Transport Canada Transports Canada

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Arctic Shipping Pollution Prevention Regulations

ARCTIC ICE REGIME SHIPPING SYSTEM

(AIRSS)

STANDARDS

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Additional copies may be obtained from:

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Additional Information may be available on the Transport Canada world wide web site:

www.tc.gc.ca

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Foreword

Through the *Arctic Waters Pollution Prevention Act (AWPPA)* of 1970, the Government of Canada enforces its responsibility for ensuring that navigation in the Arctic waters is controlled so as to preserve and protect the sensitive northern ecosystem.

The ***Arctic Ice Regime Shipping System*** (System) has been developed to enhance the safety and efficiency of shipping operations in the Canadian Arctic. It characterizes the relative risk which different ice conditions pose to the structure of different ships.

The System is eventually intended to replace the Zone/Date Shipping Safety Control scheme under *the Arctic Shipping Pollution Prevention Regulations* (ASPPR). The old scheme was based on rigid controls. The new System emphasizes the responsibility of the Master for the safety of the ship, and provides a more flexible framework to assist in decision-making. It requires a higher level of experience for ice navigators, and full use of available ice information.

During a transitional period, the System will work in parallel with the zone date controls. Operators will continue to be able to use the Zone/Date scheme to plan voyages to the Arctic. They are encouraged to use the System to help avoid dangerous conditions.

Voyages outside the Zone/Date limits **must** use the System. This means that ships are prohibited from entering ice regimes assessed as having negative ice numerals, using the calculation procedure described later in the standards.

Throughout the transitional period, experience with the System will be used to improve it, or to provide clarification on its use by both commercial ship operators and the Canadian government. Operators are therefore requested to provide feedback and to offer suggestions based on their use of the System.

Following the transitional period, consideration will be given to extend the use of the System to all voyages. By using the System, operators are given broad discretion in the planning and execution of Arctic voyages. The Canadian government retains the duty to intervene to prevent dangerous situations from arising, and will use the System as an important tool in making such decisions.

The Master as an Ice Navigator or with the assistance of one, will be responsible for interpreting the existing and forecast ice conditions for safe navigation and for passage planning.

The purpose of this publication is to make Masters, navigating officers, ship owners and operators and crew aware of their responsibilities under the *Arctic Ice Regime Shipping System*, and to provide them information which may guide them in conducting their vessel safely through the ice conditions in the Arctic.

After the transition period, it is expected that the after action reporting will only be required to be made when the ship has encountered and entered a regime which has a negative numeral as determined from the ice information on the ice charts from the Canadian Ice Service.

Periodically this publication will be reviewed and updated to incorporate users' comments, and other changes. Please forward your comments to:

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Prairie & Northern Region (AMNS-OTT)
Transport Canada
Place de Ville, Tower C
330 Sparks St., 14th Floor
Ottawa, Ontario
Canada
K1A 0N5

Telephone: (613) 991-6004
Facsimile: (613) 991-4818

List of Abbreviations

AIRSS	Arctic Ice Regime Shipping System
ASPPR	Arctic Shipping Pollution Prevention Regulations
AWPPA	Arctic Waters Pollution Prevention Act
CAC	Canadian Arctic Category
CCG	Canadian Coast Guard
CSA	Canada Shipping Act
ECAREG	Eastern Canada Traffic System
IM	Ice Multiplier
IN	Ice Numeral
NORDREG	Arctic Canada Traffic System
PPO	Pollution Prevention Officer

A short guide to the steps in applying the Arctic Ice Regime Shipping System

1. Obtain current ice information for the planned passage;
2. Select a desired route;
3. Determine the ice regime boundaries on the route;
4. Determine the Ice Numerals (IN) on the route for each separate ice regime;
5. If all the Ice Numerals are zero or greater, advise NORDREG, submit an **Ice Regime Routing Message** and proceed (Go to 8);
6. If the Ice Numeral for an ice regime is negative, consider the alternatives, such as selecting another route, waiting for improvement in ice conditions or requesting assistance of an icebreaker;
7. When an icebreaker or other vessel modifies a regime, or there is a change in the ice conditions, giving positive Ice Numerals, proceed after advising NORDREG; and
8. On completion of the voyage, send the **After Action Report** to Prairie & Northern Region - Marine (AMNS-OTT), Ottawa.

Arctic Ice Regime Shipping System

1. Application

The procedures and definitions provided in this publication apply to ships using the *Arctic Ice Regime Shipping System* [System] in a *Shipping Safety Control Zone* (Appendix A) as required by the *Arctic Shipping Pollution Prevention Regulations* (Appendix B). This means navigation outside the entry dates (Appendix C) set out in the regulations.

The procedures are intended to assist the Master in deciding whether to enter an ice regime or not. The Regulations require that the decision to enter an ice regime be based on the Master's assessment that the ship is capable to navigate safely through the ice regime.

The System can be used only by those ships which meet the design and construction requirements of either Canadian Arctic Category (CAC) 3 or 4 and all Type ships. There is no direct equivalency between the existing Arctic Classes and the new Canadian Arctic Categories. Owners of existing Arctic Class ships should apply to *Marine Safety* for the appropriate "Ice Multipliers" which are assessed on a case by case basis.

2. Ice Navigator

In accordance with section 6 of the Regulations, every ship using the *Arctic Ice Regime Shipping System* must have on board an Ice Navigator.

