The **Niederfinow** Boat Lift

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Contents

Foreword

Dear Visitor,

The question is often asked whether the Niederfinow boat lift is the largest or even the only one of its kind. Far from it. Internationally, there are probably dozens of boat lifts in operation. In the past, devices were built in 8 locations in Germany which we would today call "boat lifts". Only the masonry of two of these structures remains, one near Halsbrücke (in operation from 1789 to 1868) and the other near Grossvoigtsberg in Saxony (completed in 1791, opening unknown). They were built for 8.50 metre long and 1.60 metre wide barges with a dead-weight capacity of approx. 3 tonnes. Another one, the Henrichenburg boat lift on the Dortmund-Ems Canal, which opened in 1899 and was shut down in 1970, has been retained for future generations as a restored technical monument. A fourth structure, the planned double boat lift in Hohenwarthe near Magdeburg, was never completed as a result of World War II. The other four boat lifts are currently operated by the Federal Waterways and Shipping Administration. These are the boat lifts in Niederfinow (opened in 1934), Rothensee near Magdeburg (opened in 1938), Scharnebeck near Lüneburg (opened in 1975) and Henrichenburg near Waltrop (opened in 1962).

The Niederfinow boat lift, the exclusive subject of the remainder of this brochure, is thus the oldest of the boat lifts still "serving on duty" in Germany today. But it remains unchallenged in attracting the highest number of annual visitors. Why is that?
If you ask a visitor how they enjoyed their visit or why they come back to Niederfinow again and again, the answer is often that it is "lovely, interesting and impressive". Certainly, there are many factors which play a role, like the size of the structure, its technology and its beautiful location in the Eberswalde glacial valley, between the Oderbruch and the Barnim. Not least of all however, it is the successful harmony of technology and landscape, the interplay of people and water. One watches the boats entering and leaving, the movement of the boat tank, the caisson, the gates opening, or one simply enjoys the lovely view from the visitors' gallery.

The Directorate for Waterways and Shipping East and the local Eberswalde Office of Waterways and Shipping plan to establish a permanent information centre near the boat lift in the next few years. Here, visitors will be able to acquaint themselves with the history of canal construction between the Elbe and Oder rivers, with plans for the modernisation of this canal, and not least with the technology of the boat lift itself. Until this centre is opened, we hope that this brochure will provide a brief and understandable explanation of what you have seen and experienced.

The Development of Waterways between the Oder and Havel Rivers

Humans have long used natural rivers and streams to transport goods. When a site was first settled, waterways were often the only traffic routes. They offered the advantage of transporting relatively heavy loads by ship. At some later point in time, the need emerged to move goods from one river system to another.

Every river system has its particular catchment area, which is the total area from which all surface waters drain into the main river via tributaries. Such river systems form the Rhine, Weser, Elbe, Oder and Danube rivers in Central Europe. The boundary between two catchment systems is called a watershed. In order to cross with boats from one river system to the other, this watershed must be overcome. Possibilities had to be sought to bring the ship "over the mountain" on artificial waterways. The condition for this is the theoretical and practical mastery of lock construction. The inevitable loss of water due to evaporation, seepage and the operation of the locks, particularly at the highest point of the canal, the so-called summit reach, needs to be taken into account. These losses have to be continually replenished in order to maintain the navigability of the canal. In the Middle Ages, these problems had not yet been solved and, as a consequence, many a visionary canal project was bound to fail. Among these was a project to link the Main and Danube rivers which was started under Charlemagne in 793. A permanent version of this canal was only completed 1,200 years later.

Parallel developments could also be observed in the Mark Brandenburg. The region between the Elbe and the Oder was criss-crossed by age-old trade routes. Most important for the development of the waterway system were the Hamburg-Berlin-Breslau, Leipzig/Halle-Berlin-Stettin and Magdeburg-Berlin-Stettin routes. Due to the poor condition of country roads, water transport was vastly superior to overland transport throughout the greater part of the 19th century. In the interest of promoting trade, it soon became an urgent necessity to supplement the natural navigable lakes and rivers with the construction of canals along the old trade routes.

The first building measures along the waterways began with the appearance of watermills in the mid-thirteenth century. The first barrages or dam systems did more to hinder navigation than promote it, since they interrupted direct ship transportation. Dam-up locks were soon built to bypass the dams however. Construction on the first canals could actually begin with the invention and introduction of the chamber or navigation lock in the midsixteenth century. The year 1605 saw the construction of the first Finow Canal which was designed to connect the Havel and Oder river systems north of Berlin. With temporary interruptions, building work continued until 1620. Branching off from the Havel near Liebenwalde and flowing into the Oder at Niederfinow, the canal was 38.6 km long and equipped with 11 chamber locks. The Thirty Years' War, which began while the canal was being built, not only destroyed it but also brought a complete halt to traffic, thus bringing doings and dealings in the Mark Brandenburg to a standstill as well.

Nonetheless the opening of the original Finow Canal was the first time in the history of German waterways that a connection between two major rivers had been established. The first Finow Canal was forgotten. It took 100 years, until after Frederick the Great's accession, for the old waterway to be remembered. A commission appointed by the king recognised the advantage of a canal system for transporting salt between Prussia and Pomerania without a detour via Berlin. Furthermore, it would facilitate the transport of timber for shipbuilding and firewood from the Neumark region to Berlin, Potsdam and Magdeburg. In 1743, after having the report by the commission he had appointed reexamined, Frederick the Great ordered construction of the canal to begin. The scheduled construction time of one year expanded to three years, but on 16 June 1746, a barge loaded with 100 tonnes of salt inaugurated navigation from the River Havel to the Oder. A barge loaded with oats completed the test run in the opposite direction.

