



## Lock “Schleuse Neuer Hafen” in Bremerhaven

**The seafaring city of Bremerhaven is developing the area around both its old and new port to create a maritime theme world. A part of the project involved constructing a new chamber lock connecting the new port (Neuer Hafen) with the River Weser.**

HOCHTIEF Construction AG, Civil Engineering and Marine Works, constructed the 50 m long and 14 m wide lock on a turnkey basis in a joint venture. By implementing an innovative alternative proposal for the lock gates function we improved the lock technology and minimized costs for the client.

We handed over the impressive project to the client, Bremerhavener Entwicklungsgesellschaft, in time for the Sail 2005 international festival of windjammers and ships can now enter and exit the new port at most tidal water conditions.

## Innovative lock technology

The operational principle of the lock gates provides numerous advantages: each gate consists of two sector-shaped wings which rotate around a vertical axis. The sector gates are also used for filling and emptying the lock chamber. No additional devices, for example filling and emptying valves, are required. Compared to regular systems the new gate technology comprises fewer elements as guidance structures are not necessary at all, making the structure less vulnerable to silting and sand sedimentation than other gate structures. Opening bridges are positioned at the outer and inner entrances of the lock with

the two parts of the bridge being supported by the gate chambers and lock gates opening and closing together with the gates. The sector gate principle has already been a success in many locks abroad, however in Germany it was the first project utilizing this system. During construction the joint venture refined the concept and developed a successful solution, cutting investment and operating costs, since sector gates require less servicing and maintenance and thus make for lower operating costs.





## Technical challenges

**The new lock is sited between the Zoo am Meer and the Simon-Loschen-Lighthouse. At the same location, between 1847 and 1852, engineers built a 22 meter-wide tide lock, which was filled in 1937. In the course of the construction of the new lock we dismantled the two old pairs of dock gates, which were still present when construction work commenced. Because the lock axis needed to be changed for nautical reasons, the chamber walls of the new lock run across the brick walls and floors of the old one. Outer and inner entrances are located within the old wharves. All existing structures had timber pile foundations.**

The Loschen-Lighthouse, built between 1853 and 1855, is a brick construction on timber pile foundations. It was visibly leaning towards one side, consequently we attached special attention to minimize vibration during construction of the new lock's foundations. The existing structure of the old lock was bored with a rotary drilling rig and afterwards the sheet pile walls of the lock chamber together with the sheet piling between the lock chamber

and the inner and outer entrances were installed into single phase diaphragm walls. After partial demolition of the existing wharves in the area of the gantry rails we carefully installed the remaining sheet piling in the excavations for the entrances. During construction, this process was permanently monitored by a vibration metering system. The anchors of the lock chamber and the landward excavation walls were carried out as drilled injection anchors,

similarly the anchors for the anti-uplift systems in the excavations and the lock chamber. Both entrances were constructed in protection of a sheet-pile-walled excavation pit with an underwater concrete foundation-slab.

#### Project data

##### Client:

Bremerhavener Entwicklungsgesellschaft Alter/Neuer Hafen GmbH

##### Technical data:

Effective chamber length: 50 m

Passable width: 14 m

Lock floor: -6.5 m MSL

##### Water levels for lock operation

(LW = lock water level) :

HHLW +2.8 m MSL

LLLW -3.0 m MSL

##### Water levels Weser:

HHW +5.35 m MSL

MHW +1.74 m MSL

MLW -1.90 m MSL

LLW -4.20 m MSL

##### Water levels Port

(PW=Port water level):

HHPW +1.71 m MSL

MHPW +1.05 m MSL

LLPW +0.34 m MSL

##### Construction period:

January 2003 – June 2005

## Competence in lock construction

The lock chamber was equipped with an anchored underwater concrete foundation-slab preventing uplift. The outer and inner entrances of the finished lock can be drained for inspection or maintenance work either separately or together with the lock chamber. The lock can be operated at most of the outside water levels of the River Weser. HOCHTIEF Construction AG, Civil Engineering and Marine Works, and its partners handed over the fully operational lock to the client after a construction period of 30 months.

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