White Paper on Offshore Wind Energy

Partial review of the National Water Plan Holland Coast and area north of the Wadden Islands

White Paper on Offshore Wind Energy

Partial Review of the National Water Plan in light of the designation of the Holland Coast area and the area north of the Wadden Islands for offshore wind energy

Appendix 6
Assessment Framework for Defining Safe Distances between Shipping Lanes and Offshore Wind Farms

Version adopted by the Directors' Meeting of 9 July 2013
(on August 21, 2014, the precautionary areas are added to the various types of route and will get similar safety margins, see 3.5)

Report to the Director Maritime Affairs at the Ministry of Infrastructure and the Environment, by the Working Group Safe Distances
9 July 2013

Introduction

This Assessment Framework serves to enable the following question to be answered: how much space (path and safety margin) must be allowed between a shipping lane and a wind farm, in order for ships to be able to use that lane safely? The Assessment Framework serves as a basis for deciding situation-specific separation distances consistent with nautical safety principles. In other words, *safety distances that take account of both the characteristics of the particular location and the safety requirements of the particularshipping route*.

The path and the safety margins required for safe navigation have been defined on the basis of: international provisions and regulations: International Regulations for Preventing Collisions at Sea (COLREGs), General Provisions on Ships' Routeing (GPSR) and United Nations Convention on the Law of the Sea (UNCLOS),the interpretation of those provisions and regulations by nautical experts and maritime organisations, the review of that interpretation by nautical experts, and the minimum amount of space that a ship requires in order to fulfil its obligations.

As the foregoing implies, the government has chosen not to adopt fixed safety distances, but to provide informed guidance on the formulation of special arrangements based on shipping safety principles. The Assessment Framework serves as the basis for the definition of situation-specific safety distances. The need to define situation-specific distances derives from the Policy Document on the North Sea associated with the National Water Plan, which states that 'wind energy area designation should adhere to the principle that no permanent construction is permissible within two nautical miles (nM) of a shipping lane, anchoring area or nationally defined clearway. That point of departure reflects practical experience and the policy principles derived from the safe shipping risk analysis. At the detailed planning stage and in the light of practical experience, the application of this requirement may be adapted to particular circumstances.'

The Working Party recommends that Policy uses the Assessment Framework to define a policy framework, for application both in the designation of phase-3 wind energy areas and in the performance of safety studies in the context of lot assignment and permit issuance activities.
With this Assessment Framework, the Netherlands also seeks to contribute to the international debate on maritime safety and marine spatial planning by putting forward guidance that is based on a methodology for making a rational and balanced assessment of space required for safe navigation, which reflects the relevant international provisions and regulations (COLREGs, GPSR, UNCLOS), as well as the insight of nautical experts and the findings of relevant studies.

The Assessment Framework has been published in the form of an advisory report by the Working Group on Safety Distances to the Director Maritime Affairs at the Ministry of Infrastructure and the Environment/DGB. The Working Group was made up of representatives from: DGB, Public Works and Water Management Directorate Sea and Delta, Rotterdam Port Authority and Amsterdam Port Authority. The Assessment Framework has been developed in consultation with stakeholders and has been reviewed by independent nautical experts. The shipping sector provided both important practical input and the industry's views on safe navigation and the regulations that shipping should obey.

1. Request for advice

1.1 Commission

The Assessment Framework is an advice to the Director Maritime Affairs at the Ministry of I&M, by reference to which the Director may reach decisions on situation-specific safety distances between shipping and wind farms.

When commissioning the report, the Director requested the Working Group to address the following question:
What is the most objective way to determine a situation-specific safety distance that is consistent with safe navigation for a particular lane or zone? Within the parameters of the management and policy objectives, in preparation for phase 3 in the assignment of space for offshore wind energy, the Director Maritime Affairs at the Ministry of I&M requires an assessment framework for realising situation-specific safety distances between shipping lanes and wind farms, which are consistent with nautical safety.

Appendix 1, 'Account of the preparation of the Assessment Framework', describes how this advisory report was developed.

1.2 Why is an assessment framework needed?

The Assessment Framework serves primarily to answer the Director's question. The Assessment Framework is additionally important for the following reasons:

A basis for controlling safety at sea, even in situations where there are wind farms.
Government policy on the North Sea is directed towards bringing about a permanent improvement in shipping safety in all situations, including those where offshore wind farms are present (see section 2). That implies looking at the risk of ships colliding with each other and at the risk of ships colliding with wind farms. There is consequently a need for an assessment framework, which has nautical safety at its centre and is based on the interpretation of international regulations and routing measures, and the space that a ship requires to fulfil its associated obligations.

Indirect contribution to the attractiveness of North Sea ports, environmental interests and wind farms.
Exercising control over shipping safety and making carefully-considered and well-founded safety assessments is of major indirect benefit to various other interests. First, it enhances the accessibility of the North Sea ports, whose attractiveness, image and competitive position depend on safe approach and departure routes. 'Safe berth clauses' for ships mean that North Sea ports are less attractive if the approach and departure routes are significantly less safe. The competitive position of the North Sea ports does not form any part of the assessments with which this document is concerned, being a separate matter. However, the Working Group advises taking the attractiveness of North Sea ports into explicit account.

