

CENTRAL MARINE RESEARCH AND DESIGN INSTITUTE CNIIMF



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REPORT ON CURRENT REGULATIONS AND PRACTICES AND IMPACT OF IMO GUIDELINES

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WP2.2: Rules and Regulations

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Review of the Guide to navigating through the Northern Sea Route and analysis of its compliance with the requirements of the Rules of the Russian Maritime Register of Shipping

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ABSTRACT

The review of existing Russian and international requirements and rules for the navigation of ships in the Arctic was done. At the moment the Russian “Guide to navigating through the Northern Sea Route” and Rules for the classification and construction of sea-going ships of the Russian Maritime Register of Shipping are completed and officially published. The comparative analysis made of the requirements of the Guide and Register of Shipping has shown that as applied to arctic ships these requirements are practically identical.

The report has 22 pages and contains 3 references.

KEY WORDS: NORTHERN SEA ROUTE, RULES AND REGULATIONS, IMO GUIDELINES, ARCTIC NAVIGATION, CLASSIFICATION AND CONSTRUCTION OF SHIPS





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INTRODUCTION

The present time is characterized by the intensification of the production of oil and gas on the arctic shelf and on shelf of freezing seas. This calls for the construction of modern icebreaker fleet to provide for the transportation of hydrocarbons and for servicing of production complexes. The construction and maintenance of the icebreaker fleet has always been a priority for the Russian Transport Ministry that being associated with the necessity to ensure functioning of the Northern Sea Route (NSR) as a transport artery.

To ensure safety of the operation of ice ships is also a major task. The economic efficiency is to be combined with the ecological safety. Handling these problems of the utmost importance is the ice strength of hull and of propulsion unit due to a high level of ice loads.

Taking into account the above stated, various countries are carrying out now large-scale scientific and technical investigations in this direction. Most intensive these studies are in Russia, Finland and Canada. Early in the nineties the unification (harmonization) of requirements of various Classification Societies and Maritime Administrations for ice ships' strength has become a vital problem. Beginning in 1993, the Canada-financed works for the development of the IACS Unified Requirements (UR) for the strength of hull and machinery of polar ships were carried out. The Russian Maritime Register of Shipping (RS), as well as leading Russian organizations like A. N. Krylov Research Institute and CNIIMF take part in these IACS works.

Concurrently, within the framework of IMO at the inter-governmental level the Guide for ships operating in ice-covered arctic waters was developed. This Guide was approved by the Maritime Safety Committee at the end of 2002. Nevertheless, since in relation to the classification of arctic ships (Chapter 1. General), requirements for their construction and ice strength (Chapter 2. Structures) as well as requirements for electrical plants (Chapter 7. Main Machinery) the Guide suggests using the IACS Unified Requirements the development of which has not been completed, practically there is no possibility of the correct comparison of the international requirements and the Polar IMO Requirements with the running Russian





Guide for the through navigation of ships along the Northern Sea Route. Taking into account the above, at this stage the analysis has been made of the compliance of the Guide Requirements for the navigation of ships along the NSR (1996 edition) with the Rules of classification and construction of sea-going ships of the Russian Maritime Register of Shipping (2003 edition) as to the construction of machinery plants, systems and devices, stability and insubmersibility of ice ships.





1. Rules to be followed on the Northern Sea route

1.1. Review of the “Guide of Navigation through the Northern Sea Route”

The “Guide for Navigation through the Northern Sea Route” has been developed by the Russian Party under the “International Northern Sea Programme” – INSROP, 1993-1998) and was published in Russian (1995) and in English (1996).

The international legal basis for the “Guide” were provisions of the UNO Law of the Sea Convention, 1982 (Clause 234 “Ice-covered areas”).

In this connection, the objectives of the “Guide” were to secure safety of navigation through the Northern Sea Route and to prevent pollution of the marine environment from ships.

The provisions of the “Guide” apply both to the NSR seaway itself (from the Novaya Zemlya to the Bering Strait) and to the Barents and Bering Sea areas covered by ice.

The Decree of the RF Government permits the foreign vessels to enter in 2003 and 2004 the Arctic ports and points, in particular, Amderma, Varandey, Vitino, Kolguyev, Dikson, Khatanga, Tiksi, etc. (40 ports and points, in all). For the purpose of entering ports and points, vessels are provided with sea pilots as well as charts and sailing directions.

