

# Holland's Struggle against the Water

**The Netherlands is and always has been inseparably tied to the water. This country, which borders on the North Sea, emerged in prehistoric times as a delta of the Rhine, Meuse and Scheldt rivers. The constantly changing water level of these rivers, the wind and the tides, produced a landscape with very deep sea arms and a ragged coastline. The dunes and man-made dykes have frequently proved to be an ill-match for nature's force.**

A few centuries later the windmill came into use. By means of water wheels the water could be siphoned into a ditch or waterway situated approximately 1 1/2 meters higher up. If the polder was deeper, several mills had to be placed in a row. This is called a "molengang".

In this way it was also possible to drain sheets of water and lakes. In the province Noord-Holland, the lakes Beemster (1612), Purmer (1622), Wormer (1626) and Schermer (1635) were drained. Later still, the steam engine arrived on the scene with which even larger lakes could be pumped out.

An example of this is the Haarlemmermeer. ("Haarlem Lake") (between the cities of Haarlem, Leiden and Amsterdam), which was drained between 1848 and 1852. The most important figures who occupied themselves with the - for those days - very bold plan, were Engineer Leeghwater, Surveyor Cruquius and Baron van Lynden.

The three steam engines, which were used to carry out the project, bear their names in honour. Later still the steam engines were replaced by diesel and electric pumping installations.



# Holland



Throughout the centuries the Netherlands has frequently suffered from floods and all their consequences. Thousands of people died, many cattle drowned and large areas of land were lost. These very facts however incited the adamant Dutch to tackle the never-ending struggle against the water with even more energy. And we can state without hesitation that the Dutch have made some impressive achievements in this field; such as the draining of lakes and sheets of water, the closing off and partial reclamation of the Zuiderzee, and the daring Deltaplan, which is now almost completed. It would be exaggerated to say that the water has been completely controlled. Nature is too unreliable and too strong for that. We can say however that the water's ferocious and often destructive force has been curbed considerably. The chance of large parts of the Netherlands flooding has been minimized. Moreover it has been possible to regulate Holland's extremely complicated water management by means of advanced techniques and the most modern equipment. The many acres of land gained from the water are of great importance to densely populated Holland: agricultural land, housing area and recreational grounds.

In this brochure we will introduce you to Holland's most important hydraulic engineering projects with which our country has acquired world-wide fame and renown. We will also give you a survey of the most notable sights in this field. The water works which are still being built are especially worth a visit!

## The Old Polders

In the first centuries A.D. the Dutch built mounds of earth as refuges in case of floods. They also built houses on these so-called "terpen". When the "terpen" were linked by dykes around the year 1000, the first polders emerged automatically. Of course this was only the case with land of which the waterlevel was at regular times higher than that of the surrounding land. Thus the superfluous water could be drained into water outside the dykes through siphons or small locks.

## From Zuiderzee to IJsselmeer

Already in the seventeenth century there were plans to close off the Zuiderzee and create polders. Many of these plans, including those of a later date, proved not to be financially and technically viable. Yet time and again new people came forward with ideas to control the ferocious inland sea in some way. Finally, Engineer Lely's plan was carried out around 1920.

## The Afsluitdijk

The plan consisted of the building of a dike which was to run from the mainland of North Holland, via Wieringen island, to the town of Zurich on the Frisian coast 30 km further on. This was a gigantic project involving hundreds of people and some 500 ships. A total of 15 million cubic meters of siliceous loam were used in the 90 meter wide dike, as well as 27 million cubic meter of sand. Near Den Oever and Kornwerderzand discharging sluices were built, so that the superfluous water of the new IJssel Lake can be drained off into the Waddenzee (Dutch Shallows) at low tide. Navigation locks were also installed. On 28th May 1932, after a 5 years struggle, the last hole in the dike was filled and the Afsluitdijk was a fact. The Zuiderzee was no longer an inland sea and received the name IJsselmeer.

