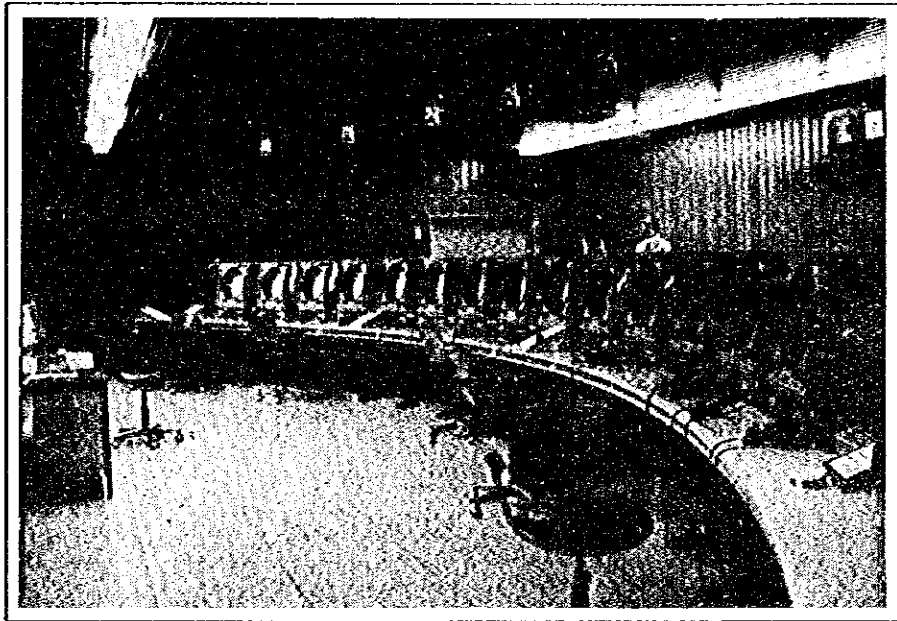


APPENDIX (CANALS IN THE WORLD)



Radar Station of Hamburg



Radar Station of Amsterdam

APPENDIX

Canals in the World

1 Canal in West Germany

In West Germany all waters including coastal areas and river areas are, in principle, under the jurisdiction of the federal government. Specifically, waterways are administered by the Waterways and Navigations Bureau (WSV: Wasser-und Schifffahrtsverwaltung) of the ministry of communication. The waters are divided into six districts. In each district is a local agency of WSV, a Waterways and Navigations District Office (WSD: wasser-und Schifffahrtsdirektionen). (Refer to Fig. 1-1 and 1-2).

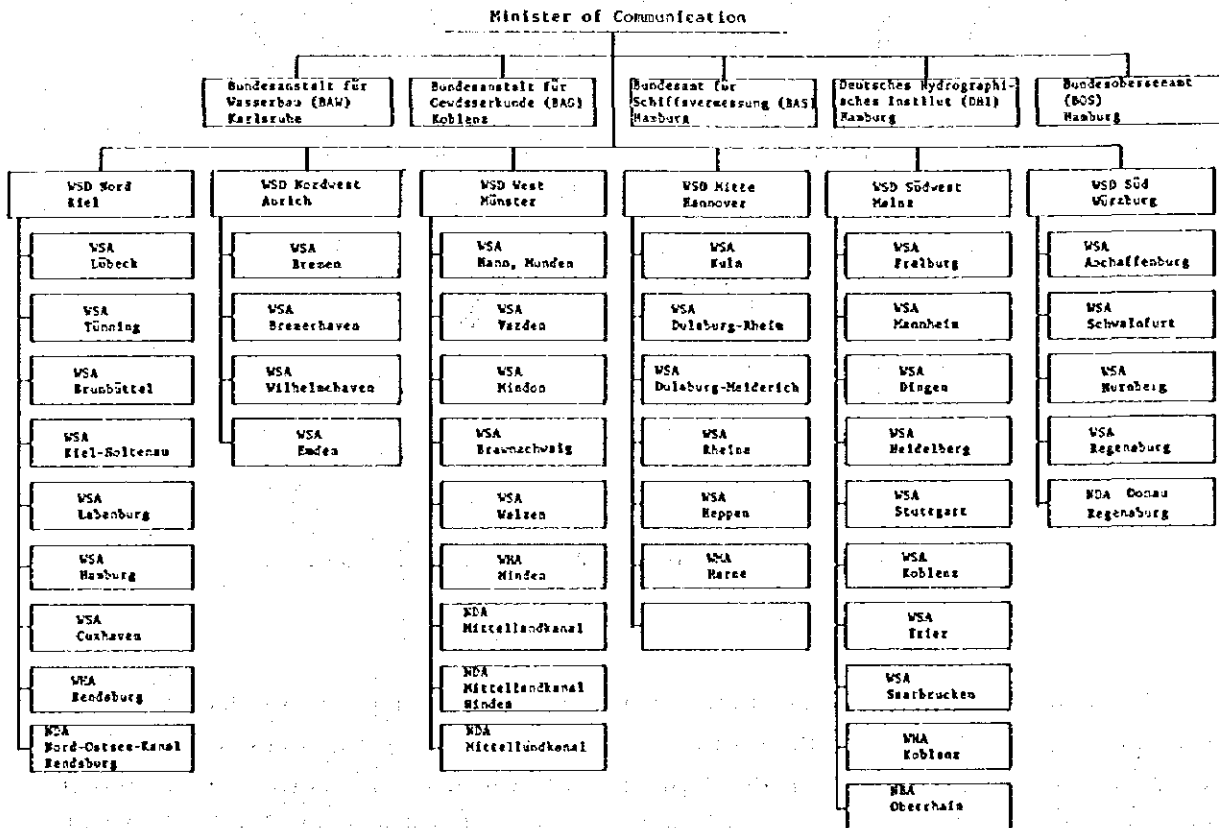


Fig. 1-1 Organization of Federal Districts of Waterways and Navigations

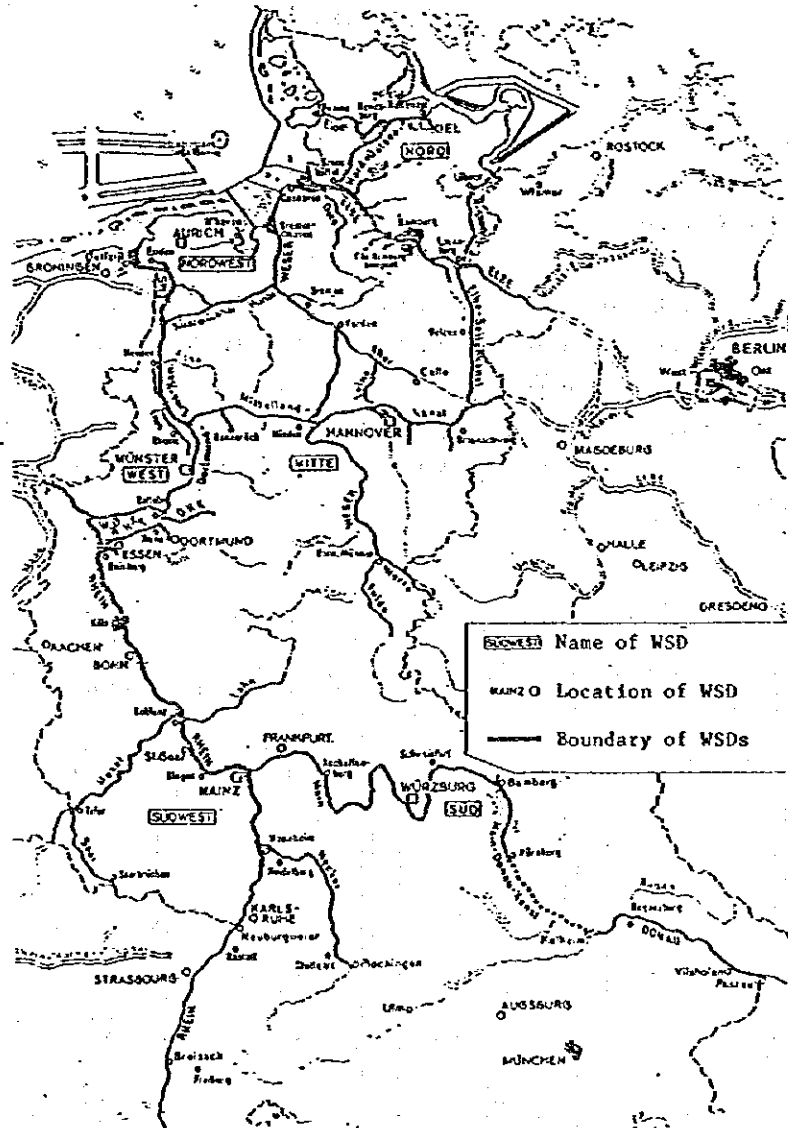


Fig. 1-2 Federal Districts of Waterways and Navigations

There are five different sets of traffic regulations which are applied to waters in different parts of the country. In the North Sea, rivers facing the North Sea, the Kiel Canal, and downstream portions of the Elbe River, the Regulations of Federal Waterways (Seeschiffahrtstrassen-Ordnung) are applied. Inland waterways including the Essen Canal are controlled by the Regulations of Inland Waterways (Binnenschiffahrtstrassen-Ordnung). Some waterways including the Rhine river are under the jurisdiction of the Rhine Navigational and Police Ordinance (Rhein-schiffahrtspolizeiver-Ordnung). Traffic along the Mosel and Donau rivers is regulated by the Mosel Navigational and Police Ordinance and the Donau Navigational and Police Ordinance, respectively.

The areas controlled by each of the sets of regulations are shown in Fig. 1-3.

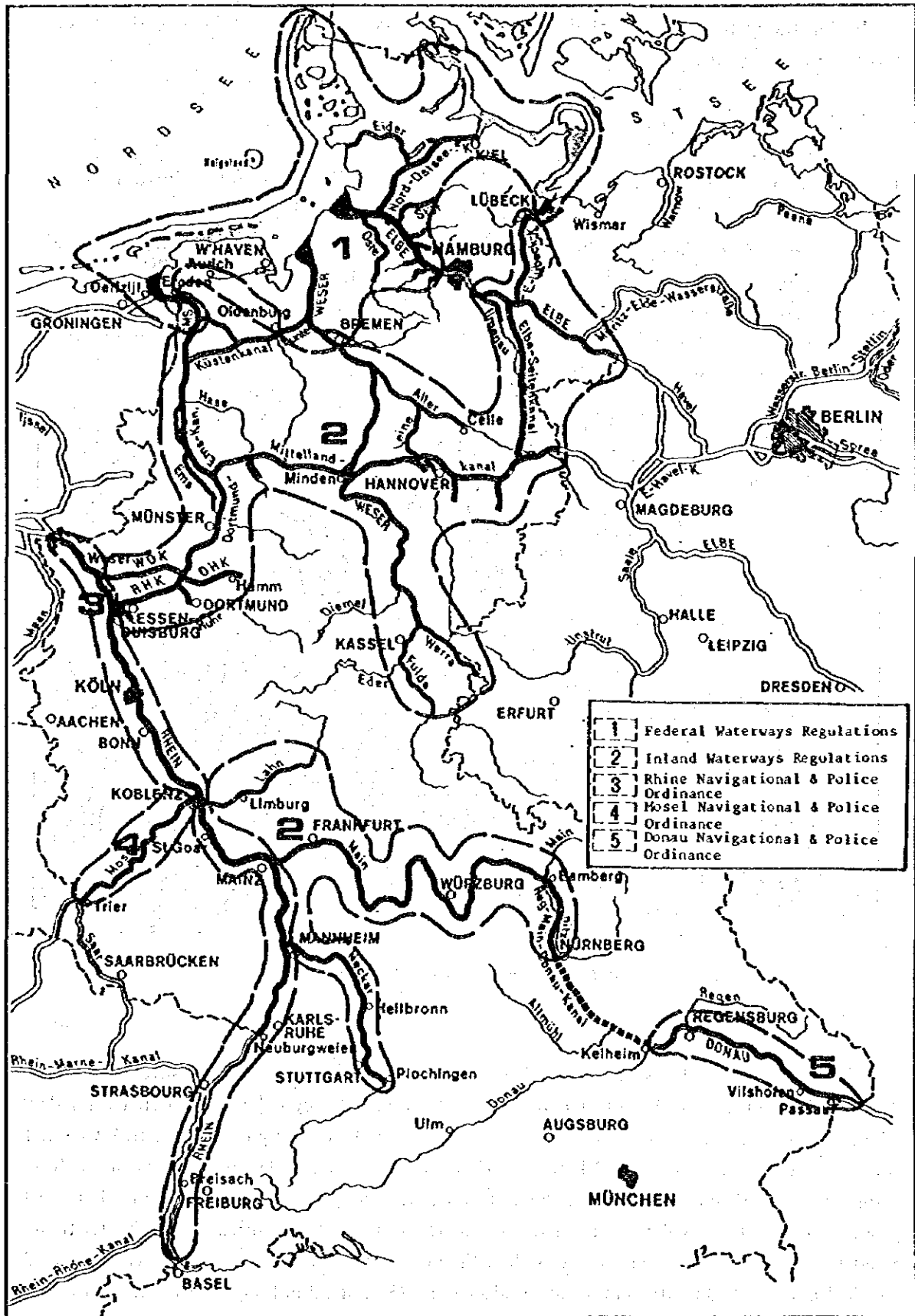


Fig. 1-3 Regulation of Federal Waterways

Within the waters of designated ports such as the Port of Hamburg, Port Authorities are in charge of waterways including traffic control of vessels.

(1) Kiel Canal (North-Baltic Sea Canal)

1) The Kiel Canal is an international canal linking the Baltic Sea with the North Sea by crossing the Jylland Peninsula, in northern West Germany.

This canal was originally constructed by the German Emperor Wilhelm II for strategic purposes. After 8 years construction work, it was opened for traffic in June, 1885. Subsequently, it was expanded in 1914 for military reasons, and was further expanded again in 1966 in response to the increasing number and increased size of transit vessels arising from the expanding trade of the Baltic countries. (Refer to Fig. 1-4)

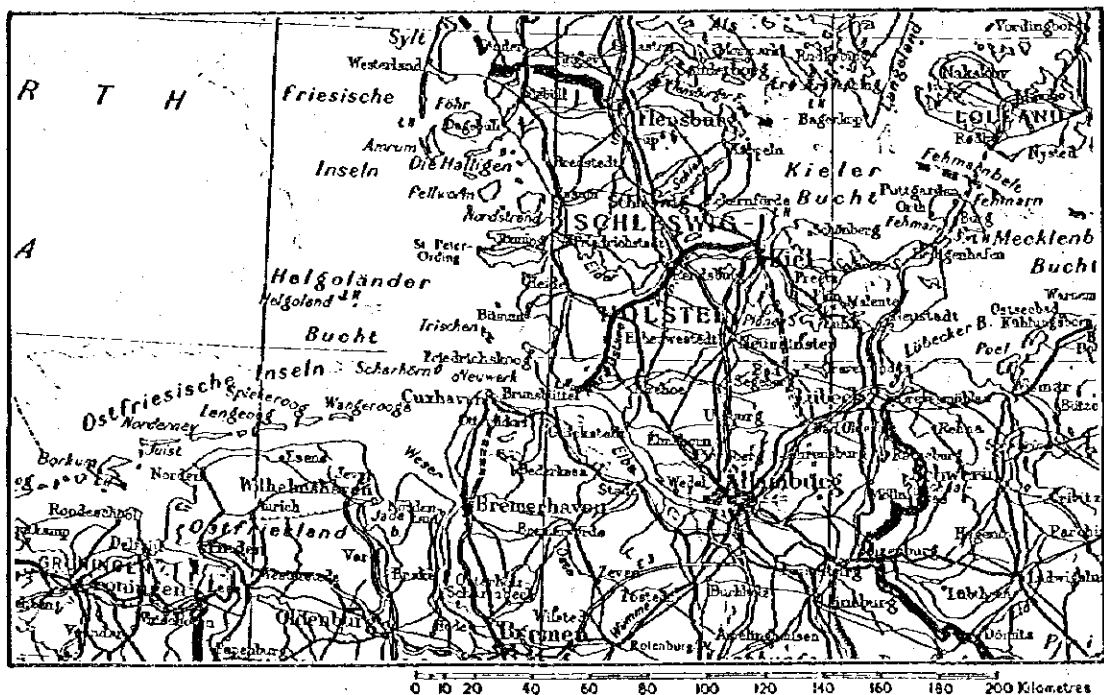


Fig. 1-4 Location of the Kiel Canal

Passage through the Kiel Canal (also known as the Northwest Canal) saves an average of 250 nautical miles over the alternative routes of passing through the Great Belt (water depth: 15 meters), or the Sund (water depth: 7.5 meters), and then through the Skagerrak Channel at the northern edge of the Jylland Peninsula (between Norway and Denmark). For many destinations, the route through the Sund is longest and that through the Great Belt somewhat shorter; passage through the canal from the Kiel area to Hamburg is 440 nautical miles shorter than the Sund route and 340 nautical miles less than the Great Belt route. Similarly the canal saves 280 nautical miles or 180 nautical miles to London and 285 nautical miles or 185 nautical miles to Le Havre. The distance saved by utilizing the Kiel Canal are shown graphically in Figure 1-5.

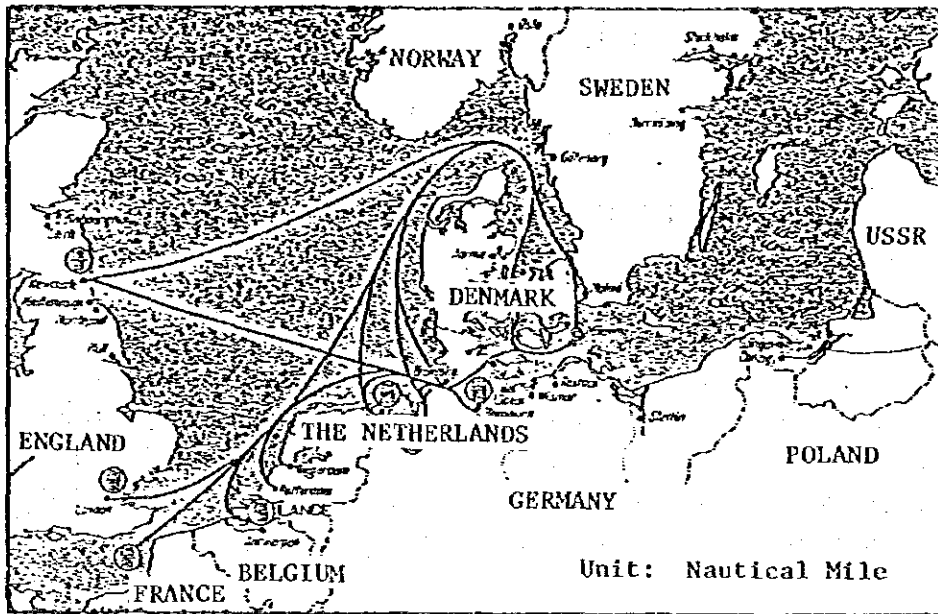


Fig. 1-5 Shortcut Effect of the Kiel Canal

2) The Kiel Canal is 98.637 kilometers long and 162 meters wide on the water surface. However, some narrower portions are 102.5 meters wide on the water surface. The Canal is 11 meters deep, and 90 meters wide on the canal bed, but 44 meters wide on the bed in the narrower sections. Passing through the entire canal requires 6.5 to 8.5 hours.

