

Transport
Canada

Coast
Guard

ROUTING STANDARDS

1991

Canadian Coast Guard

Ship Safety Branch

Ship Operations

FOREWORD

This publication supersedes the 4th Edition of the "Routing Standards - 1986".

The following standards are based on the International Maritime Organization (IMO), "General Provisions on Ships' Routing", 14 November 1977, as amended from time to time.

PART I contains information on Canadian Coast Guard policy for the introduction of Canadian routing systems. PART II contains the IMO provisions modified where necessary to reflect Canadian requirements. Canadian text in PART II is underlined. The position fixing accuracies shown in the ANNEX to PART II are generally based on the performance standards for the relative shipborne equipment described in IMO recommendations.

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PART I

DEVELOPMENT OF CANADIAN ROUTING SYSTEMS

1 General

1.1 The purpose of this publication is to establish national standards for planning, developing, establishing, amending and revoking routing systems in waters under Canadian jurisdiction.

1.2 When a routing system is proposed, amended, revoked or has its voluntary/compulsory status changed there must be thorough regional and national consultation between the Coast Guard ship routing planners, the marine industry and other interested parties.

1.3 Interested parties at the national level are those organizations and persons who are on the circulation list of the Canadian Coast Guard Marine Advisory Council (CMAC). Regional CMAC circulation lists will describe local interested parties.

1.4 Consultations shall be well documented and interested parties kept fully informed of the developments and the results of the consultation whether or not they participate.

1.5 The Director General Ship Safety of the Coast Guard (Director General) has the responsibility for routing systems and must be advised as soon as possible whenever any routing proposal is under consideration. The Director General will inform the Canadian Hydrographic Service (CHS) so that charting action can be planned.

1.6 Navigation safety and pollution prevention must not be compromised when reaching a decision between interested parties. Experience has shown that no routing system can entirely satisfy all parties because of their divergent concerns.

2 Regional level

2.1 In general, routing proposals will be initiated at the regional level and in accordance with specific regional consultative procedures. In some cases routing proposals will be initiated at the national level.

2.2 A regionally endorsed CMAC routing proposal will be forwarded to the Director General where it will be reviewed for compliance with these routing standards and Coast Guard policy. The Director General will forward the proposed routing system to CHS for review in accordance with their charting standards and those of the International Hydrographic Organization (IHO).

2.3 Routing proposals which do not meet these standards and policy will be returned to the region for amendments. Simple amendments may be made by the Director General in consultation with regional Coast Guard representatives where time would not permit a full review at the regional level.

3 National level

3.1 The Director General will table an accepted regionally endorsed routing proposal at the next CMAC meeting for national endorsement.

3.2 Following national endorsement the Director General will forward the routing proposal to CHS for charting action, and will prepare a series of notices to mariners.

3.3 The first notice to mariners will be promulgated when the charts or chart patches showing the routing system are available to mariners. This first notice will give three months warning of the coming into force of the routing system. The second notice will be promulgated as closely as possible to the date that the routing system comes into force. This second notice is a reminder and final notice.

3.4 No routing system will come into force until six months following its endorsement by the national CMAC meeting, except in cases of emergency.

3.5 These implementation procedures may be by-passed in emergency situations and traffic routed and rerouted, or a routing system temporarily established, amended or revoked for navigational safety and pollution prevention purposes. If emergency measures are required they should be brought to the attention of the interested parties as soon as possible.

3.6 The coordinated universal time (UTC) and the local time of the coming into force of routing systems will be promulgated in notices to mariners. Generally, noon local time will be used.

4 Voluntary and compulsory routing systems

4.1 Routing systems will be reviewed at a regional and national CMAA meeting after an initial period of user evaluation. If a measure of agreement is reached that navigation safety and pollution prevention is enhanced by the system, and no technical objections are established on navigation safety grounds, then the routing system will be made mandatory pursuant to the Collision Regulations and promulgated in the Annual Edition of Notices to Mariners.

4.2 The period of user evaluation will vary according to the complexity of the routing system but it should never be less than one year.

4.3 A notice to mariners will be prepared by the Director General when a routing system is changed from a voluntary to a compulsory system and vice versa. This notice will give mariners three months notice of a change in status.

5 Controlled and/or prohibited areas

5.1 Controlled and/or prohibited areas are routing systems and are dealt with by these standards.

6 Annual Edition of Notices to Mariners

6.1 The Canadian Annual Edition of Notices to Mariners describes all routing systems adopted by the International Maritime Organization (IMO), and all Canadian domestic routing systems. This Annual Edition also describes whether a routing system is voluntary or compulsory. The Annual Edition is kept up-to-date by notices to mariners and notices to shipping.

PART II

GENERAL PROVISIONS ON SHIPS' ROUTING

1 Objectives

1.1 The purpose of ships' routing is to improve the safety of navigation in converging areas and in areas where the density of traffic is great or where freedom of movement of shipping is inhibited by restricted sea-room, the existence of obstructions to navigation, limited depths or unfavourable meteorological conditions.

1.1.1 Canadian routing systems generally expand on these objectives by routing traffic point-to-point, where practicable, such as on the Great Lakes where there has never been any doubt as to the effectiveness of point-to-point routing.

1.2 The precise objectives of any routing system will depend upon the particular hazardous circumstances which it is intended to alleviate, but may include some or all of the following:

- .1 the separation of opposing streams of traffic so as to reduce the incidence of head-on encounters;
- .2 the reduction of dangers of collision between crossing traffic and shipping in established traffic lanes;
- .3 the simplification of the patterns of traffic flow in converging areas;
- .4 the organization of safe traffic flow in areas of concentrated offshore exploration or exploitation;
- .5 the organization of traffic flow in or around areas where navigation by all ships or by certain classes of ship is dangerous or undesirable;
- .6 the reduction of risk of grounding by providing special guidance to vessels in areas where water depths are uncertain or critical;
- .7 the guidance of traffic clear of fishing grounds or the organization of traffic through fishing grounds;
- .8 the guidance of traffic away from ecologically sensitive areas;

- .9 the identification of established traffic streams to unrouted traffic;
- .10 the identification of established traffic streams to enhance the usefulness of bridge-to-bridge radio communications;
- .11 the identification of common channel limits to clarify the practical application of the narrow channel steering and sailing of the Collision Regulations;
- .12 the identification of areas where the operation of ships must be controlled and/or prohibited to protect ships from danger and the marine environment from ship-source pollution.

2 Definitions

2.1 The following terms are used in connection with matters related to ships' routing:

.1 Adopted by the Organization

"Adopted by the Organization" means adopted as a resolution of the Assembly of the International Maritime Organization, or by its Maritime Safety Committee.

.2 Director General

"Director General" means the Director General of the Coast Guard Ship Safety Branch of the Department of Transport.

.3 Routing system

"Routing system" means any system of one or more routes or routing measures which systems may include traffic separation schemes, two-way routes, recommended tracks, areas to be avoided, controlled and/or prohibited areas, inshore traffic zones, roundabouts, precautionary areas and deep water routes.

.4 Traffic separation scheme

"Traffic separation scheme" means a routing measure that provides for the separation of opposing streams of traffic by appropriate means and by the establishment of traffic lanes.

.5 Separation zone or line

"Separation zone or line" means a zone or line separating routes in which ships are proceeding in opposite or nearly opposite directions, or separating a route from the adjacent inshore traffic zone.

.6 Traffic lane

"Traffic lane" means a route within which there is one direction of traffic flow.

.7 Roundabout

A routing measure comprising a separation point or circular separation zone and a circular traffic lane within defined limits. Traffic within the roundabout is separated by moving in a counterclockwise direction around the separation point or zone.

.8 Inshore traffic zone

"Inshore traffic zone" means a routing measure that is a designated area between the landward boundary of a traffic separation scheme and the adjacent coast that is intended for local traffic.

.9 Two-way route

A route within defined limits inside which two-way traffic is established, aimed at providing safe passage of ships through waters where navigation is difficult or dangerous.

.10 Recommended route

A route of undefined width, for the convenience of ships in transit, which is often marked by centreline buoys.

.11 Recommended track

A route which has been specially examined to ensure so far as possible that it is free of dangers and along which ships are advised to navigate.

.12 Deep water route

A route within defined limits which has been accurately surveyed for clearance of sea bottom and submerged obstacles as indicated on the chart.