The ice navigator may be any person on board, including the Master, who meets the requirements of section 26 (3)(b) of the Regulations, which may be summarised as:

> The ice navigator is required to have 50 days of experience as either the Master or a person in charge of the deck watch on ships operating in ice conditions that required the ship to
>
> - be escorted by an icebreaker, or
> - perform manoeuvres to prevent the ship from coming in contact with ice concentrations beyond the ship's structural capability.
>
> Of these 50 days of experience, at least 30 days must have been obtained in the Arctic.

3. Ice Terminology

.1 The "ice terminology" used is generally in accordance with the World Meteorological Organization Publication: "WMO Sea-Ice Nomenclature", reference WMO/OMM/ BMO - No 259, as of March 1985. For information on ice and ice types, the mariner may also refer to *'Manual of Standard Procedures for Observing and Reporting Ice Conditions (MANICE)"*. For ease of reference, the main types of ice are as follows:

Decayed Ice: means

(a) multi-year ice,
(b) second-year ice,
(c) thick first-year ice, or
(d) medium first-year ice,

which has thaw holes formed, or is rotten ice;

Open Water: A large area of freely navigable water in which ice is present in concentrations of less than 1/10. No ice of land origin is present.

Young Ice: Ice in the transition range between nilas and first-year ice, 10-30 cm. in thickness. May be subdivided into grey ice and grey-white ice.

> ***Grey Ice***: Young ice 10-15 cm thick. Less elastic than nilas and breaks on swell. Usually rafts under pressure.
>
> ***Grey-White Ice***: Young ice 15-30 cm. thick. Under pressure it is more likely to ridge than to raft.

First-Year Ice: Sea ice of not more than one winter's growth, developing from young ice 30 cm thick. It may be subdivided into thin first-year ice/white ice, medium first-year ice and thick first-year ice.

> ***Thin First-year Ice/White Ice - First stage****:* First-year ice 30-50 cm. thick.
>
> ***Thin First-year Ice/White Ice - Second stage****:* First-year ice 50-70 cm. thick.
>
> ***Medium First-year Ice****:* First-year ice 70-120 cm. thick.
>
> ***Thick First-year Ice****:* First-year ice over 120 cm. thick.

Old Ice: Sea ice which has survived at least one summer's melt. Topographic features generally are smoother than first-year ice. It may be subdivided into second-year ice and multi-year ice.

> ***Second-year Ice***: Old ice which has survived only one summer's melt. Thicker and less dense than first-year ice, it stands higher out of the water. In contrast to multi-year ice, summer melting produces a regular pattern of numerous small puddles. Bare patches and puddles are usually greenish-blue.

Multi-year Ice: Old ice which has survived at least two summer's melt. Hummocks are smoother than on second-year ice and the ice is almost salt-free. Where bare, this ice is usually blue in colour. The melt pattern consists of large interconnecting, irregular puddles, and a well-developed drainage system.

.2 **Open Water**: For the purposes of this publication **"Open Water"** is an ice type. It includes Bergy Water, any concentration of New Ice (Frazil Ice / Grease Ice / Slush / Shuga) Nilas (Light or Dark / Ice Rind) and loose Brash Ice.

Bergy Water**:** An area of freely navigable water in which ice of land origin is present. Other ice types may be present, although the total concentration of all other ice is less than 1/10.

Brash Ice**:** Accumulation of floating ice made up of fragments not more than 2m across, the wreckage of other forms of ice.

New Ice**:** A general term for recently formed ice which includes frazil ice, grease ice, slush and shuga. These types of ice are composed of ice crystals which are only weakly frozen together (if at all) and have a definite form only while they are afloat.

Nilas Ice: A thin elastic crust of ice, easily bending on waves, and swell, and under pressure, growing in a pattern of interlocking "fingers" (finger rafting). Has a matte surface and is up to 10 cm. in thickness.

4. Entry

Outside the Zone Dates, ships using the *Arctic Ice Regime Shipping System* may only enter an ice regime when the Ice Numeral is equal to or greater than zero.

5. Ice Numeral

.1 The Ice Numeral is an assessment of an ice regime, in mathematical terms, which is used to determine whether the ship can enter the ice regime.

.2 The Ice Numeral, for an ice regime in any *Shipping Safety Control Zone* or part of a zone, is the sum of the products of the concentration, in tenths, of each ice type and the Ice Multiplier.

6. Ice Multipliers

.1 Subject to subsection 6.2 below each ice type in columns III to XI of the Ice Multiplier Table, shall have the weighting in that column for the respective ship category in column 1.

.2 Where the total ice concentration in a regime is 6 tenths or greater and 3/10ths or more of an ice type is deformed by ridges, rubble or hummocking, the weighting for that ice type, taken from the Table, shall be decreased by 1, and for ‘decayed ice’ the weighting may be increased by 1.

ICE MULTIPLIER TABLE

I	II	III	IV	V	VI	VII	VIII	IX	X	XI
SHIP CATEGORY	ICE TYPE	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[1]	OW	G	GW	FY	FY	MFY	TFY	SY	MY
CAC 3		2	2	2	2	2	2	2	1	-1
CAC 4		2	2	2	2	2	2	1	-2	-3
Type A		2	2	2	2	2	1	-1	-3	-4
Type B		2	2	1	1	1	-1	-2	-4	-4
Type C		2	2	1	1	-1	-2	-3	-4	-4
Type D		2	2	1	-1	-1	-2	-3	-4	-4
Type E		2	1	-1	-1	-1	-2	-3	-4	-4

[1] Ice Type symbols used on ice prognostic charts that may be issued by the Canadian Ice Service, Environment Canada.