The highest point of the Canal is 25 meters above sea level, and the water level at Brunsbüttel (on the Elbe side) is $MW = NN + 1.42$ meters; the tide level at Kiel-Holtenau (Kiel Bay side) is $MW = NN - 0.02$ meters (both average during the period from 1971 to 1980).

The terminuses of the Canal are both partitioned by a pair of sluices (a total of four sluices) from outside. (Refer to Fig. 1-6) The shape of its longitudinal section is as shown in Fig. 1-7.

The canal is so designed that the area ratio of 20,000 DWT-class vessels to this longitudinal section will be approximately 7.0.

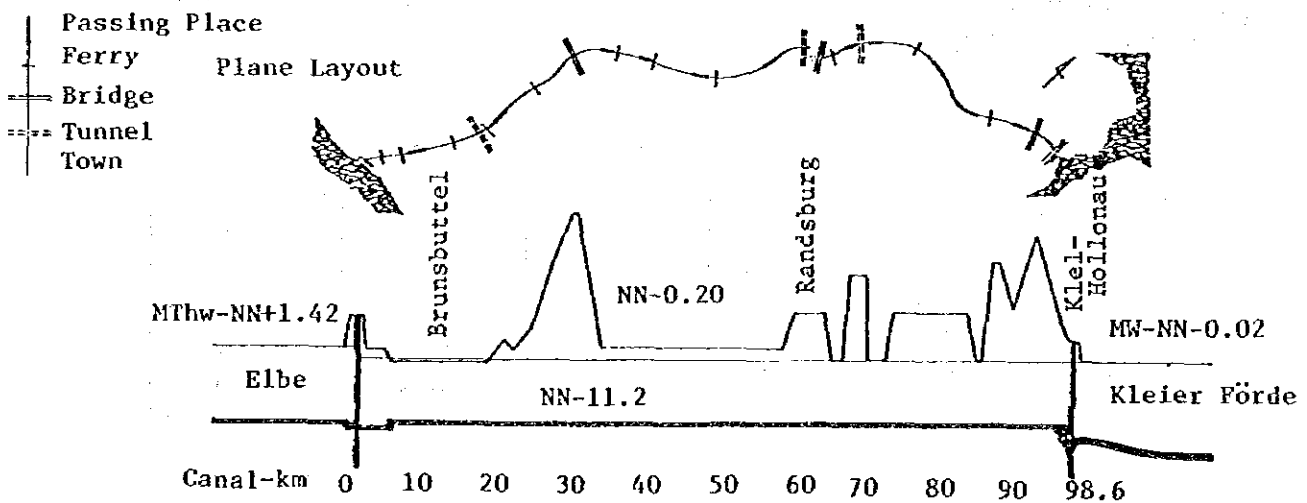


Fig. 1-6 Longitudinal Section of the Kiel Canal

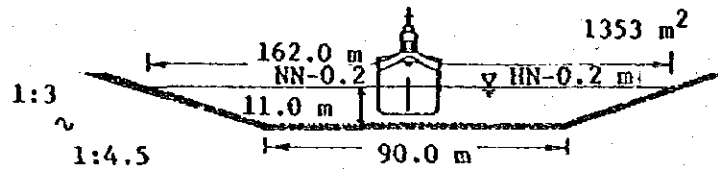


Fig. 1-7 Cross Section of the Kiel Canal

3) Vessels are classified into six groups according to dimensions (length, width and draft) as well as by type of cargo.

Group 6 includes the largest vessels and vessels carrying dangerous cargoes. In accordance with the regulations, Group 6 vessels and certain combinations of other Group vessels can only be passed at 12 designated passing points. Traffic Control Offices at Brunsbuettel and Kiel-Holtenau, and Signal Sections located between these points control passing traffic. District VHF radio links these facilities and transit vessels, providing traffic information every 30 minutes as well as communicating necessary information.

According to Canal regulations, vessels up to 160 meters long and 27 meters wide, and vessels up to 193 meters long and 20 meters wide are permitted a maximum draft of -9.5 meters.

For vessels up to 235 meters long and 32.5 meters wide, the maximum draft is -7.0 meters. In view of the fact that bridges and high-tension lines overhang the canal, the maximum height of vessels from the water level is limited to 40 meters.

The maximum navigating speed in the canal is 12 km/h (6.5 knots) for vessels classified under Group 6 and those with a draft over -8.5 meters; and 15 km/h (8.1 knots) for all other vessels.

Vessels with drafts over -3.5 meters and those classified as Group 2 and higher are subject to pilotage; and vessels over 15 meters wide are subject to canal pilotage. While the Kiel Canal is open for navigation 24 hours, pleasure boats (including yachts and motorboats) are allowed to navigate only during the day.

4) The annual dredging volume for the entire canal is estimated to be 7 million cubic meters.

5) The occurrence rate of accidents, accident locations, and accident causes are shown in Tables 1-1, 1-2, and 1-3.

Table 1-1 Occurrence Rate of Accidents

Vessels \ Year	1980	1981	1982
Vessels Involved in Accidents	289	254	265
Total Shipping Traffic	72,577	67,729	64,782
Rate (%)	0.40	0.38	0.41

Table 1-2 Accident Locations

Place \ Year	1978	1979	1980	1981
Approaches and Outer Ports	8.7%	6.7%	5.8%	7.3%
Sluice Areas	33.3%	40.9%	36.7%	37.4%
Sidings	21.3%	16.8%	26.1%	21.8%
Canal Stretches between the Sidings	15.9%	18.1%	15.9%	20.7%
Inner Harbours and Landing Places	20.8%	17.5%	15.5%	12.8%

Table 1-3 Causes of Accidents

Causes of Accidents \ Year	1978	1979	1980	1981
Fog	35 (17.0)	16 (10.7)	29 (14.0)	27 (15.1)
Engine and Rudder Trouble	38 (18.4)	23 (15.4)	34 (16.4)	35 (19.5)
Narrow Spaces	28 (13.5)	9 (6.0)	7 (3.4)	3 (1.7)
Wind, Current, Wash, Heavy Seas	44 (21.2)	33 (22.2)	60 (29.0)	38 (21.2)
Faulty Handling of the Lines	6 (2.9)	4 (2.7)	8 (3.9)	8 (4.5)
Faulty Execution of Rudder or Engine Manoeuvres	7 (3.4)	2 (1.3)	9 (4.3)	0 (0.0)
Insufficient Manoeuvrability	3 (1.4)	8 (5.4)	0 (0.0)	0 (0.0)
Violation of Laws and Orders	20 (9.7)	11 (7.4)	19 (9.2)	17 (9.5)
Icing	0 (0.0)	5 (3.4)	2 (1.0)	0 (0.0)
Speeding	2 (1.0)	1 (0.7)	1 (0.5)	0 (0.0)
Other Causes	24 (11.5)	37 (24.8)	38 (18.3)	51 (28.5)
Total	207 (100%)	149 (100%)	207 (100%)	179 (100%)

(2) Port of Hamburg and Elbe River

1) In terms of cargo volume, the Port of Hamburg is the biggest port in West Germany. 15,000 vessels call and 65 million tons of cargo are handled at Hamburg Port each year. The Port is located on the Elbe River at a point where the Elbe begins to widen significantly.

The distance from the Port of Hamburg to the port on the mouth of the Elbe, Cuxhaven (under the administration of the Hamburg Port Authority), is 104 kilometers (56 nautical miles); the distance to the Elbe Lightship in the North Sea is 141 kilometers (76 nautical miles). The Elbe River is 300 meters wide at the Port of Hamburg; 2,500 meters at a point a little downstream from the Port, and 15,000 meters wide at Cuxhaven at the mouth of the river. The water depth of the sea route sector is maintained at -13.5 meters (44 feet). The width is 250 meters at the Port of Hamburg and 750 meters to 1,000 meters near Cuxhaven. However, the water depth of the Elbe River from the average water level is -16.5 meters (54 feet); the water level difference of 3.3 meters is due to fluctuation of tide level and river flows.

2) The Hamburg Port Authority which is independent of the federal government exclusively controls the waters within the harbour area of the Port of Hamburg. This Port Authority is one of the administrative systems of the City of Hamburg and its organization relating to navigation is as shown in Fig. 1-8.

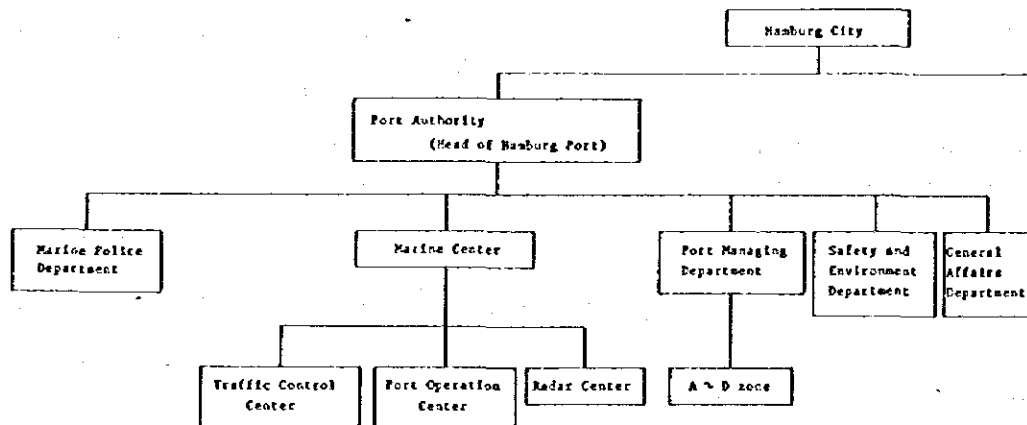


Fig. 1-8 Organization of the Hamburg Port Authority

The Federal Minister of Communication is directly in charge of navigation control and maintenance of waters from the harbour area downstream.

3) As regards Navigation Rules related to the Elbe River, "german Bight Passage Planning Guide (April 1983)" published by the Federal Ministry of Transport of the Federal Republic of Germany states as follows (Refer to Fig. 1-9):

(i) General Provisions for All Navigable Waterways

- i) Initial Report (24 hours before estimated time of arrival (ETA)) by vessels carrying dangerous cargoes.

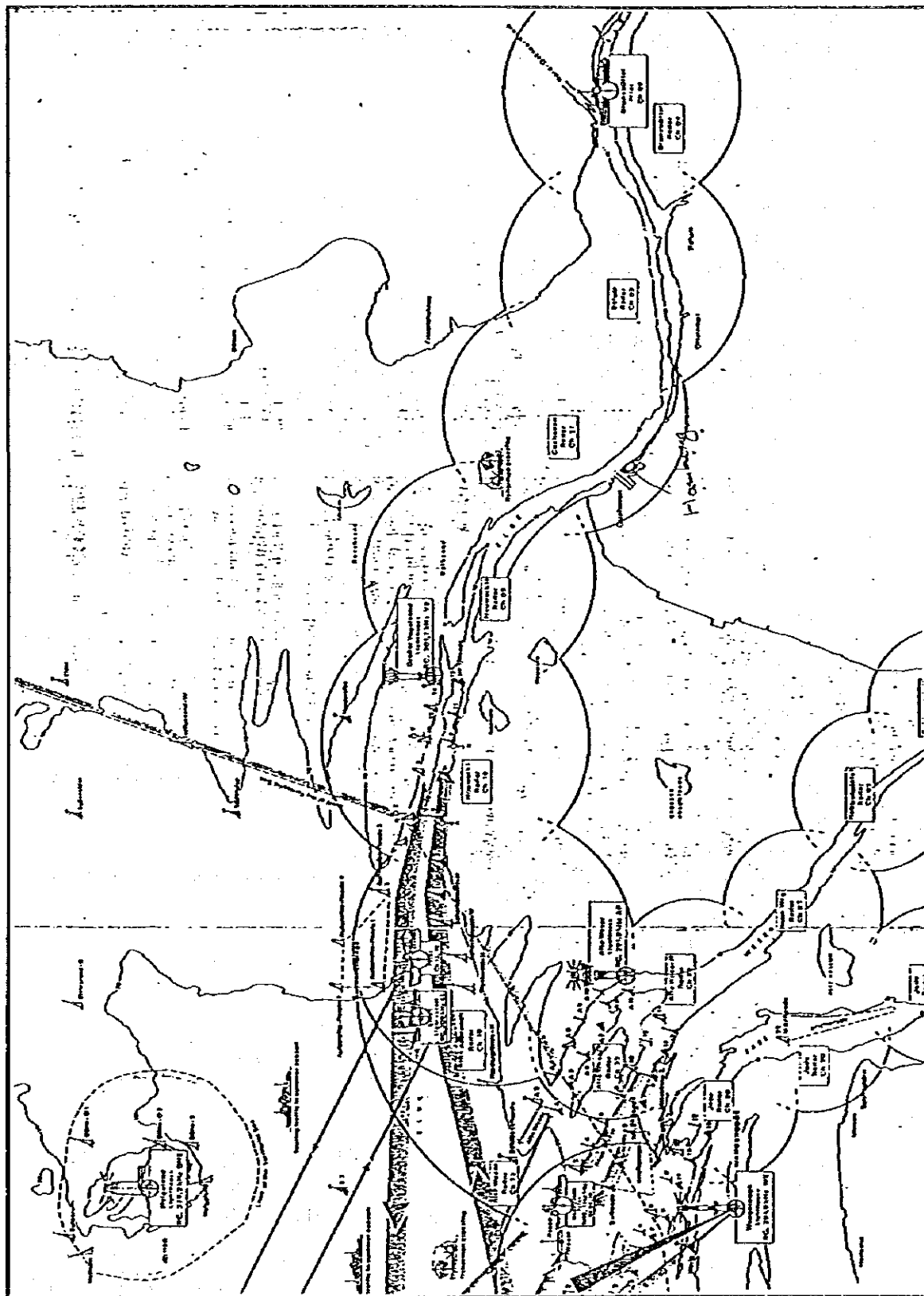


Fig. 1-9 German Bight Passage Guide

Vessels carrying dangerous cargoes (gas, chemicals, oil and oil products with a flashpoint below 35°C) and nuclear-powered vessels should send an initial report to the appropriate authority 24 hours before ETA or on departure from last port, stating:

- (a) vessel's name and call sign
- (b) Nationality
- (c) length and draft
- (d) last port of call and destination
- (e) type of cargo; details and amount of dangerous cargo
- (f) details of chemicals carried
- (g) any deficiencies of vessel or cargo
- (h) vessel's owner or agent

ii) Report by VHF radio by all ships

Before navigating waterways of the Federal Republic of Germany, all vessels over 50 m in length should contact the appropriate authority by VHF radio stating:

- (a) name
- (b) position
- (c) dimensions
- (d) destination

(ii) Elbe River

i) Initial Report

Vessels intending to navigate the River Elbe should inform Wasser- und Schifffahrtsamt (WSA) Cuxhaven 24 hours before ETA at ELBE 1 Lightvessel or on departure from last port.

ii) VHF Report

All inbound vessels over 50 m in length shall report by VHF radio before navigating the river Elbe.

CALL: ELBE 1 Lightvessel (DBBR)

Vessels carrying dangerous cargoes shall maintain a continuous listening watch with the operating stations:

- ELBE 1 Lightvessel (DBBR)
- Cuxhaven Elbe Port Radio
- Brunsbüttel Elbe Port Radio
- Stadersand Elbe Port Radio
- Hamburg Port Radio

(iii) Pilotage

i) Radar Advice (in German) is given on request. Such requests should include the vessel's name, nationality, tonnage, draft, and position. The radar stations, their VHF channels, and the areas allotted to them are indicated on the attached chart.

ii) Deep-Sea Pilots

Licensed deep-sea pilots for inbound and outbound vessels in the North Sea and the English Channel can only be requested from the Duty Room of the "Ancient

Brotherhood of Elbe Pilots".

iii) Compulsory District Pilotage

(a) Oil, Gas and Chemical Tankers:

Compulsory pilotage exists on all waterways navigable by sea-going vessels in the Federal Republic of Germany for oil, gas, and chemical tankers.

(b) All Other Vessels:

Otherwise all other sea-going vessels of 1000 gross register tons and upwards are subject to compulsory pilotage.

Exemptions:

The above regulations do not apply to tankers of less than 300 gross register tons and other sea-going vessels of less than 5,000 gross register tons provided.

- such vessels navigate a route which the master of the vessel in question has navigated at least six times within the preceding twelve months in that same vessel;
- the master of the vessel has an adequate knowledge of the German language;
- such vessels are equipped with an operational radar as well as with an operational VHF radiotelephone installation featuring the channels prescribed for the pilotage district in question.

iv) Tanker Check List

The master of an inward-bound tanker shall complete, in duplicate, a Tanker Check List prior to entering any one of the pilotage districts and to enlisting the services of a pilot. Using that list, the pilot concerned shall find out - prior to commencing pilotage - whether the tanker in question has any deficiencies that may affect him in performing his advisory work. When there are grave deficiencies, the pilot may refuse pilotage.

One copy of the Tanker Check List shall be retained on board and shall be presented, upon request, to the appropriate safety authority.

v) Regulations Applicable to Vessels Exceeding 10,000 GT

Pilots for the following vessels are transferred at DEUTSCHE BUCHT Lightvessel only:

- (a) vessels exceeding 1,000 GT carrying dangerous cargoes and bound for Rivers Jade, Weser, or Elbe;
- (b) bulk carriers other than oil, gas, and chemical tankers exceeding 35,000 GT bound for River Elbe;
- (c) vessels exceeding 60,000 GT bound for Rivers Jade, Weser, or Elbe.

a) Pilots are transferred by helicopters stationed at Wilhelmshaven-Mariensiel or, in adverse weather conditions, by boat from Helgoland. If, exceptionally, the transfer of a pilot at DEUTSCHE BUCHT Lightvessel is not possible, vessels should contact the pilot vessels near WESER LANBY or ELBE 1 Lightvessel to arrange for pilot transfer at another position.

b) Pilots should be requested 24 hours in advance for Rivers Jade or Weser from Weserlotse II, Bremerhaven, and for River Elbe from Elbiotse Brunsbüttel via Norddeich Radio call sign DAN. Message must include name of vessel, gross tons, ETA

Deutsche Bucht Lightvessel, date time of vessels arrival, draft, vessels destination and whether an official approved landing area is available.

c) Send corrected ETA at DEUTSCHE BUCHT Lightvessel six hours in advance and exact time of arrival two hours in advance to the appropriate pilot station given in (b).

d) Vessels should maintain a continuous listening watch on 500 kHz (or 512 kHz, when 500 kHz is engaged in distress traffic) from two hours before arrival at DEUTSCHE BUCHT Lightvessel for information from Norddeich Radio (DAN) on pilot transfer procedures.

e) Vessels should keep a listening watch on Channel 16 from 30 minutes before arrival at DEUTSCHE BUCHT Lightvessel so that the helicopter can contact the ship. There is a pilot-station on the island of Helgoland.

f) For homing purposes vessels should transmit their call sign twice, followed by a 30 second continuous tone (dash) and their call sign twice. These signals should be transmitted on 410 kHz from 20 minutes before the helicopter's arrival until the helicopter is hovering over the ship.

g) When transferring the pilot, vessels are restricted in their ability to manoeuvre and may exhibit the appropriate lights and shapes in accordance with the International Regulations for Preventing Collisions at Sea. In addition, they may inform shipping by VHF radio of their manoeuvres.