.13 Route

"Route" means an area within which there are at any point, one or two directions of traffic flow and that is delineated on two sides by separation lines, separation zones, natural obstacles or dashed tinted lines except that the continuity of such lines or zones may be interrupted where the route merges with, diverges from or crosses another route.

.14 Precautionary area

A routing measure comprising an area within defined limits where ships must navigate with particular caution and within which the direction of traffic flow may be recommended.

.15 Area to be avoided

A routing measure comprising an area within defined limits in which either navigation is particularly hazardous or it is exceptionally important to avoid casualties and which should be avoided by all ships, or certain classes of ship.

.16 Established direction of traffic flow

A traffic flow pattern indicating the directional movement of traffic as established within a traffic separation scheme.

.17 Direction of traffic flow

"Direction of traffic flow" means the direction for traffic in a route that is indicated by arrows on a reference chart.

.18 Recommended direction of traffic flow

A traffic flow pattern indicating a recommended directional movement of traffic where it is impractical or unnecessary to adopt an established direction of traffic flow.

.19 Controlled and/or prohibited areas

A controlled and/or prohibited area is an area within defined limits where the operation of ships is controlled and/or prohibited to protect ships from danger and/or the marine environment from ship-source pollution. Such areas include areas to be avoided, exclusion zones, security zones, particularly sensitive areas and special areas.

.20 Exclusion zone

An exclusion zone is an area within defined limits which is prohibited for certain ships to keep them far enough offshore to give sufficient time to rescue a disabled ship from going ashore and to protect the coastline from any pollution caused by a casualty.

.21 Security zone

A security zone is a defined area which for safety and environmental purposes access is limited to persons, ships or objects authorized by the Coast Guard. Such a zone may be stationary and described by fixed limits, or it may be described as an area around a ship or object in transit.

.22 Special area

A special area means a defined area where for recognized technical reasons in relation to its oceanographical and ecological conditions, and to the particular nature of the traffic in the area, the adoption of special mandatory methods for the prevention of sea pollution is required.

.23 Particularly sensitive areas

A particularly sensitive area is a defined area which needs special protection because of its significance for recognized ecological, socio-economic or scientific reasons and which may be vulnerable to damage by maritime activities.

3 Procedures and Responsibilities

Procedures and functions of IMO

3.1 IMO is recognized as the only international body responsible for establishing and recommending measures on an international level concerning ships' routing.

3.2 In deciding whether or not to adopt or amend a traffic separation scheme, IMO will consider whether:

- .1 the aids to navigation proposed will enable mariners to determine their position with sufficient accuracy to navigate in the scheme in accordance with Rule 10 of the 1972 Collision Regulations, as amended, and by Canadian modifications to the Rule;
- .2 the state of hydrographic surveys in the area is adequate*;
- .3 the scheme takes account of the accepted planning considerations and complies with the design criteria for traffic separation schemes and with established methods of routing.

3.3 In deciding whether or not to adopt or amend a routing system other than a traffic separation scheme, IMO will consider whether the aids to navigation and the state of hydrographic surveys are adequate for the purpose of the system.*

3.4 IMO shall not adopt or amend any routing system without the agreement of the interested coastal States, where that system may affect:

- .1 their rights and practices in respect of the exploitation of living and mineral resources;
- .2 the environment, traffic pattern or established routing systems in the waters concerned;
- .3 demands for improvements or adjustments in the navigational aids or hydrographic surveys in the waters concerned.

*The minimum standards to which hydrographic surveys are to be conducted, to verify that safe depths exist in the traffic lanes of a proposed or amended traffic separation scheme and recommended routes, are those defined in Special Publication No.44 of the International Hydrographic Organization - IHO standards for hydrographic surveys classification criteria for deep sea soundings - procedures for elimination of doubtful data.

Responsibilities of Governments and recommended practices

3.5 A new or amended routing system adopted by IMO shall not come into force as an IMO adopted system before an effective date promulgated by the Government that proposed the system, which shall be communicated to IMO by the responsible Government. That date shall not be earlier than six months after the date of adoption of a routing system by IMO, but when new chart editions necessitate a substantially longer period between adoption and implementation, IMO shall set a later date as required by the circumstances of the case. If the Government that proposed the system is unable at the time of adoption by IMO to declare a definite date of implementation, this information should be communicated to IMO as soon as possible thereafter and the implementation date then declared should not be earlier than four months after the date on which the declaration is made; in the case of a traffic separation scheme the exact time of implementation should also be stated. If there is a protracted delay in making such a declaration, the Government concerned should periodically inform IMO of the situation and forecast when implementation is likely to be possible. Either Notices to Mariners to amend charts, or revised charts to depict the system shall be made available in ample time before the system comes into force.

3.6 The responsible Government implementing a new or amended routing system should ensure that full and final details of planned changes to aids to navigation, anchorage areas or pilot boarding areas which are closely associated with the system and important to its effective utilization by the mariner are provided to the appropriate hydrographic authority at least six months prior to the date of implementation.

3.7 The selection and development of routing systems is primarily the responsibility of the Governments concerned.

3.8 A Government proposing a new routing system or an amendment to an adopted routing system, any part of which lies beyond its territorial sea, should consult IMO so that such system may be adopted or amended by IMO for international use. Such Government should furnish all relevant information, in particular with regard to the number, edition and where possible the geodetic datum of the reference chart used for the delineation of the routing system.** If appropriate, it should also provide the following additional information:

**When submitting a proposed new or amended routing system, it is essential to provide, in addition to the description of the routing system and associated chartlet, the reference chart or charts listed in the description of the routing system with the proposed system delineated thereon. Experts considering the proposal will use the reference chart to confirm that the provisions of section 3.2 have been met.

- .1 the reasons for excluding certain ships or classes of ship from using a routing system or any part thereof; and
- .2 any alternative routing measures, if necessary, for ships or certain classes of ship which may be excluded from using a routing system or parts thereof.

Such a system, when adopted, shall not be amended or suspended before consultation with and agreement by IMO, unless local conditions and the urgency of the case require that earlier action be taken. In considering the proposal, IMO shall take account of the objectives, procedures, responsibilities, methods and criteria for routing systems as set out in these general provisions.

3.9 In an emergency such as might result from the unexpected blocking or obstruction of a traffic lane by a wreck or other hazard, immediate temporary changes in the use of the affected traffic separation scheme may be made by the responsible and sponsoring Government or Governments, with the object of directing traffic flow clear of the new hazard. In such cases, every possible measure shall be taken by the Government or Governments concerned immediately to inform shipping of the hazard and of the temporary changes which have been made.

3.10 Governments are recommended to ensure, as far as practicable, that oil rigs, platforms and other similar structures are not established within routing systems adopted by IMO or near their terminations. When the temporary positioning of an exploration rig or a similar structure in an adopted traffic separation scheme cannot be avoided, the scheme should, if necessary, be amended temporarily in accordance with the guidelines given in Section 7.

3.11 If the above exploration activities lead to the finding of important exploitation prospects, the effect of subsequent exploitation on the safety of marine traffic should be considered carefully. If the establishment of permanent installations within a traffic separation scheme is unavoidable, permanent amendments to the scheme, if deemed necessary, should be submitted to IMO for adoption.

3.12 Governments establishing traffic separation schemes, no parts of which lie beyond their territorial seas, are requested to design them in accordance with IMO criteria for such schemes and submit them to IMO for adoption.

3.13 Where, for whatever reason, a Government decides not to submit a traffic separation scheme to IMO, it should, in promulgating the scheme to mariners, ensure that there are clear indications on charts and in nautical publications as to what rules apply to the scheme.

3.14 Governments establishing routing systems, other than traffic separation schemes, no parts of which lie beyond their territorial seas, are recommended to follow the same procedure as that set out in paragraphs 3.12 and 3.13 above.

3.15 By rules 10(k) and 10(1) respectively of the 1972 Collision Regulations a vessel restricted in her ability to manoeuvre when engaged in an operation for either the maintenance of safety of navigation or the laying, servicing or picking up of a submarine cable in a traffic separation scheme is exempted from complying with rule 10 to the extent necessary to carry out the operation. The Government or authority responsible for safety of navigation in a traffic separation scheme should ensure that:

- .1 the intention of undertaking such an operation is first notified to each Government or appropriate authority concerned;
- .2 information about such ships working in a traffic separation scheme is, as far as practicable, promulgated in advance by Notice to Mariners, and subsequently by radio-navigation warnings broadcast before and at regular intervals during the operations;
- .3 such operations are, as far as possible, avoided in conditions of restricted visibility.