The structure of the “Guide” is given in Figure 1.

The general review outlines that during navigational period, all vessels navigating on the seaway of the NSR are operational subordinate to the Marine Operations Headquarters of the Western (Murmansk) and Eastern (Pevek) Arctic Districts.

The information on securing safety is transmitted within the network of the International Automatic Satellite Communication Service SafetyNET of INMARSAT system.



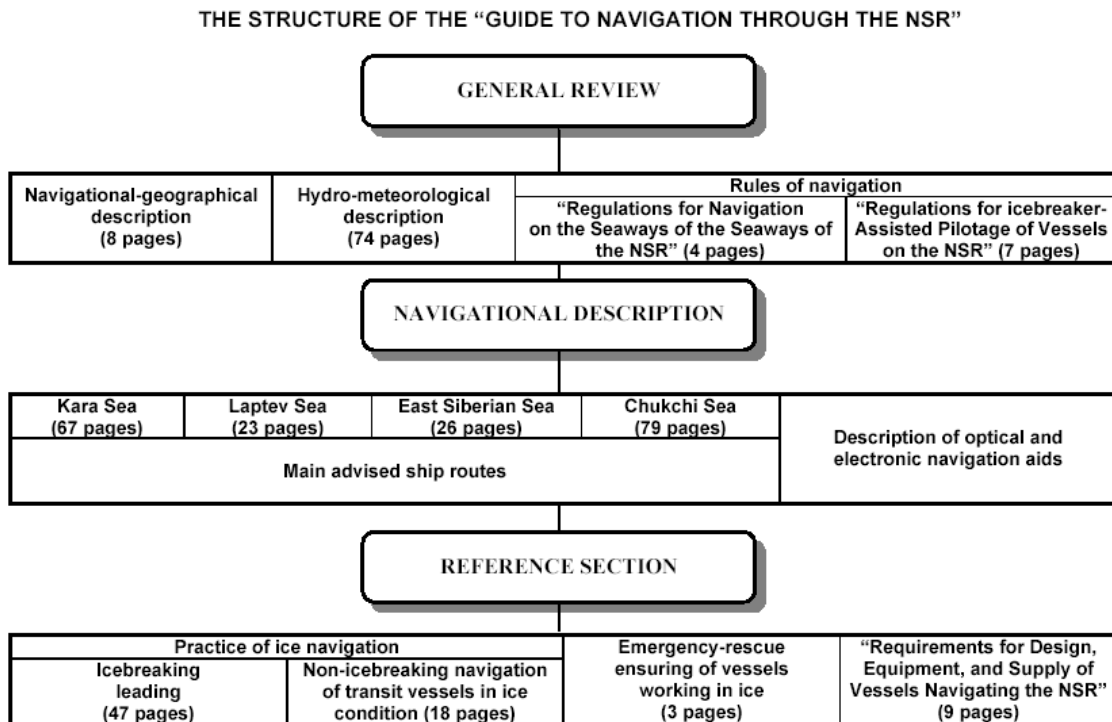


Fig.1

In the conclusion of the general review of the “Guide, the “Regulations for Navigation on the Seaways of the Northern Sea Route” and “Regulations for Icebreaker-Assisted Pilotage of Vessels on the NSR” are given.

Navigational description set forth in the “Guide” is supplemented by nautical charts and sailing instructions for general use published for all Arctic seas. Production of the electronic nautical charts is nearing completion. Shore control – correction stations of the global navigation satellite systems: Russian – GLONASS and American – NAVSTAR began to be deployed along the entire waterway of the NSR. Integrated use of the navigation satellite systems and electronic charts make it possible to render ship handling automatic to an accuracy of 10 meters.

The reference section of the “Guide” includes practice of ice navigation, salvage support to vessels operating in ice and the “Requirements for Design, Equipment and Supply of Vessels Navigating the NSR”.



Practice of ice navigation is set forth on the basis of the generalized extensive experience gained by the Russian polar seafarers and the results of the long-term investigations. The experience gained in nuclear icebreaker escorting of vessels is of particular value.

Improvement in the ice navigation tactics coupled with large displacement, hull strength, power of the main machinery of the nuclear icebreakers of the new generation the design of which is initiated by Russia will make it possible to escort the transport vessels through the entire Northern Sea Route all the year round.

