than 0 (zero) for vessels with other ice classes. These areas must be avoided by taking an alternate route, by using an escort vessel or by waiting safely until conditions improve.

FURTHER INFORMATION

- Guidance on Methodologies for Assessing Operational Capabilities and Limitations in Ice (IMO)

POLARIS Calculation Flowchart

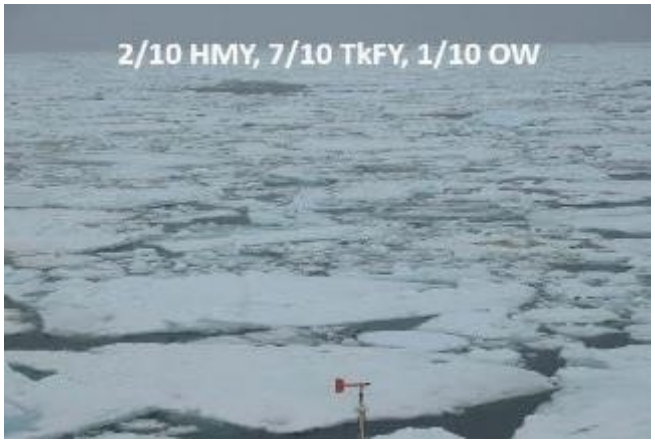


Polar Class and Type Categories Examples

PC3 VESSEL											
OW/IF	N	G	GW	$TnFY_1$	$TnFY_2$	MFY-1	MFY	TkFY	SY	LMY-2 .5	HMY
3	3	3	3	2	2	2	2	2	1	0	-1

$$RIO = [C_{TkFY} \times RIV_{TkFY}] + [C_{MFY} \times RIV_{MFY}] + [C_{OW} \times RIV_{OW}]$$
$$= [4 \times 2] + [1 \times 2] + [5 \times 3]$$
$$= +25$$

RIO > 0, the vessel may proceed as per Normal Operations



$$RIO = [C_{HMY} \times RIV_{HMY}] + [C_{TkFY} \times RIV_{TkFY}] + [C_{OW} \times RIV_{OW}]$$
$$= [2 \times -1] + [7 \times 2] + [1 \times 3]$$
$$= +15$$

RIO > 0, the vessel may proceed as per Normal Operations

$$RIO = [C_{MFY} \times RIV_{MFY}] + [C_{OW} \times RIV_{OW}]$$
$$= [3 \times 2] + [7 \times 3]$$
$$= +27$$

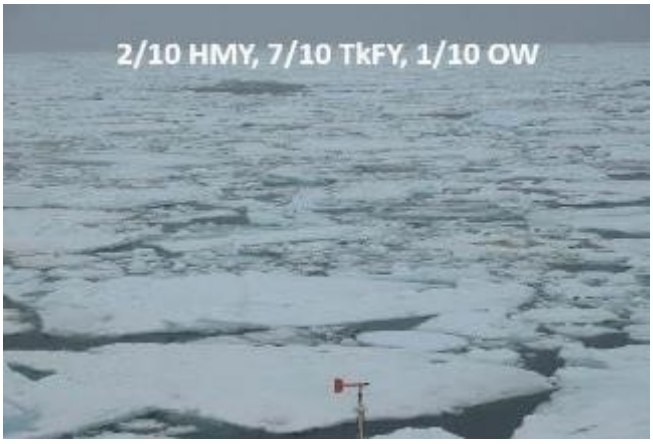
RIO > 0, the vessel may proceed as per Normal Operations

PC4 VESSEL

OW/IF	N	G	GW	TnFY1	TnFY2	MFY-1	MFY	TkFY	SY	LMY-2 .5	HMY
3	3	3	3	2	2	2	2	1	0	-1	-2

$$RIO = [C_{TkFY} \times RIV_{TkFY}] + [C_{MFY} \times RIV_{MFY}] + [C_{OW} \times RIV_{OW}]$$
$$= [4 \times 1] + [1 \times 2] + [5 \times 3]$$
$$= +21$$

RIO > 0, the vessel may proceed as per Normal Operations



$$RIO = [C_{HMY} \times RIV_{HMY}] + [C_{TkFY} \times RIV_{TkFY}] + [C_{OW} \times RIV_{OW}]$$
$$= [2 \times -2] + [7 \times 1] + [1 \times 3]$$
$$= +6$$

RIO > 0, the vessel may proceed as per Normal Operations

$$RIO = [C_{MFY} \times RIV_{MFY}] + [C_{OW} \times RIV_{OW}]$$
$$= [3 \times 2] + [7 \times 3]$$
$$= +27$$

RIO > 0, the vessel may proceed as per Normal Operations

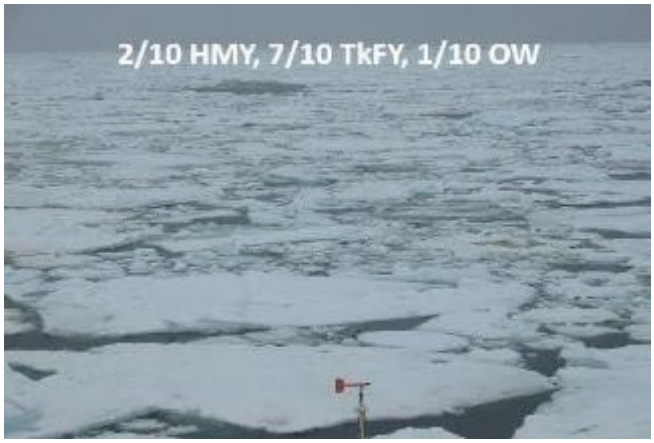
PC5 VESSEL

OW/IF	N	G	GW	TnFY1	TnFY2	MFY-1	MFY	TkFY	SY	LMY-2 .5	HMY
3	3	3	3	2	2	1	1	0	-1	-2	-2

$$RIO = [C_{TkFY} \times RIV_{TkFY}] + [C_{MFY} \times RIV_{MFY}] + [C_{OW} \times RIV_{OW}]$$