The overall length of the canal was approx. 43 km, overcoming a difference in altitude of 38 m. The sites of the 10 initial locks were oriented primarily by the locations of the locks built between 1605 and 1620. Seven locks were added later.

Traffic on the Finow Canal grew continually. In the early 1840s, more than 13,000 barges and 48,000 logs passed through its locks annually. New, more efficient locks were soon required, since lockage times rose to up to 2 weeks due to the crush of ships.

In 1906, the Finow Canal reached the limits of its capacity as the transit of goods in both directions reached 2,760,767 tonnes. The growth in freight in the preceding years led to the decision to build a second modern northern connection between the Oder and the Havel. With the act of 1 April 1905 on the construction and expansion of waterways, Emperor Wilhelm II ordered, among other things, the "construction of a shipping lane for large ships from Berlin to Stettin" (Berlin-Hohensaaten waterway). This canal, known today as the Oder-Havel Canal, was opened to traffic in 1914. It allowed the passage of ships of up to 600 tonnes, as opposed to 170 tonnes on the Finow Canal. Another serious advantage was the reduction in the number of locks which had to be passed, from the former 17 between Spandau and Hohensaaten to just 5: one in Lehnitz and four at the so-called descent in Niederfinow. Here, a difference in altitude of around 36 m

between the highest point of the canal, the summit reach, and the Oderbruch region had to be overcome. First plans were based on the construction of a boat lift. There were already suggestions in this regard towards the end of the 19th century. From 1906, in a variety of public competitions, an incredible diversity of possibilities for a boat lift were elaborated. However, none of the designs met with the unanimous approval of the Prussian Waterway Engineering Authority or the Academy of Civil Engineering. For this reason, it was decided to build a series of locks consisting of four locks each with a drop of 9 m, 10 m in width, 67 m in length and with 250 m between one lock and the next. There was relevant experience in the construction of locks, but there was not a single boat lift of such a size in the entire world. The construction of a boat lift was adjourned until the time when a fully developed, reliable technical solution had been found.

Efforts continued after World War I and the formation of a united German Waterway Administration, until between 1924 and 1926, the administration produced a design which was accepted by all the agencies involved. This project was developed according to the following specifications:

- vertical motion with wet conveyance,
- closed lower level (dry tank chamber),
- tank movement via four pinions in rack ladders,
- weight compensation by counterweight on wire cables,
- safeguarding against imbalance by so-called rotary crosspieces.

The Eberswalde Construction Development Office design was approved by the Academy of Civil Engineering in 1927 and refined further with the participation of the companies involved. The names of the companies primarily involved can be found on plaques on the visitors' walkway.

On 21 March 1934, the Niederfinow boat lift began continuous operation as the largest facility on the German inland waterway system of the time.

The Process of Lifting and Lowering

The difference in altitude of 36 metres between the lower, Oder reach, and the summit reach, the highest stretch of the Oder-Havel Canal, is cleared in just five minutes. This is equivalent to an average speed of 12 cm/s, achieved after about one metre of tank movement or 20 seconds. A vessel requires about 20 minutes for the whole passage, including entry and exit manoeuvres.
Let us now take a look at the process of lifting a ship coming from the Oder river and travelling on in the direction of Berlin. This involves the following series of events:

- Starting position: The caisson or tank is situated in the lower operating position, solidly connected with the canal level or lower pound. It is as it were a part of the canal. The tank gate and the pound lock gate at the east side are opened, the vessel lies at the starting position.
- The pilot, after being informed by radio that his vessel will be the next to be lifted, gets the green entry signal. He casts off from the starting place, pulls into the caisson and moors at the bollards.
- Water table fluctuations can arise due to the movement of the entering vessel and other ship movements in the outer approach. When these have abated, the tank driver closes the tank gate and the pound lock gate by pressing a button.
- The cleft water between the tank gate and the pound lock gate is drained off.
- The sealing frame which allows a watertight connection between the canal and the lift tank is returned to its land-side position.
- The mechanical shutter between the tank and the land is disengaged. The tank now hangs freely on the cables and is ready for transport.
- The converter is started and accelerated until it produces the direct current voltage necessary for operation.
- After the sounding of a signal, the tank begins to move upwards. The hoisting operation takes about 5 minutes. During this time the caisson driver moves from the eastern to the western control desk.
- The caisson stops automatically upon reaching the upper pound with the help of a level equalisation system.
- The caisson is locked mechanically to the upper canal connection to prevent it from swinging.
- The upper sealing frame is driven into position and settles next to the tank.
- The clearance between the upper pound lock gate and the western tank gate is filled with water.
- Both gates are raised and the tank is now a part of the summit reach.
- The vessel gets "green", the lines are cast off, the vessel exits and the process is complete.

When a ship goes in the opposite direction, the process is repeated in reverse order. There are a number of special features in the case of a multiple barge convoy which is longer than the caisson being towed through. In this case the convoy is uncoupled and the push tug leaves the tank backwards. Arriving above, the non-propelled barges are taken by a bridle hook and mechanically pulled out of the tank.

View of the boat lift from the west

Technology

The foundation engineering

In accordance with the geological conditions, the composition of the soil layers changes so greatly that only a building site on a slope came into question for the construction of the boat lift. The nine foundation piers of the lift had to be taken down to more than 20 m under the ground with the use of compressed air in order to reach load-bearing sand layers.
A concrete sump pan to support the tank by conveyance to the lower water level of the Oder reach had to be built. The sump pan at the same time also represents the main foundation raft for the framework of the boat lift. Since the caisson or tank chamber projects into the groundwater, a watertight concrete sump pan of 7.90 m internal depth had to be produced. The dimensions of the framework gave the sump pan a length of 97.65 m and a width of 29.10 m. The sole is 4 m thick. The foundation was made by lowering the ground water table in an open foundation pit to a depth of 12 m under the ground. Further lowering to the relevant foundation depth was achieved using a pneumatic process.
The foundation was completed in 1929 after a construction period of about 2 years.