## New Land at the Bottom of the Sea

After the completion of the Afsluitdijk came the next phase: the reclamation of large sections of the IJsselmeer. The Wieringermeer had been drained while the work on the Afsluitdijk was still in progress. This added 20,000 hectares of land to the Netherlands. On 21st August 1930 the reclamation was completed. Next came the Noordoostpolder. On 9th September 1942 the work was completed and 48,000 hectares of land were ready for cultivation. This polder also con-

# Water Works



tains the former islands Urk and Schokland. The polder's most important town is Emmeloord. The Flevoland polder was drained in two stages. Oostelijk (East) Flevoland was drained in 1957, while Zuidelijk (South) Flevoland was pumped out in 1968. The most important town of Oostelijk Flevoland is Lelystad and that of Zuidelijk Flevoland is called Almere.

Both polders increased the size of the Netherlands by a total of 97,000 hectares. Except for agricultural purposes the two Flevopolders are also intended as residential and recreational areas for thousands of Dutch people. It is still uncertain whether the plans for the Markerwaard polder, which would be 40,000 hectares in size, will go ahead. Opinions differ on the consequences this would have for the environment and the waterways.

## The Deltaplan

The night of 31st January to 1st February 1953 was a catastrophic night for the Netherlands. Due to the rare combination of very heavy south-western storm and springtide, dykes broke through at many places in the south-west of the Netherlands. The results were disastrous: more than 1800 people lost their lives, thousands of animals drowned and the financial damage was enormous. One thing was clear: this must never happen again! An immediate start was made with the design of a daring and extremely extensive plan: the Deltawerken. The focal point of this gigantic project is the closing off of all sea arms in the south-west of the Netherlands, with the exception of the Nieuwe Waterweg (open waterway to sea for Rotterdam) and the Western Scheldt (open waterway to sea for Antwerp). Furthermore, all dykes in this area had to be reinforced and raised considerably. The total costs of this project have by now mounted to some ten billion guilders, but for that amount the safety of Holland's low-lying parts has been guaranteed. The Deltaplan also offered a number of added bonuses. The Zuid-Holland and Zeeland islands, which until then could only be reached by ferry or all kinds of

complicated detours, were made more easily accessible for traffic, as new roads were built on top of the dams. Moreover the closed off sea arms were going to function as important areas for recreation and watersports.

## More than a Quarter of a Century in Progress

The Deltaplan was officially started in 1958. Apart from closing off sea arms, secondary dams had to be built further inland. This is to prevent the formation of too strong a current while the sea arms are being closed off. For this ambitious project the Dutch chose to work from small to large. After all, it concerned work that had never been carried out before anywhere else in the world. In this way they could, in the next job, benefit from the experience gained. The following projects were carried out in the course of 25 years.

### STORMVLOEDKERING HOLLANDSE IJSSEL

Very near Rotterdam a storm surge barrier was built in the river the Hollandse IJssel. This movable partition consists of a 80 meter wide and 11 meter high lifting door. Behind this storm surge barrier, which was completed in 1958, a second one was built in 1976 for extra safety.

### ZANDKREEK

In 1959 a start was made with the building of the Zandkreek-dam between the islands Noord-Beveland and Zuid-Beveland. On 4th May 1960 the last "closed" caisson was put in place.

### VEERSE GAT

The Veerse Gat dam connects Noord-Beveland with Walcheren. When the closing hole was filled, permeable caissons were used for the first time. These are concrete blocks measuring 45x20x20 meters through which the sea can flow freely. When, in April 1961, the last caisson had been put in place, the steel sluice valves were lowered into the concrete blocks. Finally, the concave areas were sprayed full of sand.

### GREVELINGEN

The building of the Grevelingen dam, between Schouwen-Duiveland and Goeree-Overflakkee, was very spectacular. Via an aerial rope-way, gondolas, which constantly dropped concrete blocks into the sea, were suspended above the closing hole. Over the stone ridge originated in this way the new dam was built, which was finished at the beginning of 1966.

### VOLKERAK

On a sand bank in the middle of the Volkerak an area was pumped with sand, which was called the Hellegatsplein. From here a 4½ km dam was built in westerly direction and 1200 meter bridge was built in northerly direction as well as a 3 km in southern-eastern direction, which contains one of Europe's largest locks.