Rule 10 (p) of the Canadian Collision Regulations supplements the measures described in this paragraph.

3.16 Nothing in the General Provisions on ships' routing shall prejudice the provisions of the United Nations Convention on the Law of the Sea (1982) nor the present or future claims and legal views of any State concerning the law of the sea and the nature and extent of coastal and flag State jurisdiction.

4 Methods

In meeting the objectives set out in Section 1 the following are among the methods which may be used:

- .1 The separation of opposing streams of traffic by separation zones, or lines where zones are not possible

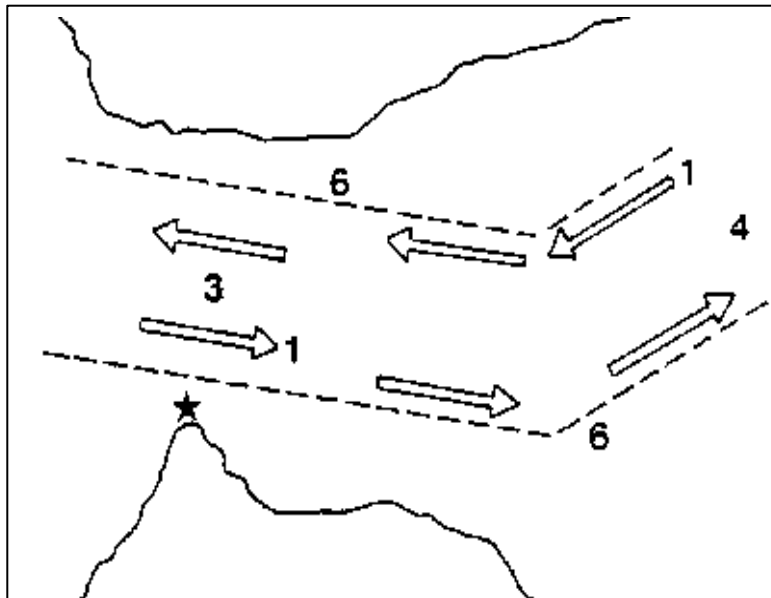


Fig. 1 - Traffic separation by separation zone and line

In this method streams of traffic proceeding in opposite or nearly opposite directions are separated by separation zones (4) or lines (3); the use of zones is to be preferred, but in narrow passages and restricted waters it may be necessary to use a separation line rather than a zone so as to allow more navigable space in the traffic lanes. A length of separation line may also be substituted for a zone in positions where this may encourage and facilitate correct procedures by crossing traffic. The outside limits (6) of such traffic separation schemes are the outer boundaries of the traffic lanes. The arrows (1) indicate the established direction of traffic flow.

- .2 The separation of opposing streams of traffic by natural obstructions and geographically defined objects

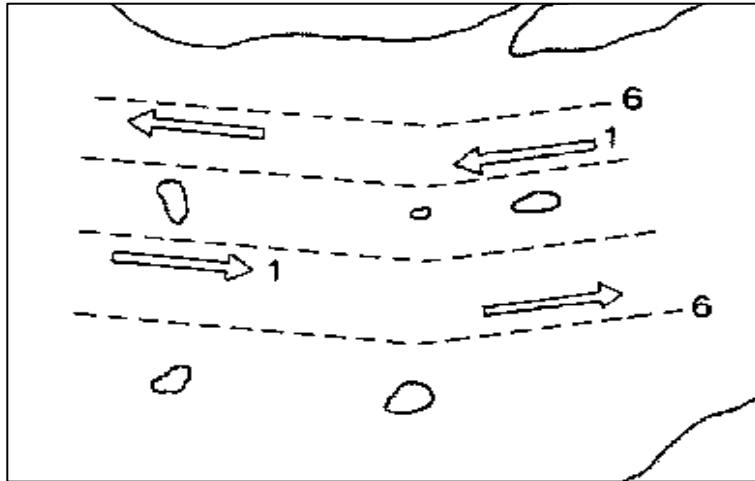


Fig. 2 - Separation of traffic by natural obstructions

This method is used where there is a defined area with obstructions such as islands, shoals or rocks restricting free movement and providing a natural division for opposing traffic streams.

- .3 The separation of through and local traffic by providing inshore traffic zones

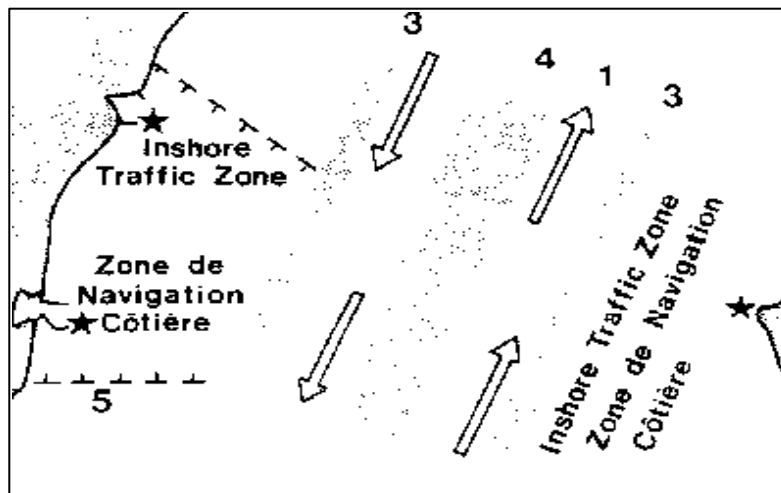


Fig. 3 - Inshore traffic zones

Beyond the outside limits of traffic separation schemes, ships may navigate in any direction. Where such areas lie between the traffic separation scheme and the coast they may be designated as inshore traffic zones (see also figures 4 and 10), with the purpose of keeping local traffic clear of the traffic separation scheme which should be used by through traffic.

Traffic in inshore traffic zones is separated from traffic in the adjacent traffic lane by separation zones (4) or by separation lines (3) (see also Figures 4 and 10).

- .4 The sectorial division of adjacent traffic separation schemes at approaches to focal points

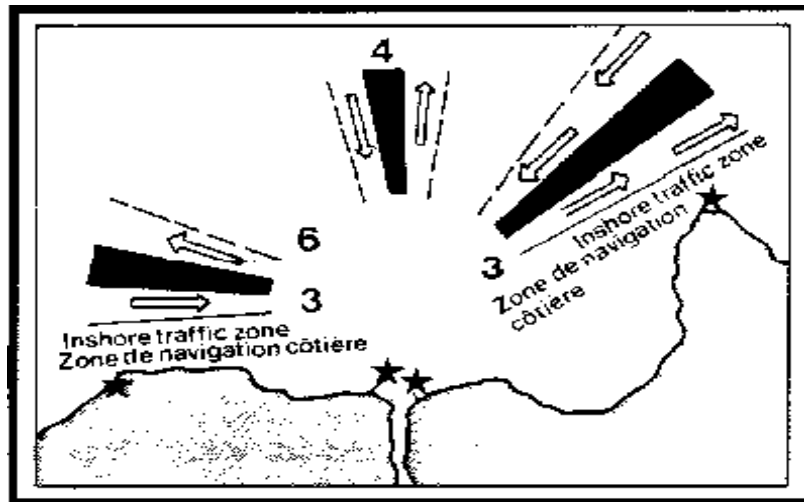


Fig. 4 - Sectorial division of adjacent traffic separation schemes at approaches to focal points

This method is used where ships converge at a focal point or a small area from various directions. Port approaches, sea pilot stations, positions where landfall buoys or light vessels are located, entrances to channels, canals, estuaries, etc. may be considered as such focal points.