7. ARCTIC SHIPPING POLLUTION PREVENTION REGULATIONS

The *Arctic Shipping Pollution Prevention Regulations* control some aspects of navigation through what is commonly known as the Zone Date system.

In the Zone Date system, the Arctic waters are divided into sixteen *Shipping Safety Control Zones*, with a schedule of earliest and latest entry dates for each zone corresponding to specific categories of vessels (see Appendices A and C). Generally, Zone 1 has the most severe ice conditions and Zone 16 the least.

The *Arctic Ice Regime Shipping System* has been introduced to allow ships to navigate in the Arctic when the ice conditions allow. To use the system, it is important that the ice information on board the ship is current.

8. USING THE SYSTEM

.1 Important Concepts

The Ice Regime System controls navigation on the basis of the actual ice conditions within a given area.

> **An ice regime is a relatively consistent distribution of any mix of ice types, including open water.**

An ice regime is a region covered with generally consistent ice conditions i.e. the distribution of ice and concentrations does not change very much from point to point in this region. The boundaries between regimes mark major differences in the regional distribution of ice types and concentrations.

A regime may be only a few 100's or 1000's of square metres in area or may be many square kilometres in expanse. The determination of the size of a regime depends solely on the distribution of ice mix. A regime may consist of the broken track behind an icebreaker or other ship, which may give an Ice Numeral considerably different from the unbroken ice, which will be another regime.

An ice regime may contain some ice which is beyond the capabilities of a ship to pass through successfully, and much which is not. The decision to enter a given Ice Regime is based on the ability of the vessel to navigate through safely - avoiding the “dangerous” ice. The Ice Regime System provides mariners with a tool to help make this decision. The tool is a simple arithmetical calculation which uses Ice Multipliers to determine a Ice Numeral. If the value of the Ice Numeral is negative i.e. less than zero, then entry into the ice regime is avoided; a value of zero or greater indicates that entry may be considered.

.2 How the calculation works

Every ice type (including open water) has a numerical value which is dependent on the ice category of the vessel. This number is called an **Ice Multiplier (IM)**. The value of the **Ice Multiplier** reflects the level of risk or operational constraint that the particular ice type poses to each category of vessel.

For any ice regime, a **Ice Numeral (IN)** is calculated by taking the sum of the products of the concentrations of the ice types present (in tenths) in the region and their ice multipliers. This is not as complicated as it may sound:

$$IN = (C_a \times IM_a) + (C_b \times IM_b) + ...$$

where:
- IN - Ice Numeral
- C_a - concentration in tenths of ice type "a"
- IM_a - Ice Multiplier for ice type "a" (see Table)

The term on the right hand side of the equation (a, b, c, etc.) is repeated for as many ice types as may be present, including open water.

The **Ice Numeral (IN)** is therefore unique to the particular ice regime and the ship operating within its boundaries.

Following are two examples of **Ice Numeral** calculation.

SAMPLE ICE NUMERAL CALCULATIONS

Example - 1

The Ice Regime in Photo 1 has 1/10th of multi-year ice; and 9/10ths of first year ice.

SHIP CATEGORY

CAC 4 $(1 \times -3) + (9 \times 2)$ i.e. $(-3) + (18) = +15$ (Ice Numeral)

(1, for 1/10th of multi-year ice multiplied by -3 which is the ice multiplier value from Table 1 for a CAC 4 ship in multi-year ice) + (9 which is for 9/10th's of first-year ice multiplied by 2 the ice multiplier value from the Table 1 for CAC 4 ship in first year ice) gives 15, the Ice Numeral.

SHIP CATEGORY

Type B $(1 \times -4) + (9 \times -1)$ i.e. $(-4) + (-9) = -13$ (Ice Numeral)

(1, for 1/10th of multi-year ice multiplied by -4, which is the ice-multiplier value from Table 1 for a Type B ship in multi-year ice) + (9 which is for 9/10ths of first-year ice multiplied by -1 the ice-multiplier value from the Table-1 for Type B ship in first year ice) gives -13, the Ice Numeral.

Example - 2

The Ice Regime in Photo 2 has : 5/10th second-year ice, 4/10ths first-year medium ice and 1/10th open water.

SHIP CATEGORY

Type B $(5 \times -4) + (4 \times -1) + (1 \times 2)$ i.e. $(-20) + (-4) + (2) = -22$ (Ice Numeral)

Type A $(5 \times -3) + (4 \times 1) + (1 \times 2)$ i.e. $(-15) + (4) + (2) = -9$ (Ice Numeral)

To get an accurate **IN,** the **Ice Multipliers** should be adjusted for decayed ice and must be adjusted for ridged ice. The reason is that, a given ice type will be weaker when it is decayed and thicker when ridged.

In all cases, the due caution of the Mariner must be exercised, taking into account such factors as changes in the weather and visibility.

Photo 1 for Example 1

This photo of a multi-year floe surrounded by broken up medium first year ice was taken in Lancaster Sound in July. The multi year piece is identified by its very smooth surface with no sharp-edged topography. The higher freeboard of multi year ice is also apparent in this scene.

There is little puddling on this floe, and no thaw holes so it would not be considered decayed. One could expect this floe to be two to five metres thick.

This scene contains one tenth multi-year in small floes, and nine tenths medium first year ice as brash.

Photo: courtesy Norland Science & Engineering Ltd.