Salvage support to vessels operating in ice is provided by the icebreakers, as well as by the special salvage tugs and sea-going diving ships and boats. For fast delivery of rescue equipment and personnel to the average ships use is made of helicopters.

General guidance of the salvage operations on the NSR is exercised by the Marine Operations Headquarters.

Seventy-year experience of the salvage support to the NSR suggests that the Arctic sea transport system created in Russia and including nuclear fleet which is the most powerful in the world and vessels with the Arctic ice category operates reliably. The likelihood of the vessel losses on the waterways of the NSR does not exceed 0.4% what is by 10 times lower than the likelihood of vessel losses in the World Ocean waters. The average likelihood of the vessel sustaining heavy ice damages which require shop repair does not exceed 2%. For comparison purposes, the likelihood that vessel will collide in coastal areas of the World Ocean is at the same level.

Generally, the “Guide” terminates in the “Requirements for Design, Equipment and Supply of Ships Navigating the NSR”.





1.2. Review of Russian regulations to be followed on the NSR

The review incorporates the following regulations which are in force on the NSR (Fig.2):

“Regulations for Navigation on the Seaways of the Northern Sea Route”;

“Regulations for Icebreaker-Assisted Pilotage of Vessels on the NSR”;

“Requirements for Design, Equipment and Supply of Vessels Navigating the NSR”.

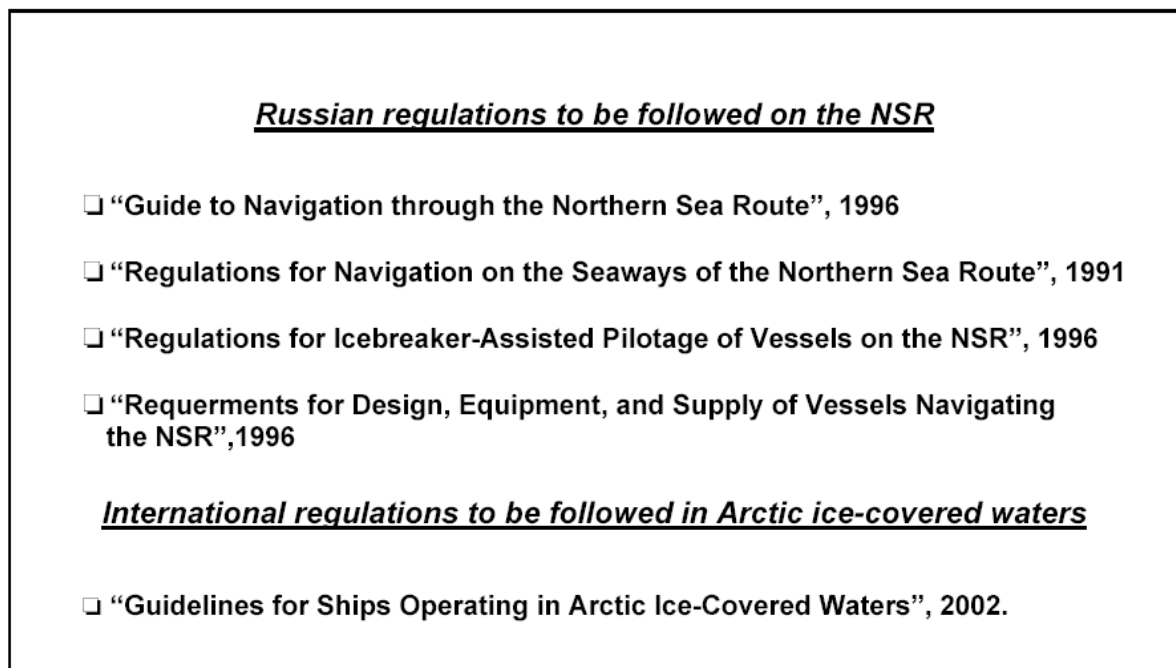


Fig.2

“Regulations for Navigation on the Seaways of the Northern Sea Route” were approved by the USSR Minister of Merchant Marine in 1990. The Regulations shall, on the basis of non-discrimination for vessels of all States, regulate navigation through the Northern Sea Route for the purpose of ensuring safe navigation and preventing marine environment pollution from vessels.