$$= [4 \times 0] + [1 \times 1] + [5 \times 3]$$
$$= +16$$

RIO > 0, the vessel may proceed as per Normal Operations



$$RIO = [C_{HMY} \times RIV_{HMY}] + [C_{TkFY} \times RIV_{TkFY}] + [C_{OW} \times RIV_{OW}]$$

$$= [2 \times -2] + [7 \times 0] + [1 \times 3]$$
$$= -1$$

-10 =< RIO < 0, the vessel is in Elevated Operational Risk and must follow measures in PWOM

$$RIO = [C_{MFY} \times RIV_{MFY}] + [C_{OW} \times RIV_{OW}]$$

$$RIO = [3 \times 1] + [7 \times 3]$$
$$RIO = +24$$

RIO > 0, the vessel may proceed as per Normal Operations

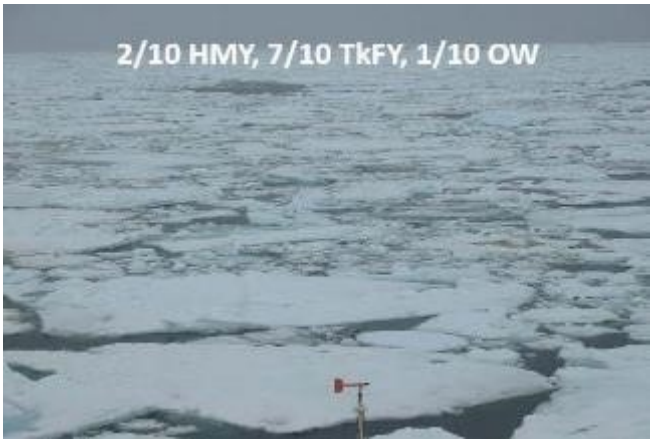
PC6 VESSEL

OW/IF	N	G	GW	TnFY1	TnFY2	MFY-1	MFY	TkFY	SY	LMY-2 .5	HMY
3	2	2	2	2	1	1	0	-1	-2	-3	-3

$$RIO = [C_{TkFY} \times RIV_{TkFY}] + [C_{MFY} \times RIV_{MFY}] + [C_{OW} \times RIV_{OW}]$$

$$= [4 \times -1] + [1 \times 0] + [5 \times 3]$$
$$= +11$$

RIO > 0, the vessel may proceed as per Normal Operations



$$RIO = [C_{HMY} \times RIV_{HMY}] + [C_{TkFY} \times RIV_{TkFY}] + [C_{OW} \times RIV_{OW}]$$

$$= [2 \times -3] + [7 \times -1] + [1 \times 3]$$
$$= -10$$

-10 =< RIO < 0, the vessel is in Elevated Operational Risk and must follow measures in PWOM

$$RIO = [C_{MFY} \times RIV_{MFY}] + [C_{OW} \times RIV_{OW}]$$

$$= [3 \times 0] + [7 \times 3]$$
$$= +21$$

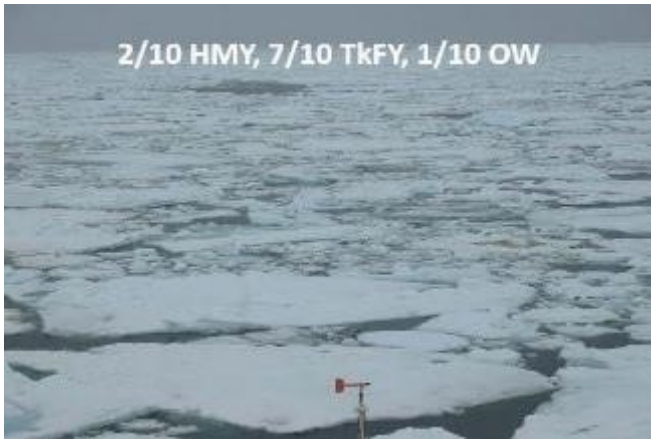
RIO > 0, the vessel may proceed as per Normal Operations

PC7 VESSEL

OW/IF	N	G	GW	TnFY1	TnFY2	MFY-1	MFY	TkFY	SY	LMY-2 .5	HMY
3	2	2	2	1	1	0	-1	-2	-3	-3	-3

$$RIO = [C_{TkFY} \times RIV_{TkFY}] + [C_{MFY} \times RIV_{MFY}] + [C_{OW} \times RIV_{OW}]$$
$$= [4 \times -2] + [1 \times -1] + [5 \times 3]$$
$$= +6$$

RIO > 0, the vessel may proceed as per Normal Operations



$$RIO = [C_{HMY} \times RIV_{HMY}] + [C_{TkFY} \times RIV_{TkFY}] + [C_{OW} \times RIV_{OW}]$$
$$= [2 \times -3] + [7 \times -2] + [1 \times 3]$$
$$= -17$$

RIO < -10, Ice Regime indicates area of No Entry

$$RIO = [C_{MFY} \times RIV_{MFY}] + [C_{OW} \times RIV_{OW}]$$
$$= [3 \times -1] + [7 \times 3]$$
$$= +18$$

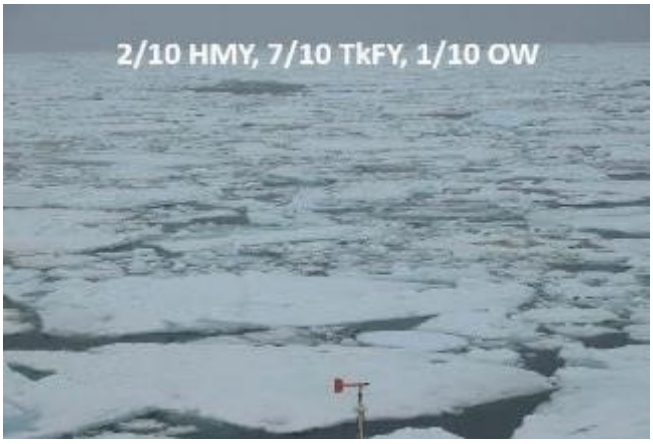
RIO > 0, the vessel may proceed as per Normal Operations