- .5 The routing of traffic at focal points and route junctions where traffic separation schemes meet

The routing measure to be utilized at focal points, route junctions and intersections should be selected from the most appropriate of the following methods:

.5.1 Roundabouts

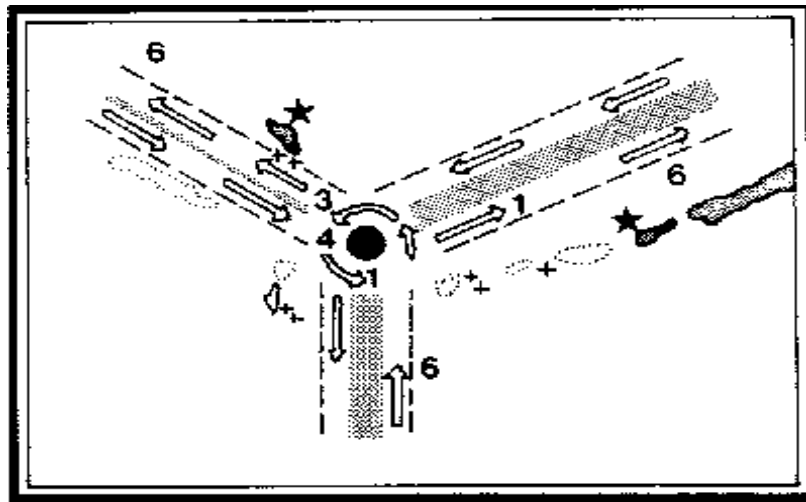


Fig. 5 - Separation of traffic at a roundabout

If the need can be demonstrated, a roundabout may be used to guide traffic counterclockwise round a circular separation zone (4) or specified point, as illustrated above.

Roundabouts are not considered appropriate for use in Canadian sponsored systems. Where it is impossible to use other methods of routing in a congested or converging zone use may be made of a "precautionary area".

.5.2 Junctions

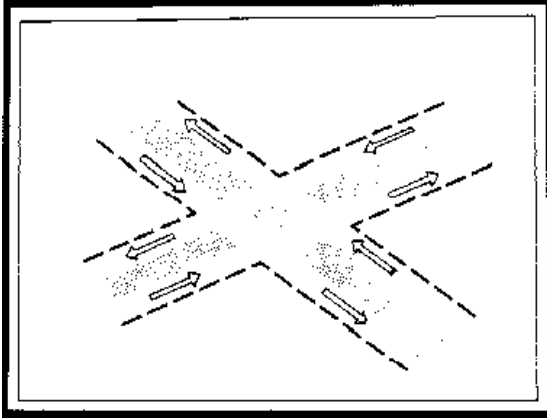


Fig. 6 - Separation of traffic at a crossing

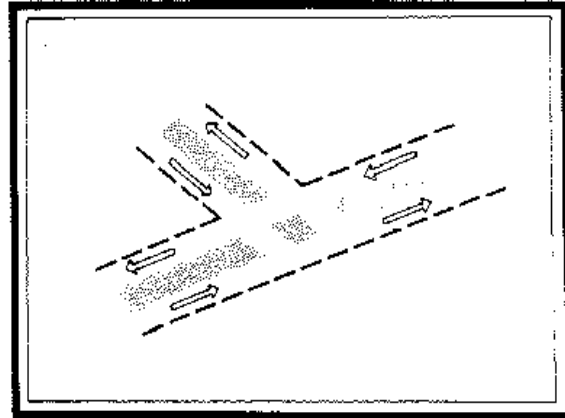


Fig. 7 - Separation of traffic at a junction

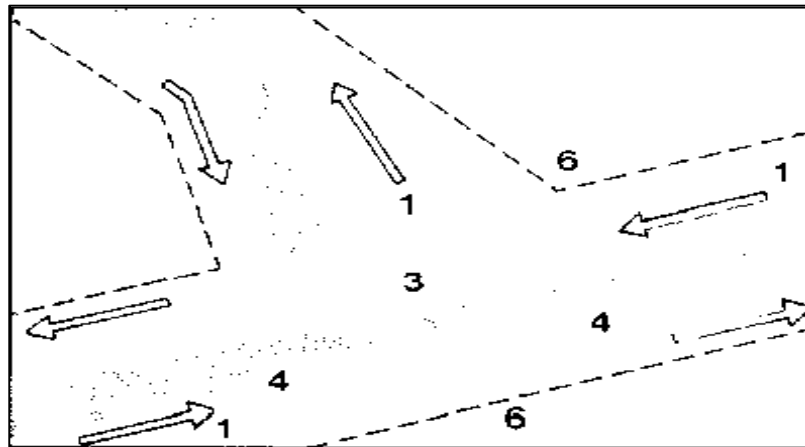


Fig. 8 - A junction, showing a separation line substituted for a zone, where there will be crossing traffic

These methods are used where two routes join or cross. The directions of traffic flow are established in the lanes of the adjoining schemes; the separation zone may be interrupted, as shown in Figures 6 and 7, or replaced by a separation line, as shown in Figure 8, in order to emphasize the correct method of crossing by traffic changing from one scheme to the other.

5.3 Precautionary Areas

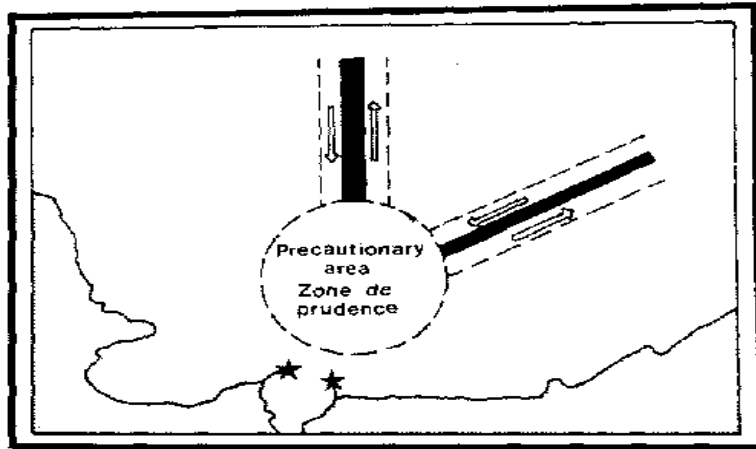


Fig. 9 - Precautionary area at a focal point

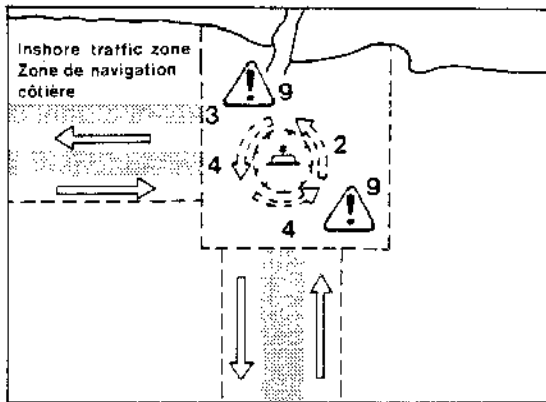


Fig. 10 - Precautionary area with recommended direction of traffic flow around an area traffic flow

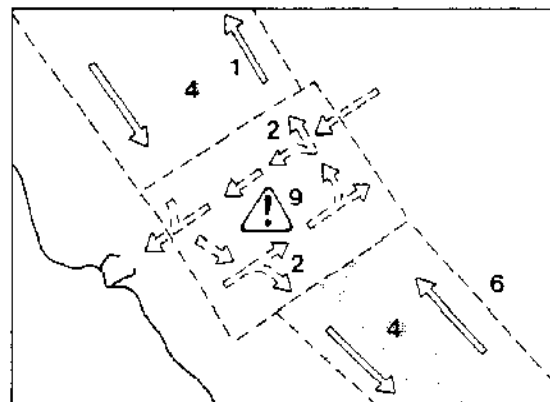


Fig. 11 - Precautionary area at a junction, with recommended directions of to be avoided

It may be best, when routes converge, to terminate them clear of their potential joining points and in such a case a precautionary area (9) can be instituted so as to emphasize the need for care in navigation. Figures 9 and 10 illustrate the use of such an area at focal points; a direction of traffic flow may be recommended (2) around the focal point as shown in Figure 10.

Figure 11 gives an example of how a precautionary area (9) can be used at a junction with crossing traffic. The traffic lanes are terminated short of the point where traffic is expected to cross and replaced by a precautionary area within which the recommended directions of traffic flow (2) are indicated.

Precautionary areas may also be used at the termination of any single route.

.6 Other routing methods

Other routing methods, which may be used are as shown in figures 12 to 19:

.6.1 deep water routes (Figures 12 and 13)

.6.2 areas to be avoided (Figures 10 and 18)

.6.3 recommended directions of traffic flow (Figure 14), two-way routes (Figure 15) and recommended routes and tracks through areas where navigation is difficult or dangerous (figures 16 and 17).

.6.4 tracks such as the Great Lakes separate courses.