### HARINGVLIET

The Haringvliet is often called Holland's main 'tap' as it is the most important outlet for the water of the big rivers. For this reason, discharging sluices were built in the 4½ km dam between the island Voorne and Goeree-Overflakkee. These are only opened in case of excessive water-drainage. In normal circumstances the sluices are closed, so that the water of the Rhine, the Meuse, the Waal and the Lek is forced to flow to sea via the Nieuwe Waterweg. In this way, oversalting of the river water, which is important for the drinking water supply, is prevented. The sluice complex is built on some 22,000 concrete ramming piles. The section between the locks and the discharging sluices was closed by means of the aerial rope-way method. For this 700 meter large closing hole, 93,000 concrete blocks of 2½ tonnes each were needed. In 1971 the work was completed.

### BROUWERSHAVENSE GATE

This is the water between the islands Goeree and Schouwen. First, a 3 1/2 km dam was built in the shallow part. The southern closing hole was filled by means of the aerial rope-way method, the northern hole with 2 closed and 12 permeable caissons. The total length of the dam is 6 1/2 km

and its width on the waterline is 200 meters.

### OOSTERSCHELDE

Preparations for the complete damming up of this last sea arm had already moved into the final stages when voices were heard demanding that this water be kept of completely or partially open. Environmental aspects in particular played an important part in this. The building of a dam with permeable caissons proved too expensive. The pillar dam being built at present however is financially viable. Between the pillars, steel lock hatches are being installed, which can be lowered in case of danger. In normal situations they are open, so that the tidal movement of the Eastern Scheldt can be maintained. Work on the dam is still in full progress. It is hoped that the job will be finished before the end of 1986. From an artificial island the concrete pillars, which weigh 18,000 tonnes at the most, are taken one by one to the right place by special ship and are then placed on the bottom of the sea. This will be ready in 1984. In the meantime, work has started on the hanging of the steel lock hatches and on the installation of the remaining parts, so that we can say that the completion of the storm surge barrier is in sight.

### SIGHTS

For the interested visitor the Netherlands has a great deal to offer in the way of hydraulic structures. Many sights are unique in character and thoroughly worth a visit. We will make a selection from the most important and fascinating water works.

### FLOOD BARRIERS OOSTERSCHELDE/ DELTA EXPO

Delta Expo, formerly the Haringvlietdam exposition at Stellingdam, is situated at the 'Neeltje Jans', informationcentre in the middle of the Oosterschelde. From Westerschouwen a bridge runs to this impressive artificial island. In the information centre situated on the island you will be able to build up a picture of the operations which are still in full progress. There is a permanent exhibition, where films, slideshows and models will provide a



good survey of the history and development of the Delta project. On a map of the Netherlands which is more than a few meters high, some 2000 lights map out the course of the Dutch waterways for you.

In the winter, buses to the information centre leave approximately every hour from the start of the dam and in the summer approximately every half hour.

(last bus leaves around 4 p.m.). Opening hours: April to October, Monday to Sunday 10 am-5 pm and November to March, Wednesday to Sunday 10 am-5 pm. Admission prices: f 5,25 p.p., children f 3,60 p.p., groups with own bus (incl. tour) f 4,95 p.p. Reservation is necessary. For information: 01115-2702.

