Construction of the new Kaiserschleuse lock in Bremerhaven

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Harbours Bremerhaven (detail)

Kaiserschleuse lock

Nordschleuse lock

Container terminal

Overseas harbours

Germany
Kaiserschleuse lock in Bremerhaven

Built in 1897, one of the largest locks in the world

Length of lock chamber: 215 m
Width of lock chamber 45 m
Clear passage width at the heads 28 m
Sill depth = MSL – 8.95 m
Obsolete technology
Modern car carriers are up to 240 m long, > 32 m wide and have draughts of up to 11 m.

Design studies, e.g. by shipping company Wallenius-Wilhelmsen already envisage vessels with a width of up to 50 m.
Existing locks

Nordschleuse lock

Kaiserschleuse lock

45m

350m

28m

215m
Harbour access options

Short Sea Carrier (SSC)
- Kaiserschleuse
- Nordschleuse

Deep Sea Carrier (DSC)
- Kaiserschleuse
- Nordschleuse

Future Carrier
- Kaiserschleuse
- Nordschleuse

Images depict various harbour access options for different types of carriers.
Dimensions at new lock heads

Length      =  305 m  +  90 m  
             (215 m)  
Width       =  55 m  +  10 m / 27 m  
             (45 m / 28 m)  
Sill depth  =  -13 mNN  +  4.05 m  
             (-8.95 m)
General construction conditions

- Construction on existing site:
  - Designed to keep effects to a minimum

- Construction while operations continue:
  - Existing lock continued to operate till end of 2007
  - Then decommissioned completely for 28 months

- Construction under tidal conditions:
  - Use of a jack-up platform

- Maintaining storm tide protection:
  - Careful planning of the individual construction phases
Construction phases - guideline
Construction phase I (April 07 – June 08)

- Preliminary work: demolish above-ground structure, site installation, relocate Lohmanndyke
- Gate chamber outer + inner lock head: assembly of foundation pit
- Preliminary dredging of tugboat harbour, produce new eastern mole
- Kaiserharbour: partial demolition of existing quay wall, produce new sheet pile wall
- Lock chamber: dismantle inner head of old lock, sheet piling, new chamber walls
- Outer harbour: install eastern wall of outer harbour, dismantle old eastern quay
- General: production of outer areas begins, carcass construction of building at outer head
- Gate chamber outer + inner lock head: production of foundation slab and chamber walls
- Completion of tugboat harbour
- Gate fittings and sill, outer and inner head: production of foundation pit, foundation slab and wall
- Lock chamber: dismantle outer head of old lock and complete new structure
- Outer harbour: produce new west wall for outer harbour, complete remaining work for eastern wall
- General: production of outer facilities, roads and canals
- Gate chamber outer head: production of operating building and installation of lifting-sliding gate
- Gate chamber inner head: production of machine house and installation of lifting-sliding gate
- Production of road crossings at outer and inner heads
- Lock chamber, outer harbour and Kaiserharbour: dredging work
- Overall inauguration of the new lock!
The average time required to fill or empty the lock chamber, assuming an average difference in water levels of 2.0 m, is just 10 minutes.
Principle of lifting sliding gate

Lifting sliding gate closed – lifting slab is lowered
Gate and lifting slab are raised

It takes approx. 2 min. to raise or lower the upper gate section.
Principle of lifting sliding gate

Sliding gate open – lifting slab raised
Overview of lifting system – upper section raised

Principle of lifting sliding gate

- lifting cylinder
- locking device
- guide elements
- supporting structure

- 4 cylinders per gate
- 4090 mm length when retracted
- 800 mm construction lift
- 8 MN max. load per cylinder
Gate drive system (cable drive)

Cable drum with transmission and motor unit

Cable drive with drive crossbar and deflection pulley with cable tensioning device (hydraulic)

- Main electric motor: 110 kW
- Transmission
- Cable drum
- Connecting shaft
- Emergency motor: 7.5 kW
The new Kaiserschleuse lock

Inauguration of the new lock on the 29th of April 2011

Contractor: Kaiserschleuse consortium
HOCHTIEF Construction AG / Aug. Prien Bauunternehmung GmbH & Co. KG / STRABAG AG

Project volume: EUR 233 million €
Thank you for your attention!

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www.Kaiserschleuse.de