Second, having shipping safety under control may be expected to have a positive effect on environmental impact by minimising collisions.

Third, the attractiveness of the North Sea as a location for wind farming is likely to be enhanced. Wind farm proprietors benefit from the existence of a clear policy for the designation of wind energy exploitation areas, clear safety assessment for assignment of lots and the award of permits, and minimisation of the risk of accidents and collisions between ships and wind installations. This Assessment Framework supports those benefits.

Implementation of policy.
The point of departure is that the safety distance between shipping lanes and wind farms should ordinarily be 2 nM, but that special arrangements are possible (see section 2). In order that such arrangements may be formulated and to ensure that they have a substantive basis, the Assessment Framework defines the space that ships require for safe navigation. The advice contained in the Assessment Framework can be translated into policy on the formulation of special arrangements. That policy can then be used by the Ministry of I&M to designate areas for wind farms in phase 3.

Assessment methodology.
In a given specific location, the National government is responsible for performing an assessment to establish whether there is any need or scope for making special arrangements. The assessment has to be carried out at the stage that lots are assigned and/or a permit granted, and has to be based on a safety study. In that context, the Assessment Framework serves as a basis for the safety study, so that the government's assessment is safety-oriented and performed in a way that all stakeholders, including the ports and the shipping sector, can support.

Joint input to the international debate.
When proposals for the amendment of existing routeing measures on the North Sea were submitted to the International Maritime Organization (IMO) by the Ministry of I&M in 2012, as required in connection with the issue of permits for phase-2 wind farms, the following was agreed: 'To enable traffic in the proposed shipping lanes to take avoiding action when encountering crossing traffic, the proposals keep a margin of two miles between (future) wind farm sites and the traffic lanes' (document 25). It is important that at international level discussion takes place regarding the form that special arrangements should take. It is desirable that, in the context of such discussions, governments and stakeholders (including the ports and the shipping sector) adopt a joint approach. A joint approach is possible because DGB, the Public Works and Water Management Directorate and the ports and the shipping sector have jointly formulated the Assessment Framework.

2. Policy principles, legislation and regulations

2.1 Policy principles

The following documents are relevant in relation to the policy principles, targets and frameworks concerning the North Sea, shipping and safety:
- The National Water Plan (NWP)
- The Policy Document on the North Sea 2009-2015 (BN), which is appended to the NWP and transcribes North Sea policy

The Assessment Framework for defining safety distances between shipping lanes and wind farms is relevant because there is potential conflict between various policy goals. For example:
- **Multiple use.** Where there is interaction between different forms of use, the aim is to realise the multiple use of space and harmonisation with established and potential future stakeholders in the relevant areas of the sea (Integrated North Sea Management Plan 2015, IBN, subsection 3.3).
  Three pillars: 'healthy, safe and economically profitable sea' ensure the integrated nature of North Sea management (Integrated North Sea Management Plan 2015, IBN).

- **Shipping policy.** The primary objectives of shipping policy are:
  - To realise the safe and efficient management of shipping traffic along the Dutch coast and to Dutch ports
  - To carefully balance the interests of shipping with the interests associated with other uses of the North Sea (IBN).

- **Continuous improvement of safety at sea.** The aim is to realise a year-on-year reduction in the total number of serious and very serious shipping accidents in the North Sea by means of a continuous safety improvement process. Where wind farms ('multiple objects') are concerned, that implies the prevention of collisions and near-collisions between ships and wind farms. The possible creation of additional wind farms in the North Sea could be at odds with this policy of seeking continuous improvements in safety on the North Sea (document 24).

- **Safe and efficient shipping; safety distance between shipping lanes and wind farms.** The Policy Document on the North Sea (§ 6.2) states that, in the designation of wind energy areas, provision is to be made for a safety distance of two nautical miles from the internationally (IMO-) defined traffic separation schemes (shipping lanes), anchoring areas and nationally (Mining Regulations-) defined clearways. This point of departure reflects practical experience and the policy principle of using safe shipping risk analyses (Shipping Policy Document). At the detailed planning stage and in the light of practical experience, *the application of this requirement may be adapted to particular circumstances*.

Explanatory information regarding safety distances between shipping lanes and wind farms, provided in the Policy Document on the North Sea:
The general principle that, for safety, the distance between large wind energy areas and shipping lanes should be two nautical miles is dictated in practice primarily by the behaviour of ships when performing avoidance manoeuvres. There should always be sufficient space for normal avoidance manoeuvres. An average containership sails at a speed of 20 knots (nautical miles per hour). The regulations require that a course change for the purpose of avoidance should be clearly discernible and performed in ample time. An avoidance manoeuvre may result in a course change of two and a half nautical miles. A half nautical mile is the normal minimum passing distance between two ships under surveyable and clear traffic conditions. At sea, traffic in one lane does not always have priority over traffic in another, and no class of vessel is exempted from the obligation to give way (i.e. taking avoiding action). The largest tankers sometimes have to adjust course to avoid the smallest vessels.
In addition to normal avoidance manoeuvres, ships sometimes need to perform emergency manoeuvres or emergency stops. Such manoeuvres can result in a course change of 90 degrees, after which the ship may sail a further one to two nautical miles before coming to a stop, depending on the ship characteristics and its speed.
A ship may also encounter unexpected mechanical damage or engine problems. Under such circumstances, the ship requires time and space to respond to the unexpected development. Where a safety distance of two nautical miles is maintained between a shipping lane and a wind farm, a ship will not immediately drift amongst the wind turbines, if the wind and the current carry it in the direction of the wind farm.
Sometimes, ships have to contend with adverse weather conditions. Wind velocity and direction play an important role in determining an appropriate safety distance. On the North Sea, the wind is force 6 or stronger in 11 per cent of the time. The wind direction is usually south-west, west or north-west. In such conditions, a ship requires additional space to make a turn against the waves in order to cope with the sea state.
Finally, the distance between a shipping lane and a wind farm should take account of the possibility of both physical and radar visibility being impaired.