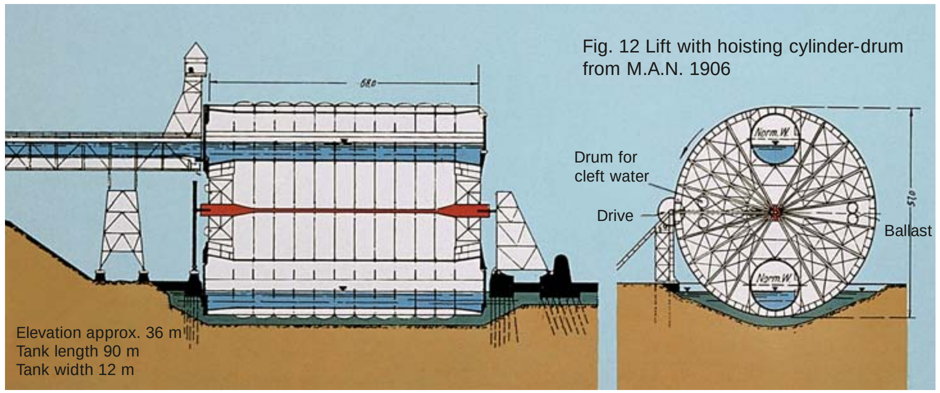
The constructional steelwork

The constructional steelwork of the boat lift is divided into four parts:

1. the caisson,
2. the steel framework,
3. the lower pound lock,
4. the canal bridge.

The caisson is the movable part of the lift. The vessels float in it while they are being lifted or lowered. It is 85 m long and 12 m wide. The water has a depth of 2.5 m which can be increased by up to 0.65 m.
The caisson weighs 4,300 tonnes, including the water load. The steel framework stands alongside the caisson and supports 64 hoisting sheaves with a diameter of 3.50 m each on both sides of the hoisting sheaves hall. The cables run over these hoisting sheaves, supporting the caisson on one side and the compensating counterweights on the other. The load is equalised by concrete weights (21 tonnes each) which are connected to the caisson by 192 cables of 52 mm in diameter. The cables are 56.70 m long. The 64 remaining cables are joined to the counterweight guide frames and have a load-bearing capacity of 4 tonnes each.
In addition, the steel framework supports the central spindle columns which take on the excess load when the balance between the caisson and the counterweight is disturbed. The rack ladders and guides along which the caisson moves up and down are also attached to the steel framework. On its western side, the framework supports the vertical gates which seal the upper reach from the lift and all the other auxiliary facilities necessary for connecting the caisson.
In cross-section, the framework con-

View of the boat lift from the south



Proposal for a boat lift constrution from 1906

sists of two-hinged frames, two of which are supported by lateral braces. In longitudinal section, there are eight of these two-hinged frames; actually, two frames at a time are joined together by longitudinal bonds ("interior and exterior wall") to form a three-dimensional double-frame. The two towers in the centre of the boat lift are connected by special bonds into a middle tower, which has the effect of a constrained framework lengthways to the boat lift. The four central spindle columns, the rack ladders and the four lateral braces are installed in this middle tower.
Two other two-hinged frames form the west tower which is connected in a longitudinally traversable manner with the middle tower. The east tower formed by the remaining two two-hinged frames is permanently connected to the middle tower by the cable sheave girders. The lower pound sealing, an independent structural component beside the steel framework, supports the vertical door which seals off the lower pound and the facilities for connecting the caisson as well as their operating gear.
The complete boat lift framework is about 60 m high, 94 m long and 27 m wide. It is made of St 37 structural steel. The steel framework was constructed between 17 February 1931 and the spring of 1932 using a special gantry crane. Most of the structural components were delivered to Niederfinow by railway and brought over the Finow Canal by railway ferry. The components were riveted together at the building site.
The canal bridge with a length of 157 metres connects the boat lift with the upper reach. The bridge tank has a waterlevel width of 28 m (total width 34 m) and a water depth of 3.00 m. The main loads of the canal bridge are transmitted by the two middle piers to load-bearing foundation soil. The foundations of the hinged piers situated about 37 m from the lift had to be just as deep as the foundation piers of the boat lift. Because of their flexibility, the hinged piers allow for temperature-related longitudinal variations in the steel construction. Two watertight contraction joints take this fact into account as well.