TYPE A (IA SUPER) VESSEL

OW/IF	N	G	GW	TnFY1	TnFY2	MFY-1	MFY	TkFY	SY	LMY-2 .5	HMY
3	2	2	2	2	1	0	-1	-2	-3	-4	-4

$$RIO = [C_{TkFY} \times RIV_{TkFY}] + [C_{MFY} \times RIV_{MFY}] + [C_{OW} \times RIV_{OW}]$$
$$= [4 \times -2] + [1 \times -1] + [5 \times 3]$$
$$= +6$$

RIO > 0, the vessel may proceed as per Normal Operations



$$RIO = [C_{HMY} \times RIV_{HMY}] + [C_{TkFY} \times RIV_{TkFY}] + [C_{OW} \times RIV_{OW}]$$
$$= [2 \times -4] + [7 \times -2] + [1 \times 3]$$
$$= -19$$

RIO < 0, Ice Regime indicates area of No Entry

$$RIO = [C_{MFY} \times RIV_{MFY}] + [C_{OW} \times RIV_{OW}]$$
$$= [3 \times -1] + [7 \times 3]$$
$$= +18$$

RIO > 0, the vessel may proceed as per Normal Operations

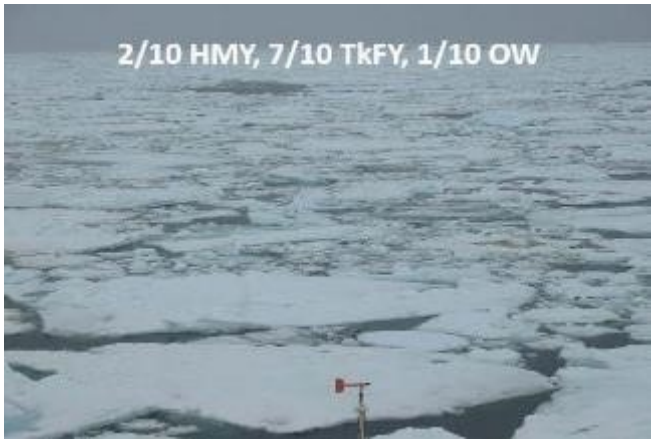
TYPE B (IA) VESSEL

OW/IF	N	G	GW	TnFY1	TnFY2	MFY-1	MFY	TkFY	SY	LMY-2 .5	HMY
3	2	2	2	1	0	-1	-2	-3	-4	-5	-5

$$RIO = [C_{TkFY} \times RIV_{TkFY}] + [C_{MFY} \times RIV_{MFY}] + [C_{OW} \times RIV_{OW}]$$

$$= [4 \times -3] + [1 \times -2] + [5 \times 3]$$
$$= +1$$

RIO > 0, the vessel may proceed as per Normal Operations



$$RIO = [C_{HMY} \times RIV_{HMY}] + [C_{TkFY} \times RIV_{TkFY}] + [C_{OW} \times RIV_{OW}]$$

$$= [2 \times -5] + [7 \times -3] + [1 \times 3]$$
$$= -28$$

RIO < 0, Ice Regime indicates area of No Entry

$$RIO = [C_{MFY} \times RIV_{MFY}] + [C_{OW} \times RIV_{OW}]$$

$$= [3 \times -2] + [7 \times 3]$$
$$= +15$$

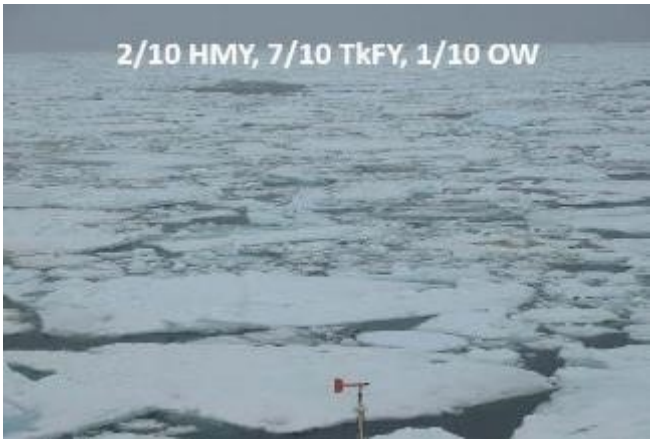
RIO > 0, the vessel may proceed as per Normal Operations

TYPE E (NON ICE STRENGTHENED) VESSEL

OW/IF	N	G	GW	TnFY1	TnFY2	MFY-1	MFY	TkFY	SY	LMY-2 .5	HMY
3	1	0	-1	-2	-3	-4	-5	-6	-7	-8	-8

$$RIO = [C_{TkFY} \times RIV_{TkFY}] + [C_{MFY} \times RIV_{MFY}] + [C_{OW} \times RIV_{OW}]$$
$$= [4 \times -6] + [1 \times -5] + [5 \times 3]$$
$$= -14$$

RIO < 0, Ice Regime indicates area of No Entry



$$RIO = [C_{HMY} \times RIV_{HMY}] + [C_{TkFY} \times RIV_{TkFY}] + [C_{OW} \times RIV_{OW}]$$
$$= [2 \times -8] + [7 \times -6] + [1 \times 3]$$
$$= -55$$

RIO < 0, Ice Regime indicates area of No Entry

$$RIO = [C_{MFY} \times RIV_{MFY}] + [C_{OW} \times RIV_{OW}]$$
$$= [3 \times -5] + [7 \times 3]$$
$$= +6$$

RIO > 0, the vessel may proceed as per Normal Operations

Vessel Operations Under Escort

To determine the RIO for a vessel under icebreaker escort, the ice immediately ahead of the vessel should be considered as its ice regime. This regime should include the track of the icebreaker and, if the icebreaker has a smaller beam than the vessel under escort, there may be further risks if the ice along the track is under pressure or if ice pieces are forced underneath the hull.

The ice in the track can be assessed for thickness (age / ice type), concentration(s), and floe size. If the actual floes are under 2 metres in diameter, consider it Brash Ice with a RIV equivalent to New Ice (+3 to +1).

The icebreaker itself should calculate its own RIO along the intended route. In general, escorted operations must be reconsidered if the icebreaker encounters a RIO below 0 (zero) or if the escorted vessel is in an ice regime of elevated operational risk, which requires using measures described in the PWOM. Proceed with caution.