- The basic principle is that shipping should not pass through wind farms. For vessels in a shipping lane, it is irrelevant from a legal viewpoint whether it is formally permissible to sail through a wind farm, as the Colregs do not make this distinction.

2.2 Legislation and regulations

The following legislation and regulations are applicable:

1. *The Water Act (WW)*, on the basis of which permits for wind farms are granted. The Water Act stipulates that the principles of national water policy and the associated aspects of national spatial planning policy are to be set out in a National Water Plan (Section 4.1.).

2. *The National Water Plan (NWP)*. The Water Act states (Section 4.1.) that, where spatial planning matters are concerned, the NWP is also a white paper in the sense of Section 2.3, subsection 2, of the Spatial Planning Act.

3. In the management of defined routeing systems for shipping on the North Sea: internationally applicable regulations, prescriptions and guidelines, which the Netherlands is required to abide by as a member of the International Maritime Organization (IMO), such as:
   - *General Provisions on Ships' Routeing (GPSR)*
   - *International Regulations for Preventing Collisions at Sea*, 1972, as amended (COLREGs)
   - *International Convention for the Safety of Life at Sea* (SOLAS), 1974

Not only are the above-mentioned regulations, prescriptions and guidelines relevant for the shipping lane manager, but to a large extent they also define the behaviour of shipping (see appendix 4) and the opportunity that ships have for safe navigation.

4. *United Nations Convention on the Law of the Sea (UNCLOS)*, Part V, Article 60, clause 5, which specifies a safety zone of up to 500 metres may be defined around 'single objects', such as drilling platforms. An IMO circular (document 21) also advises a zone of 500 metres around multiple objects. In the Netherlands, such safety zones are also instituted for wind farms, in which context a wind farm is treated as a single entity.

3. Assessment Framework

3.1 Assessment to be based on the insight of nautical experts and on international regulations

This Assessment Framework serves to enable the following question to be answered: how much space (path and safety margin) must be allowed between a shipping lane and a wind farm, in order for ships to be able to use that lane safely? The Assessment Framework serves as a basis for deciding location-specific safety distances consistent with nautical safety principles. In other words, *safety distances that take account of both the characteristics of the particular location and the safety requirements of the particular section of shipping lane*.

The path and the safety margins required for safe navigation should be defined on the basis of: international provisions and regulations (COLREGs, GPSR, UNCLOS), the interpretation of those provisions and regulations by nautical experts and maritime organisations (see appendix 4), the review of that interpretation by nautical experts (see appendices 6 and 7), and the minimum amount of space that a ship requires in order to comply with these regulations and provisions. (see also section 4: Application).

The Working Group recommends that Policy uses the Assessment Framework to define a policy framework for special arrangements, and subsequently uses that policy framework in the context of wind farm lot assignment and permit issuance activities to assess whether the lots or permits provide for sufficient space to enable the manoeuvres necessary for safe navigation to be made. The Working Group recommends using the Assessment Framework where a safety assessment is required.

3.2 3.2 Insight into the space required for safe navigation

The Assessment Framework provides insight into the minimum amount of space that a ship requires for safe navigation. The basis of safe navigation is that a ship has sufficient space to manoeuvre and to give way within a designated shipping lane in a manner necessary for the free movement of traffic in accordance with the applicable international regulations. There must also be sufficient space for the avoidance of accidents. Finally, there must be sufficient space for anchorage. In all cases, there should be no risk of a collision or near-collision with a wind farm or any other obstacle.

That implies the availability of sufficient space for:

1. **A path**, being the space that ships require under normal circumstances, i.e. the area or lane that a ship can use at all times for manoeuvring and for normal avoidance manoeuvres.

   Under the Assessment Framework, the path for a route is to be determined by reference to the length of the standard ship using that route and the intensity of the traffic on the route (see below) in twenty years' time (reference year), and a formula is to be used to determine the width of the path.

2. **A safety margin**: a space that is not normally used by shipping, but which may be used in an emergency to avoid an accident (collision or near-collision). The safety margin is the space between the path and the outer limit of the safety zone extending 500 metres around a wind farm.
   Note for clarification: the safety margin should not be confused with the safety zone that must be maintained around an object (United Nations Convention on the Law of the Sea (UNCLOS), Part V, Article 60, clause 5).