This will be shown on the ice chart as:

$$\frac{9+}{19}\ \frac{91\bullet}{31}$$

Multi-Year floe in Medium First-year ice

ICE REGIME
Photo 2 for Example 2

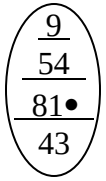
Photo: courtesy Norland Science & Engineering Ltd.

Medium Sized Second-Year Floe

This photo of a second-year floe provides a perspective on the size and scale of the topography of a typical second-year floe. Note how the freeboard is lower compared to multi-year ice. The smoother surface and drainage channels are apparent in this photo of second-year ice, similar to multi year ice as well. This flow is estimated at two metres thick.

The concentration in this scene is five tenths second-year in medium floes, four tenths medium first-year in small floes.

This will be shown on the ice chart as:



IMPORTANT ICE REGIME CONCEPTS

- An **Ice Regime** is any area composed of a relatively even distribution of any mix of ice types, including open water.
- Each ice type has an **Ice Multiplier** value relevant to the level of difficulty which that ice type may pose for a given ship category.
- **Ice Multipliers** may be increased for decayed ice and **must** be decreased for ridging.
- **Ice Numerals** are calculated based on the concentrations of different ice types within an ice regime, and the corresponding ice multipliers.
- **Ice Numerals** must be zero or higher for a ship to enter an ice regime.

.3 Determining Ice Regimes

The Ice Navigator may observe the ice conditions visually and determine the types of ice within the ship's ice regime. In addition, the information about ice conditions may also come from a variety of sources, including:

- The Arctic Vessel Traffic System (NORDREG)
- Ice charts from the "Canadian Ice Service"
- Reports from shore stations and from other ships in the area
- Helicopter reconnaissance
- Direct satellite and airborne radar imagery

The ice charts from the Canadian Ice Service contain information on ice types, concentrations and their distribution which can be used to define Ice Regimes and calculate their severity directly. Other information may require more interpretation by an Ice Navigator.

There is no set maximum or minimum size for an ice regime.

The Ice Navigator must use the best available information to develop a picture of the ice conditions which is relevant to their needs.

The Ice Analysis Charts from Canadian Ice Service, Environment Canada contain information on Ice Types, concentrations and their distribution which are well suited to the Arctic Ice Regime Shipping System. Considering that these charts are presented in an appropriate scale for: voyage planning, strategic planning and to a limited extent tactical navigation, they can be used directly to define ice regimes and calculate their severity. Other forms of information, including digital data may require more interpretation by an experienced Ice Navigator.

A safe regime may consist of a relatively narrow lead through dangerous ice, provided that conditions are likely to remain stable during the transit. The Ice Navigator must not define regimes more locally than is warranted by the ice conditions and the manoeuvring characteristics of the vessel. If inbound, the Ice Navigator must also carefully consider how conditions may change before the outbound journey. The mariner's judgement is crucial throughout. Before entering a regime, there must always be a route to a safe haven or out of the ice.

.4 Planning Routes

In general, routes should be planned to avoid ice as much as possible. Current information on ice should be used to select the easiest routes. If one or more Ice Numerals along an intended route are negative, the mariner should consider an alternate route.

An experienced Ice Navigator may recognize that some broadly drawn regimes with negative numbers are likely to include more local areas through which transits can be made safely. However a factor to consider is that conditions may change. When conditions are deteriorating more caution is needed before entering regimes which may be marginally within the vessel's capabilities.

Routing guidance from NORDREG, taking these and other factors into account, can be of assistance. When reporting voyage plans to NORDREG, the rationale is to be provided for the decisions on selecting routes, particularly if a selected route appears likely to encounter negative Ice Numerals.

.5 Considering Escort

Escort by another ship is another factor which may be considered in planning routes and defining local ice regimes. Under some circumstances an escort can be effective in easing the ice conditions along the route, e.g. breaking large pieces of dangerous ice or assisting vessels to manoeuvre around them. However, there are some situations when the effectiveness of the escorting vessel could be limited e.g. the track becomes narrow indicating that the ice is under pressure.

The Master of the vessel under escort must work closely with the Master of the escorting vessel. The escorting vessel will decide whether it is safe to break a track, but the Master of the escorted ship must continue to evaluate the conditions in order to determine whether it is safe to follow, and at what speed. Good communication between vessels is essential throughout the escorted transit.

- The publication *Ice Navigation In Canadian Waters* (Reference 3), is an excellent source of important information on escort operations.

.6 Training and Experience

Vessels planning to use the Ice Regime system must have on board a Ice Navigator with the required training and experience. It is recognized that the Arctic is a complex environment. For a ship's performance to remain within safe limits, the Master and the navigating officers should also have the necessary training and experience in ice navigation.

.7 Responsibilities

The safety of the ship is the responsibility of Master at all times. This includes avoiding areas with ice regimes beyond the ship's capabilities, and operating at suitable speeds to avoid unsafe collisions with ice. Operating within the Ice Regime System provides a useful framework for operational decisions.

9. REPORTING STRUCTURE

.1 Ice Regime Routing Message

When the *Arctic Ice Regime Shipping System* is used, the *Arctic Shipping Pollution Prevention Regulations* **require** that an *Ice Regime Routing Message* be sent to the NORDREG. This message can, in general, be very brief, however, if the vessel's route includes areas on ice analysis charts from the Canadian Ice Service with ice concentrations that may have negative Ice Numerals, the message should include additional pertinent information explaining the voyage plan e.g. expectations of changes in conditions and/or other considerations.