For voyage planning purposes only, when icebreaker escort is intended to be used, the RIO derived from non-escorted historical ice data may be assumed to be adjusted by adding +10 to its calculated value. Actual ice conditions may vary significantly from the average and the adjustment cannot be applied while underway (see Table 7).

Tug and Barge Operations

When a tug and tow combination enter an ice regime, the set of RIVs selected from Table 5 must correspond to the lightest class of the tug and towed vessel.

Table 7: Operations Under Escort

	PLANNING	ACTUAL
Icebreaker or escort vessel	Ice chart data with POLARIS and calculates RIO based on its ice class	Visual assessment
Escorted vessel	Escorted vessel uses ice chart data with POLARIS and calculates RIO based on its ice class with a +10 adjustment	Escorted vessel visually assesses ice regime made by icebreaker track with POLARIS and calculates RIO based on its ice class

Decision making subject to defined responsibilities for the convoy operation.

CCGS Pierre Radisson escorting the CCGS Caporal Kaeble toward Sept-Iles, 2018, with the CCGS Martha L. Black in the distance.

Risk Index Outcomes: An Ice Class Comparison

Vessel Class	PC 3	PC 4	PC 5	PC 6	PC 7	Type A	Type B	Type E
RIO	18	11	3	-6	-14	-15	-24	-51
Decision	Go	Go	Go	PWOM	No	No	No	No

Vessel Class	PC 3	PC 4	PC 5	PC 6	PC 7	Type A	Type B	Type E
RIO	15	6	0	-9	-18	-18	-27	-54
Decision	Go	Go	Go	PWOM	No	No	No	No

CHAPTER 8: APPLYING AIRSS

Existing vessels constructed **before** January 1, 2017, when operating **outside** the ZDS access periods, must use AIRSS for the respective ice class or opt to use POLARIS (ASSPPR s.8(2)(6)).

Vessels constructed **after** January 1, 2017, and PC vessels must use POLARIS (Chapter 7).

Visibility, vessel speed, maneuverability, availability of an icebreaker escort, and the knowledge and experience of the crew must be considered when applying AIRSS or any other methodology when navigation in ice is underway. The system is also intended to:

- minimize the risk of pollution in Arctic waters under Canadian jurisdiction due to damage of vessels by ice
- emphasize the responsibility of the vessel owner and master for safety
- provide a flexible framework for decision-making

Ice navigators or personnel holding a CoP for Polar Waters are qualified to use AIRSS and must be onboard in sufficient numbers to cover all watches where ice is present.

The basis of AIRSS is an evaluation of the risks posed to a vessel by ice conditions in relation to a vessel's assigned ice class. It uses the WMO nomenclature, as well as the ice class of the vessel.

The relative risk of damage to a vessel by different ice categories is taken into account using "weighting" factors called Ice Multipliers (IM). Once the ice regime is assessed, either from historic data or actual ice conditions from the bridge (combined with up-to-date ice charts), the IM is obtained from the table for the corresponding vessel ice class.

The IM are used to calculate the IN. This simple calculation relates vessel capability to the ice conditions encountered along the route.

The resultant IN is used to help decide whether the vessel is allowed to proceed, takes an alternate route, or calls for an escort vessel. Positive INs do not guarantee that the vessel cannot be damaged by ice.

FURTHER INFORMATION

- *Arctic Ice Regime Shipping System Standard*, TP 12259

Calculating Ice Numerals

An IN is a numerical representation of an ice regime which is used to assess whether the vessel may safely enter an ice regime. It is determined by a summation of the IM for each ice type present in the ice regime multiplied by its concentration (expressed in tenths):

$$IN = (_1 \times IM_1) + (C_2 \times IM_2) + (C_3 \times IM_3) + \ldots (C_n \times IM_n)$$

Where:

IN = the Ice Numeral;

$C_1 \ldots C_n$ are the concentrations (in tenths) of ice types within the ice regime;
and $IM_1 \ldots IM_n$ are the corresponding Ice Multipliers for each ice type and vessel class.

Higher positive INs generally represent a higher degree of safety. **Vessels are prohibited from entering ice regimes with an IN less than zero.**

Every regime is composed of an aggregate $10/10^{ths}$ concentration of various ice types. If all partial concentrations of ice do not sum to $10/10^{ths}$, **the remaining must be accounted for as open water.**

Modifications to IM

AIRSS also takes into account the stage of decay, depending upon the ice type.

In AIRSS, a value of +1 (plus one) is added to the IM for the ice type that has thaw holes (and is in the process of draining) or is rotten. This adjustment can be applied to multi-year ice, second-year ice, thick first-year ice or medium first-year ice, but the IM cannot exceed 2.

Great caution must be exercised if applying a decay factor to any type of multi-year ice, as this type of ice is responsible for the majority of vessel damage events in the Arctic. Measurements made on first-year ice, second-year ice and multi-year ice show that every ice type decreases in strength in summer, but to different degrees.

Photographs for decayed ice can be referenced from the stages of decay (Chapter 6).