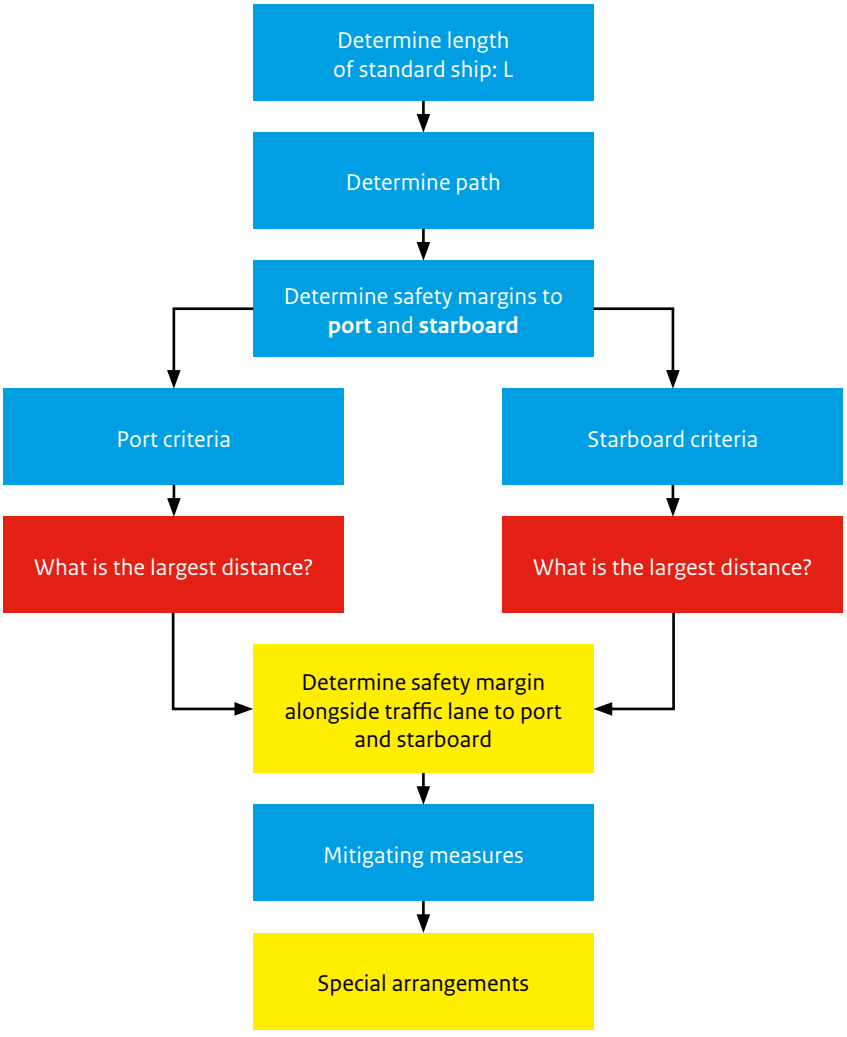
   Under the Assessment Framework the safety margin is to be determined as the space required for the avoidance of collisions and near collisions in accordance with international regulations. A series of criteria have been formulated, which need to be considered in order to determine the required space. The list of criteria (see below) is not exhaustive: it may be necessary to consider other criteria when performing a safety study for a particular wind farm at a particular location.

3. **Anchoring areas and approach routes of anchoring areas**.
   Obtaining insight into *the space that a ship requires for safe navigation* on a given route or at a given location involves a series of steps (see figure 1). First, it is necessary to determine what the 'standard ship' using that route or location is. Next, calculations are made of the amount of space required for the path and safety margin necessary for safe navigation on/at the route/location.

Insight into the path and safety margin is obtained on the basis of various criteria for safe navigation and their translation into spatial requirements. The requirements of safe navigation are based upon the international rules and regulations, which the Netherlands is required to abide by, and which 'guide' the behaviour of seafarers and ships. *The rules and regulations in question, and their interpretation by seafarers, are described in Appendix 4.*

The space required for safe navigation depends on the type of route. Distinction is made between a shipping lane defined in the context of a routing system (such as a traffic separation scheme), a clearway between two traffic separation schemes, and 'open sea'.

Figure 1 Stepped plan for determing safety distances between shipping lanes and multiple objects



3.3 Determine the size of a standard ship

The type and size of the standard ship expected to use a given route in the coming twenty years (reference year) is determined. The largest ships that are normally served by a port and that therefore use the routes leading to that port are taken as the standard or starting point for calculations; occasional visits by unusually large ships may be disregarded. The length of the standard ship is defined so that 98.5 per cent of the ships that use the route in question are no larger than the standard ship. When determining the size of the standard ship, long-term developments (ships' lengths, new types and 'generations', port expansion plans) should be taken into account. The length (L) of the standard ship is used when the criteria are translated into the 'safe space'.