The content of the *Ice Regime Routing Message* is as follows:

To: Regional Ice Operations Superintendent
NORDREG Canada.....Facsimile: (867) 979 - 4236

ICE REGIME ROUTING MESSAGE

a) the ship's name,
b) the ship's call sign and IMO number
c) the ice strengthening of the ship (Type / CAC / Arctic Class / etc.),
d) the date and UTC time,
e) the ship's current position, course and speed,
f) the anticipated destination,
g) the intended route,
h) a listing of the ice regimes and their associated Ice Numerals,
i) the source(s) of ice information,
j) any other pertinent information / comments
k) the name of any escorting vessel, and
l) the name(s) of the Ice Navigator(s) on board

Master

This message *should* be updated if the plan and/or ice conditions change significantly. In any event, the ship should provide an update on entering any area for which it has previously reported a negative Ice Numeral.

.2 After Action Report

When the *Arctic Ice Regime Shipping System* is used, in accordance with subsection 6(3) of the *Arctic Shipping Pollution Prevention Regulations*, an after action report is required to be submitted within 30 days of leaving the area. The report can be quite brief, however, in cases where the voyage has involved difficulties or unexpected occurrences, it will be valuable to include the information which the Master considers significant. This information could be useful for the future development of the system and for the overall safety of navigation in the Arctic.

Unlike the routing message, the *After Action Report* is to be sent to the Regional Director, Marine, Prairie & Northern Region, who receives it on behalf of the Minister of Transport. The content of the *After Action Report* is as follows:

To: Regional Director, Marine
Prairie & Northern Region - AMNS
Transport Canada
Place de Ville, Tower C
330 Sparks Street, 14th Floor
Ottawa, Ontario, K1A 0N5

Telephone: (613) 991 - 6004
Facsimile: (613) 991 - 4818

AFTER ACTION REPORT

a) the ship's name,

b) the ice strengthening of the ship (Type / CAC / Arctic Class / etc.),

c) a description of the actual route, including the: ice regimes encountered, transit speeds and the Ice Numerals for each,

d) copies of the ice information used,

e) escort information, if applicable
   1) duration of the escort,
   2) the ice regime under escort, and,
   3) the characteristics of the track,

f) weather conditions and visibility, and

g) any other important information.

Master

10. AGENCIES

As has been the case since 1972 with the Zone Date entry system, Marine Safety and the CCG will continue to monitor ship navigation. This is performed at three levels:

- Arctic Canada Traffic System (NORDREG)
- Regional Ice Operations Superintendent
- Marine Safety

The Canadian Ice Service supplies the ice charts that are relayed through the Coast Guard radio stations and NORDREG. They can also provide additional information on request.

.1 Arctic Canada Traffic System

For ships operating in Arctic waters, the Canadian Coast Guard administers and operates the Arctic Canada Traffic System known as NORDREG CANADA. The primary objectives of NORDREG are to:

- enhance the safe and expeditious movement of maritime transportation in Arctic waters;
- safeguard the Arctic environment; and
- contribute to the administration of Canadian Arctic waters and territories

Among its other activities, NORDREG issues acknowledgements to ships entering Arctic waters, distributes ice information and ice routings for individual ships, and co-ordinates requests for Canadian Coast Guard icebreaker assistance. In these areas NORDREG operates in a similar manner to the Eastern Canada Traffic System (ECAREG CANADA), and has similar general reporting requirements. They are contained in the **Annual Edition of Notices to Mariners** (reference 4).

NORDREG is a voluntary reporting system. All vessels are strongly encouraged to participate. In providing its services, the CCG have made it clear that there is no intention on its part to attempt to navigate or manoeuvre ships from a shore station, or to override the Master's authority and responsibility for the safe navigation of the ship.

ARCTIC CANADA TRAFFIC SYSTEM

NORDREG CANADA - HIGHLIGHTS

- Compliance with NORDREG CANADA is voluntary.
- Ships reporting to Ice Operations Office, in accordance with NORDREG CANADA, are monitored, and also are better placed to receive expedient support when they request.
- Ice routings issued by NORDREG CANADA are advisory in nature. NORDREG CANADA will not attempt to navigate or manoeuvre ships from a shore station, to over-ride the authorities of Masters, or to take over their responsibilities for the safe navigation of their ships.

.2 Regional Ice Operations Superintendent

The Regional Ice Operations Superintendent will not become involved in operational decision making as a result of the introduction of the *Arctic Ice Regime Shipping System*. The ship's Master will make the operational decisions according to the system and communicate these decisions to the Ice Operations Superintendent.

These communications do not constitute requests for permission to proceed, rather they are made for the information of the Ice Operations Superintendent. On the basis of this information and other requirements of the NORDREG CANADA system, a NORDREG acknowledgement may be issued for the vessel to proceed along the projected route and through the anticipated ice conditions. This represents an acknowledgement that the planned route appears appropriate - it does not relieve Masters of their responsibility to navigate with due caution and with continuous careful attention to the local ice conditions.

.3 Marine Safety

Marine Safety is the national authority for ensuring safe ships and protecting life, property and the marine environment from ship related impacts.

This mandate, authority and responsibilities are derived from a number of acts, the most important of which are the *Canada Shipping Act* and the *Arctic Waters Pollution Prevention Act*.

Marine Safety, performs an oversight on the System, conducts Port State Control inspections, and issues safety certification.