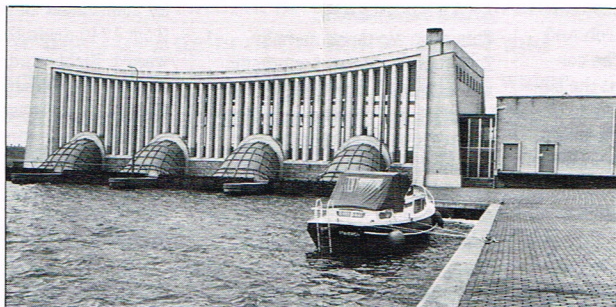
### ROTTERDAM HARBOUR

Rotterdam is the biggest port in the world where the transshipment of cereals, coal, ores, fertilizers and, of course, oil takes place. By car you can follow a route which has been specially set out through the whole harbour area. You can also follow this route by coach which operates on Wednesdays from the end of May to the middle of September and takes you in approximately 5 hours from the Central Station through the harbour area of Rotterdam, followed by a visit to Brielle and Europoort. More information and route descriptions in various languages are available at the larger VVV offices and at the "Havenbedrijf Rotterdam", Galvanistraat 15, Tel. 010-894116. There are also boattrips round the harbour lasting one hour or more. For information please contact: SPIDO, Willemsplein, Rotterdam, Tel. 010-135400.

### INFORMATIECENTRUM NIEUW LAND

In Oostelijk Flevoland you will find the 'Information Centre New Land', on the Oostvaardersdijk in Lelystad. The route is signposted. Here you will get a good impression of how the former Zuiderzee and surroundings looked a few thousand years ago.

All matters relating to drainage have received special attention: the plans, the building of dykes, the pumping stations with which the polders are pumped out, the development of nature reserves,

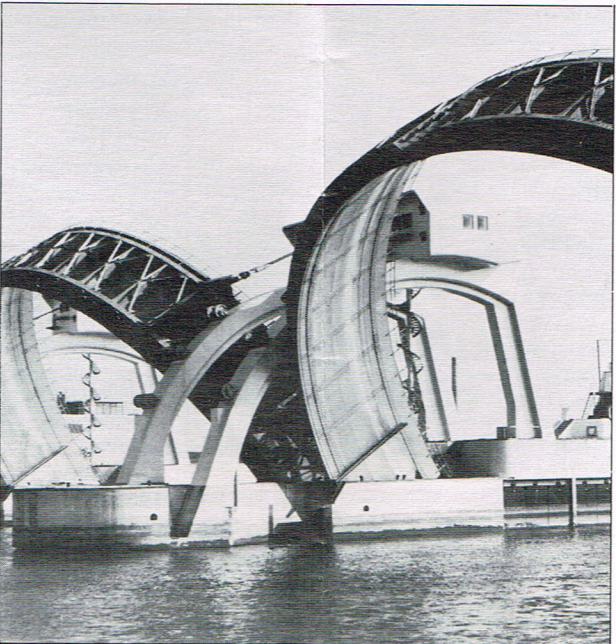


new towns, etc. By means of models, photographs, objects, and film and slide shows, the history from Zuiderzee to IJsselmeer is recounted and brought to life. Opening hours: April to October, Monday to Sunday 10 am - 5 pm. November to March, Monday to Friday 10 am to 5 pm; Sunday and Bank Holidays; 1 to 5 pm. December 25th and 1st January closed.

Admission price: adults f 2,50 and children to 16 years and OAPs f 1,50. For information: 03200-60799.

### EXPOZEE

Although Lauwersoog is in North Groningen, the area formed part of the plans of Engineer Lely. The exhibition in the recently renovated Expozee concentrates on the sea in general and the Wad ("Shallow") in particular. It shows something of the wave motion of the sea and the tides. Naturally the closing off of the Lauwerszee also receives attention.



Opening hours: April to September, Tuesday to Friday 10 am - 5 pm, Saturday, Sunday and Bank Holidays 2-5 pm.

Admission price: adults f 2, children to 5 years free of charge, 6 to 13 years olds f 1,50. For information: 05193-9045

### MUSEUM VOOR SCHEEPSARCHEOLOGIE

At the Vossemeerdijk 21 in Ketelhaven, Oostelijk Flevoland, is the Museum of Naval Archeology. Many objects which were found at the bottom of the sea during drainage of the polder are on exhibition here.

Moreover, the museum collection contains a number of shipwrecks and numerous shipping fragments which have been excavated. There are also shipwrecks from outside the IJsselmeer so that you will get an overall impression of the shipbuilding trade in the Netherlands from the year 200. Opening hours: April to September, Monday to Sunday 10

am - 5 pm. October to March, Monday to Friday 10 am to 5 pm; Saturday, Sunday and Bank Holidays 11 am to 5 pm. (closed on December 25th and 1st January).