Criterion		Notes and sources
Standard ship	98.5 per cent of the ships are no larger than the standard ship	• AIS shipping path study • Ship dimensions 2030, 2009, Lloyd's Register Fairplay (Doc 6) • Network evaluation 2008 (doc 17)

3.4 Path and safety margin: criteria for determining the space required for safe navigation

Calculation of the path

The path is the space calculated on the basis of the following criteria:

- Number and type of ships (appendix 4, page 8 ff)
- Space required to pass and overtake
- Space required to give way within the traffic lane

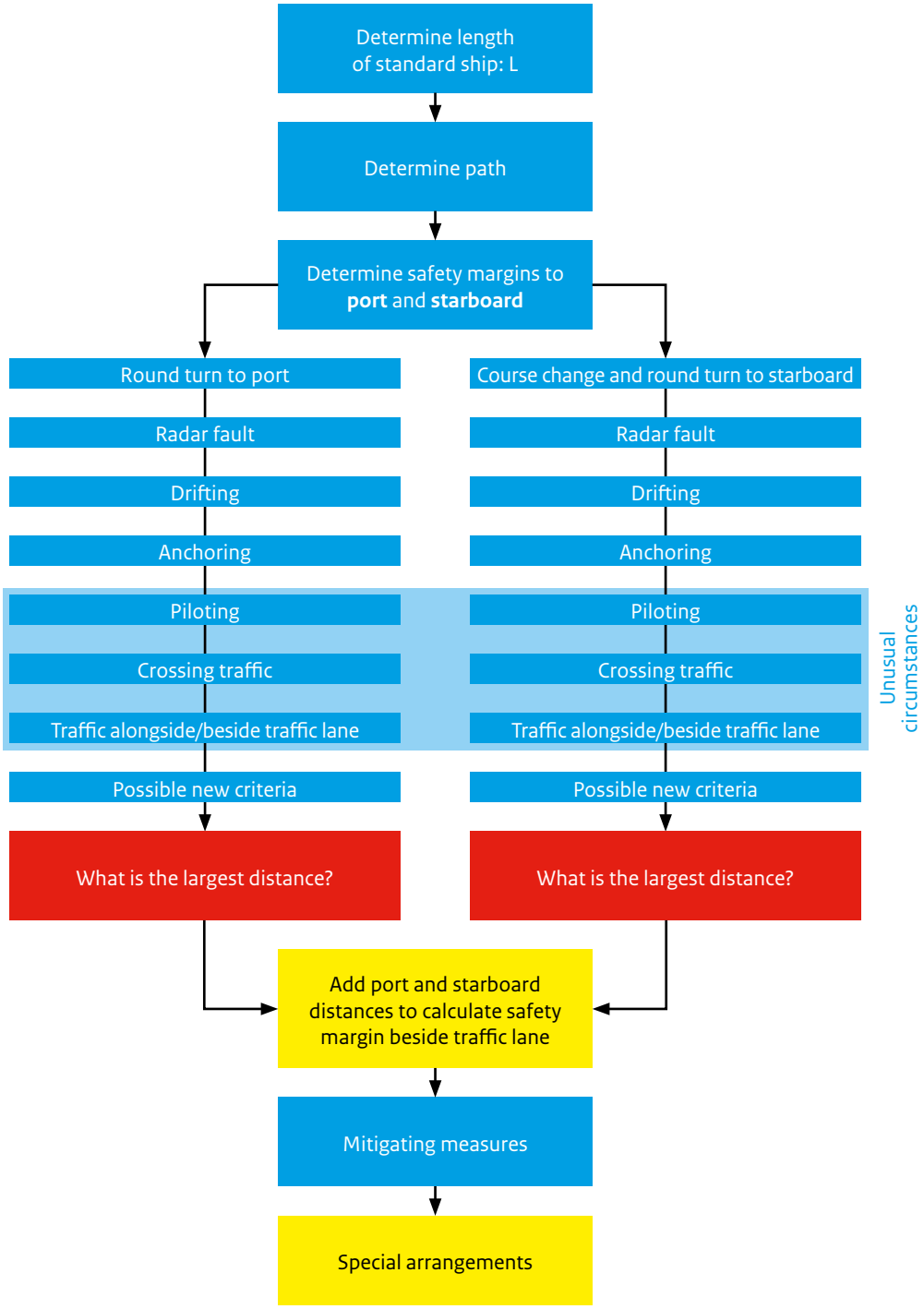
For determination of the required path width/capacity, a formula is used, in which the number of ships expected to use the route in a future reference year, is determined for the required width. The table below provides examples for standard ships with lengths of 300 and 400 metres.

Criterion	Safe space	Notes and sources
Number and type of ships	< 4,400 ships: 4L	Appendix 4 p. 8 ff
Passing and overtaking	Example: = 0.86 nM for a standard ship of 400 m = 0.65 nM for a standard ship of 300 m.	• Discussion paper on safe safety distances (doc 30) • MARIN Network evaluation 2007 p. 69-84 (doc 10) • PIANC, Approach Channels (doc 9) • Network evaluation 2006 (doc 16) • Network evaluation 2008 (doc 17)
Avoidance	Example: > 4,400 and < 18,000 ships: 6L = 1.30 nM for a standard ship of 400 m = 0.97 nM for a standard ship of 300 m. Example: > 18,000 ships: 8L = 1.73 nM for a standard ship of 400 m = 1.30 nM for a standard ship of 300 m.	• Marin simulator research West Rhine (doc 7 subsection 5.3) • International Regulations for Preventing Collisions at sea (COLREGs) (doc 13) a. The space required to starboard for an avoidance manoeuvre is based on COLREGs, rule 15. b. The space required to port for a collision avoidance manoeuvre is based on COLREGs, rules 15 and 19 (d) (ii)

Determining the safety margin

The safety margin must be sufficient for ships to perform the manoeuvres necessary for safe navigation consistent with international regulations in an emergency. The safety margin is therefore determined by working out how much space is required for ships to make the manoeuvres necessary for the prevention of collisions and near collisions. When determining the safety margin, at least the following criteria should be taken into account (see figure 2).