.4 Canadian Ice Service

The Canadian Ice Service is part of Environment Canada's *Atmospheric Environment Service* (AES). The goal of the Ice Services Program is to ensure that ice information is available as needed and is used effectively by our clients to make sound decisions that will promote safe and efficient maritime operations for the economic benefit of Canadians while environmental integrity is preserved. The Canadian Ice Service, as an integral part of AES, is a centre of expertise for the ice related information for all of Canada.

To achieve this goal, ice conditions across Canada are monitored using the latest satellite technology as well as aerial reconnaissance, ships and shore reports. Numerical ice models assist experienced ice forecasters in predicting ice growth, movement, deformation and decay.

The Canadian Ice Service produces ice hazard bulletins and ice charts describing the general ice distribution and hazard areas to marine operations. For more specific client needs, ice forecasts and analysis can be produced on request in addition to any consultation service that may be needed. When tactical support is required, a radar equipped aircraft manned by Ice Specialists from AES can be dispatched within 4 hours.

The Canadian Coast Guard, through its marine radio stations, broadcasts the ice bulletins and ice charts produced by the Canadian Ice Service according to schedules published in *Radio Aids to Marine Navigation*. These products, as well as more detailed information, can be received by fax or electronic mail directly from the Ice Centre in Ottawa. The Canadian Ice Service also has World Wide Web page on the internet. For more details or specific information on ice information products and services, please contact the Canadian Ice Service at:

Telephone: (613) 996-1550 / (800) 767 - 2885
Facsimile: (613) 947-9160

Address: Canadian Ice Service
Block "E", 3rd Floor
373 Sussex Drive
Ottawa, Ontario
K1A 0H3

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11. REFERENCES & BIBLIOGRAPHY

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[2] **Validation Trials of the Proposed Ice Regime Shipping Control System, "M/T HUBERT GAUCHER" 1992 and "M/V FEDERAL POLARIS", 1992**. (Reports prepared for Canadian Coast Guard.) Norland Science & Engineering Ltd., 1993.

[3] **Ice Navigation In Canadian Waters**, 1992 Revised Edition, Canadian Coast Guard.

[4] **Notices to Mariners 1 to 45,** Annual Edition, Canadian Coast Guard Marine Navigation Services.

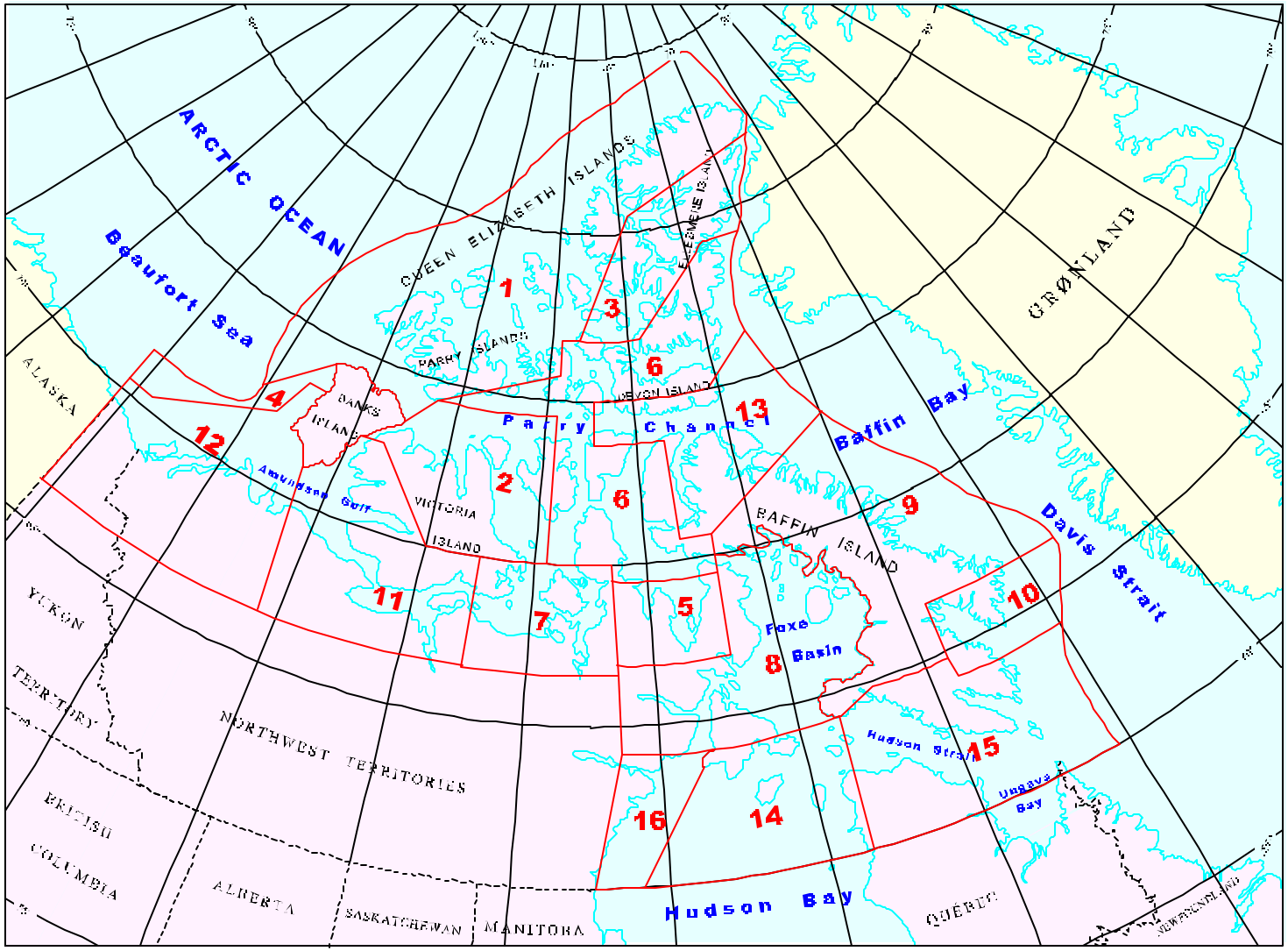
[5] **Proposals For The Revision Of The Arctic Shipping Pollution Prevention Regulations**, Volume 1: Background, Volume 2: Regulations, December 1989. (Report of the Sub-Committee for the Canadian Coast Guard) TP 9981