The gates

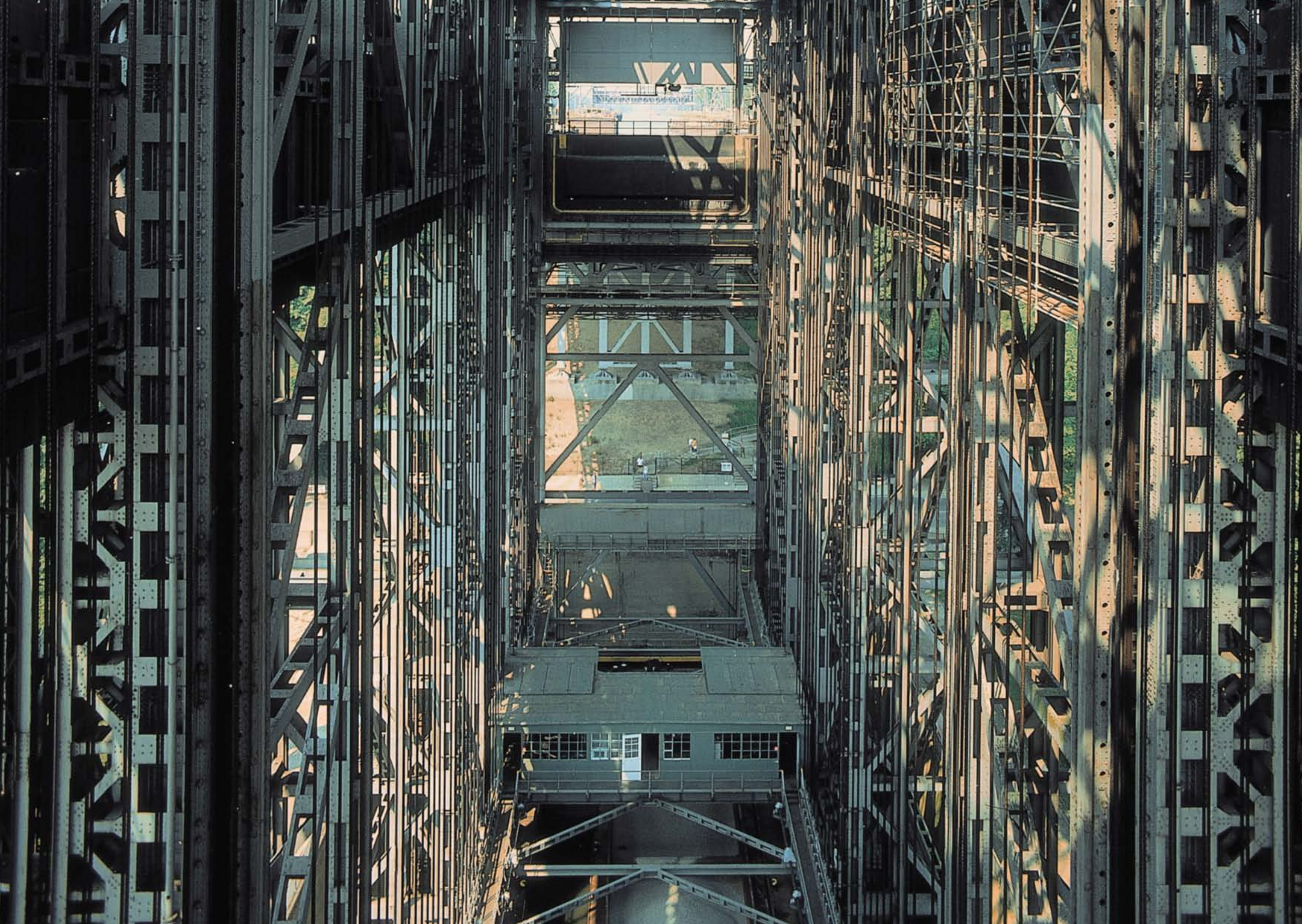
The tank gates and the pound lock gates are built as vertical gates. Each tank gate is 12.5 m wide and 3.50 m high. They close the tank at both sides. The pound lock gates close the upper and lower pounds respectively. One tank gate weighs approx. 23 tonnes. The pound lock gates have the same width but are slightly taller and thus also slightly heavier.
The gate bodies consist of a sectional steel construction, on the air side of which a sheet-metal skin has been riveted. The tank gates, which have been renovated, are a welded construction. The gates are driven transversely and longitudinally on rollers. Counterweights running on cables nearly equalise the weight of the gates. In order to close the gate securely, there is a gate excess load of approx. 1 tonne in closed position. A second cable, the hoisting cable, connects the gate with the operating gear which effects the lifting and lowering process. The gates are sealed by a U-shaped rubber moulding running around the water cross-section. The necessary compression of the rubber is produced by the water pressure on the gate. There are timber fender beams in front of the pound lock gates to protect the gates from any possible collisions with arriving vessels. In case the upper pound lock gate suddenly malfunctions or has to be repaired, an auxiliary gate of the same size is located about 3 metres in front of the actual gate. It also serves as a cut-off if any cleaning or repair work has to be carried out on the upper reach connection in the underwater zone. Another gate which can be locked by remote control is situated in the upper approach at the end of the canal bridge. It serves, on the one hand, for the drainage of the canal bridge for monitoring, maintenance and repair work and, on the other hand, as an emergency seal in the case of leakage in the canal bridge or the canal route. This gate was assembled on site as a separate structure.

The lock approaches

Even when the first descent, the staircase of locks, was being built, allowances were made for the planned second descent. The upper entrance was thus continued as a straight lengthening of the canal.
The upper approach has a length of 1,200 m, a water-level width of 66 m and a sole width of 35.60 m. These dimensions guarantee room for four vessels to berth next to each other and to sail past. The lower approach has a water-level width of 68.80 m and a sole width of 41 m. In both approaches, electric towing locomotives taken over from the staircase of locks towed the vessels without their own propulsion from the tank. In the course of the transition from tug shipping to push shipping, the electric towing locomotives were taken out of service. Barges without their own propulsion are today towed out by a winch traction facility, while the push boat pushes them into the entrance.
The upper approach, the mooring pillars, the route of entry and the abutments of the canal bridge were all built on dry land.