Ridged Ice

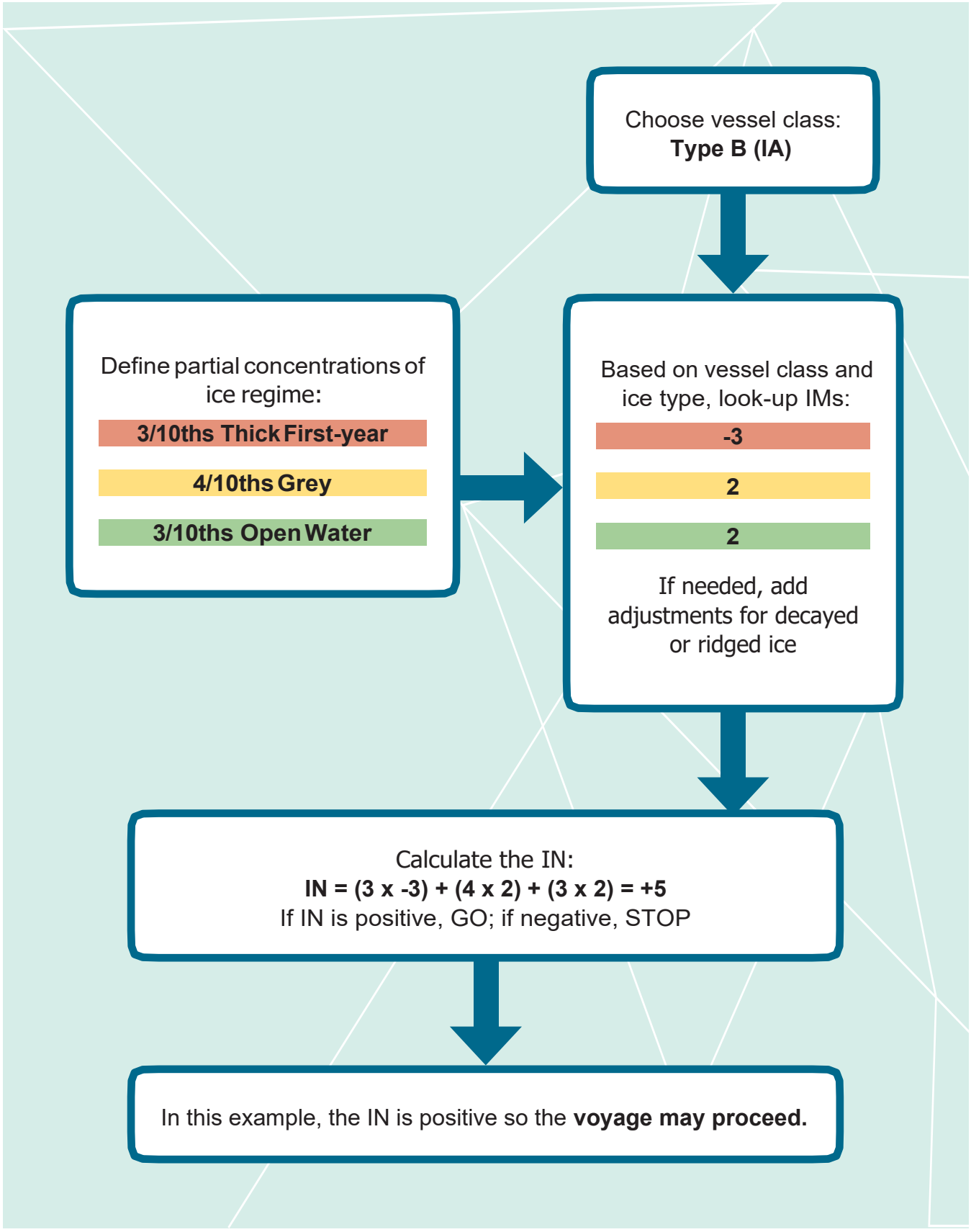
Where the total ice concentration in a particular regime is $6/10^{ths}$ or greater, and at least $3/10^{ths}$ of the area of an ice type (other than Brash Ice) is deformed by ridging, rubbling or hummocking, the IM for that ice type, shall be decreased by 1 (one). The basis for this numeric adjustment is that ridged ice is thicker. For example, if a Type E (not ice-strengthened) vessel finds a regime with ridged thin first-year ice, the IM changes from -1 to -2.

Table 8. AIRSS Ice Multipliers

VESSEL CATEGORY		OPEN WATER	GREY ICE	GREY WHITE ICE	THIN FIRST YEAR 1ST STAGE	THIN FIRST YEAR 2ND STAGE	MEDIUM FIRST YEAR	THICK FIRST YEAR	SECOND YEAR	MULTI YEAR
	Ice Type Symbol	OW	G	GW	TnFY1	TnFY2	MFY	TkFY	SY	MY
	Egg Code	(1 or 2)	-4	(3 or 5)	-8	(7 or 9)	(1 .)	(6 or 4 .)	(8 .)	(7. or 9 .)
CAC 3		2	2	2	2	2	2	2	1	-1
CAC 4		2	2	2	2	2	2	1	-2	-3
Type A (IA Super)		2	2	2	2	2	1	-1	-3	-4
Type B (IA)		2	2	1	1	1	-1	-2	-4	-4
Type C (IB)		2	2	1	1	-1	-2	-3	-4	-4
Type D (IC)		2	2	1	-1	-1	-2	-3	-4	-4
Type E (Not ice-strengthened)		2	1	-1	-1	-1	-2	-3	-4	-4

The IM can be adjusted for ice decay by a value of +1 for MFY and thicker.

AIRSS Calculation Flowchart



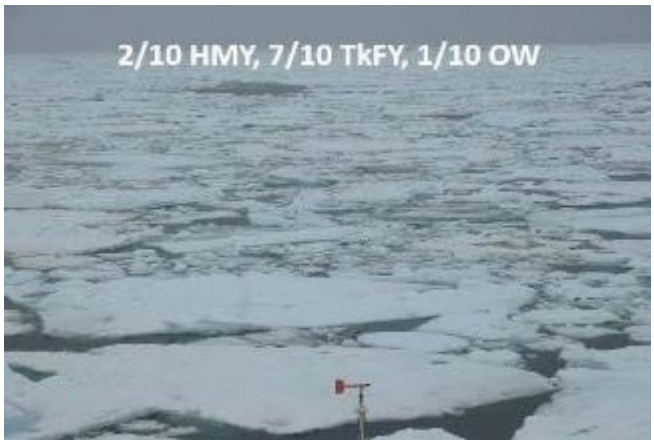
Vessel Categories Type Examples

TYPE A (IA SUPER) VESSEL

OW	G	GW	FY	FY	MFY	TFY	SY	MY
2	2	2	2	2	1	-1	-3	-4

$$IN = [C_{TFY} \times IM_{TFY}] + [C_{MFY} \times IM_{MFY}] + [C_{OW} \times IM_{OW}]$$
$$= [4 \times -1] + [1 \times 1] + [5 \times 2]$$
$$= +7$$

Since IN > 0, the vessel may proceed



$$IN = [C_{MY} \times IM_{MY}] + [C_{TFY} \times IM_{TFY}] + [C_{OW} \times IM_{OW}]$$
$$= [2 \times -4] + [7 \times -1] + [1 \times 2]$$
$$= -13$$