Admission price: adults f 1,50 children to 13 years f 0,75, OAPs f 1,-.

For information: 03210-3287.

### ZUIDERZEEMUSEUM

The Zuiderzeemuseum in Enkhuizen is housed in a row of historic buildings. One of these is a former warehouse of the Dutch East-Indies Company, which played an important role in trade with overseas territories in the Golden Age (17th C.). The museum houses many objects of the shipping and fishing trade and folk art from the rich history of the Zuiderzee towns.

You will find authentic interiors, national costumes and tools. The boat house behind the museum contains a real fleet of freighters, fishing boats and pleasure-crafts which were taken out of service. The "Buitenmuseum" (open air museum) consists of a village of some 135 houses and workshops together with streets and gardens from the Zuiderzee area. They have been largely decorated such that they give you an excellent idea of how people used to live and work here.

Opening hours: "Binnenmuseum" (inside): April 5th to October 20th. Monday to Saturday 10 am-5 pm, Sunday and Bank Holidays 12 to 5 pm.

(1st January closed).

"Buitenmuseum" (outside): April 5th to October 20th, Monday to Sunday 10 am to 5 pm.

All-in package (admission to 'Binnenmuseum' and 'Buitenmuseum', ferry, parking): adults f 9,-, children to 5 years f 4,-, 6 to 17 years old and OAPs f 7,-. Guided tour on request at f 1,50 to f 2,50.

For information: 02280-10122.

### NATIONAAL BAGGERMUSEUM

In a refurbished building at the Molendijk in Slidrecht you will find the National Dredging Museum. The collection contains models of the earliest dredging equipment through to the most modern examples. Furthermore, there are prints, maps and pain-



tings, photographs and parts of dredging tools. By regularly changing the exhibitions the developments of modern techniques and the progress of large hydraulics projects are illustrated.

Opening hours: Tuesday to Saturday 2 to 5 pm (closed on Bank Holidays and Sunday).

Admission price: adults f 2,-, children to 16 years and OAPs f 1,-.

For information: 01840-14166.

## HONDSBOSSE ZEEWERING

Between Camperduin and Petten there are no dunes. Since the fifteenth century the Dutch have built a structure of dykes here. The present dykes - the "Waker" (Waker) on the seaside, the "Dromer" (Dreamer) behind it and the "Slaper" (Sleeper) further inland - date from 1780. At the Zuiderhazedwardsdijk (Zuiderhaze Cross Dyke) you will find an exhibition called "De Dijk te Kijk", admission to which is free. It illustrates the complete history of the sea wall.

Opening hours: May, June, September, Saturday and Sunday 2 to 5 pm; July and August, Monday to Friday 10 am to 5 pm, Saturday and Sunday 2 to 5 pm.

## STOOMGEMAAL DE CRUQUIUS

De Cruquius near the town of Vijfhuizen is one of three steam engines with which the Haarlemmermeer was drained in 1848 and 1852. In 1933 the engine was taken out of service and made into a museum object. The old steam engine has been carefully maintained and is also interesting for the non technically minded. There are also maquettes, models and drawings of draining tools.

Opening hours: April to September, Monday to Saturday 10 am to 5 pm, Sunday and Bank Holidays 12 noon to 5 pm, October and November opened until 4 pm.

Admission price: adults f 2,50, children to 17 years and OAPs f 1,50.

For information: 023-285704.

## MUSEUM SCHOKLAND

On the former island of Schokland, now part of the Noordoostpolder, you will find a museum of

the same name. The museum is housed in a former church and a number of annexes. The collection of objects found at the bottom of the sea is split into an archaeological and geological collection. The museum also houses many objects, prints and such like, which bear relation to the history of the island.

Opening hours: April to October Monday to Sunday 10 am to 5 pm. November to March, Tuesday to Friday 10 am-5 pm. Saturday and Sunday 11 am-5 pm. (closed Jan. 1 and Dec. 25).

Admission price: adults f 1,50, children to 13 years f 0,75 OAPs f 1,-.