The Owner or Master of a vessel intending to navigate through the Northern Sea Route shall submit to the Administration (Marine Operations Headquarters) a notification and request for





leading through the Northern Sea Route as well as the information on guarantee of payment of the icebreaking dues.

The inspection of the vessels shall be carried out at any place at the Owner's request and at his expense. Vessels that have not aboard a certificate of due financial security with respect to the civil liability of the Owner for damage inflicted by polluting marine environment should not be permitted to navigate the Northern Sea Route.

A vessel that has been admitted for leading through the Northern Sea Route shall navigate it following the seaway that has been assigned her and adhering to the routes recommended by the Marine Operations Headquarters.

Compulsory icebreaker-assisted pilotage is established in the Vilkitskogo Strait, Shokalskogo Strait, Dmitriya Lapteva Strait and Sannikova Strait.

If a vessel navigating the Northern Sea Route violates the provisions of these Regulations, it may be ordered to leave the Route.

The Administration and the Marine Operations Headquarters shall not be liable for damage inflicted on a vessel by leading in ice conditions unless it is proved that they bear guilt for the damage inflicted.

In accordance with the Federal Law "On Inner Sea Waters, Territorial Sea and Adjacent Zone of the Russian Federation", 1998, (Clause 14), the "Regulations" are to be approved by the Government of the Russian Federation. In this connection, new draft of Regulations has been developed.

The new draft of Regulations has properly accounted for the recent Russian and international legal acts and the experience in regulation of shipping on the NSR, as well as on the world seaways, through straits and canals.

Approval of the "Regulations" by the Government of the Russian Federation will result in rise of the legal status of the "Regulations", and, thereby, a maritime safety assurance will be given at the governmental level to vessels of all States.





“Regulations for Icebreaker-Assisted Pilotage of Vessels on the NSR” define the procedure for submitting requests, organization of the pilotage, obligations and responsibilities of the Master of the vessel, the Master of the icebreaker and the pilot on the waterways of the NSR.

Since the navigation of a vessel through the NSR has been started, the vessel is placed under control of the Marine Operations Headquarters in the western and eastern parts of the NSR, which fully settle all matters associated with icebreaker support and regime of navigation.

Navigation behind the icebreaker does not relieve the Master of the vessel from control over the safety of navigation of his vessel. For this purpose, the Master of every vessel shall have Russian nautical charts and guides to navigation.

At present, a new draft of the “Regulations” has been developed. This new draft will account for the experience gained in the icebreaker-assisted pilotage and, in accordance with the “Merchant Shipping Code”, 1999, the obligations and responsibilities of the Master of the vessel, the Master of the icebreaker and the pilot will be updated as well.

“Requirements for Design, Equipment and Supply of Vessels Navigating the NSR” account for the particularly complicated and dangerous navigational conditions on the NSR and aim at securing safety of navigation and at preventing marine environmental pollution from vessels.

Particular requirements apply to the hull, machinery installations, systems and arrangements, stability and watertight integrity, navigational and communication facilities, supplies and emergency outfit, manning.

At present, considering large amount of liquid hydrocarbons which began to be transported by tankers from the Arctic fields, a new draft of the “Requirements” has been developed. This draft reflects the provisions of:





“Merchant Shipping Code of the Russian Federation”, 1999;

“Rules for the Classification and Construction of Sea-Going Ships of the Russian Maritime Register of Shipping”, 1999;

Rules of the “International Association of Classification Societies”;

“International Convention on Civil Liability for Oil Pollution Damage”, 1992;

International “Guidelines for Ships Navigating in Arctic Ice-Covered Waters”, 2002.

International regulations to be followed in Arctic ice-covered waters

Development of the International Safety Code for vessels in polar waters began in 1993 within the framework of IMO at the meeting in Helsinki. It was anticipated that the International Code will cover polar water of the Arctic and Antarctic. As a result of prolonged discussions within IMO in December, 2002, the Guidelines superseded the Code. The sphere of validity of the Guidelines covers the Arctic waters only.

“**Guidelines for Ships Operating in Arctic Ice-Covered Waters**” define special measures for safety of life and protection of natural environment of Arctic seas and Arctic Ocean. For this purpose, the Guidelines” harmonize national requirements relating to the standards of the navigational and communication facilities, hull structure, equipment and manning of vessels. Recommendations are provided for unified ice classification of Arctic vessels.