4) Within the waters of the Port of Hamburg, the Traffic Control Centre and the Radar Centre are responsible for safe navigation.

(i) To ensure safety, a mutual information system is established in the Traffic Control Centre. This system incorporates all sea-going vessels, all harbour vessels and inland water crafts exceeding 100 m in length, and floating implements including dredgers, floating cranes, grain elevators, and all difficult towing and pushing units. These crafts are requested to report themselves when passing the harbour frontier, leaving or hauling immediately before departure mentioning the following information: Name of the vessel, incoming/outgoing/hauling from/to berth, etc.

When visibility is poor, below 3000 metres, the Radar Centre is manned only by harbour pilots. (Refer to Fig. 1-10)

When visibility is good, Traffic Control Officials pass on information by the radar screen installed in the Traffic Control Centre. Radar advice is given on request. 10 Radar towers are placed at strategic locations along the waterway of the port.

Radar information from several scanners is transmitted to a central location and displayed in one operations room in the Marine Centre.

(ii) Compulsory pilotage exists on all waterways navigable in the Port of Hamburg and Elbe River by sea-going vessels over 1,000 GT. This regulation also applies to tankers over 300 GT.

The harbour pilots are self-employed under the close control of the port authority.

Apart from the technical aspects of his task, the pilot plays an important part in the exchange of data between ship and Marine Centre. Moreover, the pilot should convey the necessary information relating to the instructions, regulations and practices of the port.

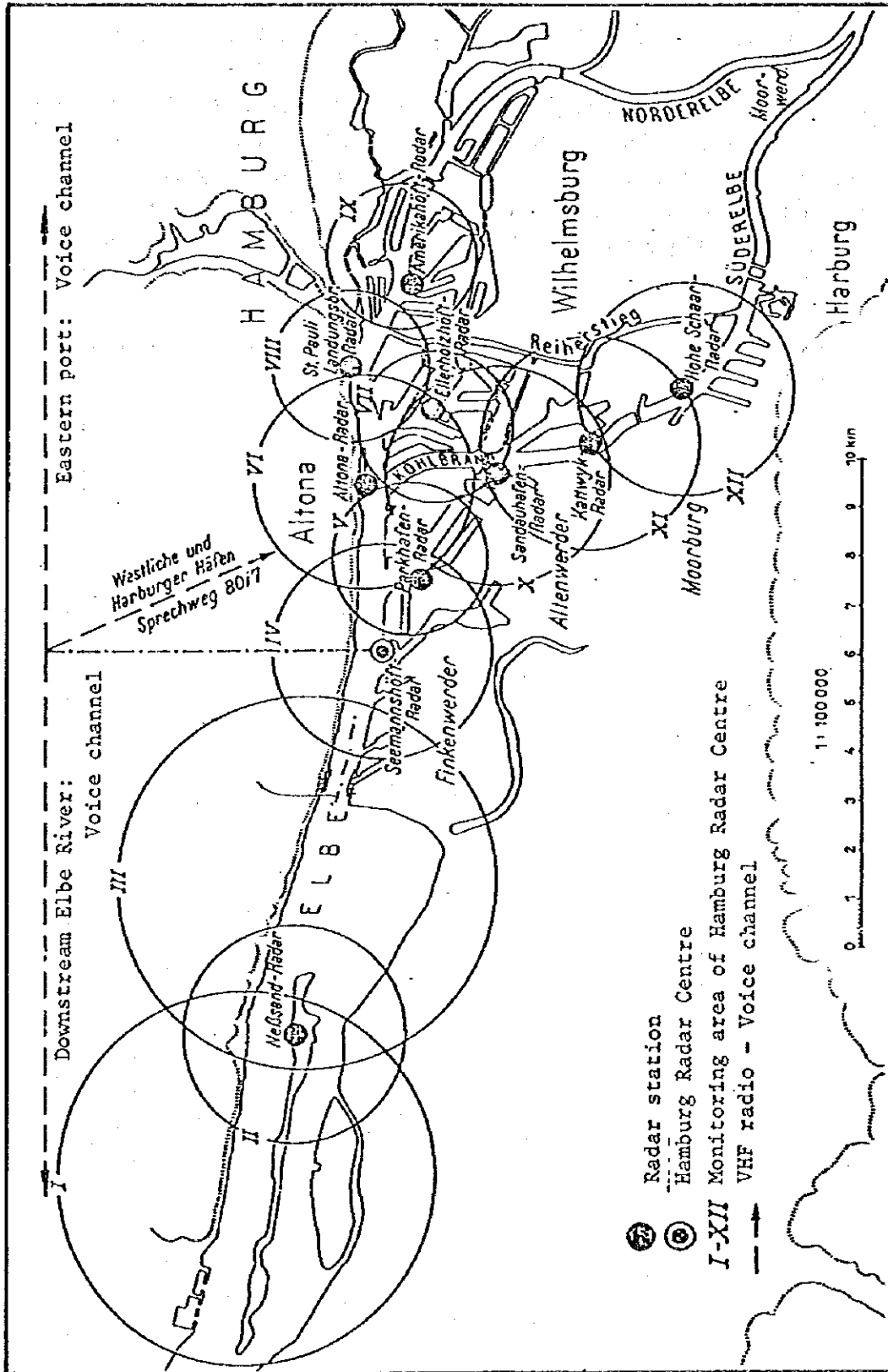


Fig. 1-10 Radar Network

However, the master is still responsible for the manoeuvres of his ship. The pilot is his advisor, and provides him with all the necessary information concerning the difficulties of navigation in the area and orders from the Marine Centre which he has received concerning the ship and its berthing.

In specific cases, the pilot may issue strict directives in respect of local navigational regulations, for example, ships constrained by their draft. These ships, owing to their draft, require special manoeuvring conditions, and have right-of-way over other vessels which the Traffic Control Centre and the pilot have to take into account. Their navigation should not be impeded by other ships. The pilot will advise the master as to the number and power of tugs required.

- 5) Tugboats with fire-fighting ability owned and operated by a private company at the Port of Hamburg are listed in Table 1-4.

Table 1-4 List of Tugboats with Fire-Fighting Ability
Tugboats of the Marine Accidents Rescue Co., Ltd., Hamburg

Name	Drive Unit (motor)	Horsepower/ Kilowatts	Pile Extractor	Fire-fighting Equipment	Drainage System
Tugboat 1	Schottel	2400/1764	30 tons	None	2 portable diesel driven pumps, 100 tons total
Tugboat 4	Schottel	2400/1764	30 tons	None	2 portable diesel driven pumps, 100 tons total
Tugboat 5	Schottel	2400/1764	30 tons	None	2 portable diesel driven pumps, 100 tons total
Tugboat 7	Kortduse	2750/2021	42 tons	2 monitors 21/8 meters above water level, water/foam	Stational pump 710 cbm (cubic meter)/h 2 portable electric submersible pump
Tugboat 8	Schottel	2400/1764	30 tons	None	2 portable diesel driven pumps, 100 tons total
Tugboat 9	Schottel	2400/1764	30 tons	None	2 portable diesel driven pumps, 100 tons total
Tugboat 10	Schottel	2400/1764	30 tons	None	2 portable diesel driven pumps, 100 tons total
Tugboat 15	Konvent.	1000/735	14 tons	None	None
Tugboat 16	Konvent.	1200/882	15 tons	1 monitor, water/foam	stationary and portable pumps, 250 tons total
Tugboat 17	Konvent.	1200/882	15 tons	1 monitor, water/foam	stationary and portable pumps, 250 tons total
Tugboat 22	Konvent.	1000/735	8 tons	None	None
Tugboat 23	Konvent.	1000/735	8 tons	None	None
Tugboat 28	Kortduse	940/691	14 tons	None	None
Tugboat 29	Kortduse	940/691	14 tons	None	None
Tugboat 30	Kortduse	940/691	14 tons	None	None
Tugboat 31	Kortduse	940/691	14 tons	None	None
Tugboat 33	Kortduse	1770/1301	25 tons	1 monitor, water/foam	stationary, portable diesel, and electric pumps, 230 tons total

In addition to the above items:
Several portable electric motor and diesel driven marine disaster rescue pumps, each having a capacity ranging from 50 cm³/h to 350 cm³/h; and oil hydraulic emergency bilge, 1,000 m³/h in the tugboat house on the border of the canal.
Among these tugboats 10 of them are always ready to sail, in the event that more tugboats are required they will be dispatched from Brunsbüttel, Cuxhaven and Wilhelmshaven.

(3) Essen Canal (Rhein Herne Canal)

1) This canal is a major canal with a total length of 46 kilometers linking cities on North Sea side such as Dortmund and Niedersachsen, and Central Rheinland and Southern Germany. It is a lock type canal with seven sluices, and a height differential of 39 meters (Refer to Fig. 1-11)

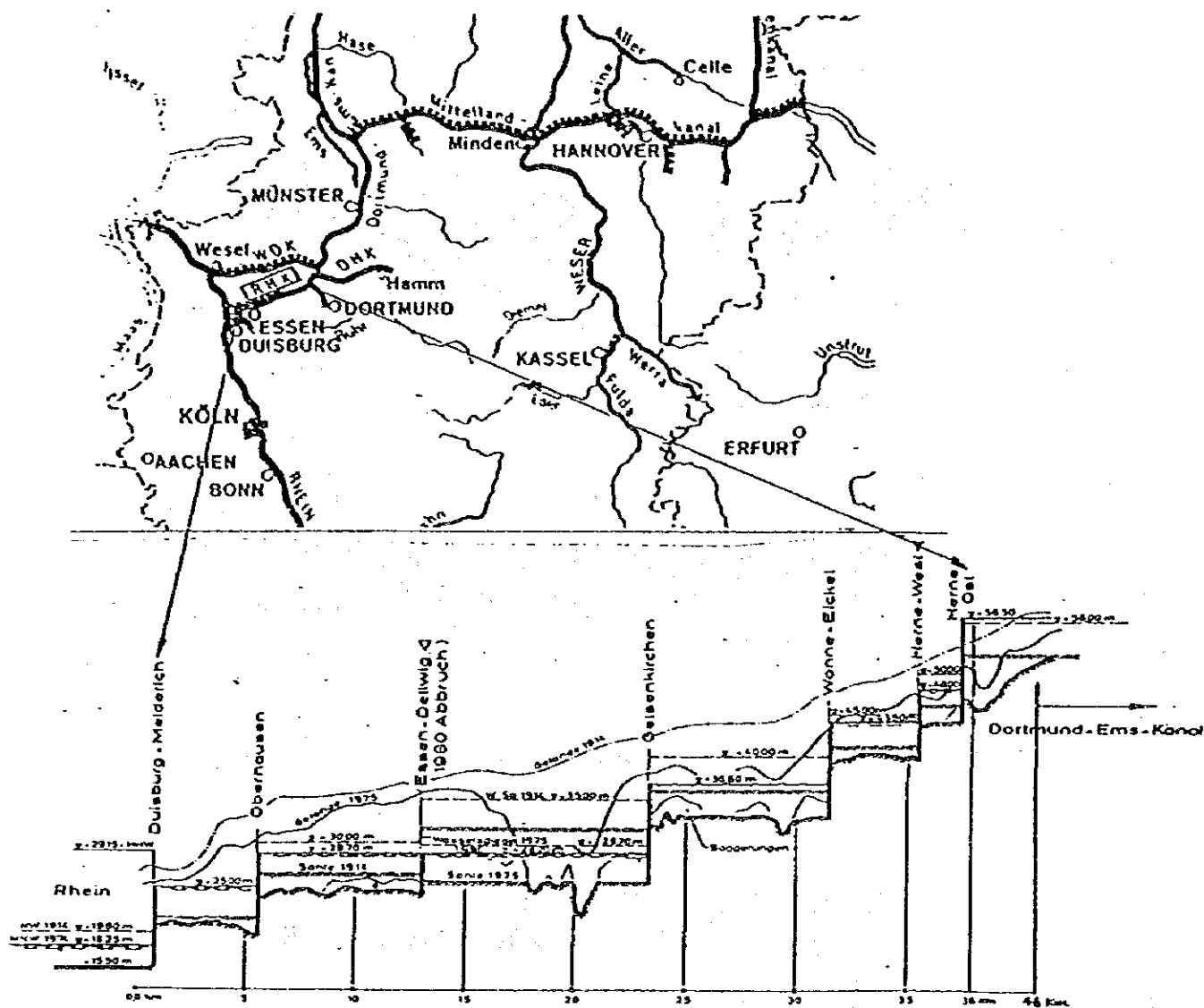
The Essen Canal is under the administration of the Federal Ministry of Communication and all works including construction of bank protection, maintenance, dredging, toll collection and traffic control are handled by the federal government.

2) A cross section of the canal is as shown in Fig. 1-12, and the canal is so designed that its area ratio will be 7.0.

Navigating vessels are assumed to be sideways coupling of two vessels (2,700 DWT) each 85 meters long, draught ~2.5 meters and 9.5 meters wide, so-called European type barges (1,350 DWT payload); occasionally double coupling (5,400 DWT) consisting of lengthwise coupling of the above sideway coupling of vessels, or triple coupling (8,100 DWT) consisting of three pairs of vessels. However, as recently European II type barges (slightly extended length and 11.4 meters wide) are now being used more extensively, modification of sluices is now being planned.

3) Annual navigating vessels number approximately 30,000 and the maximum navigating speed 10 km/h when loaded and 12 km/h in ballast.

4) Dredging work for maintenance is conducted regularly twice a year, in spring and fall.

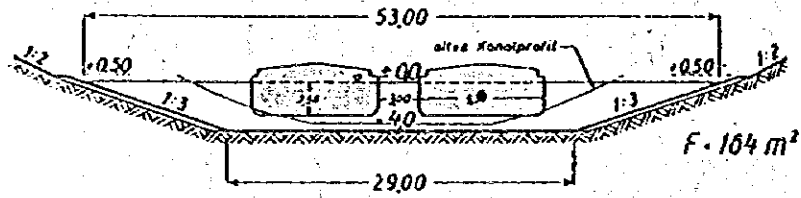


Difference of Water Level (m)

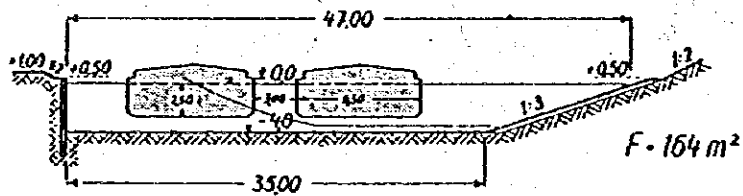
Sluices	1914	1977	1979	Planned
Duisburg-Meiderich	5.40	6.61	6.61	9.70
Oberhausen	5.00	3.70	4.10	4.10
Essen-Deilwig	5.00	1.00	—	—
Gelsenkirchen	5.00	6.90	7.40	5.50
Wanne-Eickel	5.00	7.20	7.30	9.20
Herne-West	5.00	4.40	4.40	—
Herne-Ost	6.00	8.30	8.30	12.70
Total Height Differential	36.40	38.11	38.11	41.20

Fig. 1-11 Longitudinal Section of Essen Canal

1. Slope structure type



2. One side vertical bank protection type



3. Both sides vertical bank protection type

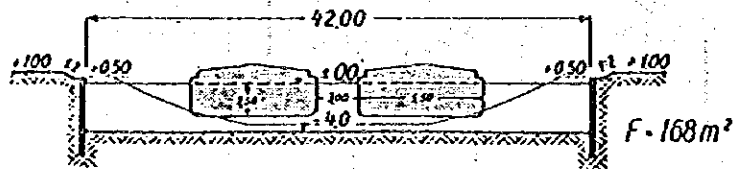


Fig. 1-12 Cross Sections of the Essen Canal

2 Canals and Channels in Netherlands

(1) Port of Rotterdam

1) Outline

The Port of Rotterdam is a river port located at the mouth of the River Rhein facing the North Sea that boasts the world largest terminal of seaborne traffic with the major industrial areas of Europe located within 500 km of the port. Blessed with this geographic advantage, the port of Rotterdam is a vital nucleus of goods distribution in Europe.

However, being a river port, the river mouth is vulnerable to siltation blocking the waterway. Thus a massive dredging operation is carried out.

The depth of the outer harbour is 24 m, and depth decreases as it goes to the deep of the port 19 m, 15 m, 13 m and then to 12 m, and those barges with low draught can proceed up to Basel, Switzerland.

The total length of the port extends 35 km, and the total number of ocean-going ships entering the port is about 30,000 a year (170 per day), and the largest ship type calling is a 275,000 DWT (draft 20.75 m) type tanker. The total cargo handling volume is about 200,000,000 tons a year.

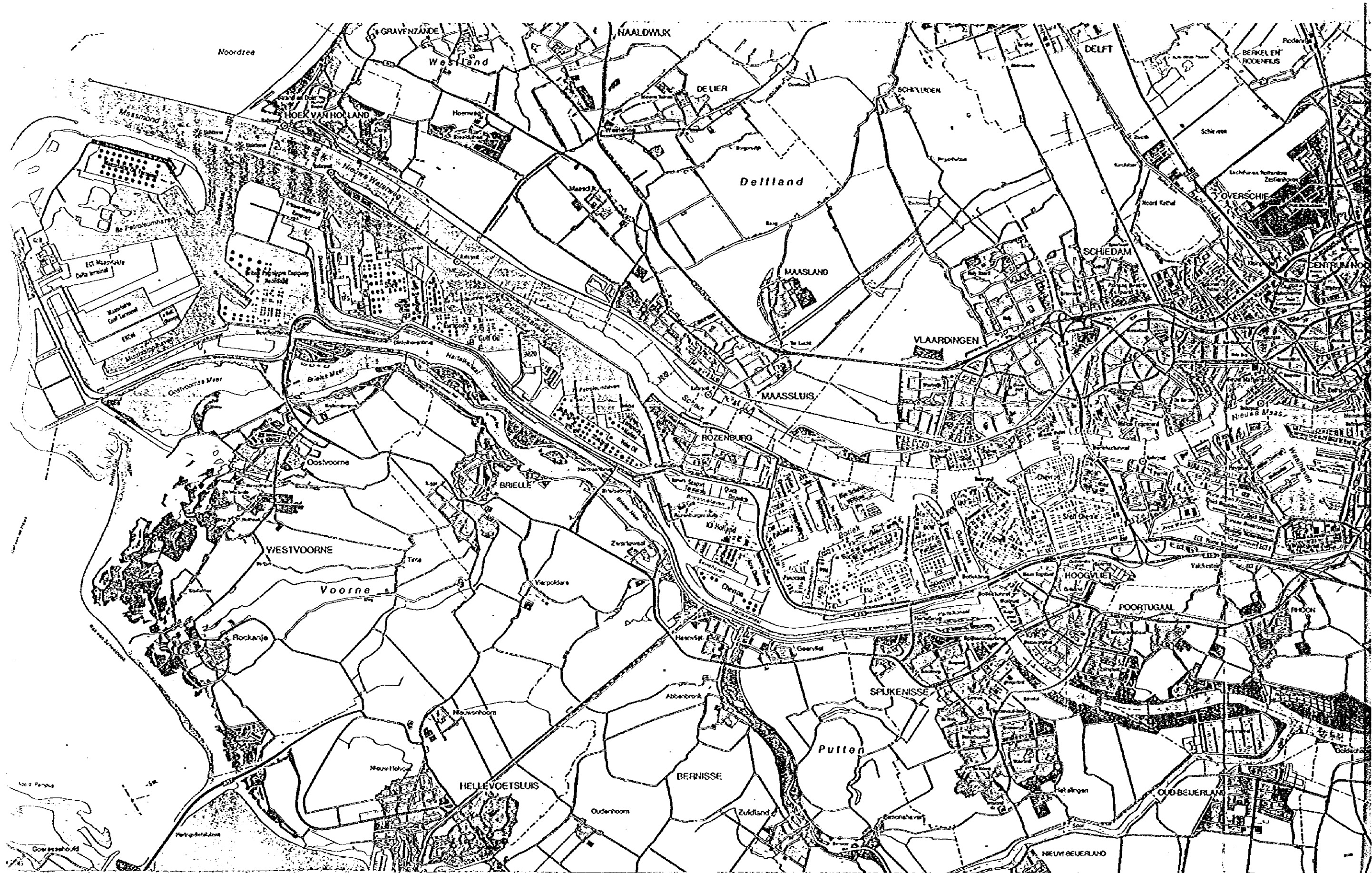


Fig. 2-1 Port of Rotterdam



Fig. 2-1 Port of Rotterdam

2) Outline of Safety Measures for Navigation

(i) Seaborne traffic controls are effected by the coordinating centre having the centralized function of traffic management system provided within the Port Authority with a total of seven radar stations within the waters of the canal and port (one radar station is located at the river mouth) covering the entire area of control.