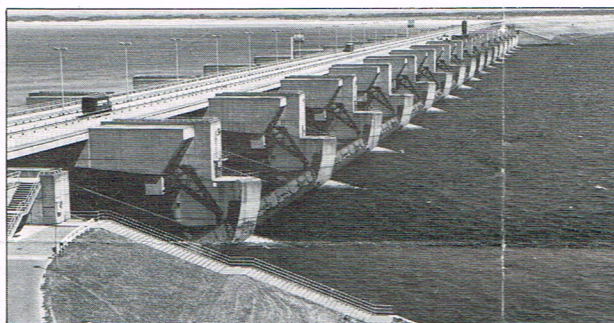
For information: 05275-1396.

## ZAANSE SCHANS

This open air museum near Zaandam consists of windmills and authentic houses from the Zaanstreek. It gives you a nice picture of a neighbourhood in this area around the year 1700. You will also find a bakery museum, a grocery museum, a clock museum and a period room museum. Furthermore, there are a few mills, a shipping yard, a cheese farm and a clog maker. Free admission throughout the year.

## MOLENGANG NEAR KINDERDIJK

Very near Rotterdam, in the village Kinderdijk, is a complex of



18 poldermills. Seven windmills from 1740 drain the polder Overwaard. Eight windmills from around 1738 drain the polder Nederwaard. These mills are the largest of their kind.

Finally, there are three more mills, of which one is a 'wipwatermolen', draining the remaining polders.

## MUSEUM MILL

In the town Schermerhorn in the province Noord-Holland there are three windmills which are still in operation. In the central mill a museum is housed. The three seventeenth century mills form a so-called 'molendriegang' ('triple mill track'), which is used for 'flighted drainage' (each mill takes the water a step higher). The museum will give you information on the polderland and the role played by the windmills. You will also find miller's tools.

Opening hours: May to September, Tuesday to Sunday 10 am to 5 pm; October to April, Sunday 10 am to 4.30 pm.

Admission price: adults f 1,75 children to 15 years f 1,-.

Other interesting museums which deal with water in some way are:

**Marinemuseum (Navy) in Den Helder**

**Maritiem museum in Zierikzee**

**"Scheepvaartmuseum" (Maritime museums) in Groningen, Sneek, Amsterdam and Texel island.**

**Museum Ship 'De Buffel' in Rotterdam.**

The Netherlands Board of Tourism assumes no responsibility with respect to the complete accuracy of these particulars.

Nothing contained in this publication may be reproduced and/or published by means of print, photocopy, microfilm or by whatever other means, without the prior permission of the publisher.

A publication of the Netherlands Board of Tourism, Vlietweg 15, 2266 KA Leidschendam.

Printed in the Netherlands  
By Veldwijk bv,  
2740 AC Waddinxveen

# Holland

## AMERICA (U.S.A.) (Information Office)

Netherlands Board of Tourism (NBT)  
437 Madison Avenue, New York, NY 10022  
Tel.: 0(212)245-5320

## AMERICA (U.S.A.) (Westcoast)

Netherlands Board of Tourism (NBT)  
603 Market Street, Room 401, San Francisco, Cal. 94105  
Tel.: 0(415)7813387

## CANADA

Netherlands Board of Tourism (NBT)  
25 Adelaidestreet East  
Suite 710, Toronto, Ont. M5C 1A2.  
Tel.: 1(416)3631577

## GREAT BRITAIN AND IRELAND

Netherlands Board of Tourism (NBT)  
Savory and Moore House; 143 New Bond Street (2nd floor),  
London W1Y 0QS  
Tel.: 01-4999367/8/9 / Telex: 269005

## SWEDEN

Holländska Statens Turistbyrå (NBT)  
Styrmansgatan 8 114 54 Stockholm  
Tel.: 08-782 9925 / Telex 17740

## WEST GERMANY

Niederländisches Büro für Toerismus (NBT)  
Laurenzplatz 1-3, 5000-Köln-1,  
Tel.: 0221-236262, Telex: 8882511