Figure 2 Assessment criteria



For the criteria in figure 2, the space required for safe navigation is as follows:

Criterion	Safe space	Notes and sources
Collision Avoidance manoeuvre, giving way to other traffic to starboard	To starboard 0.3 nM (see note)	Appendix 4, p. 15 ff • Marin simulator research West Rhine (doc 7 subsection 5.3) • International Regulations for Preventing Collisions at sea (COLREGs) (doc 13) • Simulation study (doc 7 p. 33) • Report: Behaviour of shipping in links (doc 4) • PIANC, Approach Channels (doc 9) • Report: Behaviour of shipping in links. No generally applicable conclusions – behaviour is situation-dependent. (doc 4) • Guidelines on the application of COLREGs. Rules on the prevention of collisions at sea (doc 12) • Network evaluation 2007 (doc 10)
Round turn after ineffective collision avoidance manoeuvre to starboard	To starboard 6L. Examples of distance for collision avoidance of other traffic and round turn to starboard, where: • Standard ship = 400 m: 0.3 + 1.3 = 1.6 nM • Standard ship = 300 m: 0.3 + 0.97 = 1.27 nM	Appendix 4 p.17 ff • Marin simulator research West Rhine (doc 7 subsection 5.3) • International Regulations for Preventing Collisions at sea (COLREGs) (doc 13) • GPSR rule 19 • IMO Standards for Ship Manoeuvrability – 'Para. 5.3.1. / Para. 1.2.3.5. (see respectively, Resolution MSC.137(76) and MSC/Circ.1053) • Network analysis 2007 (doc 10)

Note regarding criterion 'collision avoidance manoeuvre to starboard'
Within the Working Group, the consensus was that an collision avoidance manoeuvre to starboard takes up an athwartships distance of 0.3 nM from the course.

Consensus was not reached as to whether the safety margin should necessarily afford space for the manoeuvre, or whether space for the manoeuvre may also be found or may already exist within the path (see definition of 'path').

There are two viewpoints:
1. Since the whole of the path is available for navigation, a vessel may follow a course anywhere within the path, including a course along the very edge of the path. Therefore, space for collision avoidance must be afforded within the safety margin. The consulted nautical experts (experts' meeting, January 2013) supported this view.
2. If there is traffic alongside the traffic lane, a ship will hold a course some distance from the edge of the system. Therefore the space for collision avoidance may, in accordance with the definition of a path, also be found within that path.

The question is whether the 0.3 nM needed for collision avoidance should be defined within the total required space. Consideration may be given to doing so, and then raising the matter in the context of international debate.

The following points are also of significance:
a. The total space for path + safety margin to starboard ('path width', 6L, 500m UNCLOS, and 0.3 nM collision avoidance space) has to be found within the space calculated from the port boundary of the traffic lane.
b. If the space for collision avoidance manoeuvring to starboard cannot be found within the path, because it is already too narrow, consideration may be given to reserving the space within the safety margin. On the basis of viewpoint 1, that space must be available in all cases.

c. The minimum width of the safety margin is 6L (+ 500m UNCLOS).

All the organisations represented in the Working Group were willing to accept that – if the safety margin is too narrow (i.e. less than 6L, possibly plus the 0.3 nM avoidance space) – consideration should be given to making the path narrower and thus the safety margin wider on the basis of international discussion.

Criterion	Safe space	Notes and sources
Round turn to port	To port 6L (see note)	Appendix 4 p.17 ff • Marin simulator research West Rhine (doc 7 subsection 5.3) • International Regulations for Preventing Collisions at sea (COLREGs) (doc 13) • GPSR rules 15 + 19 • IMO Standards for Ship Manoeuvrability – 'Para. 5.3.1. / Para. 1.2.3.5. (see respectively, Resolution MSC.137(76) and MSC/Circ.1053) • Network analysis 2007 (doc 10)

Note regarding criterion 'round turn to port'
Within the Working Group, the consensus was that round turns to port are sometimes made (albeit rarely) and that, if made, the manoeuvre requires a space of 6L.

Consensus was not reached, however, as to whether space should be reserved for round turns to port.

There are two viewpoints:
1. Ships are obliged to follow the international rules and regulations. In order to fulfil the obligations in emergency situations, a ship needs to be able to safely perform a round turn to port. A space of 6L from the port boundary of a traffic lane should therefore be available. That view implies that the shipping lane controller should design the traffic lane in such a way that ships are able to fulfil their obligations.
2. The provision of space for a round turn to port does not promote safety, because, if there is a wind farm to the port side of the traffic lane and a safety zone of 500m is present, there cannot be any (crossing) traffic or any traffic beside the traffic lane, which the ship might be required to avoid in an emergency. Consequently, making a navigable strip available alongside the traffic lane could adversely affect traffic safety, since it would actually increase the possibility of a round turn to port being necessary.