The mechanical and electrical technology

Strictly speaking, the boat lift is a gigantic machine which required a large share of structural engineering for its construction and functioning. There are a large number of mechanical drives on the lift, for example the caisson, the pound lock gates and the tank gates, the sealing frames, the shuttering and drainage systems and so on.
Let us take a look at the mechanical technology of the caisson movement. The caisson is moved by four rack-and-pinion drives. The racks are fixed onto the lift framework, while the drive pinions are fixed onto the caisson. Each rack-and-pinion drive is connected with a safety catch which catches



the caisson in the case of larger disturbances in equilibrium. It consists of an irreversible screw spindle (rotary crosspiece), which is moved in a full-length slotted nut (central spindle column). These central spindle columns are connected to the lift framework while the rotary crosspieces are fitted to the caisson. The drive units are accommodated in engine rooms on the superstructure of the caisson. They are connected with each other by a shafting loop line (ø 130 mm) to guarantee complete synchronisation. Each of the four drives consists of a spring-mounted pinion driven via four spur-geared back gears by an electric motor. A direct-current motor is the drive unit for each machine. The motor operates on the first countershaft via a flexible membrane clutch.

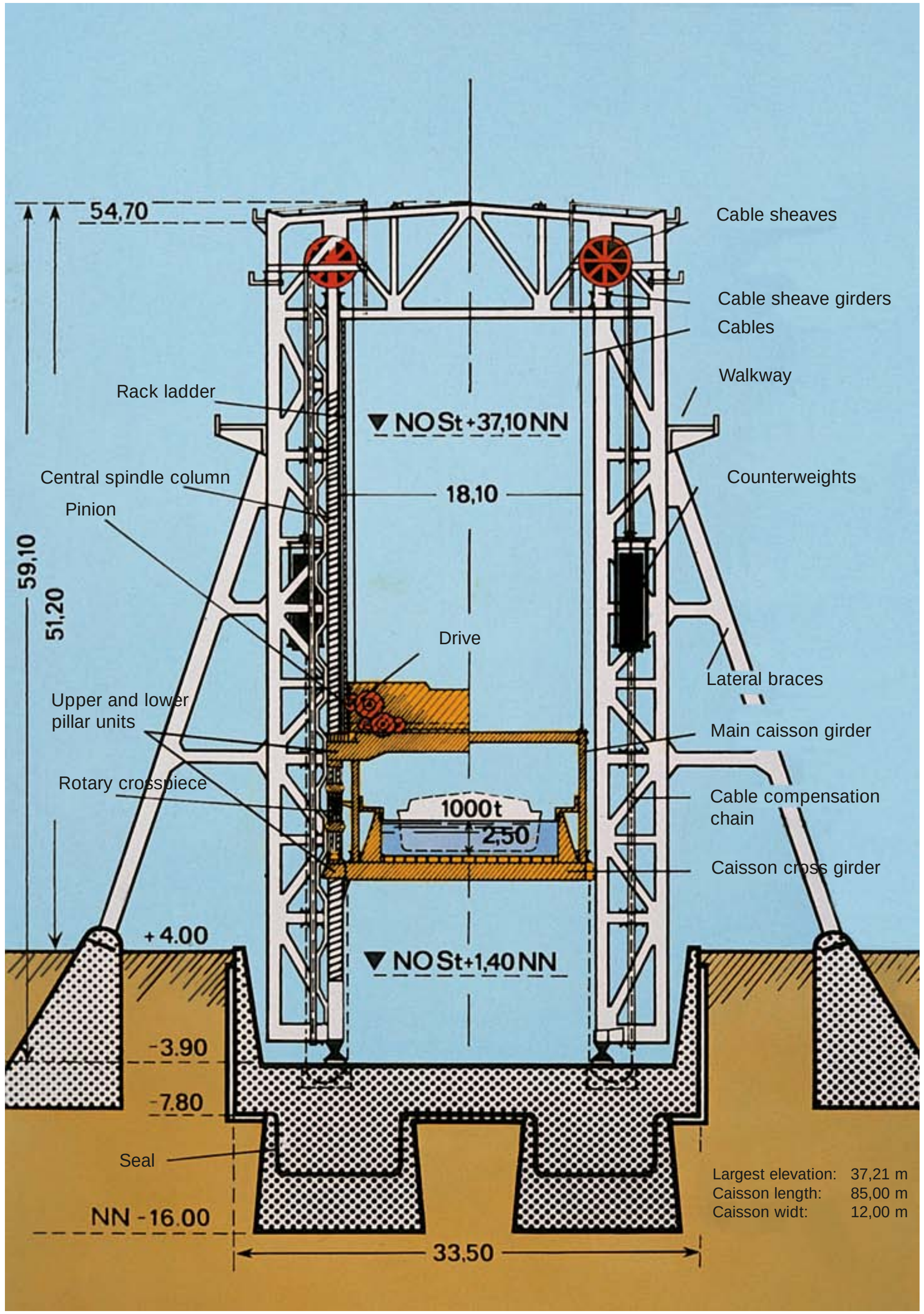
The electrical installations on the caisson are primarily for the operation of the caisson. The four drive motors are direct-current shunt motors of a power of 55 kW (75 horsepower). The speed of the four motors is regulated automatically by the control unit using the Ward-Leonard speed-control system in a range of 60 to 700 revolutions per minute, during one trip from start to stop. The technical specifications of the Ward-Leonard converter are:

Drive motor:	310 kW; 380 V three-phase current; 25% duty cycle; 140 rpm
Control generator:	277 kW; 479 V DC; 25% duty cycle; 1,450 rpm
Excitation generator:	15 kW; 230 V DC; 25% duty cycle; 14,50 rpm

The major overhaul in the years 1984-85 included the larger part of the mechanical engineering and electrotechnical systems. During this period, all 256 cables were replaced, all cable sheave supports were replaced, and the electrical systems of the upper and lower pounds as well as the caisson were renewed. After a short interruption further repairs took place in the following areas:

- reconditioning of the sealing frame drives of the upper and lower pounds,
- renewal of the ring shaft,
- construction of the winch traction facility with original reproduction of the towing towers.