The Director General should be consulted if it is intended to use tracks. It should be borne in mind, however, that tracks cannot be established on a firm legal basis because of practical difficulties in enforcement.

.6.5 controlled and/or prohibited areas (Figures 18 and 19).

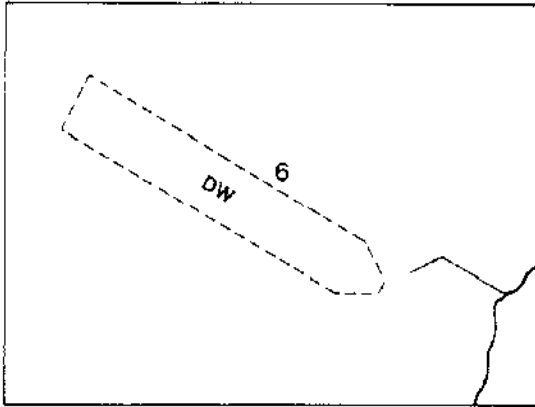


Fig. 12 - Deep water route (two-way)

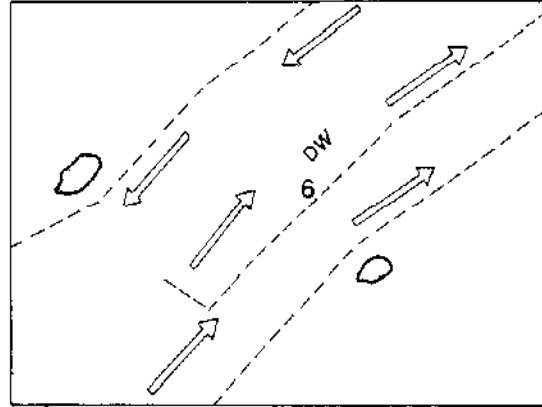


Fig. 13 - One-way deep water route (within a traffic lane)

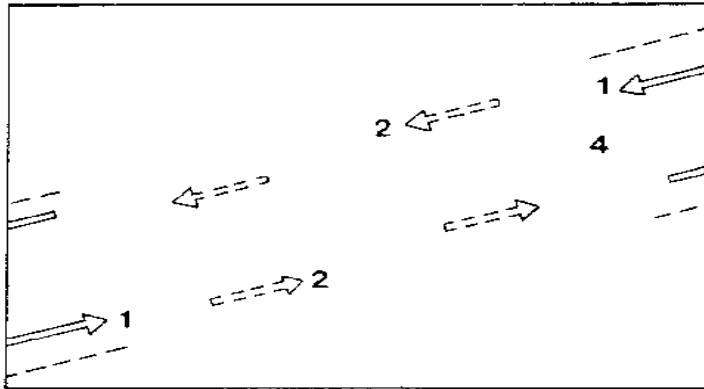


Fig-14 - Recommended directions of traffic flow between two traffic separation schemes

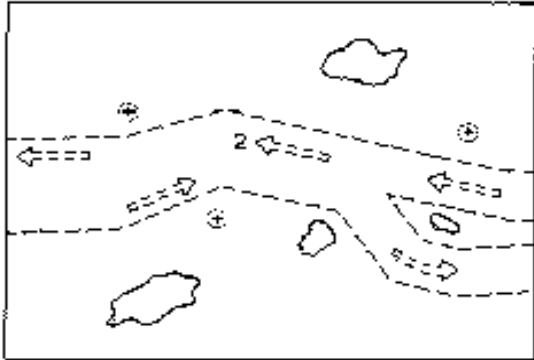


Fig. 15 - Two-way route (with one-way sections)

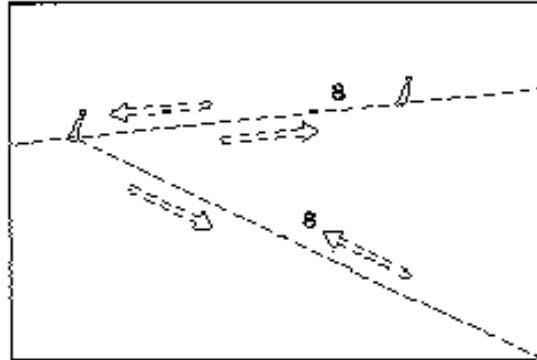


Fig. 16 - Recommended routes

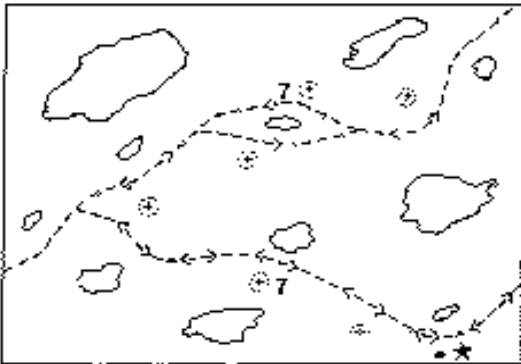


Fig. 17 - Recommended tracks

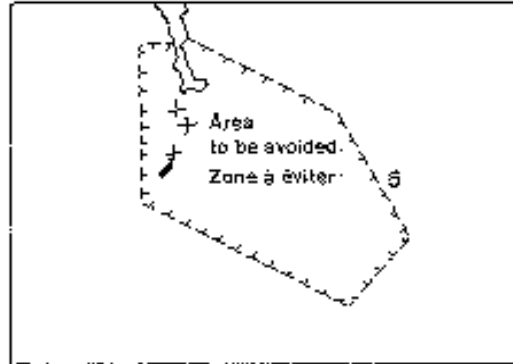


Fig. 18 - Area to be avoided

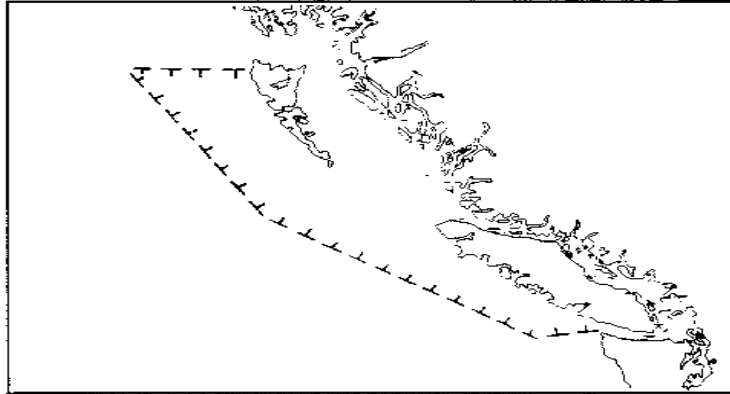


Fig. 19 - Controlled and/or prohibited areas
(areas to be avoided, exclusion zones, security zones,
particularly sensitive areas and special areas)

These areas all use the same symbol as an area to be avoided. This symbol
is the recognized symbol for the limits for restricted areas (see item 5 of
paragraph 9.3).

5 Planning

5.1 Routing systems should only be established when safety of navigation in the area can thereby be clearly improved.

5.2 The routing system selected for a particular area should aim at providing safe passage for ships through the area without unduly restricting legitimate rights and practices, and taking account of anticipated or existing navigational hazards.

5.2.1 Routing systems should be planned so that the routes concerned may be made compulsory and enforceable.

5.2.2 The routing systems in an area should form part of a general overall plan developed for the entire geographical area. This general plan will permit the development of additional routing without requiring major amendments to existing systems.

5.2.3 A copy of a proposed routing system will be forwarded to the CHS as soon as possible for a thorough check of water depths in and adjacent to the proposed system. Early notification will also permit CHS to plan the necessary charting action.

5.2.4 Charts used to plan and design a routing system must be the latest CHS editions corrected up-to-date.

5.3 When planning, establishing, reviewing or adjusting a routing system, the following factors shall be among those taken into account by a Government:

- .1 their rights and practices in respect of the exploitation of living and mineral resources;
- .2 previously established routing systems in adjacent waters, whether or not under the proposing Government's jurisdiction;
- .3 the existing traffic pattern in the area concerned, including coastal traffic, crossing traffic, naval exercise areas and anchorage areas;
- .4 foreseeable changes in the traffic pattern resulting from port or offshore terminal developments;
- .5 the presence of fishing grounds;

- .6 existing activities and foreseeable developments of offshore exploration or exploitation of the sea-bed and subsoil;
- .7 the adequacy of existing aids to navigation, hydrographic surveys and nautical charts of the area;
- .8 environmental factors including prevailing weather conditions, tidal streams and currents and the possibility of ice concentrations;
- .9 the existence of environmental conservation areas and foreseeable developments in the establishment of such areas; and
- .10 the need to control and/or prohibit the operation of ships in an area to protect ships from danger and the environment from ship-source pollution.