Since the national requirements agreed with Clause 234 of the UNO Law of Sea Convention, 1982 apply to the majority of the Arctic coastal waters (exclusive economic zones), the fulfilment of the “Guidelines” requirements by the Arctic States will provide full coverage of all matters concerning safety of Arctic shipping.





2. Analysis of the compliance of the requirements of the Guide for through navigation of ships along the NSR with the requirements of the Rules of classification and construction of ice ships of the Russian Maritime Register of Shipping

According to Guide to Navigating through the Northern Sea Route (NSR, issue 1995) ships following the NSR are to meet the Register's current Rules for ships having in their class notation the marks of an ice strengthening category L1, UL and ULA, as well as to meet the requirements of current international conventions and the IMO Code (see NSR, issue 1995, Part "Requirements for the Design, Equipment and Supplies of Vessels Navigating the Northern Sea Route", Section 2 "General provisions"). *This requirement establishes the conformity of the RS Rules requirements to those of the NSR for the design and power of ice ships.*

Table 1 contains the NSR requirements and the relevant ones in the RS Rules and international conventions.





Table 1

Conformity of NSR requirements to those of RS Rules and international conventions

NSR requirements		Requirements of the RS (2003) and international conventions
3. Ship's hull		
3.1.	<p>All ships are to have a double bottom throughout the entire width of a ship and over the entire length between the forepeak and afterpeak bulkheads. The height of the double bottom is to meet the current rules of the classification societies.</p> <p>On ships with an icebreaker stem and a short forepeak the double bottom need not extend to the forepeak bulkhead in way of the raked stem provided the watertight compartments located between the forepeak bulkhead and the bulkhead in way of the joint between the stem and the keel line are used for storage of non-polluting substances only.</p> <p>Tanks in a double bottom and double sides are not to be used for storage of petroleum products and other harmful substances. The use of double bottom and double sides tanks on ships in service at the time of publication of these Requirements is permitted for storage of fuel oil and lubricants.</p>	<p>RS Rules 2003. <u>Pt. II. Hull:</u> Ch. 1.1 paras. 1.1.6.3 and 1.1.6.4., Ch 2.4, para. 2.4.4.1</p>
3.2.	<p>The cargo tanks of tankers over 5000 tdw used for carrying petroleum products, as well as the cargo tanks of chemical tankers and gas carriers are to be located at a distance of not less than 0.76 m from the shell of the ship's hull. Tanks in the double bottom and double sides of tankers may be used as tanks for segregated ballast or are to be kept empty.</p>	<p>Guidelines for ships operating in arctic ice-covered waters // IMO, MSC/Circ. 1056, MEPC/Circ. 399, 23. 12.02</p>
3.3.	<p>The hull shape for ships intended for use on the NSR is to be tailored for navigation in ice conditions of the Arctic Basin. If hull shapes different from those recommended by the RF Register's Rules are used, the operation of such ships on the NSR is to be approved by the Administration (Headquarters) <u>Navigation of ships with bulbous bowlines</u></p>	<p>RS Rules 2003, <u>Pt. II. Hull:</u> Ch. 3.10, para. 3.10.1.2</p>





	(Headquarters). Navigation of ships with bulbous bowlines is generally not permitted.	
3.4.	Ice strength and design of the hull of ships intended for navigation along the v are to meet the requirements of the RF Register's current Rules for ships having ice strengthening category ULA, UL and L1 or the equivalent requirements of other classification societies.	RS Rules 2003, <u>Pt. II. Hull:</u> Ch. 3.10, para. 3.10.2
3.5.	To ensure safe navigation on the NSR with due regard for the hull strength, it is recommended that ships carry onboard the ship's Ice Certificate, or, if the latter is lacking, Temporary Recommendations on Safe Speeds When Traveling through Ice. This will allow the mariners to determine the safe speed of the ship in ice as a function of the region and seasonal ice conditions along the route, as well as the technical condition of the hull.	RS Rules 2003, <u>Pt. I Classification:</u> Ch. 2.2, para. 2.2.3.4
3.6.	In deciding whether domestic ships constructed in accordance with the RF Register's Rules effective prior to 1981 should be permitted to navigate along the NSR, the technical condition, design and strength of the ship's hull is to be subjected to a special examination by the Administration (Headquarters).	RS Rules 2003, <u>Pt. II. Hull:</u> Ch. 3.10
3.7.	To ensure a possibility of ship's close towing by an icebreaker, additional strengthenings of the plating and framing, as well as potential fastening of a tow line, are to be provided in the forward end of the ship. If necessary, devices should be provided for removal and stowing of bow anchors onboard the ship.	In the RS Rules this requirement does not provided
4. Machinery installations		
4.1.	Machinery installations are to meet the requirements of the RF Register's Rules or equivalent rules of foreign classification societies for ships of the corresponding categories.	RS Rules 2003 <u>Pt. VII. Machinery installations</u>