Repair measures will be completed within the next few years with the reconditioning of the rotary crosspieces. Through the regeneration of the elements of the system, it is possible to maintain the tried and tested technology at a level which prolongs the working life of the boat lift and allows continued, uninterrupted operation.



Schematic cross-section of the boat lift

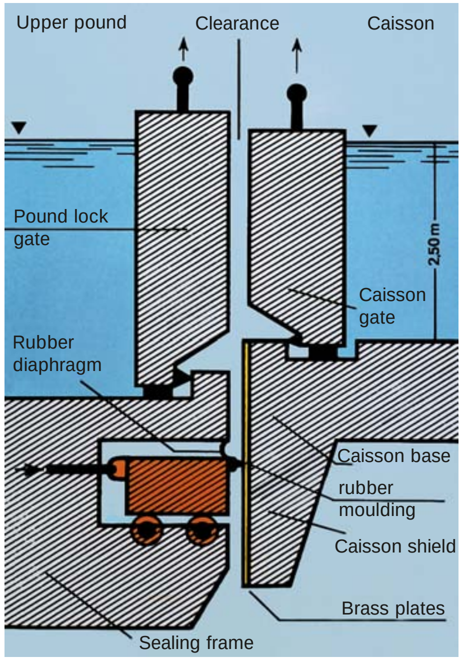
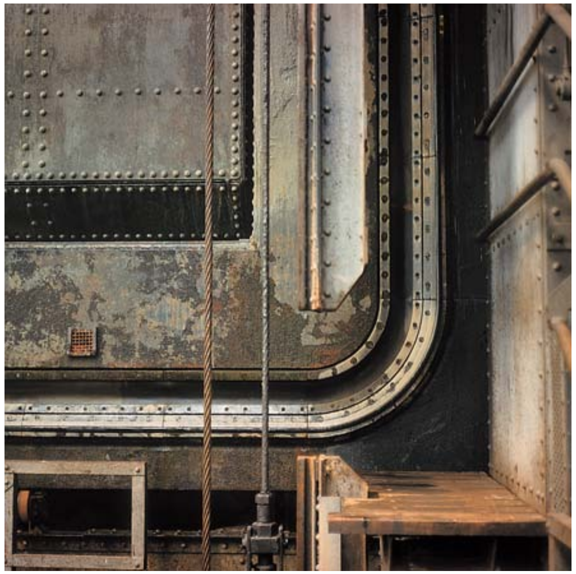


Diagram of the sealing system



Partial view of the sealing frame

Shipping Traffic

The individual processes of lifting and lowering are already described in another part of this brochure. These procedures are controlled by four staff from the Eberswalde Office of Waterways and Shipping. The shift manager has overall control. He keeps the statistics, receives the shipping announcements over the radio, distributes the starting numbers and prescribes the order of lockage and thus the caisson allocation. The caisson driver controls all mechanical processes. The towing men handle the mooring of barges to the caisson and the towing of non-propulsive barges. They accompany these to their waiting places and moor them to the bollards.

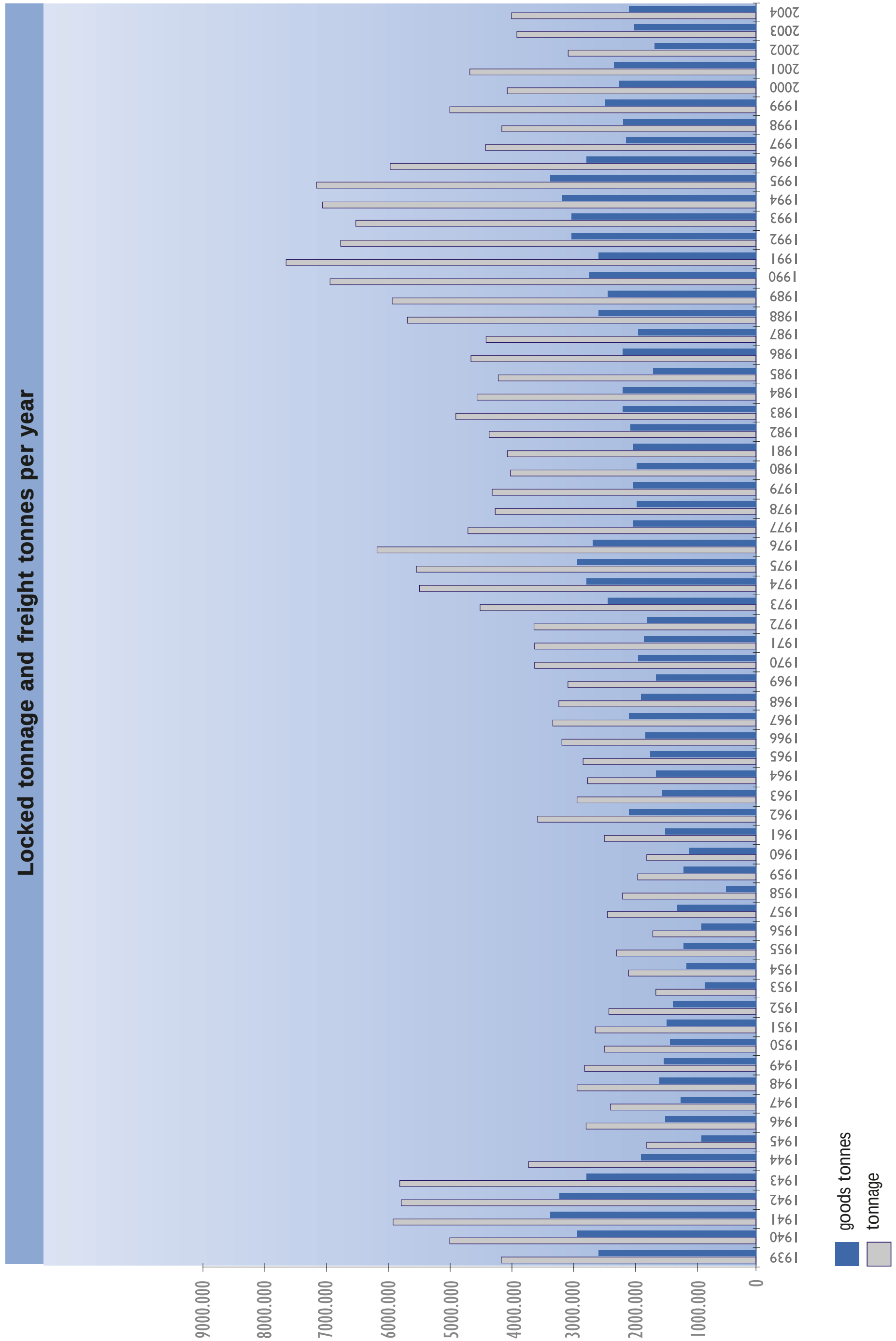
The entire route of the Havel-Oder Waterway begins at km 0.0 (Spandauer Havel mouth), continuing on to Lehnitz lock (the so-called Havel reach), then from Lehnitz at km 28.60 to Niederfinow (the so-called summit reach with sealed route from Marienwerder to Niederfinow) and from the Niederfinow boat lift to Hohensaaten lock at km 92.80 (the so-called Oder reach), before proceeding along the Hohensaaten-Friedrichsthal Waterway until km 135.0 at the mouth of the West Oder river. It allows vessels of many different load capacities in individual sections of the waterway.