Since IN < 0, the vessel must not proceed

$$IN = [C_{MFY} \times IM_{MFY}] + [C_{OW} \times IM_{OW}]$$
$$= [3 \times 1] + [7 \times 2]$$
$$= +17$$

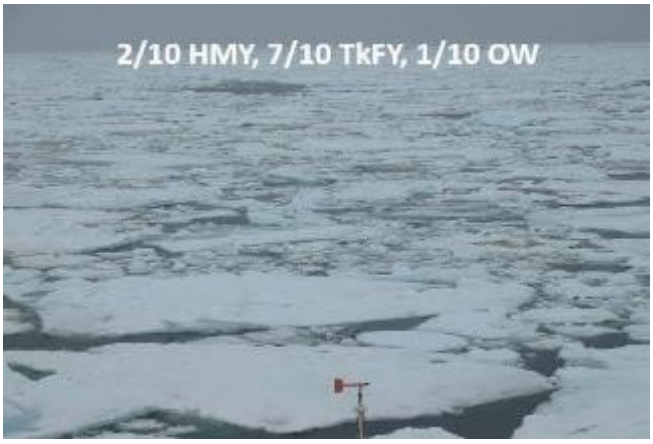
Since IN > 0, the vessel may proceed

TYPE B (IA) VESSEL

OW	G	GW	FY	FY	MFY	TFY	SY	MY
2	2	1	1	1	-1	-2	-4	-4

$$IN = [C_{TFY} \times IM_{TFY}] + [C_{MFY} \times IM_{MFY}] + [C_{OW} \times IM_{OW}]$$
$$= [4 \times -2] + [1 \times -1] + [5 \times 2]$$
$$= +1$$

Since IN > 0, the vessel may proceed



$$IN = [C_{MY} \times IM_{MY}] + [C_{TFY} \times IM_{TFY}] + [C_{OW} \times IM_{OW}]$$
$$= [2 \times -4] + [7 \times -2] + [1 \times 2]$$
$$= -20$$

Since IN < 0, the vessel must not proceed

$$IN = [C_{MFY} \times IM_{MFY}] + [C_{OW} \times IM_{OW}]$$
$$= [3 \times -1] + [7 \times 2]$$
$$= +11$$

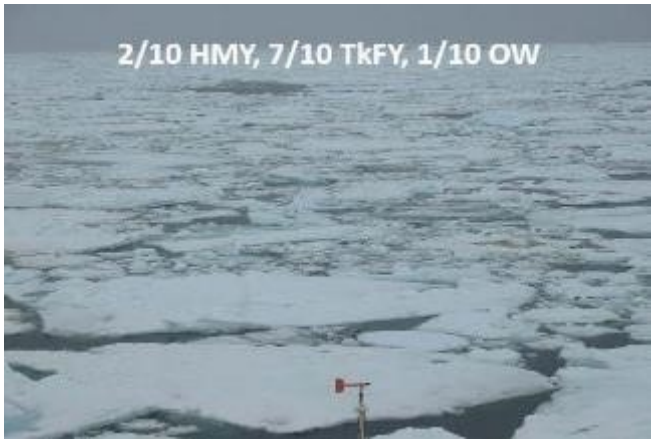
Since IN > 0, the vessel may proceed

TYPE E (NON ICE STRENGTHENED) VESSEL

OW	G	GW	FY	FY	MFY	TFY	SY	MY
2	1	-1	-1	-1	-2	-3	-4	-4

$$IN = [C_{TFY} \times IM_{TFY}] + [C_{MFY} \times IM_{MFY}] + [C_{OW} \times IM_{OW}]$$
$$= [4 \times -3] + [1 \times -2] + [5 \times 2]$$
$$= -4$$

Since IN < 0, the vessel must not proceed



$$IN = [C_{MY} \times IM_{MY}] + [C_{TFY} \times IM_{TFY}] + [C_{OW} \times IM_{OW}]$$
$$= [2 \times -4] + [7 \times -3] + [1 \times 2]$$
$$= -27$$

Since IN < 0, the vessel must not proceed

$$IN = [C_{MFY} \times IM_{MFY}] + [C_{OW} \times IM_{OW}]$$
$$= [3 \times -2] + [7 \times 2]$$
$$= +8$$

Since IN > 0, the vessel may proceed

Vessel Operations Under Escort

In determining the IN for a vessel under icebreaker escort, the ice immediately ahead of the vessel should be considered as its ice regime. This regime should include the track of the icebreaker and if the icebreaker has a smaller beam than the vessel under escort. There may be further risks if the ice along the track is under pressure or if ice pieces are forced underneath the hull.

The ice in the track must be assessed for thickness (age/ice type), concentration(s), and floe size. If the actual floes are under 2 metres in diameter, consider it Brash Ice with an IM equivalent to OW (+2).

Tug and Barge Operations

When a tug and tow combination enter an ice regime, the set of RIVs selected from Table 5 must correspond to the lightest class of the tug and towed vessel.

MV National Geographic Explorer under escort by CCGS Pierre Radisson in Franklin Strait, 2014

CHAPTER 9: FREQUENTLY ASKED QUESTIONS

What is the first contact for owners/operators of vessels planning a trip in Arctic waters under Canadian jurisdiction?

For questions on voyage planning and vessel operations, the Prairie and Northern Region of TC (Marine Safety and Security) may be the first point of contact and can be reached by phone at 1-888-463-0521 or by email at PNRMarine-Administration-MaritimePNR@tc.gc.ca.

The TC Arctic Shipping Website has information and links to other relevant websites. Questions on compliance with regulations applicable in Arctic waters under Canadian jurisdiction can be directed to TC Marine Safety and Security at marinesafety-securitemaritime@tc.gc.ca.

Polar Knowledge Canada is the point of contact for requests specifically related to Scientific Research in Canadian Arctic Waters.

Global Affairs Canada is the point of contact for state-sponsored Marine Scientific Research in Canadian Arctic Waters.

The CCG may be reached via NORDREG at iqanordreg@innav.gc.ca or by telephone at 1-867-979-5724.

Where can I find advice from an operator's perspective about common issues when navigating through ice?