4.2.	The time for reversing the main engine (in manoeuvring mode) or for adjusting the CPP Hades from "full speed ahead" to "full speed astern" is not to exceed 45 s.	RS Rules 2003 <u>Pt. VII. Machinery installations:</u> Ch. 6.5, para. 6.5.5
4.3.	When running astern, the main engines are to develop at least 70% of the rate of revolutions for the forward running mode.	RS Rules 2003 <u>Pt. VII. Machinery installations:</u> Sec. 2, Ch. 2.1, para. 2.1.4
4.4.	The propellers are to have at least four blades and to be made of stainless steel or high-strength bronze. Propellers with detachable blades are recommended.	RS Rules 2003 requirements with regard to materials for manufacturing: <u>Pt. VII, Ch. 2.4., para. 2.4.3</u>
4.5.	The propellers shaft tunnels are to have watertight closures locally and remotely controlled. On ships that entered into service prior to publication of these Requirements only a local drive may be fitted.	RS Rules 2003 - <u>Pt. II. Hull:</u> Ch. 1.1, paras. 1.1.6.1, 1.1.6.2; Ch. 2.7, paras. 2.7.2, 2.7.2.1 and 2.7.4.6; - <u>Pt. VII. Machinery installations:</u> Ch. 4.5, para. 4.5.3; - <u>Pt. III:</u> Ch. 7.12
4.6.	On all ships one of sea chests is to be an ice box with devices for heating and blowing.	RS Rules 2003 <u>Pt. VIII Systems and Piping:</u> Ch. 4.3, para. 4.3.1





5. Systems and devices		
5.1.	All ships are to be fitted with a closed sewage system that includes a plant for biological cleaning or physicochemical treatment and disinfection of sewage. The plant capacity is to be sufficient for simultaneous treatment of both sewage and domestic water. A holding tank with capacity sufficient for 30-day navigation is to be provided for collecting wastes (slurry) from the plant. Where the sewage treatment plant is absent, a system with a holding tank of the capacity sufficient for sewage storage onboard while the ship is in the regions forbidden for discharge, is to be provided.	Rules for the prevention of pollution from ships, PC 1999г. <u>Часть IV</u> Requirements for ships equipment and arrangements for the prevention of pollution by sewage
5.2.	Every ship is to be provided with a bilge water separator ensuring the content of petroleum in the effluent below 15 ppm and with storage tanks for bilge, rinse and ballast water contaminated with petroleum products, including that from the hold well, when transporting toxic cargoes, forbidden for discharge along the NSR. The capacity of the storage tanks is to be sufficient for 30-day navigation of the ship.	Rules for the prevention of pollution from ships, PC 1999. <u>Part II</u> , Chapter 4, item 6 и 7
5.3.	Every ship is to be provided with a unit for collection and destruction (incineration) of garbage and wastes contaminated with petroleum products (wastes from separation and filtration of fuel oil, lube oil, cleaning wastes, etc.) or a tank for storage of these wastes whose capacity is sufficient for 30-day navigation of the ship.	Rules for the prevention of pollution from ships, PC 1999. <u>Part II</u> , Chapter 7, item 7.1.4; <u>Part V</u> , Chapter 2
5.4.	The tanks specified in paras. 5.1 and 5.2 are to be provided with a pipeline led to both sides of the deck and with suitable pumping equipment for pumping out polluted water to a collection vessel or a quay.	Rules for the prevention of pollution from ships, PC 1999. <u>Part II</u> , Chapter 6, 7
5.5.	The ballast tanks adjacent to the outer side above the load waterline, double side tanks inclusive, are to be provided with a heating system.	RS Rules 2003 <u>Part VIII</u> , item 8.3.2