The shipping period (the period from the opening of shipping to the closing of shipping) is dependant upon the winter temperatures and is as follows for the boat lift:
The section which ices over first and thaws last (the summit reach from Niederfinow to Lehnitz) determines as a rule a halt to shipping as a result of icing over from mid-December to March. An evaluation of many years of icing over in the period from 1950 to 1995 showed an average icing over period of 67 days, on 33 of which navigation was completely impossible and therefore closed. In this connection, however, the clear differences between mild and hard winters must be stressed.
During this above-mentioned forced break in winter, there is a regularly ordered closing of the boat lift for necessary maintenance and repair works. As a rule, this planned closing for shipping takes place between 3 January and 15 March each year (depending on the extent of the repairs).
After this, the boat lift works without any significant interruptions until the new icing over of the canal. In so-called dry years, there were restrictions for navigation or a lowering of the permissible draught, for example in 1959 -10 cm, in 1963 -5 cm, in 1992 -40 cm (from 15 August to 2 September). In normal weather conditions however, the feeding of the canal, the balance of seepage, evaporation and lockage water, is guaranteed by the Liebenwalde weir, so that the maximum allowed draught (from 1959 to 1963 - 175 m, from 1963 - 185 cm, from 1985 - 200 cm and since 1996 - 190 cm) is usually available for navigation.
From the opening of the boat lift in

1934 until the end of its 60th year of operation, about 127 million tonnes of freight were locked from the hill to the valley or vice-versa. The "Locked tonnage and freight tonnes per year" diagram clearly shows the development of the traffic volume for tonnage (possible load quantity) and freight tonnes (actual load quantity corresponding to the allowed draught).

The main types of goods are building materials, coal, and fertiliser, as well as iron ore and scrap metal.

View of the boat lift from the south of the lower approach



The southern line of cable sheaves on the uppermost storey of the boat lift

Specifications of the Niederfinow boat lift

A brief data overview

Start of construction: 1927
Opening: 21 March 1934

Required were:	72,000 m³ of concrete 14,000 t of steel 27,5 million Reichsmarks
The boat lift is approx.	60 m high 94 m long 27 m wide

The piers extend 20 m under the ground.
The sole of the caisson or tank chamber consists of a 4 m thick concrete slab.

The **caisson**	weighs is compensated by each via each with	4,290 t (with water) 256 wire cables 52 mm in diameter (parallel lay) 128 cable sheaves (double grooved) 3.5 m in diameter 192 counterweights.
The **lifting process**	elevation at a speed of through with each and takes	36 m 12 cm/s 4 drive pinions 4 direct current motors 75 horsepower (55 kW) 20 min (≙ by the staircase of locks in the past).

The upper connection to the Oder-Havel-Canal is made by the

Canal bridge:	It is and was built of	145,96 m long 4,000 t of steel.

A ship arrives in the caisson of the boat lift from the upper approach

Outlook

The Niederfinow boat lift has served shipping for over 60 years. It began operating 16 hours a day and was forced to take up 24-hour operation on 1 May 1994 because of longer ship waiting periods due to the extremely high volume of traffic.
In 1995, 3.3 million tonnes of freight passed through the boat lift. This represents an increase of around 50% in comparison to the roughly 2 million tonnes of freight each year in the eighties.
In order to maintain the importance of the waterway as an environmentally friendly and cost-effective possibility for transport in the future, it must adapt to changing demands. These are a further increase in transport quantity and the increasing size of vessels.
Freight transport via the boat lift is estimated at just under 10 million tonnes for the year 2010. This freight will be transported on vessels of up to 110 m in length and 11.4 m in width. For these volumes and these vessels, a second descent structure will be required and some stretches will have to be expanded.
The present dimensions of the waterway were determined by the construction between 1906 and 1914. At a water depth of 3.00 m, it reaches a water-level width of between 33 m and 44 m. The basis for the early plans was the encounter in transit of two barge convoys.
The largest boats were 67 m long and 8.2 m wide. With a draught of 1.75 m, they would have been carrying a load of around 600 tonnes.