[6] **Vessel Traffic Services,** Centre Manual, Arctic Canada Traffic System (NORDREG), Element T-2, June 1994. TP 1526

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

Appendix A Zones Map

SHIPPING SAFETY CONTROL ZONES



Appendix B

Extract from the *Arctic Shipping Pollution Prevention Regulations*

6. ….

(3) Subject to subsection (3.2), no ship that carries oil in a quantity in excess of 453 m^3 may navigate in a zone at a time outside the period set out in Schedule VIII for that category of ship and zone unless

(a) the ice numeral for the ice regime in those parts of the zone to be navigated is greater than or equal to zero and is determined in accordance with sections 3,5 and 6 of the *Arctic Ice Regime Shipping System (AIRSS) Standards* (TP 12259), published by Marine Safety, Transport Canada, in June 1996, as amended from time to time;

(b) the master of the ship has taken into account:

(i) the manoeuvring characteristics of the ship and escorting ship, if any,

(ii) the operating characteristics and condition of the ship and of any equipment on board designed for the purpose of detecting ice hazards,

(iii) the probability of a change in the ice conditions during the intended transit through the zone, and the probable effect of the change, and

(iv) weather conditions;

(c) the master of the ship has sent a message to the Canadian Coast Guard that contains the following information:

(i) the call letters and category of the ship, and the name of any escorting ship,

(ii) a description of the proposed route through the zone,

(iii) the final destination of the ship,

(iv) the name of the master of the ship and the ice navigator, and

(v) a description of each ice regime on the proposed route and the ice numeral for the regime; and

(d) the master of the ship receives an acknowledgement of the message sent pursuant to paragraph (c) from the Canadian Coast Guard before entering the zone.

(3.1) the master of a ship of any category set out in column I of an item of Schedule VIII that complies with subsection (3) and navigates in a zone at a time outside the period set out in Schedule VIII for that category of ship and zone shall send to the Minister of Transport within 30 days after the end of the transit an after-action report that contains:

(a) a copy of the ice information used; and

(b) a summary description of the transit that includes:

(i) the ship's name and category,

(ii) the duration of escort, if any, by an escorting ship,

(iii) weather conditions and visibility, and

(iv) the route followed, and the ice regimes encountered on the route and their ice numerals.

(3.2) Subsection (3) does not apply in respect of a ship of a category referred to in subsection (4), (5), (6), (7), (8) or (9) that is navigating in the zone and during the period referred to in the same subsection of subsections (4) to (9).

Appendix C Shipping Safety Control Zones - Dates of Entry

	Col. I Col. XII	Col. II Col. XIII	Col. III Col. XIV	Col. IV Col. XV	Col. V Col. XVI	Col. VI Col. XVII	Col. VII	Col. VIII	Col. IX	Col. X	Col. XI
Item	Category Zone 11	Zone 1 Zone 12	Zone 2 Zone 13	Zone 3 Zone 14	Zone 4 Zone 15	Zone 5 Zone 16	Zone 6	Zone 7	Zone 8	Zone 9	Zone 10
1.	Arctic All Class 10 Year	All All Year Year	All All Year Year	All All Year Year	All All Year Year	All All Year Year	All Year	All Year	All Year	All Year	All Year
2.	Arctic All Class 8 Year	July 1 All to Year Oct. 15	All All Year Year	All All Year Year	All All Year Year	All All Year Year	All Year	All Year	All Year	All Year	All Year
3.	Arctic All Class 7 Year	Aug. 1 All to Year Sept. 30	Aug. 1 All to Year Nov. 30	July 1 All to Year Dec. 31	July 1 All to Year Dec. 15	July 1 All to Year Dec. 15	All Year	All Year	All Year	All Year	All Year
4.	Arctic July 1 Class 6 to Mar. 31	Aug. 15 All to Year Sept. 15	Aug. 1 All to Year Oct. 31	July 15 All to Year Nov. 30	July 15 All to Year Nov. 30	Aug. 1 All to Year Oct. 15	July 15 to Feb. 28	July 1 to Mar. 31	July 1 to Mar. 31	All Year	All Year
5.	Arctic July 5 Class 4 to Jan. 15	Aug. 15 June 1 to to Sept. 15 Jan. 31	Aug. 15 June 1 to to Oct. 15 Feb. 15	July 15 June 15 to to Oct. 31 Feb. 15	July 15 June 15 to to Nov. 15 Mar. 15	Aug. 15 June 1 to to Sept. 30 Feb. 15	July 20 to Dec. 31	July 15 to Jan. 15	July 15 to Jan. 15	July 10 to Mar. 31	July 10 to Feb. 28
6.	Arctic July 5 Class 3 to Dec. 15	Aug. 20 June 10 to to Sept. 15 Dec. 31	Aug. 20 June 10 to to Sept. 30 Dec. 31	July 25 June 20 to to Oct. 15 Jan. 10	July 20 June 20 to to Nov. 5 Jan. 31	Aug. 20 June 5 to to Sept. 25 Jan. 10	Aug. 1 to Nov. 30	July 20 to Dec. 15	July 20 to Dec. 31	July 20 to Jan. 20	July 15 to Jan. 25
7.	Arctic July 10 Class 2 to Nov. 20	No June 15 Entry to Dec. 5	No June 25 Entry to Nov. 22	Aug. 15 June 25 to to Sept. 30 Dec. 10	Aug. 1 June 25 to to Oct. 31 Dec. 20	No June 10 Entry to Dec. 10	Aug. 15 to Nov. 20	Aug. 1 to Nov. 20	Aug. 1 to Nov. 30	Aug. 1 to Dec. 20	July 25 to Dec. 20
8.	Arctic July 15 Class 1A to Nov. 10	No July 1 Entry to Nov. 10	No July 15 Entry to Oct. 31	Aug. 20 July 1 to to Sept. 15 Nov. 30	Aug. 20 July 1 to to Sept. 30 Dec. 10	No June 20 Entry to Nov. 30	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
9.	Arctic July 15 Class 1 to	No July 1 Entry to	No July 15 Entry to	No July 1 Entry to	No July 1 Entry to	No June 20 Entry to	Aug. 25 to	Aug. 10 to	Aug. 10 to	Aug. 10 to	Aug. 1 to