6. Stability and flood ability		
6.1.	Intact stability of ships is to meet the RF Register's requirements or the current international requirements provided for in international conventions, codes and other IMO documents.	RS Rules 2003 <u>Pt. IV. Stability</u>
6.2.	The ship's stability is to be checked with due regard for icing. The amount of ice per square meter of area of the total horizontal projection of exposed decks should be assumed at least 30 kg and of area of the lateral windage, 15 kg.	RS Rules 2003, <u>Pt. IV. Stability:</u> Ch. 2.4 Allowance for icing, paras. 2.4.3 and 2.4.4
6.3.	Subdivision and damage stability are to meet the requirements of the RF Register Rules or international regulations set forth in the SOLAS-74/78 and MARPOL-73/78 Conventions and other documents developed by the IMO for various ship types.	RS Rules 2003, SOLAS-74/78, MARPOL-73/78
6.4.	Regardless of compliance with the requirements of 6.3, all ships are to meet the requirements of 6.5 with ice damages specified in 6.6 The hypothetical ice damages for oil tankers, chemical tankers, gas carriers, ice category ULA dry cargo ships, drilling and passenger ships may be at any point within the ice damages range. For ice categories UL and L1 dry cargo ships, including ro-ro-type ships, these may be between watertight bulkheads, platforms and decks. The requirements of 6.5 do not apply to flooding of the engine room located aft for ice category UL ships under 90 m long and for ice category L1 ships under 125 m long..	RS Rules 2003 <u>Pt. V. Subdivision:</u> paras. 3.4.11 and 3.4.11.3





<p>6.5.</p>	<p>The requirements for damage draught and stability are considered to have been fulfilled if the following conditions are satisfied:</p> <p>6.5.1. The damage waterline after ship's equalization or after flooding, when the ship's equalization is not carried out, is to be below the bulkhead deck.</p> <p>6.5.2 In the final stage of flooding, the initial metacentric height of a ship in the upright condition determined by the constant displacement method, prior to taking measures for its increase, is to be at least 0.05 m.</p> <p>6.5.3. The angle of heel for unsymmetric flooding is not to exceed 20° (for passenger ships 15°) and 12° after taking measures for ship's equalization.</p> <p>6.5.4 The static stability curve of a damaged ship in the final stage of flooding is to have an area of at least 0.0175 m/rad with a positive arm section of at least 20° and the maximum arm of at least 0.1 m within this section</p>	<p>RS Rules 2003 <u>Pt. V. Subdivision:</u> para. 3.3</p>
<p>6.6.</p>	<p>Calculating damage stability the following dimensions of ice damages in the zone of their location from the base line up to the level 1.2 α_i within the length L_i are to be assumed:</p> <ul style="list-style-type: none">- length wise space 0.045 L_i, if the middle of the hole is at a distance of 0.4 L_i from the fore perpendicular, and 0.015 L_i, if in any other part of the ship;- depth of damage measured normally to the shell at any point of the design damage area, 0.76 m;- vertical dimension, 0.2 α_i. <p>Here L_i = ship's length measured along the waterline corresponding to the draught up to the upper boundary of the ship's ice belt.</p>	<p>RS Rules 2003 <u>Pt. V. Subdivision:</u> para. 3.4.11.4</p>





CONCLUSION

In legal respect, the NSR, as defined by the Russian legislation, is a national transportation line. Russia being interested in development of international shipping through the NSR takes care of high standards of maritime safety and environmental protection.

Arctic is a very sensitive region and any accident at sea may cause serious consequences. Therefore, vessels are to navigate on the seaways of the NSR under reliable State control, being escorted by the Russian icebreakers.

The review of existing Russian and international requirements and rules for the navigation of ships in the Arctic has shown that at the moment the Russian “Guide to navigating through the Northern Sea Route” and Rules for the classification and construction of sea-going ships of the Russian Maritime Register of Shipping are completed and officially published. The comparative analysis made of the requirements of the Guide and Register of Shipping has shown that as applied to arctic ships these requirements are practically identical.





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