(ii) At the centre, national and municipal employees work around-the-clock to undertake services such as reception of advance notice of entering/leaving, transmission of information to pilots on incoming/outgoing ships, communications with radar stations and CIQ, reporting seaborne traffic information including tide and current to ships, and giving detailed instructions to ships carrying dangerous goods and requesting submission of detailed reports.

(iii) Pilots are government employees. Sea pilots for pilotage services in the outer harbour are the employees of the national government, whereas docking pilots for pilotage services within the port are employees of the municipal administration. Despite the difference in their status, they are all under the control of the Coordination Centre, and in close communication with control officers stationed at the Coordination Centre and radar stations. The safety of incoming and outgoing ships is ensured by the system.

(iv) With advance notice given from ocean-going ships and inland barges carrying dangerous goods to the Hook of Holland radar station at the mouth of the river 24 hours, 4 hours and 2 hours before arrival, pilots, tugs and berths are arranged by the station.

(v) Since sailing plans are drafted through the cooperative work between the ship master and the pilot 24 hours in advance, no adjustment of the entering port time is made by either the Coordinating Centre or the radar stations.

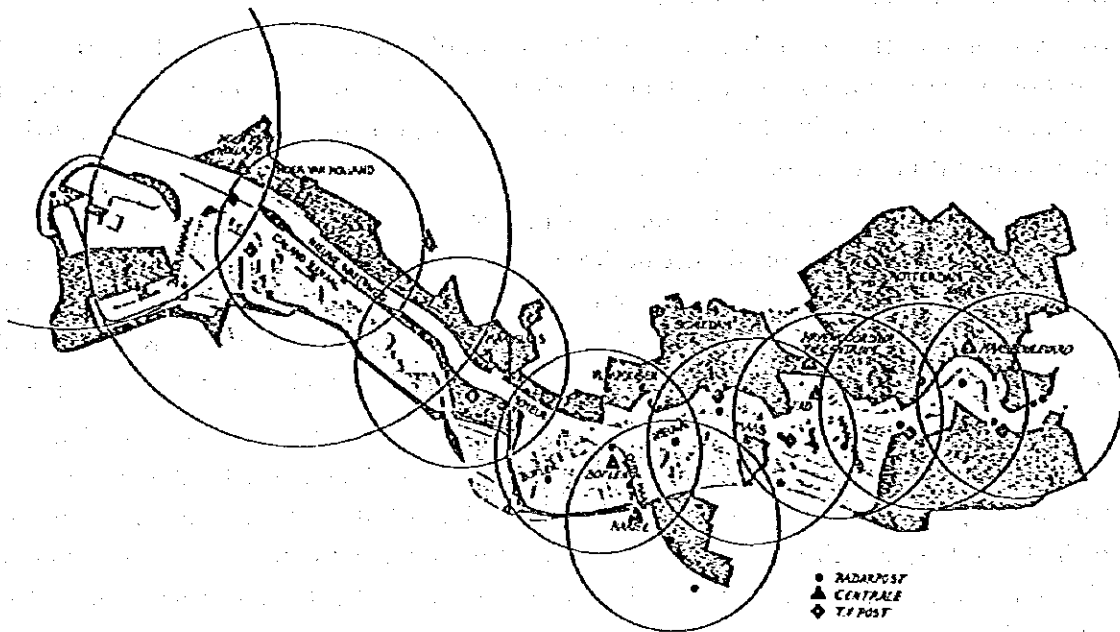


Fig. 2-2 Rotterdam Radar Chain

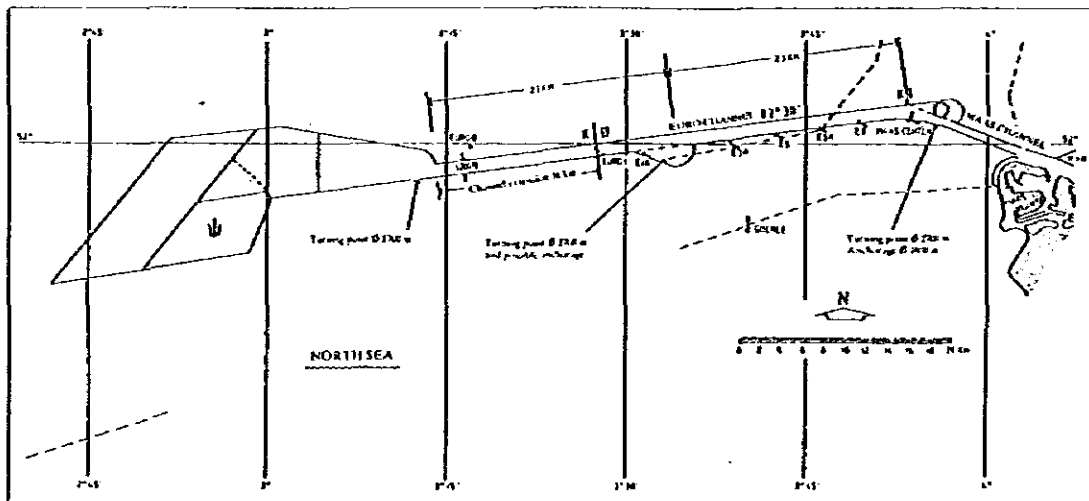


Fig. 2-3 Approach to Rotterdam

(vi) Crossing or overtaking within the harbour waters is prohibited, and those ships meeting must follow the principle of keeping the track on the starboard side.

On the radar CRTs at each radar station, the centrelines of waterways are displayed as chain lines (a piece of full line represents 50 m and a broken space represents 50 m), and when a ship enters the opposite zone by mistake, the control officer contacts the pilot on board the ship.

To avoid radio interference, different VHF channels are used for each designated area assigned to the radar station.

(vii) Control officers serving at each radar station work on an around-the-clock basis under a three-shift system (one radar unit in service at all times) and twin radars units, VHF transmitters and receivers are provided as a back up in the possible event of the failure of one service unit.

Radar is used by the control officer at night and when visibility becomes poor (visibility of 1,500 m or below), and when visibility drops below 1,500 m, traffic restrictions are imposed.

When the control officer anticipates the risk of collision or grounding of a ship, immediate notice is given to the pilot on board the ship, but no direct instructions for the manoeuvring of the ships are, as a rule, given. The duties of the control officers may be enumerated as follows:

- i) To provide information
- ii) To give advisory service to the pilots
- iii) To give instructions to a certain degree
(restrictions on passage in case of poor visibility)

(viii) The types of information given by the control officers may be listed as follows:

- i) Movements of nearby ships
- ii) Seaborne traffic condition in the vicinity
- iii) Weather conditions including wind velocity, direction and wind scale
- iv) Tides and currents
- v) Pilots arrangements
- vi) Guidance for selecting the course up to the assigned berth

Control officers do not provide regular broadcasts of information, but give information individually at the request of each ship.

(ix) There are two waiting anchorages outside the port, and the underkeel clearance in the waterway 50 km from the river mouth is strictly controlled to be 20% of the draft, 25 km, 15%, and when a ship is proceeding at a low speed within the harbour water, under-keel clearance is to be 10% of the draft. These anchorages are normally used for waiting for berths, as shelter from bad weather, and for checking dangerous goods.

(x) Compulsory pilotage requirements are specified in detail under criteria such as ship type, type of cargo and wind force, e.g., compulsory pilotage is required when wind velocity is 4.7 m/sec or more from the east, or 6 m/sec or more from the west.

(xi) The controls over dangerous goods are extremely stringent, and those ships carrying dangerous goods are required in addition to the ordinary advance notice to submit a special

report in a specified format.

Thereafter, berths are designated by the duty officer of the Coordination Centre with additional instructions on all the required safety measures and special steps, and arrangement of cargo operation. Data on those ships carrying dangerous goods which enter the port of Rotterdam are stored in a special format at the Coordination Centre, and are referred to at their next arrival in the port. In case of an accident involving any of these ships carrying dangerous goods, the stored data can be utilized for establishing effective accident prevention. Further, information on the name of the berth, time in port, time of cargo operation, type and quantity of dangerous goods of these ships, together with information relating to the special safety measures taken are open to the public to respond to the needs of the citizens.

(xii) As an effective measure to lower the probability of accidents arising from spillage of dangerous goods, a system relying on the Ship-Shore Safety Check List and Guideline has been implemented, and special formats are specified for oil tankers, chemical tankers and gas carriers respectively. The Check List is filled out by the master and authorized terminal representative, and it is made obligatory for them to express their agreement with the Work Plan in writing.

On LPG and LNG carriers, in particular, stringent regulatory controls are imposed whereby arrangement of escort ships and accident prevention arrangements for the safety of the shore installations are specified.

(xiii) The nuclear submarines of the United States are allowed to call at the port of Rotterdam, but special berths are assigned to them to ensure the safety against radiation hazards.

(xiv) An example of a major marine casualty which occurred within the water of the port of Rotterdam is as follows:

About two years ago, a tanker when proceeding within the harbour was fractured and split into two halves with 600 kilolitres of cargo oil spilled out. However, the spilled oil was quickly enveloped by oil booms and decontamination work was successfully completed.

(xv) As for the means of traffic controls within the harbour area and accident prevention, an air-cushion type high-speed patrol boat (speed 32 knots, provided with fire-fighting equipment), two fire-fighting boats, one oil sweeping boat and other vessels, 25 in total, are provided and they are functionally linked with the Vessel Traffic Management System with their areas of service properly assigned. Their services are executed under close liaisons with the control officers. In order to be well prepared for major marine accidents, an accident prevention committee has been organized by concerned members of the shipping industry for establishing effective measures to respond to accidents.

(xvi) In view of the growing deterioration of the existing vessel traffic management system due to ageing, an extensive renewal project of the system is now in progress whereby the existing radar system will be either consolidated or replaced to realize a new modern traffic control system. The new traffic control system is due to be completed in 1986. This system is based on a large scale R&D project under the following system concepts:

- i) To establish a fully workable vessel traffic control and port management system, the entire project from the very outset to the completion should be subject to down-

to-earth deliberation by all the parties concerned at all stages of progress.

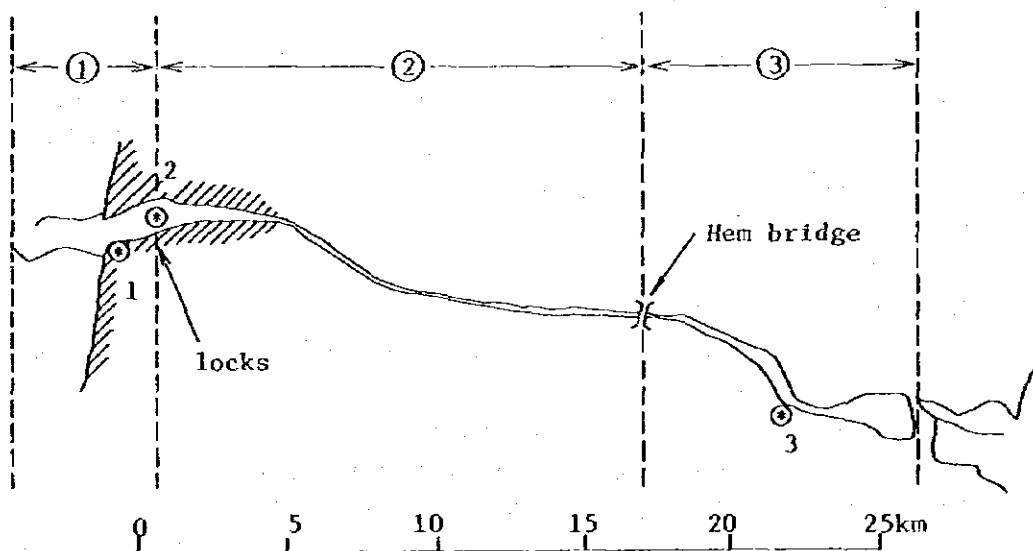
ii) All items of work for vessel traffic service including the pilotage service should be integrated.

The system will be provided in three blocks (1) Europort and areas in the vicinity of the river mouth, (2) areas of heavy industrial concentration and (3) urban areas, and a traffic control centre is provided in each such block for integration at the Coordination Centre, thus it is intended that (1) shore-based control organizations, (2) pilots, and (3) sea patrols will be integrated. At each traffic control centre, computer-aided radars, and after sophisticated electronic equipment such as ITV connecting the traffic control posts at key points within the harbour area will be provided.

(2) Port of Amsterdam and the North Sea Canal

In this report, the objective waters are divided into the following three zones for the convenience of explanation (Fig. 2-4):

- | | |
|-------------------|--|
| 1 Ijmuiden | Ijmuiden (West of the Locks) |
| 2 North Sea Canal | North Sea Canal (Locks – Hem Bridge) |
| 3 Amsterdam | Port of Amsterdam (East of Hem Bridge) |



- ⊙1: Port Operation Centre
- ⊙2: Lock radar
- ⊙3: Amsterdam Port Authority

Fig. 2-4 Three Zones

1) Outline of the Traffic Control System

No traffic controls are carried out, but the Port Operation Centre serves the following functions to ensure the safety of ship operations:

- i) Surveillance of coasting ships
- ii) Aiding pilots with navigational information for immediate use
- iii) Adjustments in traffic between Ijmuiden and the North Sea Canal

(i) Scope of Services

The scope of services is as follows:

- i) Port Operation Centre (and Locks radar)
Ijmuiden and the North Sea Canal

Radars of the Centre are designed to cover the North Sea (on the west side) up to 40 km, whereas radars provided at Lock radar stations cover up to 5 km to the side of the North Sea Canal.

- ii) Amsterdam Port Authority

In the absence of radar installations, communications are being carried out only through radiotelegraphy.

(ii) Advance Notice System

- i) To make adjustments for pilots, berths and locks, advance notice must be given 4 hours (at least 2 hours) before arrival.

- ii) For ships carrying dangerous goods, advance notice must be given one day before the day of departure/arrival, and depending on the type of dangerous goods, such notice must be given 24 hours before entering the territorial waters of the Netherlands.

(iii) Priority order for traffic time adjustment

1st priority Naval craft

2nd priority Public ships

3rd priority Liners

(Liners connecting the Netherlands, Belgium, UK, Norway and Sweden)

4th priority Liner mail and passenger ships

(Those connecting ports outside Europe)

5th priority Ships carrying perishable vegetables and fish

Ships carrying dangerous goods and inflammable goods are required to pass the locks alone.



Fig. 2-5 North Sea Canal and Port of Amsterdam

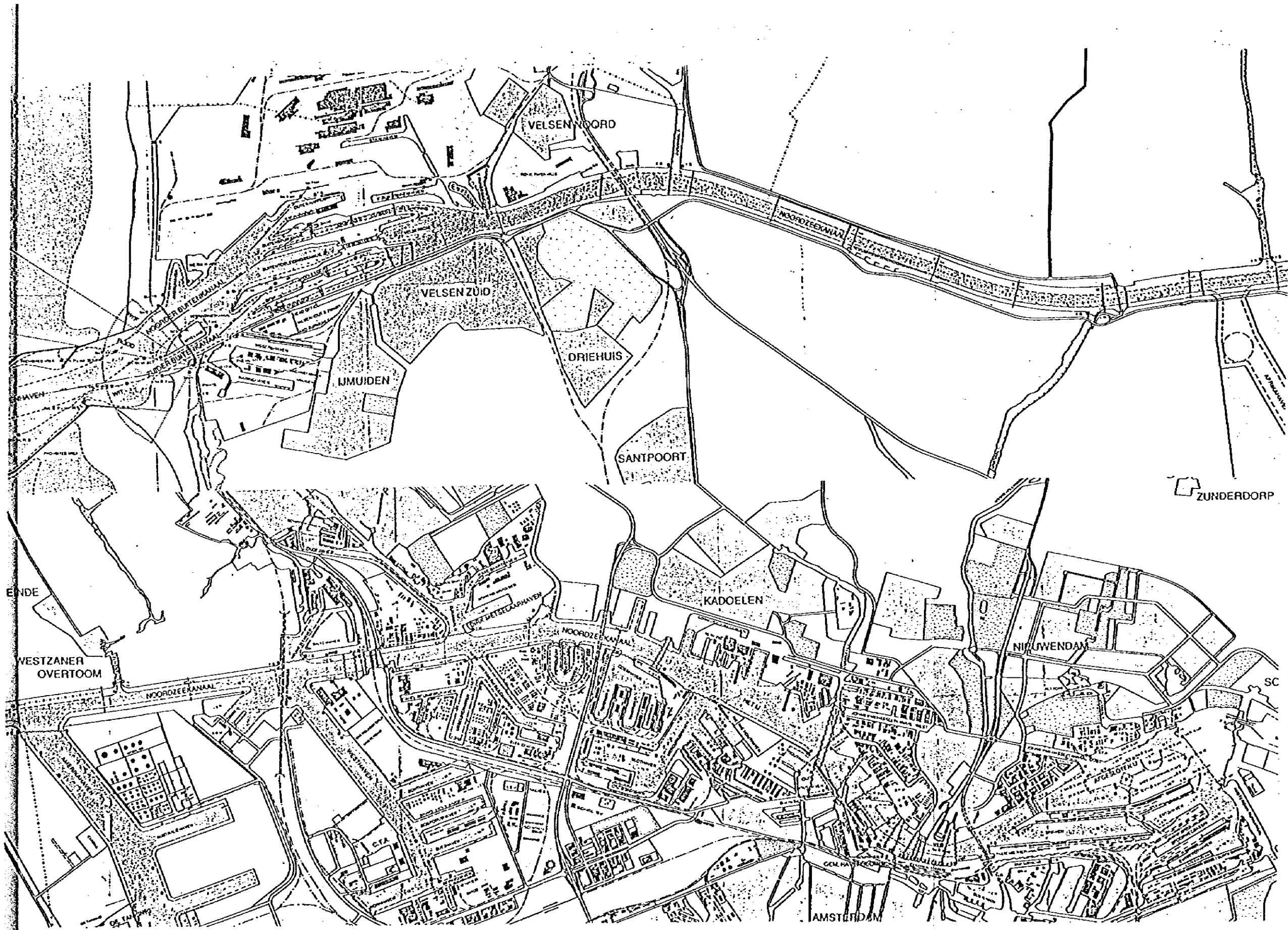


Fig. 2-5 North Sea Canal and Port of Amsterdam

(iv) Speed Restrictions

i) North Sea Canal

(a) Restriction by draft

up to a draft of 4.5 m	275 m/min approx. 8.9 kt or less
draft 4.5 to 8 m	225 m/min approx. 7.3 kt or less
draft over 8 m	200 m/min approx. 6.5 kt or less