Chapter 4 of Ice Navigation in Canadian Waters (2022), published by the CCG, is a detailed examination of common ice navigation issues and contains a useful compilation of tactics and suggestions for maneuvering in ice. It has experienced guidance for operating in adverse environmental conditions, improving stability, radar considerations, ice accretion precautions when using navigational charts for the Arctic and icebreaking escort operation signals.

Can I use either POLARIS or AIRSS if operating outside the ZDS?

See which system your vessel may use by referring to the requirements in the *ASSPPR* and the *AIRSS Standard* (TP 12259). Existing vessels that are not PC and that were constructed before January 1, 2017, are the only vessels that have the choice of using either POLARIS or AIRSS. TC recognizes that the use of these systems for an identical ice regime may produce minor differences in operating outcomes.

What additional navigation equipment or other considerations are required for operating in Polar Regions?

In addition to standard navigation equipment, the following must be provided in accordance with the Polar Code for new and existing vessels:

- a clear view at all times through at least two front windows or more depending on bridge configuration, regardless of weather conditions (SOLAS V/22.1.9.4) and, depending on the bridge configuration, have a clear view astern (Part I-A, 9.3.2.1.2)
- means to prevent ice accumulation on navigation and communication antennas where ice accretion is likely (Part I-A, 9.3.2.1.3)
- two non-magnetic independent means to determine and display heading (Part I-A, 9.3.2.2.1)
- at least one GNSS compass or equivalent if vessel proceeds to latitudes over 80° N (Part I-A, 9.3.2.2.2)
- means to visually detect ice with two remotely-rotatable narrow-beam searchlights controllable from the bridge with lighting over an arc of 360°, unless solely operating in 24h daylight (Part I-A, 9.3.3.1)
- a manually-initiated flashing red light visible from astern, with a visibility range of two nautical miles on vessels that will be involved in escort operations (Part I-A, 9.3.3.2)

All systems providing reference headings and position fixing must be connected to the vessel's main and emergency source of power.

Ice strengthened vessels of Polar Code Categories A and B must protect all equipment sensors that project below the hull. Those vessels built after January 1, 2017, must be provided with:

- two independent echo-sounding devices or one echo-sounding device with two separate independent, transducers (Part I-A, 9.3.2.1.1) and
- bridge wings enclosed or designed to protect navigational equipment and operating personnel (Part I-A, 9.3.2.4.2).

What about machinery items under Arctic conditions?

The Polar Code establishes functional requirements for machinery installations in its own Chapter 6. The IACS Unified Requirements for machinery items for PC vessels are set out in Section 13 of that publication. The safe operation of all vessels depends on the capability of the machinery to work effectively under anticipated conditions in remote areas. There is guidance in many technical publications, including the following two:

- Guidance on Design and Construction of Sea Inlets under Slush Ice Conditions (MSC/Circ.504);
- Winter Navigation on the River and Gulf of St. Lawrence: Practical Notebook for Marine Engineers and Deck Officers (TP 14335).

What is the standard practice for icebreakers escorting in Canadian waters?

CCG icebreakers will lead escorted vessels from ahead, either singularly or in convoy, so that other vessels may follow in their track. Use of a long towline is only undertaken in emergency situations when the escorted vessel is without power and ice conditions permit. Close-coupled towing is not practiced by Canadian icebreakers.

What is an ice navigator under the Canadian regime and a qualified person under the Polar Code and STCW?

In Canada, the concept in practice is similar with variations for qualifying experience and the phase-in period under STCW was until 2020. Training is mandatory for a qualified person unless the applicant has sufficient qualifying experience during the phase-in period.

The ice navigator qualifications are described in the ASSPPR and further elaborated in Ship Safety Bulletin 01/2018. The qualifications and training for a qualified person required by the Polar Code, are included in the STCW Convention and Code, effective July 1, 2018.

Who is ultimately responsible for personnel and vessel safety?

The master remains solely responsible for the safety of the vessel and persons on board. The Canadian government has some powers when dangerous situations could arise and will use the POLARIS/AIRSS risk assessment systems as an important tool in making such decisions.

How do I interpret Egg Codes from ice charts when planning my voyage?

The CIS MANICE is the resource to interpret Egg Codes. It is available on the CIS website.

What are the additional means of communication when operating in Arctic waters under Canadian jurisdiction?

Depending on the route of the voyage or category of vessel, additional considerations for suitable means of communication may include:

- two-way voice and/or data for ship-to-ship and ship-to-shore along the route
- when vessel escort and convoy operations are anticipated
- two-way on-scene and search and rescue purposes including aeronautical frequencies
- equipment to enable tele-medical assistance in Arctic waters

DEFINITIONS

Any specific ice terminology used in these Guidelines are generally in accordance with the WMO Sea-Ice Nomenclature or IMO guidance.

Arctic waters under Canadian jurisdiction – waters north of 60°N: see *Arctic Waters Pollution Prevention Act*.

Polar Waters – same meaning as in regulation 1.4 of Chapter XIV of SOLAS.

Shipping Safety Control Zone (SSCZ) – similar to Arctic waters under Canadian jurisdiction but does not include rivers, lakes or fresh water: see *Shipping Safety Control Zones Order*.

Limiting ice regime – an ice regime assessed by AIRSS to have an Ice Numeral less than zero or an ice regime assessed by POLARIS to be operations of "normal or elevated" risk for that vessel.

Open Water (OW) – for the purposes of AIRSS and for determining Ice Numerals, OW is considered an ice type and includes Bergy Water and any concentration of New Ice (Frazil Ice / Grease Ice / Slush / Shuga) Nilas (Light or Dark / Ice Rind) and/or Brash Ice up to $1/10^{th}$ concentration.

Ice Free – No ice present in the operating area.