5.4 Routing systems should be reviewed, re-surveyed and adjusted as necessary, so as to maintain their effectiveness and compatibility with trade patterns, offshore exploration and resource exploitation, changes in depths of water, and other developments.

5.5 Routing systems should not be established in areas where the instability of the sea bed is such that frequent changes in the alignment and positions of the main channels, and thus of the routing system itself, are likely.

5.6 When establishing areas to be avoided by all ships or by certain classes of ship, and other controlled and/or prohibited areas, the necessity for creating such areas should be well demonstrated and the reasons stated. In general, these areas should be established only in places where inadequate survey or insufficient provision of aids to navigation may lead to danger of stranding, or where local knowledge is considered essential for safe passage, or where there is the possibility that unacceptable damage to the environment could result from a casualty, or where there might be hazard to a vital aid to navigation. These areas shall not be regarded as controlled and/or prohibited areas unless specifically so stated; the classes of ship which should avoid the areas should be considered in each particular case.

5.7 Governments, considering establishing a new routing system or amending an existing one, should consult at an early stage with:

- .1 mariners using the area;
- .2 authorities responsible for aids to navigation and for hydrographic surveys and nautical publications;

.3 port authorities; and

.4 organizations concerned with fishing, offshore exploration or exploitation and environmental protection, as appropriate.

This consultation process is implied in sections 3.4, 3.8, 5.3, 5.5 and 6.2

6 Design Criteria

6.1 The following standards should, so far as the circumstances allow, be applied in the design of ships' routing measures.

General

6.2 Routes should follow as closely as possible the existing patterns of traffic flow in the areas as determined by traffic surveys.

6.3 The configuration and length of routing systems which are established to provide for an unobstructed passage through offshore exploration and exploitation areas may differ from the dimensions of normally established systems if the purpose of safeguarding a clear passage warrants such a special feature.

6.4 Course alterations along a route should be as few as possible and should be avoided in the approaches to convergence areas and route junctions or where crossing traffic may be expected to be heavy.

6.5 The number of convergence areas and route junctions should be kept to a minimum, and should be as widely separated from each other as possible. Adjacent traffic separation schemes should be placed such that nearly opposing streams of traffic in the adjacent schemes are separated as widely as possible. Route junctions should not be located where concentrated crossing traffic, not following established routes, may be expected, e.g. ferry traffic.

6.6 Routes should be designed to allow optimum use of aids to navigation in the area, and of such shipborne navigational aids as are required or recommended to be fitted by international conventions or by IMO resolutions and recommendations. Consideration may also be given to navigational aids that are commonly fitted in vessels navigating the area but in such cases the route must be established for such class of vessels and appropriate provision made for vessels not so fitted.

6.7 The state of hydrographic surveys within the limits of a routing system and in the approaches thereto should be such that full information on existing depths of water and hazards to surface navigation is available to nautical charting authorities.

6.7.1 The safe outer limits of the navigable area must be established by delineating temporarily a danger line based on the required minimum depth supplemented by a bottom contour based on the maximum safe depth attainable along the route. The route shall be designed within the safe limit making best use of the greater depths so as to avoid future realignment of the route in the event that a deep water terminal is developed within the system.

6.7.2 Geographical coordinates are not normally used in describing Canadian routing systems. Where coordinates are required for any purpose they will be supplied by CHS after the routes have been plotted and aligned on the appropriate reference charts.

6.7.3 Where possible crossing, bifurcation, junction and turning points of routes should be within radar range of readily detectable and identifiable landmarks.

Traffic separation schemes

6.8 The extent of a traffic separation scheme should be limited to what is essential in the interests of safe navigation.

6.9 Traffic lanes should be designed to make optimum use of available depths of water and the safe navigable areas taking into account the maximum depth of water attainable along the length of the route. The width of lanes should take account of the traffic density, the general usage of the area and the sea-room available.

6.10 Where there is sufficient space, separation zones should be used in preference to separation lines to separate opposing streams of traffic and to segregate inshore traffic zones from adjacent traffic lanes. Separation zones or lines may also be used to separate a traffic lane from adjacent sea areas other than inshore traffic zones, in appropriate circumstances, taking into account traffic density and the available means of fixing ships' positions.

6.11 It should be possible for ships to fix their position anywhere within the limits of and in the immediate approaches to a traffic separation scheme by one or more of the following means, both by day and by night:

- .1 visual bearings of readily identifiable objects;
- .2 radar bearings and ranges of readily identifiable objects; and
- .3 D/F bearings.

6.12 When it is considered essential to provide within a traffic separation scheme an additional lane for ships carrying hazardous liquid substances in bulk, as specified in the International Convention for the Prevention of Pollution from Ships, 1973, in circumstances where it is not possible for ships to fix their position as set out in paragraph 6.11 over the whole area of that lane and an electronic position-fixing system covers that area, the existence of that system may be taken into account when designing the scheme.

6.13 The minimum widths of traffic lanes and of traffic separation zones should be related to the accuracy of the available position-fixing methods, accepting the appropriate performance standards for shipborne equipment as set out in IMO resolutions and recommendations. See Annex.

6.14 Where space allows the use of traffic separation zones, the width of the zone should, if possible, be not less than three times the transverse component of the standard error (measured across the separation zone) of the most appropriate of the fixing methods listed in paragraph 6.11, as supplemented by 6.7. Where necessary or desirable, and where practicable, additional separation should be provided to ensure that there will be adequate early indication that traffic proceeding in the opposite direction will pass on the correct side.

6.15 If there is doubt as to the ability of ships to fix their positions positively and without ambiguity in relation to separation lines or zones, serious consideration should be given to providing adequate marking by buoys.

6.15.1 Traffic separation zones or lines should be no longer than is absolutely necessary. When establishing the length of a separation line or zone, the overriding criteria should be to provide traffic using the route with "protection" in the vicinity of course alterations, route crossings, divergence and convergence areas. Where possible at least two miles of positive protection should be provided.

Converging and junction areas

6.16 Whichever of the several available routing methods is chosen for use at a route junction or in a converging area, it must be a cardinal principle that any ambiguity or possible source of confusion in the application of the 1972 Collision Regulations, as amended by Canadian modifications, must be avoided. This principle should be particularly borne in mind when establishing or recommending the direction of traffic flow in such areas. If recommended directions of traffic flow are adopted, these should take full account of the existing pattern of traffic flow in the area concerned, and also of all other applicable provisions of ships' routing.

6.17 At route junctions the following particular considerations apply:

- .1 the need to encourage the crossing of traffic lanes as nearly as possible at right angles;
- .2 the need to give ships which may be required to give way under the 1972 Collision Regulations, as amended by Canadian modifications, as much room to manoeuvre as possible;
- .3 the need to enable a stand-on vessel to maintain a steady course, as required by the 1972 Collision Regulations, as amended by Canadian modifications, for as long as possible before the route junction;
- .4 the need to encourage traffic not following an established route to avoid crossing at or near route junctions; and
- .5 the need to ensure as far as possible that the mariner is faced with only one type of collision hazard at a time, ie, crossing traffic, merging traffic, etc.

Deep water routes

6.18 In designing deep water routes, consideration should be given to marking critical turning points. Any wrecks or sea-bed obstructions which lie within the limits of a deep water route and which have less depth of water over them than the minimum depth of water for the route as indicated on the charts, should be marked.

Controlled and/or prohibited areas

6.19 Controlled and/or prohibited areas should be no greater than is absolutely necessary to protect ships and the environment.

6.20 In designing a controlled and/or prohibited area the following conditions should be taken into account:

- .1 the type of ships and operations being controlled and/or prohibited, and the type of ships and operations not being controlled and/or prohibited;
- .2 the geographical, oceanographical and ecological conditions; and
- .3 the traffic patterns.

7 Temporary Adjustments to Traffic Separation Schemes

7.1 When the temporary positioning of an exploration rig is unavoidable, the design criteria and the provisions for planning should be taken into account before permitting the positioning of the rig or subsequently adjusting a traffic separation scheme.