(b) Towed ships 150 m/min approx. 4.9 kt or less

(c) When damage due to backwash is anticipated

Speed as considered reasonable

ii) Amsterdam

(a) Restrictions by draft

up to a draft of 5.0 m	250 m/min approx. 8.1 kt or less
draft 5.0 to 6.5 m	200 m/min approx. 7.3 kt or less
draft over 6.5 m	175 m/min approx. 5.7 kt or less

(b) When damage due to backwash is anticipated

Speed as considered reasonable

iii) Restrictions on minimum speed

(a) In flood tide

Ships bound for South pierhead 6 knots or more

(b) In ebb tide

Ships bound for North pierhead 6 knots or more

(v) Pilots

Ships exempted from compulsory pilotage requirements are as follows:

i) Ships with draft not exceeding 2.2 m

ii) Naval craft

iii) Yachts and other craft belong to Navy

iv) Pilot boats and buoy tenders

v) Foreign pilot boats and buoy tenders covered under the principle of mutual reciprocity

vi) Fishing boats and customs boats hired by the Department of Waterways and Public Works

vii) Training ships of the Netherlands

viii) Rescue boats and ambulance boats

ix) Craft belong to rowing clubs, sailing clubs and yachting clubs

x) Cable-laying ships of the Netherlands

xi) Cable-laying ships of foreign registry engaged in cable-laying operations

xii) Ships exclusively engaged in towing and salvaging services

(vi) Maintenance of Communications with Control Officers

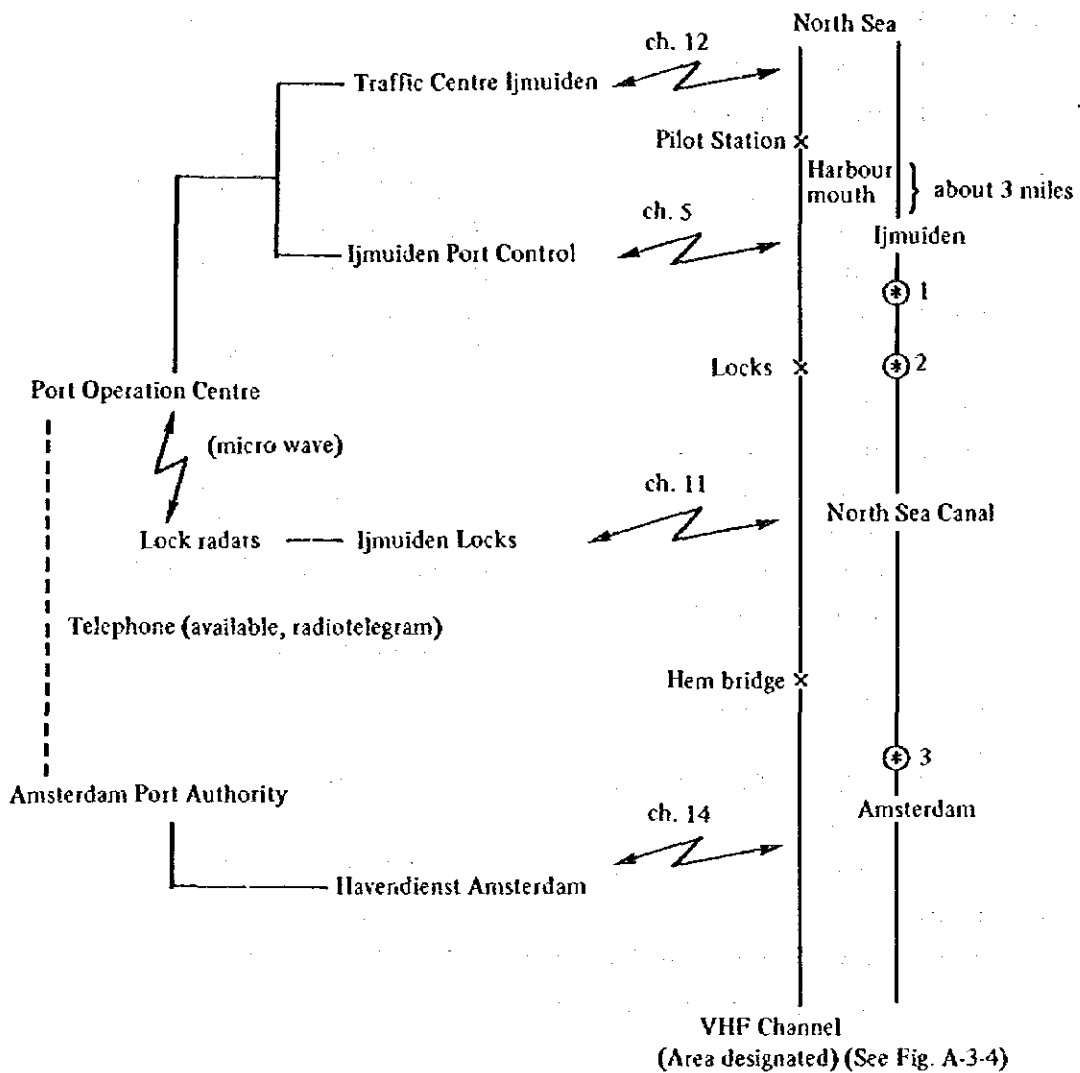


Fig. 2-6 Maintenance of Communications (Normal Case)

i) Normal Case (See Fig. 2-6)

(a) Incoming Ships

a) During the passage up to the pilot station, communications are maintained with Traffic Centre Ijmuiden within the Port Operation Centre through Channel 12. (Communication must be initiated as soon as the ship enters the area of radio coverage.)

Items of information to be transmitted by ships:

Ship's name

Estimated time of arrival

Drafts

Necessity of pilotage service

Other items as considered necessary

Items of information to be verified by Traffic Centre Ijmuiden:

- Ship's name
- Ship's position
- Other items as considered necessary

- b) During the passage from the pilot station to the locks, communications are maintained with the Ijmuiden Port Control within the Port Operation Centre through Channel 5. (Communications must be initiated when the pilot comes on board, or when no pilot is employed, from the time when the pilot station is passed.)

Items of information to be transmitted by ships:

- Ship's name
- Time when the pilot came on board (when no pilot is employed, change to channel 11)

Items of information to be verified by Ijmuiden Port Control:

- Ship's name
- Ship's position
- Lock No.
- Berth
- Other items relating to the traffic within the port of Ijmuiden

- c) During the passage from the locks to Hem Bridge, communications are maintained with the Ijmuiden Locks within the Locks radar station through Channel 11.

(Communications must be initiated when the vessel is moored within the locks.)

Item of information to be transmitted by ships:

- Ship's name
- Ship's position
- Change to channel 14.

Items of information to be verified by Ijmuiden Locks:

- Ship's name
- Items relating to traffic within the North Sea Canal

- d) During the passage from the Hem Bridge to Amsterdam, communications are maintained with Havendienst Amsterdam within the Amsterdam Port Authority through Channel 14.

(Communications must be initiated when the vessel passes Hem Bridge.)

Items of information to be transmitted by ships:

- Ship's name
- Mooring time

Items of information to be verified by Havendienst Amsterdam:

- Ship's name
- Items relating to traffic within the waters concerned

- (b) Outgoing Ships

a) During the passage from Amsterdam to Hem Bridge, communications are maintained with Havendienst Amsterdam through Channel 14.

(Communications must be initiated before departure.)

Items of information to be transmitted by ships:

Ship's name

Departure time

Drafts

Change to channel 11.

Items of information to be verified by Havendienst Amsterdam:

Ship's name

Matters relating to traffic conditions

b) During the passage from Hem Bridge to the locks, communications are maintained with the Ijmuiden Locks through Channel 11.

(Communications must be initiated on passing Hem Bridge.)

Items of information to be transmitted by ships:

Ship's name

Ship's position

Drafts

Change to channel 5.

Items of information to be verified by Ijmuiden Locks:

Ship's name

Matters related to traffic conditions

Estimated time of entering the Lock

Lock No.

c) During the passage from the locks to the pilot station, communications are maintained with the Ijmuiden Port Control through Channel 5.

(Communications must be initiated immediately before leaving the lock.)

Items of information to be transmitted by ships:

Ship's name

Disembarkation of the pilot

Change to channel 12.

Items of information to be verified by Ijmuiden Port Control:

Ship's name

Matters relating to the traffic conditions

d) From the pilot station, communications are maintained with Traffic Centre Ijmuiden through Channel 12.

(Communications must be initiated when the pilot disembarks, or when the vessel passes the pilot station.)

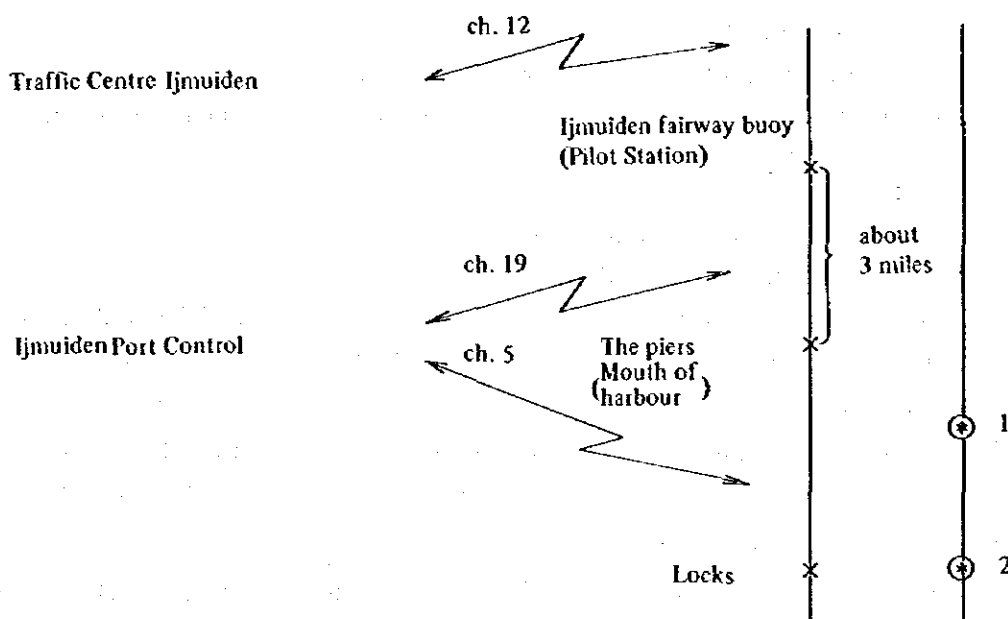


Fig. 2-7 Maintenance of Communications (Poor Visibility)

ii) In Case of Poor Visibility (See Fig. 2-6 and Fig. 2-7)

When visibility worsens due to fog, the volume of communications for providing radar information to ships increases, and the area covered by Ijmuiden Port Control is divided into the outer water and the inner water of the breakwater.

Ships in the outer water communicate through channel 19, whereas other ships in the inner water communicate through channel 5 with the Ijmuiden Port Control.

Also, when visibility is poor, ships proceeding relying solely on radar are subject to listening obligation for radiotelephone messages as follows:

- Passage between harbour mouth and locks: Channel 5
- Passage between locks and Hem Bridge: Channel 11
- Passage on the east side of Hem Bridge: Channel 14
- Regulations: Ministerial Order on Vessels with Radar

iii) In the case of the following ships, they are not included in the automatic information processing system and necessary measures are taken as required.

(a) Inland shipping

a) Masters are requested to have their men assume the duty of listening information at all times by setting the channel of the VHF receiver according to the designated channel number for the specific area of water so that communications with the Traffic Centre and other ships is available whenever necessity arises.

b) Inland vessels entering a specific area of water must give the following information to the Traffic Centre of such area:

- Ship's name
- Ship's position

Destination

Other items of information considered necessary

c) The Traffic Centre verifies the call of the inland vessels and provides necessary information.

(b) Fishing Vessels

The same as in the case of inland vessels.

(c) All other Traffic including Recreation Boats

All of these boats are subject to obligatory listening to VHF radiotelephone information by setting the designated channel number.

(vii) Restrictions on Passage

Excluding ships carrying dangerous goods, the established principle is "first come, first go." Note, however, that there are several restrictions on passage as given below:

i) Pilotage is sometimes compulsory.

ii) Permission by the Government Harbour Master is necessary for anchorages outside the port of IJmuiden and within the waters of the North Sea Canal.

iii) In the North Sea Canal

(a) Ships with a draft in seawater exceeding 45 feet (13.7 meters) are requested to obtain permission in writing by submitting prior application to the Government Harbour Master.

(b) For ships proceeding to the locks, the Head Lock-master gives permission on obtaining approval from the Government Harbour Master.

(c) Maximum speed is restricted according to the draft of the vessel.

(d) Ships with a draft of 8 meters or more must fly the international code flag "P" in daytime, and three red lights posted in a vertical line at night.

(e) Any stowage involving on-deck cargo protruding beyond the ship side is prohibited.

iv) Maximum speed is restricted according to the draft of the ship within the port of Amsterdam.

(viii) Providing Information Necessary for the Safety of Ships' Passage

i) Under Gale Warnings, the following information is provided:

(a) Radiotelegram Transmitted by 461 kHz at time of issuance of the warning and after a silence for the following period (subsequent to calling attention at 500 kHz).

(b) Radiotelephone Transmitted by 1,862, 1,939 and 2,600 kHz in the same manner as above (subsequent to calling attention at 2,182 kHz).

(c) Radio telex Transmitted by 518 kHz (Mode FEC) at time of issuance of the warning and at the following GMT:
0348 – 0748 – 1148 – 1548 – 1948 – 2348 (all only when necessary)

ii) Navigational Warnings

- (a) Radiotelegram Transmitted by 461 kHz at the following GMT:
0018 – 0418 – 0818 – 1218 – 1618 – 2018 (subsequent
to calling attention at 500 kHz.)
- (b) Radiotelephone Transmitted by 1,862, 1,939 and 2,600 kHz at the follow-
ing GMT:
0333 – 0733 – 1133 – 1533 – 1933 – 2333 (subsequent
to calling attention at 2,182 kHz.).
- (c) Radio telex The same as in the case of gale warnings.
- iii) Pilot Services and Termination of Decca-transmissions
 - (a) Radiotelegram The same as in the case of navigational warnings
 - (b) Radiotelephone The same as in the case of navigational warnings
 - (c) Radio telex The same as in the case of gale warnings.
- iv) Ice Warnings

2) Safety Measures for Dangerous Goods

(i) General Controls over Dangerous Goods

- i) On all items of dangerous goods specified in the IMDG Code of IMO, a notice stating the amount of dangerous goods, quantity of cargo operation and scheduled berth must be submitted to the Government Harbour Master and Harbour Master of the Port of Amsterdam on the day before arrival in IJmuiden in the case of ships entering the port, and on the day before departure from Amsterdam in the case of ships leaving the port.
- ii) In the case where Class 1 dangerous goods and goods specified in 5.2, and other items of dangerous goods exceeding 1,000 kg of the IMDG Code are carried, the master of such a ship must give a notice stating the following items to the Commandant of the Corps of Controllers of Dangerous Goods and the Authorities controlling the berth 24 hours before entering the territorial waters of the Netherlands:
 - (a) Ship's name, signal letters, flag, ship's length and draft, the name of agent in the port of destination, port of destination, waiting area and berth
 - (b) Name and class of dangerous goods, UN No. or page of IMDG Code, quantity, method of package, number of cases, storage method, possibility of transshipment, name and address of consignee, method of subsequent shipment, place of transshipment and time.
 - (c) Overheating or fire of the cargo or suspicion of overheating
 - (d) Damage to the ship or cargo
 - (e) Estimated time of departure
- iii) Ships bound for Amsterdam, except those carrying Class 1 dangerous goods, may be permitted to address the report only to the Harbour Master of Amsterdam.
- iv) Ships calling at ports other than the port of Amsterdam
 - A notice must be given directly to the Government Harbour Master one day before passage through the North Sea Canal.

(ii) Explosives

i) Carriage of explosives up to the following quantities is permitted:

Class 1

Dangerous Groups 1.1, 1.2 and 1.5	125 kg
Dangerous Groups 1.3 and 1.4	500 kg
Dangerous Group 1.4S	1,000 kg
Dangerous Groups 1.4S/UN 0012 and 0014, 0055 and 0105	300,000 kg

ii) As exceptions to the above, carriage of explosives from the outer water to the point of transshipment of dangerous goods located in the vicinity of Buitenhuisen may be permitted up to the following quantities:

Class 1

Dangerous Groups 1.1 and 1.5	30,000 kg
Dangerous Groups 1.2 and 1.3	120,000 kg
Dangerous Group 1.4	Unrestricted

iii) Ships carrying dangerous goods in quantities exceeding those specified above, must stay at the point of transshipment of dangerous goods except when waiting to enter the locks.

iv) Supervisions by the Corps of Controllers of Dangerous Goods is required for cargo operation and transshipment of dangerous goods. No such supervision is required up to the following quantities:

Class 1

Dangerous Groups 1.1, 1.2 and 1.5	125 kg
Dangerous Groups 1.3 and 1.4	500 kg
Dangerous Group 1.4S	1,000 kg
Dangerous Group 1.4S/UN 0012, 0014 and 0055	2,500 kg

In each of these cases, application for permission or report must be submitted to the Commandant of the Corps of Controllers Dangerous Goods.

For anchoring and cargo operation at Buitenhuisen, permission from the Government Harbour Master is required.

v) No permission is given for handling explosives in the period between sunset and sunrise.

(iii) Preventive measures to be taken on board ships (March, 1980 issue of the Netherland Government Gazette)

Ocean-going vessels carrying explosives or dangerous goods shall observe the following precautions:

- i) Sufficient and adequate fire-fighting equipment and installations
- ii) Arresting means of sparks from motors, boilers, stoves, etc.
- iii) Supervision by the responsible personnel of the boiler, stoves, etc.
- iv) Dangerous work such as welding shall be subject to permission from the Harbour Master.