The consulted nautical experts (experts' meeting, January 2013) supported the view that, in case of emergency, a space of 6L should be reserved to port of a traffic lane within a traffic separation scheme, in order that a round turn manoeuvre can be safely executed.
While a wind farm is under construction, allowance should be made for a larger area than that normally required for safe navigation, out of consideration for the additional traffic in and around the construction site. Following the construction phase, allowance should be made for maintenance traffic serving the site.
With regard to the width of the safety margin to port in the case of a traffic lane within a traffic separation scheme, the following point is of significance:
- None of the 0.3 nM of avoidance space required to port has to be found within the safety margin, because the manoeuvre is not performed (see appendices 4 and 6, 7: panel discussion).

Although the focus here is on the criterion 'round turn to port', it should be borne in mind that, in the context of the safety study, other criteria also need to be assessed. In all cases, the safety margin assessment is separate from the minimum dimensions of the safety zone, which has to extend 500 metres (UNCLOS) between a wind farm and a shipping lane.

Criterion	Safe space	Notes and sources
Drift	Distance depends on location, circumstances, prevailing wind speed and direction. On the basis of research, the shipping sector maintains a distance of 1.7 nM from any wind farm.	pendix 4 p. 12 • Safety research wind farm (doc 1 p. 17) • Simulator research risk analysis for TAQA platform P15-E (doc 3) • Behaviour of shipping in links (doc 4)
Radar interference	There is no objective, evidence-based standard; provisional safe distance based on the experience of the shipping sector is 0.8 nM from a wind farm.	Appendix 4 p. 13 • Various studies are mutually contradictory: MCA and QinetiQ proprietary report (doc 14), Radio Holland: interference with radar and radio signals (doc 11) • On the basis of practical experience, the shipping sector maintains a distance of 0.8 nM from a wind farm. This may be supported by the guidelines followed by shipping lines. • If evidenced by the shipping sector, Policy and the licensing authority should take account of and investigate whether a seafarer is able to select a course within the available space so as to satisfy this criterion of a safe distance from the wind farm and can act safely.

Anchoring criterion	Safe space	Notes and sources
Approach to anchoring area	2 nM is generally regarded as sufficient for safe use of an anchoring area.	Appendix 4 p. 27 • Accessibility of anchoring area 5A (doc 5) • Simulator research Q10 (doc 7)
Dragging anchor in anchoring area	Idem	Appendix 4 p. 27 • Studies for particular sites, e.g. TAQA report regarding single objects (p. 5), also followed in the design of anchoring area 5.

Special circumstances criterion	Safe space	Notes and sources
Piloting, mining, instrument towers measuring Wind or tide signal stations, shallows, wrecks	There should be sufficient space for piloting and to enable shipping to navigate safely within the path and safety margin, taking account of various factors that influence or can influence safety.	
Crossing traffic	Allowance should be made for crossing traffic. To that end, sufficient space for avoidance manoeuvres should be left at the corners of wind farms, e.g. corners of 2.5 and 3 km, as well as taking other mitigating measures.	Simulator-research Q10 (doc 7)
Traffic beside traffic lane	The type and volume of traffic beside the traffic lane should be estimated.	
Traffic separation scheme (TSS) Junction with TSS	Indent clearway of 0.3 nM at a distance of 5 nM from boundary of traffic separation scheme: no abrupt transitions between routing systems and clearways, necessitating major course adjustments.	Appendix 4 p. 25
Hotspot	Routes and sites to which numerous criteria apply and where traffic patterns are complex.	Appendix 4 p. 25

Mitigating measures
Examples: traffic guidance and traffic management, including enclosure of wind farms (on one side), marking and lighting, removing sharp corners from wind farm sites, making emergency towage available. The point of departure for safe navigation is that mitigating measures should not be required. Mitigating measures can nevertheless increase safety. It is important that possible measures are explicitly assessed from the shipping safety perspective, as well as from the cost and return perspective, cf. the FSA methodology.

Particular attention should be given to mitigating measures in connection with the construction and maintenance of wind farms. Account should be taken of the strength and direction of the prevailing wind, the additional traffic associated with the construction of wind farms (within, adjacent to, approaching and leaving the site). During the construction period, a larger area is required for safe navigation. The maintenance traffic after the construction phase should also be considered. Mitigating measures consist of provisions and measures relating to the construction and maintenance of wind farms, and arrangements for their monitoring. Mitigating measures require close consultation amongst the various government services, the ports and the shipping sector.

3.5 Conclusion and notes regarding various types of route

Conclusion
With regard to application of the Assessment Framework, the conclusion is that the total amount of space required by a ship for safe navigation has several components. First and foremost, there is the 'path width', which is calculated from the 2L ship domain and the traffic volume on the route. Then there is the safety margin, which is based on criteria such as the space required for avoidance manoeuvres, for making round turns, for drifting, for radar interference and for special circumstances. The total requirement should be measured from the 500-metre safety zone stipulated by UNCLOS. In individual cases, additional criteria may be determined for the location specific special arrangements.

Notes on application of the Assessment Framework to various route types

(a) The route is part of an existing traffic separation scheme
The characteristic of this route type is that the port and starboard boundaries of the traffic lane are marked on the chart. The ship regards the space beyond those boundaries as the safety margin.