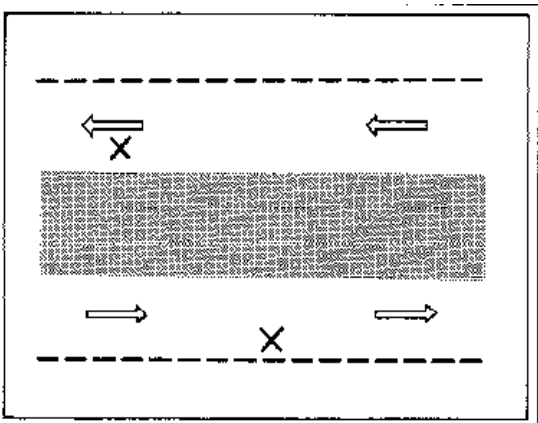
7.1.1 The offshore resource industry has been assured that routes will be adjusted and relocated where necessary and practicable. Advance notice to shipping in this regard should be about 6 to 12 months.

7.2 The said adjustments should be made in accordance with the following:

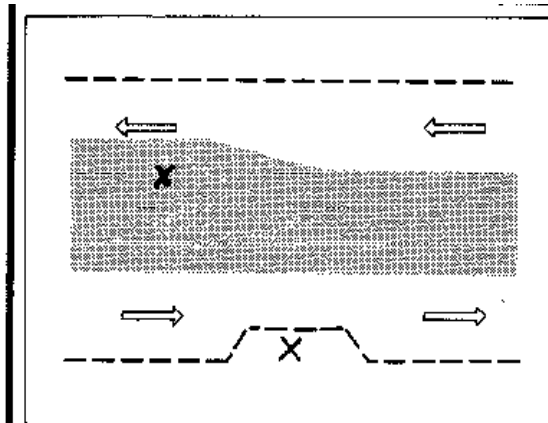
- .1 when the drilling location is situated near the boundary of a traffic lane or separation zone, a relatively slight adjustment of the scheme could have such effect that the drilling rig and its associated safety zone are sufficiently clear of the traffic lane;

Example

original situation



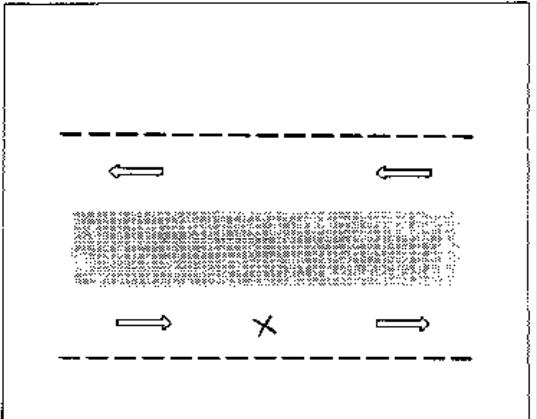
adapted situation



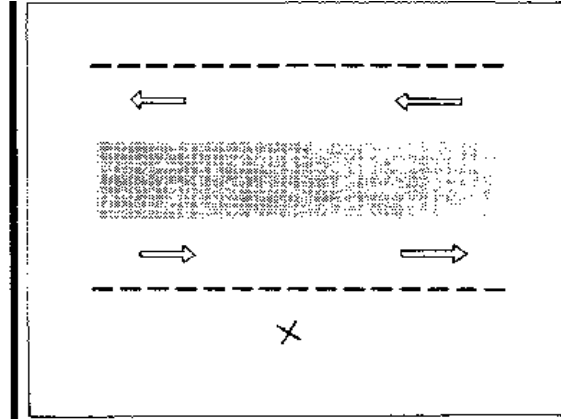
- .2 if a small temporary adjustment of the traffic lane is not possible the whole or part of the scheme could be temporarily shifted away from the drilling area so that traffic connected with the drilling operations will stay clear of the lane;

Example

original situation



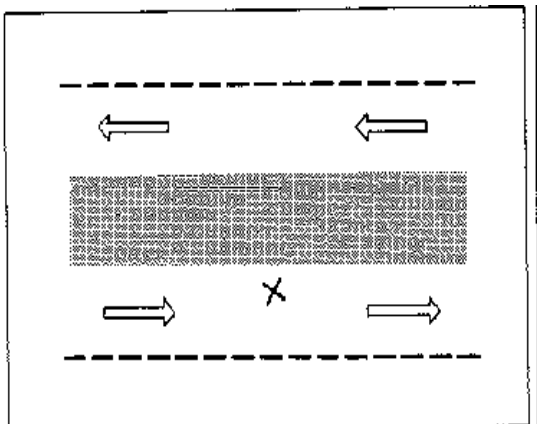
adapted situation



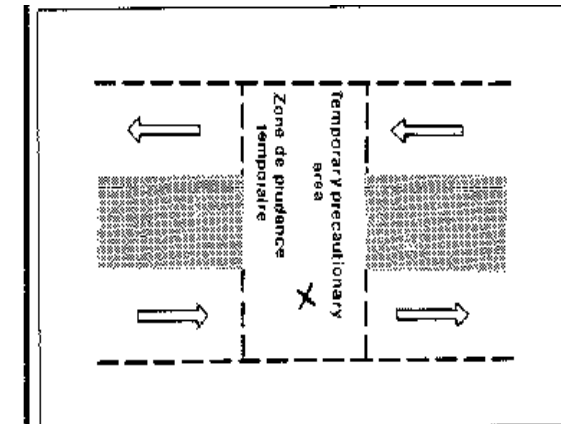
- .3 temporary local interruption of the scheme or part of the scheme in the area of location of the drilling rig. Such an interruption could be made a precautionary area;

Example

original situation



adapted situation



- .4 temporary suspension of the whole scheme.

7.3 In each case, exploration sites should be reviewed and such conditions specified as the responsible Government may deem necessary to ensure safety of navigation in the area.

7.4 Details of these temporary adjustments should be forwarded to IMO and to appropriate hydrographic offices at least four months before the rig is positioned within an adopted traffic separation scheme so as to allow ample time to inform shipping. When the duration of such temporary adjustments is expected to be six months or more, this should be made known to the relevant hydrographic authorities in order to allow appropriate action to be taken in notifying mariners.

7.5 In the event of a temporary adjustment to a traffic separation scheme remaining in force for more than one year, the responsible Government should consider whether permanent amendments to the scheme may ultimately become necessary and, if appropriate, initiate timely procedures for IMO to adopt such amendments.

8 The use of routing systems

Canadian notice to mariners number 10 provides additional information on routing systems in waters under Canadian jurisdiction.

8.1 Routing systems are intended for use by day and by night in all weathers, in ice-free waters or under light ice conditions where no extraordinary manoeuvres or ice breaker assistance are required. Frazil ice or slush which can clog engine room intakes may require certain extraordinary manoeuvres.

8.2 Routing systems are recommended for use by all ships unless stated otherwise. Bearing in mind the need for adequate under-keel clearance, a decision to use a routing system must take into account the charted depth, the possibility of changes in the sea-bed since the time of the last survey, and the effects of meteorological and tidal conditions on water depths.

8.3 A ship navigating in or near a traffic separation scheme adopted by IMO shall in particular comply with Rule 10 of the 1972 Collision Regulations, as amended by Canadian modifications, to minimize the development of risk of collision with another ship. The other rules of the 1972 Collision Regulations, as amended by Canadian modifications, apply in all respects and particularly the rules of Part B, Sections II and III, if risk of collision with another ship is deemed to exist.

8.3.1 Canadian compulsory and recommended routing systems are listed in the Canadian Annual Edition of Notice to Mariners. It is recommended that ships conduct themselves in accordance with the provisions of the 1972 Collision Regulations when navigating in or near routing systems which are recommended for use by all ships.

8.4 At junction points where traffic from various directions meets, a true separation of traffic is not really possible, as ships may need to cross routes or change to another route. Ships should therefore navigate with great caution in such areas and be aware that the mere fact that a ship is proceeding along a through-going route gives that ship no special privilege or right-of-way.

8.5 A deep-water route is primarily intended for use by ships which, because of their draught in relation to the available depth of water in the area concerned are required to use such a route. Through traffic to which the above consideration does not apply should, as far as practicable, avoid using deep-water routes.

8.6 Precautionary areas should be avoided, if practicable, by passing ships not making use of the associated traffic separation schemes or deep-water routes, or entering or leaving adjacent ports.

8.7 In two-way routes, including two-way deep-water routes, ships should as far as practicable keep to the starboard side.