- v) Smoking may be permitted only in the designated places.
- vi) The following requirements must be observed for the crew members, installations and power supply.
 - (a) No ship officers under the effects of alcohol or narcotics shall be employed in the handling of explosives and dangerous goods.
 - (b) When the vessel is at the berth, it shall be ensured that immediate embarkation/disembarkation is possible.
 - (c) The compartments in which explosives or dangerous goods are stored, shall not be opened whilst the vessel is proceeding in the harbour waters or laying alongside berth in the port of Amsterdam.
- (iv) Combination ships
 (All ships fit to carry dry cargo and liquid cargo in bulk)
 General Rules applicable to oil tankers shall apply by considering these as similar to oil tankers.
- (v) Carriage of gases by tankers
 - i) Permission from the Minister of Transport and Public Works is necessary.
 - ii) The required conditions and rules are specified on the permit.
 There are the following exceptions:
 - (a) When ethylene oxide of 5,000 m³ or less is carried by vessels provided with a tank with a maximum capacity not exceeding 1,000 m³.
 - (b) When acetaldehyde, ammonia, ethylchloride and methyl chloride of 7,500 m³ or less are carried by vessels provided with a tank with a maximum capacity not exceeding 1,500 m³.
 - (c) When butane, butane/propane mixtures of 15,000 m³ or less are carried by vessels provided with a tank with a maximum capacity not exceeding 3,000 m³.
 (There are many examples.)
 - (d) When dichlorodifluoromethane and others are carried.
 (No restrictions are imposed.)
 As for the construction of tankers, a Certificate of Compliance issued by a competent authority shall be kept on board the vessel to prove that the requirements of the IMO Liquefied Gas Carrier Code have been satisfied.
- (vi) Emergency Towing Wires
 Emergency towing wires of sufficient length and strength shall be arranged so that one end of the wire comes awash with the water surface.
- (vii) Gas-freeing
 - i) The criterion for gas-freeing is 20% Lower Explosive Limit (LEL).
 - ii) Inerting shall be carried out in such a manner that the following requirements are met:
 - Oxygen content not exceeding 5% (vol)
 - Inflammable vapours not exceeding 2% (vol)

3) Outline of the Accident Prevention System

(i) Tugboats

2,400 HP	4 vessels
1,500 HP	4 vessels
600 HP	5 vessels

(ii) Fire boats

Governmental agencies	2,000 litres foam 13 knots, 16,000 litres/min	3 vessels
Private organizations		4 vessels

(iii) Oil-collecting services

Oil collecting boats		6 boats
Oil boom stretchers	Port Authority	5 boats
	Private	6 boats
Oil collecting equipment	Private	4 units
Oil booms	Port Authority	360 m
	Cleaning contractors	100 m
	Terminal	200 m
Oil dispersants	Port Authority	2 x 1,700 litres
	Cleaning contractors	5,000 litres
	Terminal	10,000 litres
Oil dispersant spraying boats	Port Authority	2 boats
	Cleaning contractors	6 boats

(iv) Organization for decontamination work

This work is undertaken by private organizations whereby decontamination services meeting the requirements of the Port Authorities are being effected.

(v) Communications: VHF

(vi) Fire-fighting

Fire-fighting operations are carried out under the direction of autonomous bodies, and when ships are involved, coordination with the Port Authority is made.

(vii) Decontamination work

Decontamination work is under the direction of the Port Authority with the participation of private organizations.

4) Others (According to the Port Authority)

(i) Outline of the Port Operation Centre

j) Basic systems provided are as follows:

- Radar heads and radar display facilities
- Radar heads and radar display facilities in the vicinity of the locks
- Information processing and delivery systems (IPDS)
- Communications facilities

ii) Information from incoming ships

In normal cases, the first information is obtained through local agents three or four days before arrival.

iii) Operators

(a) Operators having sea-going experience on board ocean-going vessels holding a master's license are subjected to 6-month long on-site training before employment.

(b) There are plans to implement a 6-month long simulation and other training at the Laboratory of Wageningen starting from 1985.

(c) From now on, those who have taken a 9-week long special training at the nautical schools are subjected to a 1-year long practical training before employment.

iv) Watch system

(a) 3-shift system with two watchkeeping personnel

(b) One of the two undertakes communications with the Port Traffic Control, whereas the other undertakes Pilot Services.

(ii) Pilots

i) State servants (Expected to be transferred to the private sector from June, 1985)

ii) Those qualified as masters before age 30 having sea-going experience as watch officers for a period exceeding 4 years.

(iii) Dimensions of the port of Amsterdam and canals

i) Mouth of the port of IJmuiden

width 400 m, depth 15.0 m

(length of breakwater 700 m)

ii) Waterway to the Middle Lock

width 65 m, depth 10.5 m

iii) Waterway to the South Lock

width 43 m, depth 7.5 m

iv) Waterway to the North Lock

width 110 m, depth 15.0 m

v) Waterway to the North Sea Canal

width 170 m, depth 15.0 m

(at Hem Bridge width 55 m x 2, height of high tension cables 37.2 m)

vi) Canal to the South Lock

depth 6.4 m

vii) North Lock

width 50 m, depth 15.0 m

viii) Middle Lock

width 25 m, depth 10.12 m

ix) South Lock

width 18 m, depth 8.00 m

width 12 m, depth 5.24 m

(iv) Maximum ship size that the port can accommodate

(a) In ballast 250,000 DWT 330 m (L) x 48 m (B)

(b) Loaded 80,000 DWT

(v) Control of Dangerous Goods

The municipal port authority is responsible for the control of dangerous goods, including segregation and stowage, certificates, governmental permissions and exemptions etc. concerning permits for entering the port of Amsterdam.

(vi) Record of Entering Ships

No nuclear ships or LNG-carriers.

(unit: vessels)

	1980	1981	1982
LPG carriers	17	40	26
Crude carriers	8	6	7
Other oil carriers	396	439	581
Chemical tankers	17	41	28
General cargo ships loaded dangerous goods	546	541	475
	984	1,067	1,117

Number of Ships by gross tonnages (for all ships)

(unit: vessels)

	1980	1981	1982
0 ~ 1,000	1,382	1,280	1,843
1,000 ~ 10,000	1,959	1,786	1,295
10,000 ~ 90,000	995	994	891
	4,336	4,060	4,029

(3) Port of Delfzijl, port of Eemshaven and Eems River Waterway

1) Location (See Fig. 2-8)

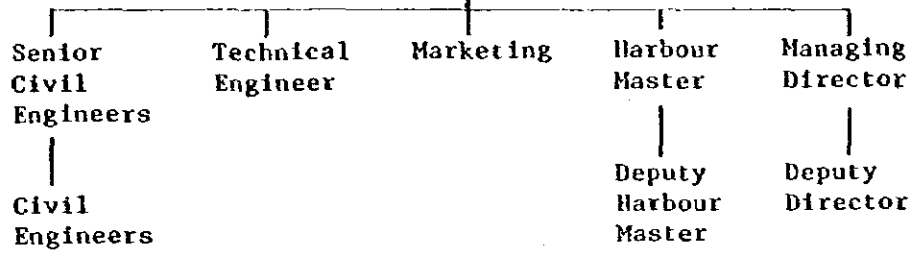
Both Delfzijl and Eemshaven are located at the mouth of the River Eems in the northern part of the Netherlands.

2) Safety Measures

(i) Control Organization

The Port of Delfzijl Authority controls the port of Delfzijl and the port of Eemshaven under the following organization. It is understood that safe navigation, safe maintenance and encouragement of industry are its major tasks.

Executive Board



URUZEKI

4°N)

10 15

JNDINGSIN

of 10 meter

HEIGHTS IN METERS

above mean sea level

Keijl zijn geen bouwen,

re geven getuigend.

In contour duve, beacons

is Aan been omitted.

Dyed fairways)

Sailed fairways marked by stakes

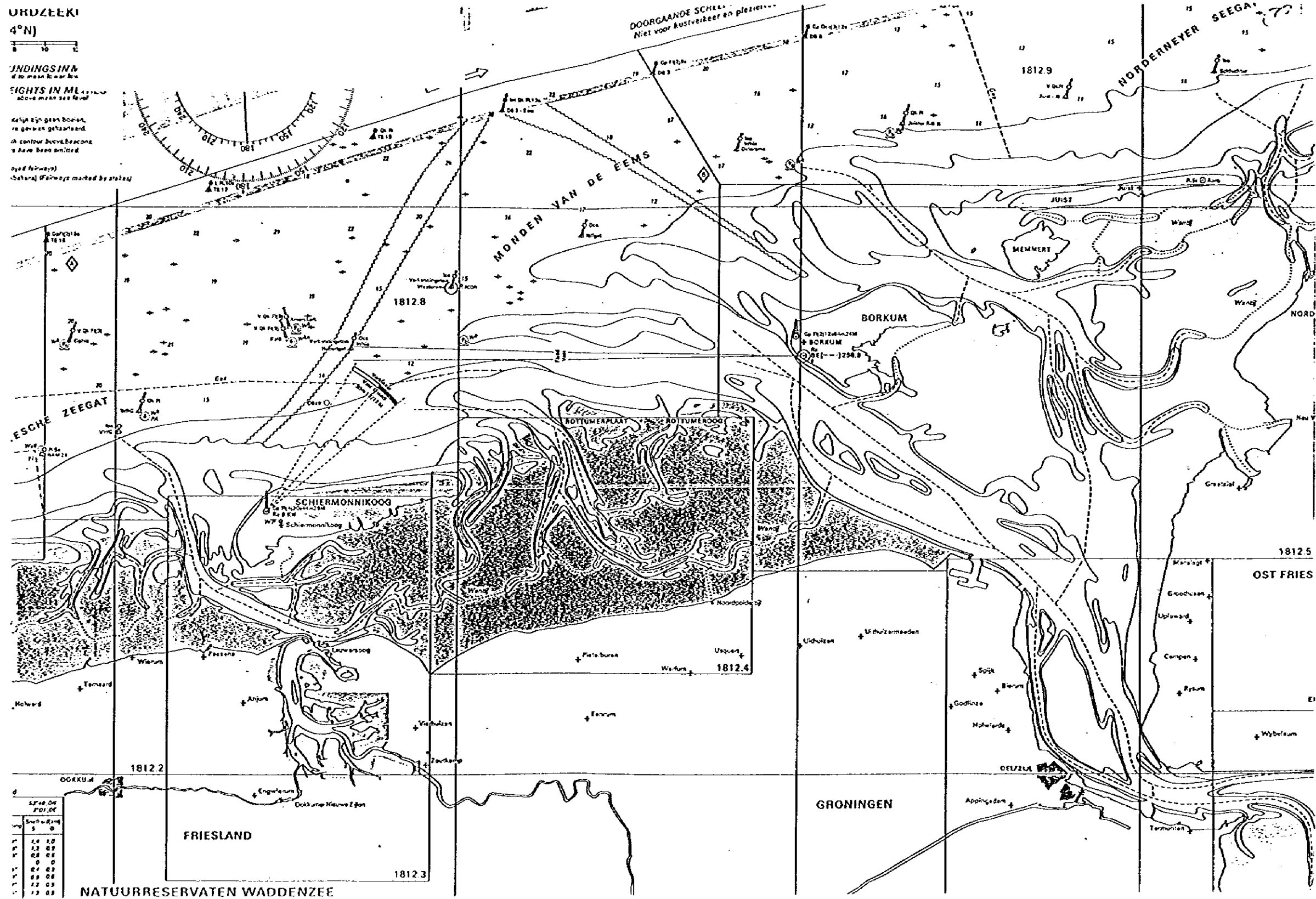


Fig. 2-8 Approach to Port of Delfzijl and Eemshaven

(ii) Maintenance of Waterways

There is a 32-mile long waterway from the pilot station of the fairway buoy of Westereems to the port of Delfzijl via Ranselgat, Dostriese and Gaatje where ships with a draft of 8.70 meters can proceed while maintaining one metre under-keep clearance. For the passage from the pilot station to the port of Eemshaven, there are two waterways; one via Ranselgat and another via Huibertgat and Oude Westereems, measuring 22 miles and 25 miles respectively. The waterway via Ranselgat enables ships with a draft of 11.00 m while maintaining 1.2 m under-keel clearance to proceed, whereas the waterway via Huibertgat is exclusively for the passage of small craft.

These waterways freeze in winter (January/February). For avoiding undue drifting or damage, buoys are removed every year before the waterways freeze, and are reinstalled after thawing.

The port of Eemshaven has been selected by the Government of the Netherlands to serve as the first national port to import liquefied natural gas. Although there was a plan to dredge the port to about 15.50 m to enable LNG carriers with a draft of 13.50 m to navigate in this area by the year 1984, the plan was suspended.

(iii) Radar Chain

Along the waterways of the River Eems, radar stations are provided at three places in West Germany: Borkum, Knock and Wybelsum, and at one place, Oude Schip, in the Netherlands whereby information necessary for safe navigation is provided (with the master station located in West Germany) to masters and pilots in ships proceeding through the waterways on request as detailed in the following table. These are international waterways where the requirements of the International Convention for Preventing Collisions at Sea govern as the sailing rules, and no other specific rules are provided, and thus a vessel traffic control system has not been introduced in these areas. However, in winter, light buoys become unidentifiable, thus radio piloting using the existing system significantly contributes to the enhancement of safety. For example, the entering/leaving port manoeuvres of the "AIKO MARU" were reportedly greatly assisted by the system.

Station	Area	VHF CH
Borkum	River Eems from Wester Eems buoys 1/2 or Huibertgat buoys H1/H2 to buoys 34/35	18
Knock	River Eems from buoys 34/35 to entrance of the port of Delfzijl buoys 56/57	21
Wybelsum	River Eems from buoys 56/57 to entrance of the port of Emden	23
Eemshaven	River Eems from buoy 31 or buoy 35 to a berth in the port of Eemshaven	4

(iv) Pilotage

Pilotage is compulsory for all sea-going ships calling at the port of Delfzijl and the port of Eemshaven.

Note, however, that there are few exceptions for ships in ballast with a draft of 2.20 m or less.

For the passage between the port of Delfzijl and the port of Eemshaven, pilotage is not compulsory.

Normally, German ships are served by German pilots, whereas ships of the Netherlands are served by those of the Netherlands.

The organizations of West German pilots is a private enterprise, but the pilots of the Netherlands belong to the Ministry of Transport and are therefore government employees. However, the pilots' organization of the Netherlands will be converted into a private organization from the year 1985 for financial reasons.

Communications among the pilot office, pilot boats, pilots, Port Authorities, Harbour Master and ships are effected by means of VHF radiotelephony.

In liaisons between pilot boats and ships, wireless communications at a frequency of 2,182 kHz or 2,391 kHz are also available.

(v) Port Radio Service

Each port office and pilot office of the port of Delfzijl and the port of Eemshaven are provided with VHF available 24 hours a day through channel 14 for receiving information or exchanges of information.

(vi) Port Facilities and Tugs

i) Port of Delfzijl

The port of Delfzijl consists of an outer harbour and an inner harbour.

The width of the breakwater entrance is 400 m on the sea surface, whereas the bottom width at a depth of 10.00 m is 208 m.

At a point about 600 m west of the entrance, there is a swinging circle with a diameter of 400 m, and depth of 10.00 m.

The navigable width progressively narrows down from a depth of 10.00 m which is approximately 100 m and at the point of Akzo Bulk Salt Terminal, it narrows further to 80 m.

(a) Private berths

Name of Berth	Water Depth (m)	Max. Ship Length (m)	Permissible Draft (m)
Aldel Jetty	12	200	9.00
MCN Jetty	10	200	—
Akzo Bulk Salt Terminal	12	135	9.00
Alcohol Factory Jetty	12	200	9.00
Quay Wagenborg Terminal B.V.	7	110	—

- (b) **Handelshaven**
 Depth 11 m
 Maximum ship length 505 m
 Permissible draft 8.25 m
- (c) **Bulkenhaven**
 Mooring buoys
 Depth 8.50 ~ 5.50 m
 Span 140, 165 and 130 m
- (d) **Damsterhaven**
 Depth 6.5 m
 Maximum ship length 148 m
- (e) **Sea Locks**
 Western Lock 123 m x 7 m x 2.4 m (depth)
 Eastern Lock 120 m x 16 m x 5.45 m (depth)
 The Locks and Eems canals are under the control of the Province of Groningen.
 The Eems Canals are navigable for ships up to 1,350 tons, but the reality is that inland barges comprise as much as 90% of the transiting ships.
- (f) **Farmsumerhaven**
 Depth 3.88 m
 Maximum ship Length 150 m
 Permissible draft 3.8 m
- (g) **Oosterbarnhaven**
 Depth 5.12 m
 Maximum ship length 75 m
 Permissible draft 4.5 m
- ii) **Port of Eemshaven**
 Eemshaven is a new port constructed in 1974 and encompasses an industrial area of approximately 600 hectares which are under the control of the Port Authority.
 The harbour area consists of a central channel, Doekegatkanaal and 3 basins, viz. Wilhelminahaven, Emmahaven and Julianahaven.
- (a) **Doekegatkanaal**
 The width of the mouth is 325 m with a length of 2,100 m.
 The width at its narrowest point is 275 m and the depth is 12 m.
 The south end forms a swing basin with a diameter of 500 m and a depth is 15 to 17 m.
- (b) **Wilhelmhaven**
 The bottom width is 200 m, length, 600 m, and depth, 15 to 17 m.
 This is mainly used for the shipment of petroleum and chemicals.
- (c) **Julianahaven**
 Width 700 m Length 1,200 m
 The bottom width at a depth of 14 to 17 m is 200 m.
 Provided on the south is a multi-purpose pier with a length of 600 m and a width of 250 to 300 m.

At the basin of Wilhelmhaven, the "AIKO MARU" of Japan, a ULCC of 410,000 DWT, has been laid up for an extended period.

iii) Tugs

Four tugs as given in the table are provided for services in these two ports.

WATERPOORT 800HP

Callsign PIMY V M Rt E FF P (350) Rd

WATERMAN 800HP

Callsign PIMW V M Rt E FF P (350) Rd

WATERGEUS 950HP

Callsign PIMR V M E FF P (500) Rd C.W.

WATERLINES 600HP

Callsign PIMS V M E Rd

V = VHF

M = Motorola comm. system

Rt = Radiotelephone

E = Echosounder

F = Fire fighting equipment

FF = Fire fighting and foam equipment

P () = Salvage pump (capacity in m³/hr in parentheses)

Rd = Radar

CW = Welding and cutting equipment

(vii) Dangerous Goods Regulations

Ships carrying dangerous goods must give notice on the type and quantity of the dangerous goods to the Harbour Master 24 hours or more before arrival in port. (Those ships entering the territorial water of West Germany passing through the River Eems are subject to the German national regulatory controls.)

The system of classification of dangerous goods is compatible with the IMO Code.

Whenever any abnormality is found on any of the dangerous cargoes carried, immediate notice must be given prior to arrival in port.

The controls over dangerous goods are extremely severe as exemplified by the case of a ship for which entrance to the port was refused because of the leakage of the ethylene cargo carried.

It has been established that these regulations relating to ships carrying dangerous goods are applicable to all ships without exception, and all the ships concerned must undergo strict inspection carried out in accordance with the Check List common to all EC countries by the control officers of the Port Authorities and specialists at time of entering the port.