ABBREVIATIONS AND ACRONYMS

AIRSS	Arctic Ice Regime Shipping System
ASSPPR	Arctic Shipping Safety and Pollution Prevention Regulations
AWPPA	Arctic Waters Pollution Prevention Act
CCG	Canadian Coast Guard
CIS	Canadian Ice Services
CoP	Certificate of Proficiency
CSA	Canada Shipping Act, 2001
DFO	Department of Fisheries and Oceans
ECCC	Environment and Climate Change Canada
EMRLCA	Eeyou Marine Region Land Claims Agreement
FSICR	Finnish-Swedish Ice Class Rules
GNSS	Global Navigation Satellite System
IFA	Inuvialuit Final Agreement
IM	Ice Multiplier
IMO	International Maritime Organization
IN	Ice Numeral
LILCA	Labrador Inuit Land Claims Agreement
JBNQA	James Bay and Northern Quebec Agreement
NORDREG	Northern Canada Vessel Traffic Services Zone Regulations
MANICE	Manual of Standard Procedures for Observing and Reporting Ice Conditions
MCTS	Marine Communications and Traffic Services
MSI	Marine Safety Inspectors
NRC	National Research Council of Canada
NILCA	Nunavik Inuit Land Claims Agreement
NLCA	Nunavut Land Claims Agreement
NQA	Northeastern Quebec Agreement
OW	Open Water
PC	Polar Class
PPO	Pollution Prevention Officers
POLARIS	Polar Operational Limit Assessment Risk Indexing System
PWOM	Polar Water Operational Manual
RIO	Risk Index Outcome
RIV	Risk Index Value
SAR	Search and Rescue
SSCZ	Shipping Safety Control Zone
SOLAS	International Convention for the Safety of Life at Sea, 1974 and the protocol of 1988 relating to the Convention
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 as amended
TC	Transport Canada
TSB	Transportation Safety Board
WMO	World Meteorological Organization
ZDS	Zone Date System

LIST OF REFERENCES

Aids to Marine Navigation, Canadian Coast Guard (issued seasonally)

Arctic Ice Regime Shipping System Standard, TP 12259

Arctic Shipping Safety and Pollution Prevention Regulations

Arctic Waters Oil Transfer Guidelines, TP 10783E

Arctic Waters Pollution Prevention Act

Canada Shipping Act, 2001

Charts and Nautical Publications Regulations, 1995

Cold Weather Marine Survival Guide, TP 11690

Enhanced Contingency Planning Guidance for Passenger Ships Operating in Areas Remote from SAR Facilities, IMO, MSC.1/Circ.1184

Guidance on Methodologies for Assessing Operational Capabilities and Limitations in Ice, MSC.1 / Circ. 1519

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

Guidelines for the Operation of Passenger Vessels in Canadian Arctic Waters, TP 13670

Guidelines on Voyage Planning for Passenger Ships Operating in Remote Areas, IMO, RESOLUTION A.999(25)

HELCOM Recommendation 25/7

How to Meet STCW Requirements for Masters, Deck Officers, and other Crew members of Certain Canadian Ships Operating in Polar Waters, Ship Safety Bulletin 01/2018

IACS Unified Requirements for Polar Ships.

Ice Glossary, Canadian Ice Service

Ice Navigation in Canadian Waters, Canadian Coast Guard

International Code of Safety for Ships Operating in Polar Waters (Polar Code)

MANICE, Manual of Standard Procedures for Observing and Reporting Ice Conditions, Canadian Ice Service, Environment and Climate Change Canada

Marine Environment Handbook – Arctic and Northwest Passage, Department of Fisheries and Oceans

Marine Mammals of Hudson Strait, WWF

Marine Personnel Regulations

Marine Survival Handbook for Cold Regions, TP 11969E

Northern Canada Vessel Traffic Service Zone Regulations (NORDREG)

Notices to Mariners, Canadian Coast Guard

Navigational Warnings, Canadian Coast Guard

Seasonal Outlook, Canadian Ice Service

Shipping Safety Control Zones Order

Shipping Through Sea Ice: Impact on Marine Habitats and Best Practices, WWF

Thirty Day Forecast, Canadian Ice Service

Transportation Safety Board Regulations

Understanding and Identifying Old Ice in Summer, National Research Council of Canada

Winter Navigation on the River and Gulf of St. Lawrence: Practical Notebook for Marine Engineers and Deck Officers (TP 14335)

WMO Sea-Ice Nomenclature, World Meteorological Organisation 1985 Reference Publication. WMO/OMM/BMO No. 259

CONTACT INFORMATION

Transport Canada

Contact Transport Canada for questions on:

- the ASSPPR, POLARIS, AIRSS Standards
- any other regulatory issue related to marine safety and security marinesafety-securitemaritime@tc.gc.ca

Northern Canada Traffic System (NORDREG Canada)

While in Arctic waters under Canadian jurisdiction, contact NORDREG for ice information, ice routing, and icebreaker assistance.

Regarding the POLARIS or AIRSS systems, the *Ice Regime Routing Message* is to be sent to Transport Canada via NORDREG Canada.

During the summer shipping season, this office is staffed 24 hours a day. (More information in the Annual Edition, Notices to Mariners, No. 6 & 26, as well as Notices to Shipping)

NORDREG Canada
P.O. Box: 189
Iqaluit, N.W.T
X0A 0H0

Telephone: +1 (867) 979-5724
Facsimile: +1 (867) 979-4236 or
+1 (867) 979-4264
Radiogram: NORDREG CANADA

Outside of the summer shipping season the function of NORDREG Canada is carried out by the St. John's MCTS Centre which may be contacted by phone at (709) 772-2106.

Canadian Coast Guard (CCG) Arctic ice operations:

Arctic - June to November
(Subject to change depending on ice conditions)
7 days a week / 24 hours a day

Information on icebreaking operations

- Telephone: +1-514-283-2784
  Toll-free: +1-855-209-1976
  Email: DFO.IceOpsArctic.GlacesOpsArctique.MPO@dfo-mpo.gc.ca

Information on ice conditions

- Telephone: +1-514-283-1752
  Toll-free: +1-855-201-0086 / Fax: +1-514-283-1818
  Email: DFO.IceArctic.GlacesArctique.MPO@dfo-mpo.gc.ca

Mailing address: Montreal Ice Centre
Canadian Coast Guard
5th floor, 105 McGill
Montreal, QC, Canada
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Environment and Climate Change Canada

Canadian Ice Service

Transportation Safety Board of Canada

Telephone (toll-free in Canada): 1-800-387-3557
Telephone (outside Canada): 819-994-3741

Mailing address: Transportation Safety Board of Canada

200 Promenade du Portage
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