8.8 Arrows printed on charts in connection with routing systems merely indicate the general direction of established or recommended traffic flow; ships need not set their courses strictly along the arrows.

8.9 The signal "YG" meaning "You appear not to be complying with the traffic separation scheme" is provided in the International Code of Signals for appropriate use.

8.9.1 Ships in waters under Canadian jurisdiction and Canadian ships in all other waters should supplement the signal "YG" with bridge-to-bridge radiocommunications by using plain language as described in the "Standard Marine Navigational Vocabulary" or by the phrase "Interco-Yankee Golf".

8.9.2 Canadian VHF bridge-to-bridge regulations require a ship to make a navigation safety call when such call may contribute to the safe navigation of the ship or any other ship. An appropriate use for bridge-to-bridge would be a navigation safety call warning a ship that it does not appear to be complying with a routing system, and warning other ships of this apparent non-compliance.

9 Representation on charts

9.1 The legends, symbols and notes appearing in sections 9.2, 9.3, 9.4 and 9.5, except for the references to controlled and/or prohibited areas, are recommended by the International Hydrographic Organization as guidance for the representation of details of routing systems and associated measures on nautical charts. They are included to illustrate the information likely to be found on charts and as an aid to those designing proposed routing systems for adoption by IMO.

9.1.1 The Canadian Hydrographic Service is the Canadian authority for chart symbols.

9.2 Use of legends on charts and in notes

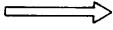
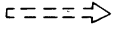
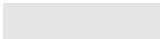

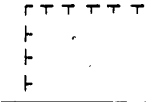
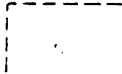
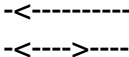
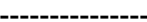

Legend	Use of legend
Traffic separation scheme	Not usually shown on charts. Referred to in notes as "traffic separation scheme" or its national language equivalent.
Inshore traffic zone	"Inshore traffic zone" or its national language equivalent is shown on charts and is referred to in notes.
Precautionary area	"Precautionary area" or its national language equivalent may be shown on charts in lieu of the symbol and is referred to in notes.
Deep-water route	"DW" is shown on charts to indicate the deep water, "DW" or "deep-water route" is referred to in notes.
Area to be avoided (<u>includes all controlled and/or prohibited areas</u>)	"Area to be avoided" or its national language equivalent is shown on charts and is referred to in notes.
Two-way route	"Two-way route" is not usually shown on charts but is referred to in notes.
Recommended route	"Recommended route" is not usually shown on charts but is referred to in notes.

Recommended track

"Recommended track" is not usually shown on charts but is referred to in notes.

9.3 Symbols for basic elements of routing measures

Unless otherwise specified symbols are printed on charts in colour, usually magenta.

Routing Term	Symbol	Description	Applications	Notes and Section References
1 Established direction of traffic flow		Outlined arrow	Traffic separation schemes and deep water routes (when part of a traffic lane)	(1) (2)
2 Recommended direction of traffic flow		Dashed outlined arrow	Precautionary areas, two-way routes, recommended routes and deep water routes	(1)
3 Separation lines		Tint, 3mm wide	Traffic separation schemes and between traffic separation schemes and inshore traffic zones	(3) (4) and section 9.4
4 Separation zones		Tint, may be any shape	Areas to be avoided and defined ends of inshore traffic zones, <u>and controlled and/or prohibited areas</u>	(4) (5) and section 9.4
5 Limits of restricted areas (charting term)		T-shaped dashes	Generally reserved for use by charting authorities Recommended routes	(6) and section 9.4
6 General maritime limits (charting term)		Dashed line	Precautionary areas	
7 Recommended tracks: one-way two-way		Dashed lines with arrowheads (colour black)		(7)
8 Recommended routes		Dashed lines with arrowheads (colour black)		
9 Precautionary areas		Dashed line and dashed outlined arrows Precaution-ary symbol		(8)

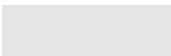



For examples of routing measures using these basic symbols see Figures 1 to 19 in section 4.

NOTES

- 1 Arrows dispersed over width of route. Arrows may be curved. Where the traffic lane is converging, arrows should be oriented to the approximate average directions of the side boundaries.
- 2 Arrow omitted at intersections (other than roundabouts) to avoid implying priority of one lane.
- 3 Separation line 3 mm wide where chart scale permits.
- 4 Tint light enough not to obscure detail beneath it.
- 5 If traffic lanes are separated by natural obstacles, may be replaced by the symbol for general maritime limits at the boundaries of the lanes.
- 6 Stems of dashes pointing towards the area in question.
- 7 Symbol intended for tracks to be followed closely through inadequately surveyed areas.
- 8 Legend "Precautionary area" or its national language equivalent may also be used within the precautionary area instead of the symbol.

9.4 Boundary symbols in detail

Example: Boundary symbol 8 means that the boundary, indicated by the line, between a precautionary area and an inshore traffic zone is to be shown by T-shaped dashes, with the stems of the Ts pointing towards the ITZ.

1	Traffic separation scheme (ends) Open sea	No boundary
2	Traffic separation scheme (sides) Open sea	----- or  or  (zone)
3	Traffic separation scheme Inshore traffic zone	or   (zone)
4	Traffic separation scheme next to Traffic separation scheme	No boundary
5	Inshore traffic zone (ends) Open sea	- - - - - or no boundary where limits are undefined
6	Precautionary area Open sea	-----

7	Precautionary area Traffic separation scheme	-----
8	Precautionary area Inshore traffic zone	- - - - -
9	Deep-water route (sides) Open sea	-----
10	Deep-water route (ends) Open sea	-----
11	Deep-water route (ends) Traffic separation scheme	-----
12	Deep-water route next to Deep-water route	No boundary
13	Deep-water route (ends) Precautionary areas	
14	Deep-water route Separation zone/line	(Separation zone/line acts as boundary)

15 **Two-way route**

All other areas

16 **Area to be avoided**
(includes all controlled and/or
prohibited areas)

- - - - -

All other areas

9.5 **Cautionary and explanatory notes on charts**

9.5.1 **Traffic separation schemes and other routing measures**

The existence of special provisions applying to particular measures should be mentioned on the charts affected, if necessary referring mariners to the full text in "sailing directions".

9.5.2 **Deep-water routes**

Where maintenance of a minimum depth can be guaranteed, the least depth (e.g. 22 m) may be given after the abbreviation "DW". In other cases charted soundings will indicate the least depth, preferably in conjunction with a note giving the date of the latest survey.

9.5.3 **Areas to be avoided (includes all controlled and/or prohibited areas)**

Notes on conditions governing avoidance, control and/or prohibition of areas (classes and sizes of ships, nature of cargoes, etc.) should preferably be given on charts and should always be given in "sailing directions".

ANNEX

POSITION FIXING ACCURACIES

1 Radar

1.1 Twenty-four miles should be considered as the maximum range for radar position fixing in a routing system. This maximum range should be used with caution, reduced in doubtful cases and only increased where local experience has positively determined a greater distance.

1.2 The errors to be taken into consideration when assessing the fixing accuracy of a radar should be

- ranging error 1.5%,

- bearing error $\pm 1^\circ$.

2 Radio D.F.

2.1 Radio D.F. may supplement radar as a fixing device. In areas outside the effective range of radar, D.F. is to be treated as the prime navigational aid and routes should be designed to make the best use of D.F. taking into account its limitations, particularly "coastal error".

2.2 The range and bearing error to be taken into consideration when assessing the fixing accuracy of D.F. should be

- range as published in the Radio Aids to Marine Navigation,

- bearing error $+1^\circ$.

3 Echo sounder

3.1 The design of the route should also take into consideration the practical use of an echo sounder as a supplementary positional check.

3.2 The errors to be taken into consideration when assessing the accuracy of the echo sounder should be

- ± 1 metre on the shallow range scales,
- ± 5 metre on the deep range scales,
- or
- $\pm 5\%$ of the indicated depth, whichever is the greater.

4 **Visual fixing**

4.1 The routes should be designed so that the best use can be made of visual fixing as a supplement to other methods.

4.2 The errors to be taken into consideration when assessing the accuracy of visual bearings

- $\pm 1^\circ$ when using a gyro compass,
- $\pm 1^\circ$ when using a magnetic compass.

This includes allowance for personal error and assumes compasses are frequently checked in accordance with good practice and the compass bearings have been corrected for known errors.