(viii) Accident Records

i) Port of Delfzijl

Year	Collisions with Other Ships	Contact with Objects Other than Ships	Damage to Small Craft Due to Waves made by Passing Ships	Groundings	Oil Spillage	Total
1975		1				1
1976	2	6	1			9
1977	2	4				6
1978	1	1				2
1979		1		1		2
1980		1			2	3
1981		4				4
1982		2	1		1	4
1983					1	1
Total	5	20	2	1	4	32

ii) Port of Eemshaven

Year	Collisions with Other Ships	Contact with Objects Other than Ships	Damage to Small Craft Due to Waves made by Passing Ships	Groundings	Oil Spillage	Total
1982		1				1
Total		1				1

iii) Eems River Waterway

Year	Collisions with Other Ships	Contact with Objects Other than Ships	Grounding	Oil Spillage	Violation of Rules and Others	Total
1977					2	2
1978	1	3	1	1	5	9
1979		1		1	7	9
1980	4	2	1	1	7	15
1981					2	2
Total	5	4	2	3	23	37

3) Others

(i) Number of Ships Entering the Ports

i) Port of Delfzijl

(a) Shipping-traffic by seagoing vessels

Arrived at the Port of Delfzijl:	1973	1974	1975	1976	1977	1978	1979	1980
Number of Vessels	1,863	2,989	1,845	1,866	1,535	1,280	1,362	1,439
Gross Tonnage in Cubic Metres	5,869,075	7,015,822	5,823,695	5,653,192	6,119,234	6,109,723	6,163,414	5,510,672

(b) Shipping-traffic by inland navigation vessels

Arrived at the Port of Delfzijl:	1973	1974	1975	1976	1977	1978	1979	1980
Number of Vessels	3,171	3,526	3,061	3,263	2,970	2,988	2,496	2,405
Loading Capacity in Tons	2,071,540	2,494,676	2,250,069	2,371,846	2,180,567	2,330,815	2,040,660	1,997,547

ii) Port of Eemshaven

(a) Shipping-traffic by seagoing vessels

Arrived at Eemshaven:	1977	1978	1979	1980
Number of Vessels	2	368	164	178
Gross Tonnage in Cubic Metres	32,233	3,352,173	997,272	1,379,184

(b) Shipping-traffic by inland navigation vessels

Arrived at Eemshaven:	1977	1978	1979	1980
Number of Vessels	175	429	89	83
Loading Capacity in Tons	177,099	462,115	90,854	79,829

(ii) Largest Ship Type which has Entered the Port

- i) Port of Delfzijl 35,000 tons
- ii) Port of Eemshaven 410,000 tons
(in ballast, laid-up)

3 Panama Canal

(1) Outline

The Panama Canal connects the Atlantic Ocean with the Pacific Ocean. The Atlantic entrance is at Cristobal, and the Pacific entrance at Balboa.

The length from deep water in the Atlantic to deep water in the Pacific is about 83 km from ocean to ocean. The channel is maintained to a minimum width of 152.4 m and a depth of 12.80 m at MLW. The lock chambers are 304.8 m long and 33.53 m wide, with depth of water over mitre sills of 12.4 m at the most restrictive point, the south end of the Pedro Miguel Locks.

From the Atlantic terminal, Cristobal Harbour or Limon Bay, the channel extends to Gatun Locks, a distance of about 12 km, where vessels enter a 3-lift lock and are raised 25.90 m to the level of Gatun Lake, which is the summit elevation of the Canal. All locks have two parallel lanes. The channel from Gatun Locks through the lake extends 37.6 km to Gamboa, where vessels enter the Gaillard Cut, which runs approx. 12.8 km to Pedro Miguel, where ships enter a single-lift lock and are lowered 9.45 m to a small lake, through which they pass to Miraflores Locks, a distance of about 1.6 km. Here they enter a 2-lift lock and are lowered to sea level, passing out through a channel about 11 km long to the Pacific.

Vessels are towed through the locks by electric locomotives assisted by ship's engines and rudder.

A vessel of medium size can pass through the Canal in about 9 hours.

The Panama Canal Commission is experimenting with a system of transit reservations.

In general, transit priorities are established on the basis of arrival time. The convoy system is not employed. Vessels are dispatched for transit under a fairly complex system, resulting from the need to schedule traffic in accordance with vessel size, which governs pilot and equipment requirements, and restrictions on transit time and conditions.

Large vessels and dead tows which require "clearcut" and/or "daylight transit" are usually dispatched during the early morning, with smaller vessels commencing transit later in the day and during the night.

"Clearcut Transit" is transit in which a vessel, because of size, manoeuvrability, cargo or structural peculiarity can not meet another vessel in Gaillard Cut.

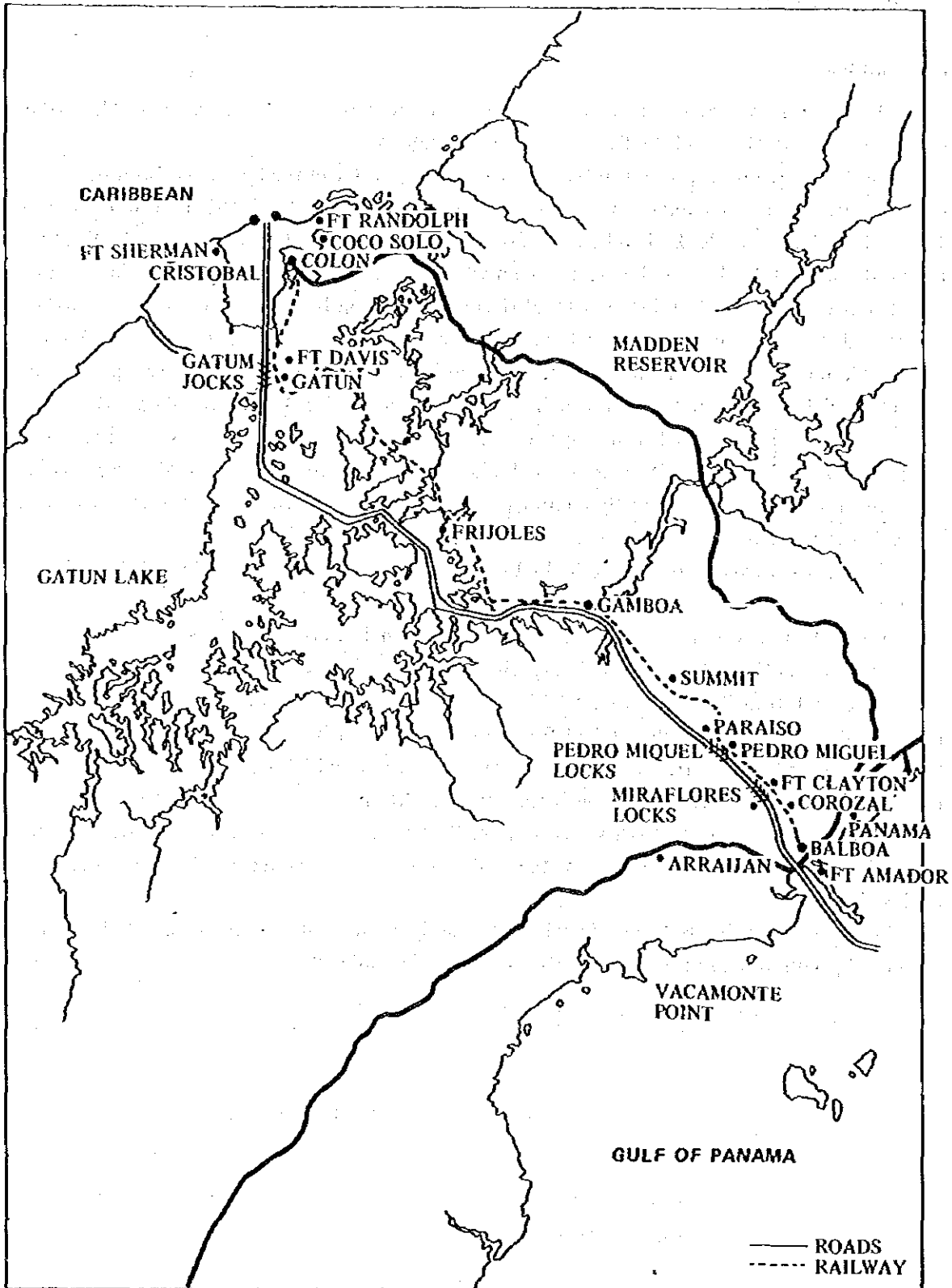


Fig. 3-1 The Panama Canal

"Daylight Transit" means a transit of all Locks, Miraflores Lake and Gaillard Cut during daylight hours, but not necessarily in a one-day period. (Refer to Fig. 3-1)

(2) Profile and Cross Section of The Canal

Fig. 3-2 shows the Profile of the Panama Canal, and Fig. 3-3 shows the Cross Section at Gaillard Cut Culebra Reach.

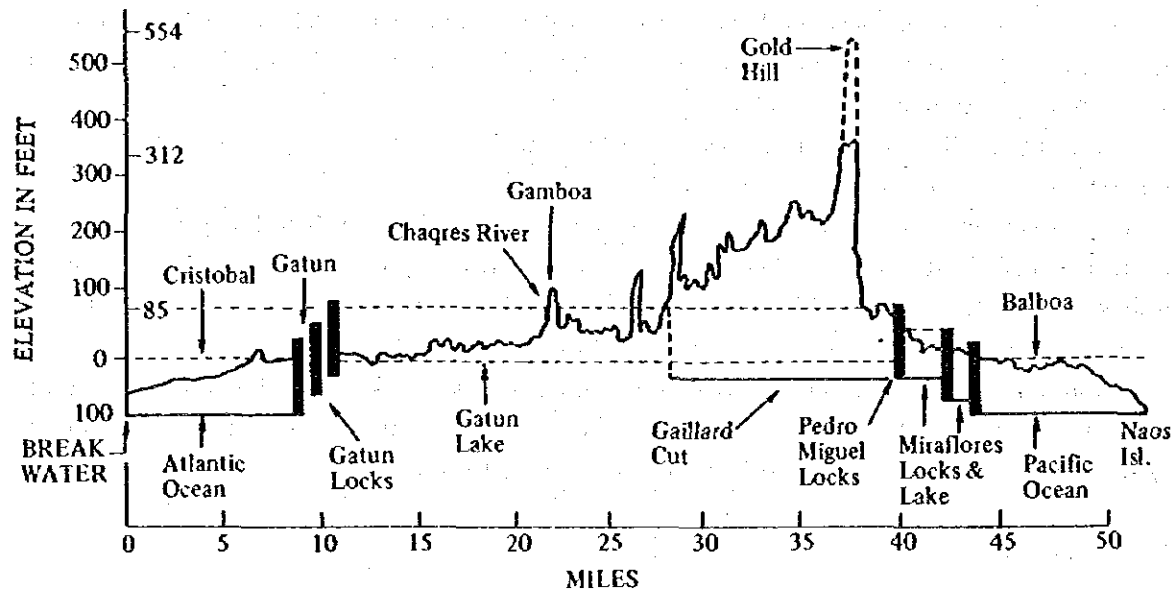


Fig. 3-2 Profile of The Panama Canal

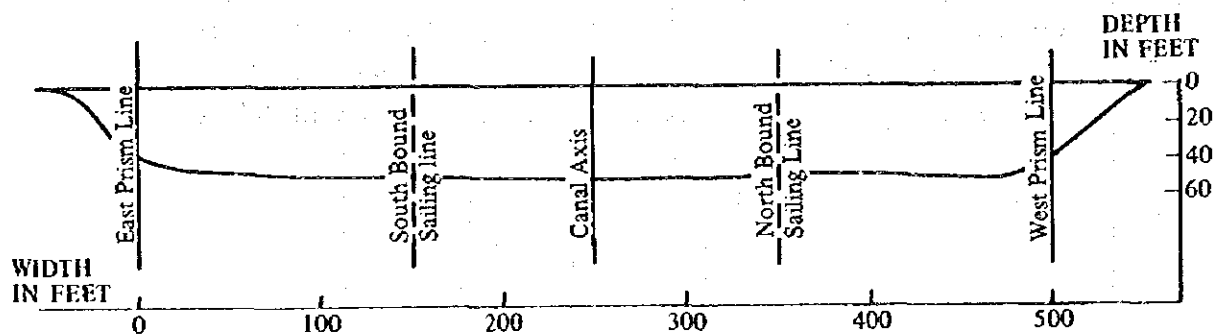


Fig. 3-3 Cross Section at Gaillard Cut Culebra Reach

(3) Organization

The Panama Canal is managed by the Panama Canal Commission and transit is operated by the Transit Operations Division.

The organization of the Panama Canal Commission and the Transit Operations Division are shown in Fig. 3-4 and Fig. 3-5.

(4) Maximum Size of Vessel

Maximum length including bulbous bow for a commercial vessel acceptable for regular transit, is 274.3 m, except passenger and container ships may be 289.5 m LOA.

The maximum beam acceptable is 32.30 m. Wider commercial vessels up to 32.61 m beam may be permitted to transit on a one time delivery basis only, with the deepest point of immersion not exceeding 11.28 m TFW.

Non self-propelled vessels are restricted to LOA, including accompanying tugs of 259.08 m and maximum beam of 30.48 m.

The maximum permissible transit draft for any vessel is 12.04 m, load line permitting; this is subject to peculiarities of bilge keel construction, and vessels presenting themselves for initial transit with a draft in excess of 10.82 m TFW, should submit bilge keel information to the Canal authorities to ensure safe passage at the full extent of permissible draft.

Maximum draft is also subject to seasonal fluctuations in lake level, but the dredging of Gaillard Cut has alleviated this condition. However, the possibility exists that reduced rainfall may result in draft restrictions, most likely from February to April.

(5) Minimum Draft

All vessels transiting the Canal should have sufficient ballast to provide for safe handling during transit. The following are minimum drafts in tropical salt water for cargo ships according to the dimensions of the vessel.

over 425', up to 475'	8' forward, 14' aft
over 475', up to 525'	18' forward, 20' aft
over 525', up to 580'	20' forward, 22' aft
over 580', up to 625'	22' forward, 24' aft
over 625'	24' forward, 26' aft

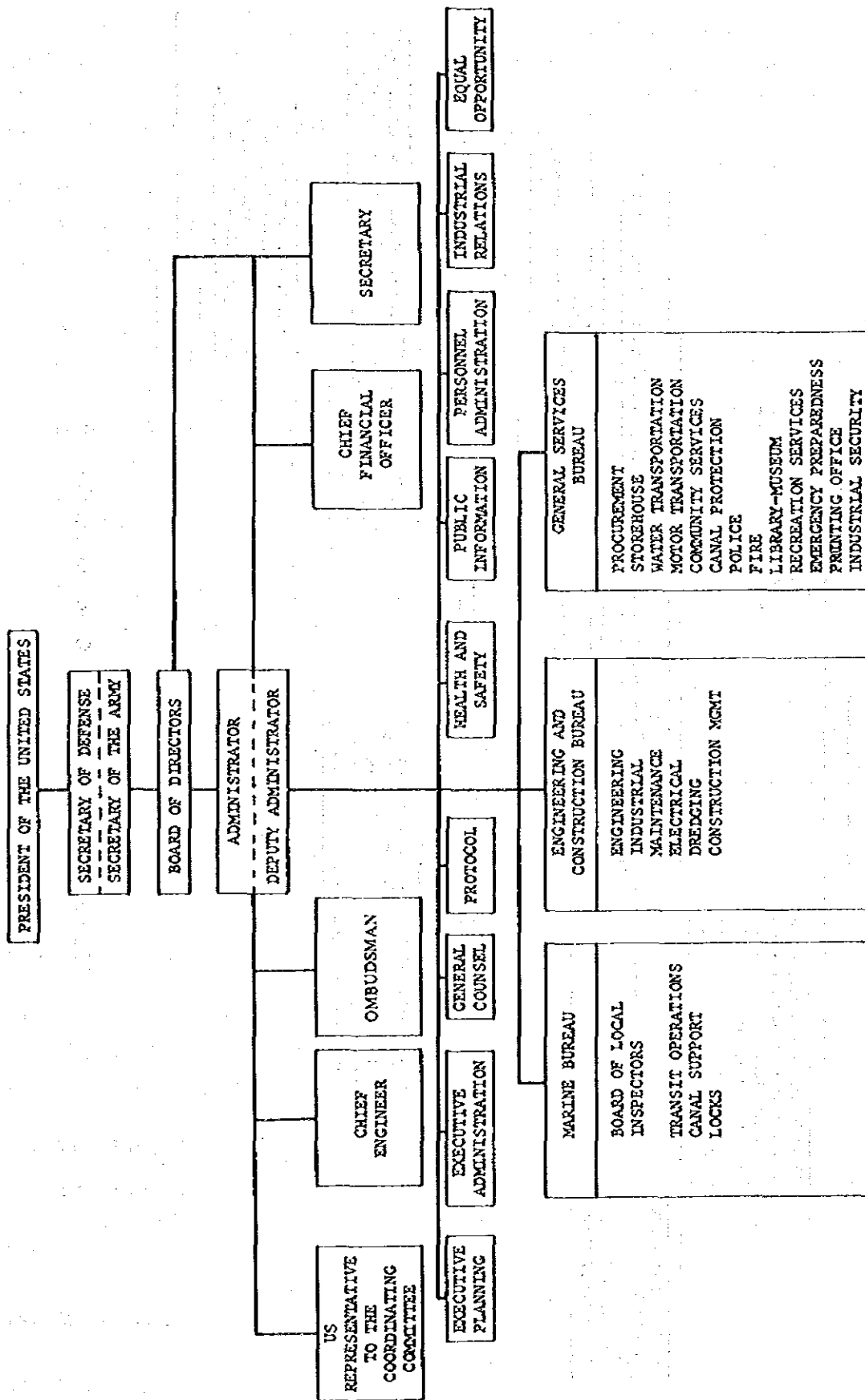


Fig. 3-4 Organization of The Panama Canal Commission

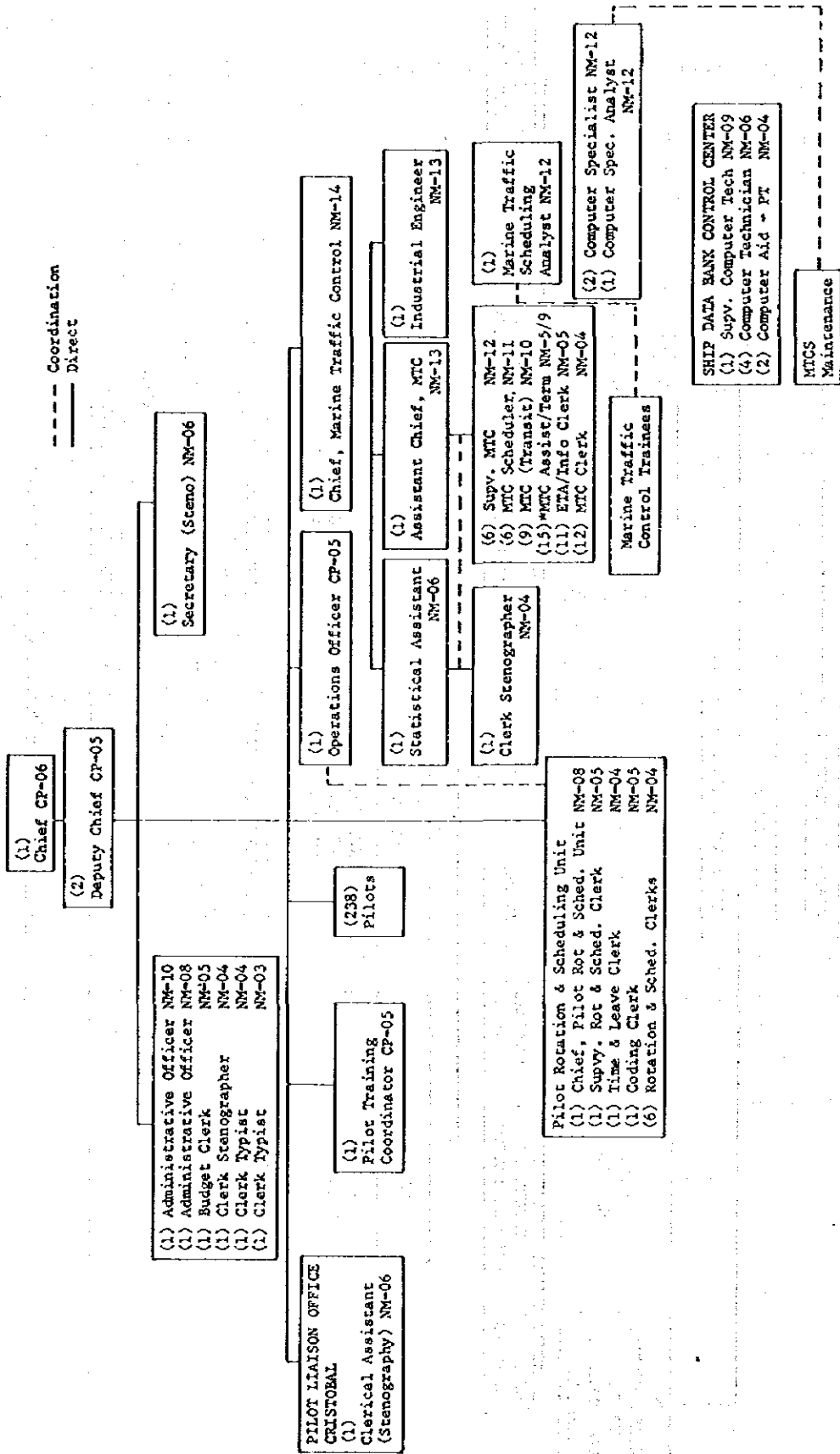


Fig. 3-5 Organization of Transit Operations Division

Vessels that are not capable of ballasting to these drafts will be required to take their maximum ballast and shall be required to sign a release for not meeting the required minimum draft for a vessel of their dimensions. Tug assistance shall be assigned for vessels in this category whenever deemed necessary by the Pilot in order to effect safe handling of the vessel.