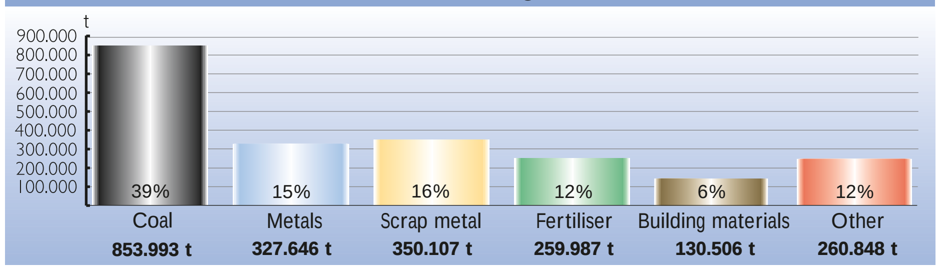
Inland shipping underwent far-reaching structural changes after World War II. The slow towed convoys which had predominated up until then were replaced by fast-moving, motor-powered freight vessels and push boat convoys. The largest units plying the water today are 80 m long and 9.5 m wide motor-powered freight vessels with a maximum draught of 1.70 m at a load of up to 700 tonnes and 135 m long push boat convoys with a draught of up to 2.00 m at a load of 1,200 tonnes. Larger dimensions are absolutely impossible. The water displacement which these vessels produce gives rise to high-velocity backflow in the canal cross sections which the protective layers of the embankment and the canal sole cannot withstand in the long run. The 23 km sealed stretch east of the boat lift in particular has incurred heavy damage. In the mid-eighties, the protective layer was reinforced and an alternative one-way traffic system was arranged in order to protect the seal. The reinforcement decreased the depth of the water to 2.80 m. Because of the alternative one-way traffic system, vessels do not meet in the sealed section. The boats pass through this stretch in convoys. Once every eight hours, a convoy from Berlin reaches the boat lift. Subsequently, another convoy starts in the opposite direction. Due to this arrangement, ships have to wait up to 7.5 hours. With just under 10,000 ships a year and 12 working hours per day, the total waiting time for the shipping on the Havel-Oder Waterway theoretically adds up to more than 3,000 days per year.

View from the gallery of the boat lift: The old Finow Canal can be seen in the background.

The 1992 Federal Traffic Routes Plan provides for the improvement of this waterway for the safe, easy and economical operation of present and future ships. The necessary water-level width of 55 m at sloped embankments and 42 m at steep banks was determined in earlier projects through numerous calculations and subsequently confirmed in relevant tests. The Havel-Oder Waterway will continue to have a depth of 3 m, thus allowing a maximum draught of 2.2 m. This increased draught will improve the efficiency of the present motor-powered freight vessels considerably. After development is completed, the approx. 80 m long canal boats developed in the GDR will be able to handle about 300 additional tonnes, or roughly 55% more, without additional expense. The same is true for the vessels currently being developed in the State of Brandenburg especially for the conditions on eastern German waterways (VEBIS project). The Havel-Oder Waterway will be developed in a series of interconnected projects. The realisation of each project will noticeably improve the reliability and efficiency of the waterway. The two most important projects are the development and renovation of the stretch between Lehnitz and Niederfinow, as well as the construction of another descent structure in Niederfinow. The development of the stretch will mean an increased draught for motor-powered freight vessels of at least 2.00 m and that the traffic expected by 2010 will be able to travel freely without waiting periods. After the completion of the new descent structure, ships with a length of up to 110 m will be able to navigate the Havel-Oder Waterway generally. Repairs to the old boat lift will no longer lead to six to eight week long interruptions of traffic and the traffic expected for the year 2010 will be able to be handled safely.

Today, the waterway built in the period from 1906 to 1914 fits wonderfully into the natural environment. This is clearly shown by the many nature reserves and protected landscape areas along its banks. In order to preserve this environmentally-compatible form of waterway, an environmental impact assessment will be carried out for each project. Appropriate environmental impact studies will be carried out for these assessments. These studies will be the basis for the way in

Niederfinow boat lift freight traffic 2004



which the waterway will be designed. The study for the stretch between Lehnitz and Niederfinow began in 1994. The following planning principles were derived from the first results and the experience of other projects:

- Sloped embankments protected by stones similar to those at present will ensure that animals will also be able to cross the waterway without difficulty in future. In addition, the bank area will develop like the existing areas and provide a habitat for a large number of plants and animals.

- Single-sided development will mean that development work in the unsealed stretches will be restricted to one bank. This will considerably reduce intervention in the relatively valuable woodside and bank zones, especially in densely wooded areas. In order for this environmentally compatible construction method to unfold its full effect, no new service roads will be developed on the bank not affected by development. The decision as to which side will be developed will be based primarily on the results of the environmental impact study. The extensive consideration given to the importance of nature and the landscape lead to hope that individual projects will be swiftly implemented. The improvement of traffic conditions on the Havel-Oder Waterway would considerably help to ease road traffic, since inland shipping can carry out transportation of all kinds more economically and in a more environmentally-friendly way than any other means of transport.

Bibliography

Interested visitors can find further information about the Niederfinow boat lift in the following works, which were also used in this brochure:

(1) "Das Schiffshebewerk Niederfinow", commemorative volume, Wilhelm Ernst und Sohn, Berlin 1935, in
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Plarre and Contag: Sonderentwürfe für die Gestaltung des Schiffshebewerkes Niederfinow
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The **Niederfinow** Boat Lift