In summary, where a traffic lane that forms part of a traffic separation scheme is concerned, the conclusion is that the minimum total amount of space required port to starboard for safe navigation, which must be provided by the path plus the safety margin, is made up of the following components:
a. 500 m for compliance with UNCLOS
b. >> depending on viewpoint: safety margin to port
c. 'path width'
d. >> depending on viewpoint: 0.3 nM to starboard to allow for collision avoidance
e. 6L safety margin starboard
f. 500 m for compliance with UNCLOS.
This is the safe navigation space on the basis of the specified criteria (round turn, avoidance). Adaptations may be made on the basis of the other defined criteria (see 'safety margin').

NB: As regards a precautionary area the same reasoning applies as for a traffic separation system.

(b) The route is a clearway between two traffic separation scheme, or 'open sea'
Within a clearway between two traffic separation schemes, no shipping lanes are marked on the chart. The total amount of space required for path plus safety margins must be provided by the space measured from the wind farm. Attention should be given to the transition to and from the traffic lane (see appendix 4).

(c) The route is part of a new traffic separation scheme
Where a new traffic management system is concerned, insight is required into the path (shipping lane) and the safety margins.

4. Application of the Assessment Framework for policy formulation, lot assignment, permit issuance, international coordination

The Assessment Framework is intended for use in the context of the effective route structure. It may also be useful in connection with the design or revision of routeing measures. The advice to I&M's Director Maritime Affairs regarding application of the Assessment Framework is as follows:

1. Application as a policy framework
   a. It is recommended that the Assessment Framework should be used as a policy framework for making special arrangements regarding safety distances between shipping lanes and wind farms *that are consistent with nautical safety*. Policy should apply the principles and criteria specified in the Assessment Framework, and should translate them into the space required for safe navigation.
   b. Regular evaluation and updating of the Assessment Framework are desirable, to take account of new insights and experiences and the outcomes of international discussion. The advice to the Ministry of I&M is therefore that the Assessment Framework should be incorporated into the National Water Plan or the White Paper on Offshore Wind Energy, so that it may be periodically updated.

2. Application in the context of lot assignment
   a. Within the designated wind energy areas, lots will be assigned for the development of wind farms. A safety assessment is made for each individual lot, since the layout and position of the lot requires assessment at the detail level. It is recommended that the Assessment Framework is used in the context of such safety studies and that the ports and the shipping sector should be involved in the safety assessment process.

3. Application in the context of permit issuance
   a. When considering a permit application, the competent authority (Public Works and Water Management Directorate) investigates whether the application is consistent with the formulated policy with regard to nautical safety and the requirements made in the context of lot assignment with regard to special arrangements concerning safety distances.

4. Application in the context of international coordination
   a. It is recommended that the Assessment Framework, the criteria and the insights regarding the space required for safe navigation be used as a joint contribution by the ports, the shipping sector and the Ministry of I&M to international discussions regarding safety distances between shipping lanes, wind farms and spatial planning at sea.

Glossary

ADC test	A test to verify that alternatives have been investigated, that there is an urgent and important public interest, and that the effects have been offset.
EEZ	Exclusive Economic Zone *That part of the coastal waters, outside the territorial zone, to which the Netherlands claims rights, extending up to a maximum of 200 nautical miles (370.4 km) from the coast, measured from the low waterline and taking account of the limitations imposed by international law.*
GBF	Gravity-based foundations *A GBF is a large concrete structure serving as a foundation for an offshore installation. The foundation remains in place purely because of its weight and footprint size. A GBF is not anchored to the seabed by piles, but carefully positioned on a prepared area of seabed.*
IBN 2015	Integrated North Sea Management Plan 2015 *(Government Gazette, no. 20771, 18 November 2011)*
IMO	International Maritime Organization *A London-based organisation that realises international agreements amongst member states, with a view to making shipping as safe and environmentally friendly as possible. The IMO is a specialist agency of the United Nations.*
KCD	Quality and Capacity Document *A Quality and Capacity Document is a document in which TenneT specifies how the quality, safety and capacity of power transmission in the Netherlands will be assured in the future.*
KM	Kilometre (km)
KRM	Marine Strategy Framework Directive *The Marine Strategy Framework Directive (Dutch initials KRM) requires every EU member state to define a marine strategy for the protection, maintenance and restoration of the marine environment (the good environmental condition (GMT) of the North Sea) while also assuring sustainable use of the North Sea.*
MW	Megawatt
NCP	Dutch Continental Shelf *The NCP is the same as the Dutch Exclusive Economic Zone (EEZ).*
NM	Nautical mile / sea mile: 1,852 metres *Standard unit of distance used in shipping and motorised aviation..*
NWP	National Water Plan *(Parliamentary Document: Lower House, parliamentary year 2009–2010, 31 710, no. 12)*
RCR	National Coordination Regulations *The National Coordination Regulations provide for the various decisions (regarding permits and exemptions) required in connection with a project to be taken simultaneously and on the basis of consultation. The regulations also cover the national integration plan: a spatial ruling made by the national government, similar to a zoning plan.*
SVIR	White Paper on Infrastructure and the Environment *(Parliamentary Document: Dutch Parliament, parliamentary year 2011–2012, 32 660, no. 51)*
UNCLOS	United Nations Convention on Law of the Sea