(6) Maximum Speed

Maximum speeds are prescribed as follows:

- 1) A vessel shall not exceed the speeds designated below, except in an emergency:

	Knots
Atlantic entrance to Gatun Locks	12
Gatun Lake in a 1,000-foot channel	18
Gatun Lake in an 800-foot channel	15
Gatun Lake in a 500-foot channel	12
When rounding Buoy No. 17 in Gatun Reach, northbound	10
Gaillard Cut (in the straight reaches)	8
Gamboa: When passing reserve fleet basin, concrete dock, or floating crane berth; when using a tug astern	6
Miraflores Locks to Buoy No. 14	6
Buoy No. 14 to Pacific entrance	12

- 2) A vessel in Canal operating area waters at locations other than those specified in paragraph 1) of this section, including Gatun Anchorage, when rounding Bohío and Darien bends, Miraflores Lake, and in or near the locks, shall not exceed a speed that is safe under the existing circumstances and conditions, except in an emergency.

- 3) Vessels over 90 feet in beam shall reduce speed while approaching the locks, so as to be proceeding no faster than 1 mile per hour along the center wall prior to entering the chamber. Vessels 90 feet and under shall reduce speed while approaching the locks so as to be proceeding no faster than 2 miles per hour along the center wall prior to entering the chamber.

- 4) Vessels departing the locks shall do so as expeditiously as possible, however, if at all possible, full ahead shall not be used. Reserve power should, if possible, be kept available to use in case vessels are captured by adverse hydrodynamic forces.

(7) Time Interval

The normal time interval consistent with the safe handling of a vessel across Miraflores Lake is considered to be 15 minutes for an average vessel and 25 minutes for super class vessels when laden.

(8) Marine Traffic Control

- 1) Objective

The Panama Canal has the Marine Traffic Control System. The system consists of the Ship

Data Bank System and the CCTV Monitoring System.

The objective of Marine Traffic Control is to schedule and control the movement of vessels through the Canal and its terminal ports.

The accomplishment of this objective requires the coordination of multiple Canal resources and consideration of Canal operating conditions and ship performance characteristics. Communication is maintained between Pilots and other operating personnel as required to try to maintain transit schedules within prescribed operating limits.

2) Ship Data Bank System

This system controls input and output for the computerized Ship Data Bank, and contains vital data on all ships using the Panama Canal, including dimensions, type, registry, operating characteristics, transit requirements, pilot utilization, transit details, revenue, and cargo statistics.

3) CCTV Monitoring System

Closed circuit television (CCTV) cameras are being installed to help Panama Canal Commission marine traffic controllers monitor transiting vessels, Commission equipment, and existing conditions at certain locations on the Canal and to selectively record events as they occur along the waterway.

18 cameras are now operational, and have the coverage includes all critical areas along the Canal monitor the three locks, Gaillard Cut, and the Atlantic and Pacific approaches. The cameras are sensitive enough to allow marine traffic controllers to monitor the waterway around the clock, except in conditions of severe rain or fog.

(9) Pilot

1) Pilot's Responsibility.

The pilot assigned to a vessel shall have control of the navigation and movement of such vessel.

2) Compulsory Pilotage.

Except when exempted by the Administrator, no vessel shall pass through the Canal, enter or leave a terminal port, or maneuver within Canal operating area waters without having a Panama Canal Commission Pilot on board. These rules apply south of the "mole" beacon No. 1, Cristobal Harbor, and north of buoys 1 and 2, Balboa approach channel.

3) Requirement for Two Pilots

Vessels over 80.0 feet in beam are required to have two pilots.

(10) Regulations for Transiting Vessels Carrying Hazardous Cargoes

1) Guidelines

(i) Normal operational restrictions will generally apply unless dangerous cargoes are carried in bulk. Liquid is considered to be in bulk unless contained in portable tanks of less

than 100 U.S. gallons (or packaged in accordance with 49 CFR (Code of Federal Regulations)) which are loaded and discharged with their contents intact. Solids are in bulk form when transported without mark or count which are loaded without containers or wrappers into holds. Explosives are considered in bulk if a vessel is carrying over 5 long tons.

(ii) Vessels carrying petroleum products having a flashpoint greater than 80°F and classified lower than Grade C under the U.S. system, or having a flashpoint greater than 23°C and classified higher than 3.2 under the IMO system are not considered to be carrying dangerous cargo for purposes of these restrictions.

(iii) Additional operating restrictions may be imposed by appropriate Panama Canal Authorities on vessels carrying especially hazardous materials such as radioactive material, Class A and B poisons, and corrosives in other than bulk amounts.

(iv) Vessels carrying dangerous cargo (including liquefied gases) in bulk will anchor in designated explosive anchorages. Unless gas free, petroleum or liquefied gas vessels will remain outside the breakwater on the Atlantic side until such time as they enter to pick up a pilot either for transit or to proceed to a pier.

(v) Vessels arriving on the Atlantic side and carrying dangerous cargo in bulk will anchor in the outside anchorage. These vessels shall not enter the breakwater until given orders to do so. Such orders will be issued through the Signal Station by the assigned pilot. Orders will be given only after the pilot is standing by to board and has received the assurance from the Signal Station that there are no outbound vessels. When weather and boarding conditions permit, the pilot may board outside the breakwater.

On outbound vessels carrying dangerous cargo, the pilot must remain on the bridge until the vessel passes the Mole Buoy. The pilot shall not leave the bridge until he has arranged with the Marine Traffic Control and the Signal Station for one-way traffic outbound through the breakwater.

2) Transit Restrictions

To better assure the safe passage of vessels carrying dangerous cargo, the following transit restrictions will apply:

(i) Pilots shall be notified that the letter "B" (BRAVO) will be added to the transit schedule number and flown as part of the schedule flag hoist by the ship. It will also be used by pilots and traffic controllers in calling via radio or referring to the vessel.

(ii) In meeting situations between "B" vessels and other vessels, both shall meet at a safe speed and shall, as far as practicable, avoid meeting on the turns.

(iii) "B" vessels shall not be scheduled to overtake or be overtaken by other vessels. If an overtaking situation occurs between a "B" vessel and another vessel, due care must be exercised by both vessels.

(iv) When "B" vessels are required to anchor in Gatun anchorage, they shall be anchored well clear of the channel and other shipping as conditions permit. "B" vessels shall not be moored at Gamboa without prior approval of the Chief, Canal Support Division.

(v) Normally, there will be no tandem restrictions on vessels flying the BRAVO signal

unless the nature of the cargo or the condition of the vessel so indicates. In such instances, the appropriate restrictions will be imposed by competent authority.

(vi) Insofar as possible, the Transit Operations Division will avoid scheduling a vessel flying the BRAVO signal to enter a lock chamber where another vessel is clearing, or to clear a lock chamber where another vessel is entering. In case this type of scheduling is unavoidable, the pilot of the entering vessel will hold back to allow the departing vessel adequate manoeuvring room.

(vii) Tug assistance at the Locks and in Gaillard Cut shall be assigned to vessels flying the BRAVO signal if, in the judgement of the appropriate Canal authority, or upon request of the pilot, the assignment is required.

(viii) Vessels possessing a valid Letter of Compliance from the United States Coast Guard will be accepted for transit within the restrictions outlined on the letter.

(11) Tug Boats

1) Requirement for Tug Assistance

(i) Vessels over 80.0 feet, but less than 91 feet in beam shall have tug assistance entering Locks and tug aft in Gaillard Cut when laden to a mean draft of 34 feet or over in Tropical Fresh Water.

(ii) Vessels of 91 feet, but less than 100 feet, beam shall have tug assistance entering all Locks and tug in Gaillard Cut. Tug assistance out of Locks, at Pilot's request, shall be provided when beam exceeds 95.0 feet and deeply laden.

(iii) Vessels of 100-foot beam and over shall have tug assistance in and out of all Locks after evaluation by Chief, Navigation Division, for loaded and ballast condition.

(iv) Tug assistance at the Locks and in Gaillard Cut shall be assigned to vessels carrying dangerous cargo and flying the BRAVO signal if, in the judgement of the appropriate Canal Authority, or upon request of the pilot, the assignment is required.

2) List of Tugs and Its Equipment

(i) Canal Tug Boats
Listed in Table 3-1.

(ii) Harbour Tug Boats
Listed in Table 3-2.

Table 3-1 Canal Tug Boats

Names (By Classes)	H.P.	Length and Beam	Rated Bollard Pull (lbs)		Fire Pump	Mon- itors	Foam Capacity	CO ₂ Capacity	Dry Chemical	Sub- mer- sible Pumps
			Ahead	Astern						
CULEBRA	1000	127'02" x 29'10"	30,000	18,000	700 GPM @123 psi	1	25 ea 5 gal cans	None	1 Ansul unit 1000 lb cap.	0
RODMAN	2000	109'00" x 29'00"	70,000	46,836	2000 GPM @150 psi	2	1500 gals	3600 lbs	2 Ansul units 500 lb cap.	2
ROUSSEAU	2000	109'00" x 29'00"	70,000	46,836	2000 GPM @150 psi	2	1500 gals	3600 lbs	2 Ansul units 500 lb cap.	2
GOETHALS (1)	2400	105'04" x 26'02"	57,000	33,000	1000 GPM @150 psi	1	480 gals	3600 lbs	2 Ansul units 500 lb cap.	2
STEVENS	2400	105'04" x 26'02"	57,000	33,000	1000 GPM @150 psi	1	480 gals	3600 lbs	1 Ansul unit 1000 lb cap.	2
WALLACE	2400	105'04" x 26'02"	57,000	33,000	1000 GPM @150 psi	1	480 gal	3600 lbs	2 Ansul units 500 lb cap.	2
HARDING (2)	3000	96'00" x 28'00"	80,000	50,000	2000 GPM @150 psi	2	1968 gals	3600 lbs	1 Ansul unit 1000 lb cap.	2
MEHAFFEY	3000	96'00" x 28'00"	80,000	50,000	2000 GPM @150 psi	2	1968 gals	3600 lbs	1 Ansul unit 1000 lb cap.	2
MORROW	3000	96'00" x 28'00"	80,000	50,000	2000 GPM @150 psi	2	1968 gals	3600 lbs	1 Ansul unit 1000 lb cap.	2
SCHLEY	3000	96'00" x 28'00"	80,000	50,000	2000 GPM @150 psi	2	25 ea 5 gal cans	3600 lbs	1 Ansul unit 1000 lb cap.	2
TRINIDAD	3000	96'00" x 28'00"	80,000	50,000	2000 GPM @150 psi	2	25 ea 5 gal cans	3600 lbs	1 Ansul unit 1000 lb cap.	2
BURGESS (3)	2400	96'00" x 33'00"	71,560	71,560	64,400					
WALKER	2400	96'00" x 33'00"	71,560	71,560	64,400					
PARFITT (4)	4000	105'00" x 36'00"	80,000	80,000	70,000 (Est.)					
ALLANZA (5)	3000	100'00" x 30'00"	90,000	70,000						
AMSTAD	3000	100'00" x 30'00"	90,000	70,000						
PROGRESSO	3000	100'00" x 30'00"	90,000	70,000						

- (1) Controllable Pitch Propeller.
- (2) Twin Screw, twin rudders.
- (3) Tractor tug, twin Schotell Rudder Propellers in Kort Nozzle.

Table 3-2 Harbour Tug Boats

Name	H.P.	Length and Beam	Bollard Pull (Lbs)	
			Ahead	Astern
PORTOBELO *	2600	88.6' x 28.9'	69,000	63,000
CHARGES *	2600	88.6' x 28.9'	68,000	65,000
DONOSO #	2600	86.9' x 28.2'	66,000	58,000
SAN BLAS *	2400	77.1' x 28.2'	58,000	52,000
BAYANO *	2400	94.2' x 28.2'	58,000	52,000

* Two Niigata Z-pellers, ZP-2" 2 sets.

Two IHI duckpellers, DP 308" 2 sets.

(12) Statistics

1) Total Transits

Table 3-3 Total Transits

Year	North	South	Total	Daily Average	Average Canal Water Time	Average Transit Time
1982			14,009	38.4		
1981			13,984	38.3		
1980	6,817	7,908	14,725	40.2	34.9	9.1
1979	6,752	7,610	14,362	39.3	24.0	8.7
1978	6,719	7,089	13,808	37.8	29.0	8.3
1977	6,371	6,716	13,087	35.9	20.0	7.4
1976	6,432	6,769	13,201	36.1	21.2	7.7
1975	7,334	7,400	14,734	40.4	16.9	7.2
1974	7,377	7,892	15,269	41.8	22.9	8.3

2) Transit Operations Summary

Table 3-4 Transit Operations Summary

	FY 1978	FY 1979	FY 1980
Transits Using Locomotives	12,824	13,077	13,615
Average Daily Transits Using Locomotives	35.1	35.8	37.2
Oceangoing Transits	12,785	13,056	13,614
Average Daily Oceangoing Transits	35.0	35.8	37.2
Total Transits	13,808	14,362	14,725
Average Daily Total Transits	37.8	39.4	40.2
Pilots Per Transits Using Locomotives	1.63	1.69	1.83 (24,979)
Pilots Per Total Transits	1.54	1.58	1.72 (25,288)
Dredging Division Advisors/Handlines	290	370	377
Average Canal Waters Time	29.0	24.0	34.9
Average In Transit Time	8.3	8.7	9.1
Number of Ships in Canal Waters Over 24 Hours	6,864	5,527	8,753
With Daylight Restrictions	1,963	2,130	2,897
Total Number of Vessels 80' Beam & Over	5,200	5,503	6,089
Percent of Vessels 80' Beam & Over	41%	42%	45%
Total Number of Vessels 100' Beam & Over	1,456	1,871	2,172
Percent of Vessels 100' Beam & Over	11%	14%	16%
Number of Vessels delayed due to Fog	336	436	266
Number of Hours Delayed due to Fog	1842.8	2989.9	2262.1
<u>Pilotage</u>			
Total Pilot Transit Jobs	21,319	22,718	25,283
Total Pilot Harbor Jobs	9,903	9,365	7,946
Total Pilot Shuttle Jobs	143	39	229
Total Pilots Completing 4th Transit	1,472	1,682	1,914
Total 4th Transit Premium Pay	\$258,368	\$306,396	\$321,916
Total Pilots Overtime Hours	41,273	40,990	50,637
Total Multiple Pilot Jobs — 4-Man	1,090	1,467	1,605
Total Multiple Pilot Jobs — 2-Man	4,392	4,349	4,795

3) Number of Accidents by Vessel Type

Table 3-5 Number of Accidents by Vessel Type

Vessel Type	1981	1982	1983	Total	Percent
Cargo	34	31	17	82	42.93%
Passenger	0	0	1	1	.52%
Tanker	15	20	17	52	27.23%
Container	3	2	4	9	4.71%
Barge	2	1	2	5	2.62%
Naval	0	1	0	1	.52%
Handline	2	3	0	5	2.62%
Fishing	2	2	2	6	3.14%
Special (Includes Launches and Tugs)	14	11	5	30	15.71%
Total	72	71	48	191	100.00%

4) Number of Accidents by Type

Accident Type	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	Total	Percent
None	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	.23%
Collision	9	24	21	29	17	15	34	8	16	10	16	22	16	12	14	16	10	16	11	5	10	0	7	2	340	25.42%
Grounding	6	4	5	17	6	6	11	8	7	3	6	4	2	4	9	6	1	5	2	6	6	2	4	7	137	10.64%
Lock Striking	25	32	24	24	17	22	20	15	14	12	19	13	7	12	15	13	10	11	13	10	8	16	11	11	374	29.06%
Pier Striking	2	3	6	2	4	6	5	4	3	6	6	7	5	5	5	5	7	6	7	5	4	7	1	1	112	8.70%
Burning	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	4	.31%
Sinking	0	0	2	0	3	1	0	3	0	0	1	0	0	3	1	2	0	0	0	0	0	0	1	0	17	1.32%
Injury/Death	4	3	3	6	8	13	17	24	9	8	14	11	5	8	6	2	9	4	4	0	1	0	1	0	160	12.43%
Tug Striking	2	2	8	0	2	1	6	8	4	10	1	2	2	4	0	7	4	0	4	4	0	0	7	2	80	6.22%
Miscellaneous	0	1	1	6	3	2	6	4	0	2	4	1	2	2	4	2	4	1	2	3	5	2	1	2	60	4.65%
Total	48	71	72	84	60	67	99	74	53	51	67	60	39	48	56	52	47	43	43	33	35	27	33	25	1287	100.00%

5) Risk Level

Table 3-7 Risk Level from 1974 to 1982

Year	Number of Transits	Number of Accidents	Risk Level ($\times 10^{-4}$)
1974	15,269	51	33.40
1975	14,734	53	35.97
1976	13,201	74	56.06
1977	13,087	99	75.65
1978	13,808	67	48.52
1979	14,362	60	41.78
1980	14,725	84	57.05
1981	13,984	72	51.49
1982	14,009	71	50.68
Average	14,131	70	49.54

JICA