							Sept. 30	Oct. 15	Oct. 31	Oct. 31	Oct. 31
	Oct. 20	Oct. 31	Oct. 15	Nov. 30	Nov. 30	Nov. 15					
10.	Type	No	No	Aug. 20	Aug. 20	No	Aug. 15	Aug. 1	Aug. 1	Aug. 1	July 25
	July 10	June 15	June 25	June 25	June 25	June 20					
	A	Entry	Entry	to	to	Entry	to	to	to	to	to
	to	to	to	to	to	to					
				Sept. 10	Sept. 20		Oct. 15	Oct. 25	Nov. 10	Nov. 20	Nov. 20
	Oct. 31	Nov. 10	Oct. 22	Nov. 30	Dec. 5	Nov. 20					
11.	Type	No	No	Aug. 20	Aug. 20	No	Aug. 25	Aug. 10	Aug. 10	Aug. 10	Aug. 1
	July 15	July 1	July 15	July 1	July 1	June 20					
	B	Entry	Entry	to	to	Entry	to	to	to	to	to
	to	to	to	to	to	to					
				Sept. 5	Sept. 15		Sept. 30	Oct. 15	Oct. 31	Oct. 31	Oct. 31
	Oct. 20	Oct. 25	Oct. 15	Nov. 30	Nov. 30	Nov. 10					
12.	Type	No	No	No	No	No	Aug. 25	Aug. 10	Aug. 10	Aug. 10	Aug. 1
	July 15	July 1	July 15	July 1	July 1	June 20					
	C	Entry	Entry	Entry	Entry	Entry	to	to	to	to	to
	to	to	to	to	to	to					
							Sept. 25	Oct. 10	Oct. 25	Oct. 25	Oct. 25
	Oct. 15	Oct. 25	Oct. 10	Nov. 25	Nov. 25	Nov. 10					
13.	Type	No	No	No	No	No	No	Aug. 10	Aug. 15	Aug. 15	Aug. 5
	July 15	July 1	July 30	July 10	July 5	July 1					
	D	Entry	Entry	Entry	Entry	Entry	Entry	to	to	to	to
	to	to	to	to	to	to					
								Oct. 5	Oct. 20	Oct. 20	Oct. 20
	Oct. 10	Oct. 20	Sept. 30	Nov. 10	Nov. 10	Oct. 31					
14.	Type	No	No	No	No	No	No	Aug. 10	Aug. 20	Aug. 20	Aug. 10
	July 15	July 1	Aug. 15	July 20	July 20	July 1					
	E	Entry	Entry	Entry	Entry	Entry	Entry	to	to	to	to
	to	to	to	to	to	to					
								Sept. 30	Oct. 20	Oct. 15	Oct. 20
	Sept. 30	Oct. 20	Sept. 20	Oct. 31	Nov. 5	Oct. 31					

Note: There are additional date restrictions contained in the regulations for certain ships. Please verify the actual allowed dates from Section 6 of the regulations.

ppendix D Template - Ice Regime Routing Message

To: Regional Ice Operations Superintendent
NORDREG Canada Facsimile: (867) 979 - 4236

a) Ship's Name	
b) Call Sign & IMO Number	
c) Ice Strengthening Category (Type / CAC / Arctic Class / etc.) (Arctic Pollution Prevention Certificate)	
d) Date & UTC Time	
e) Destination	
f) Position, Course & Speed	° ‘ North _____ °True ° ‘ West _____ Knots
g) Intended Route	
h) A list of Ice Regimes and their Ice Numerals	
i) Source(s) of Ice Information	
j) Other Information / Comments	
k) Name of any Escorting Vessel (if applicable)	
l) Ice Navigator(S) - Name(s)	
Master's Name	