RENOVATION OLD ELBTUNNEL, HAMBURG

Renovation old Elbtunnel, Hamburg, Germany

Total restoration of the vault, banquette including utility ducts of the antique single track road tunnel under the Elbe, linking the parts St. Pauli and Steinwerder of the city of Hamburg.

Scope

- Two tubes single track tunnel, length each 426 m
- Two shaft buildings with elevator height of 23.5 m
- Operation of the antique building since 1911

Challenges

- Historic monument showing significant deterioration
- Static relevance of restoration works
- Under passing the groundwater level

Amberg Services

- Entire project review
- Support of client during the planning phase
- Support of client during tendering process

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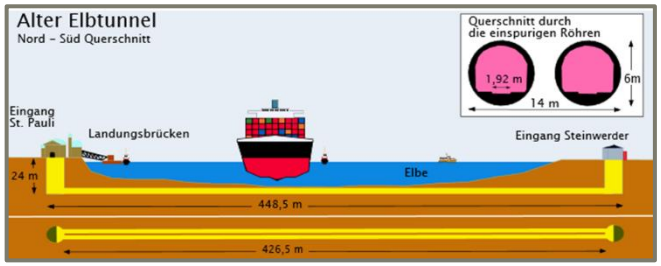
- Old Elbtunnel linking St. Pauli and Steinwerder



- Cut of the Elbtunnel with the riverbed of the Elbe

- Shaft of the entrance at St. Pauli

AMBERG FACTS

Contracted value Amberg

- Total, 153’000 CHF

Project Phases & Duration

Project review	2008
Design and static calculations	2009
Submission	2009
Renovation of eastern tunnel	2010 - 2016
Renovation of western tunnel	2016 - 2019

Project Details

Restoration of eastern tunnel

- Removal of historic material for preservation, i.e. tiles etc.
- Restauration of building substance and renewal of sealing
- Placement of preserved material at original state

Restoration of western tunnel

- Removal of historic material for preservation, i.e. tiles etc.
- Restauration of building substance and renewal of sealing
- Placement of preserved material at original state

Restoration of operational facilities

- Removal of old equipment
- Refurbishment of reusable equipment
- Replacement of components where necessary
- Installation of refurbished equipment
- Installation of up to date safety equipment

CLIENT FACTS

Overall costs

- Renovations costs approx. 23 Mio. €

Overview Project

- The old Elbtunnel consists of two single track tubes with 426 m length each and crosses below the sea waterway Elbe at the harbor of Hamburg.
- The tunnels are reached by 2 shaft buildings equipped with elevators
- The tunnel was built with shield heading and sealed with steel segments
- The lining was made with drainage concrete, which was covered with tiles.
- The project comprises the entire restoration including the banquettes and utility ducts

Geology

- Alluvial mud with rests of wood

Referenzperson

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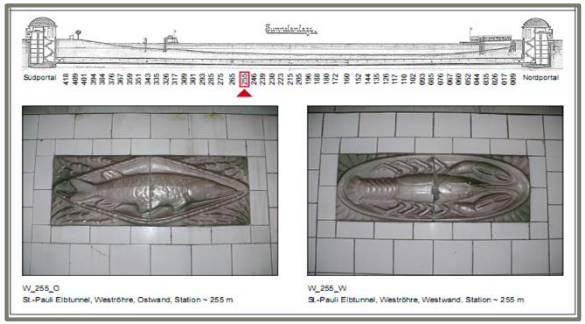
CHALLENGES

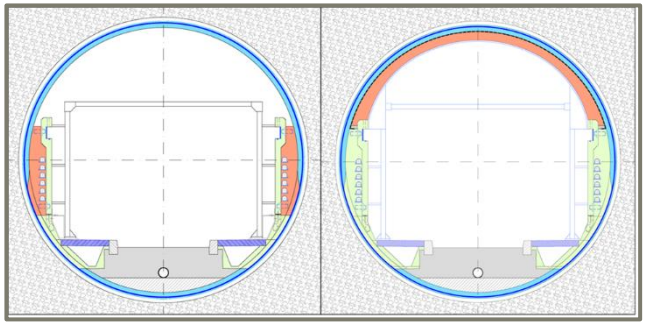


- Historic parts at tunnel walls to be preserved

Preservation of historic tunnel building

- Removal and preservation of the original tiles covering the walls for later reinstallation
- Removal of cast in place concrete to free the steel segments.
- Removal of bad lead joint sealing between the segments
- Difficult site access and logistics
- Special measures for work safety (breathing masks, protective clothing).
- Placement of additional weights when removing material for avoiding of buoyancy of entire tunnel.

ENGINEERING APPROACH



- Sequential procedure of restoration works

Renovation of existing building substance

- The segments are consisting totally 1671 ring shaped 25 cm wide steel girders. Six of them are riveted among each other and screwed with the next segment.
- Bad screws and rivets (leaking) needed to be replaced
- 37’000 m of joint lead sealing needed to be renovated, as the joint material showed leakage and oxidation
- Replacement of the poisonous heavy metal by synthetic material were not practical. The old system needed to be used, the joints needed to be stuffed and caulked by lead.

TECHNICAL SOLUTIONS

- Restored part of tunnel, new safety installations

Rebuilding of tunnel with authentic materials, plus up to date safety installation

- Installation of a temporary transport route with wooden planks.
- Sideways to be removed and placed back after renovation of building structure.
- Imperative preservation of authenticity, placing the historic relief tiles after restauration to the walls and ceiling.
- Safety installations and automatic ventilation as well a modern technique (i.e. gas alarm) needed to be integrated in harmony with the historic building substance

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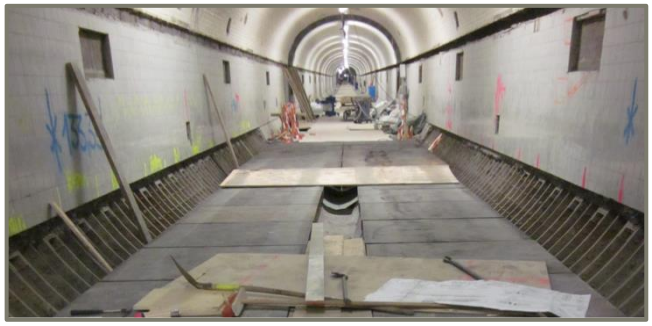
CHALLENGES

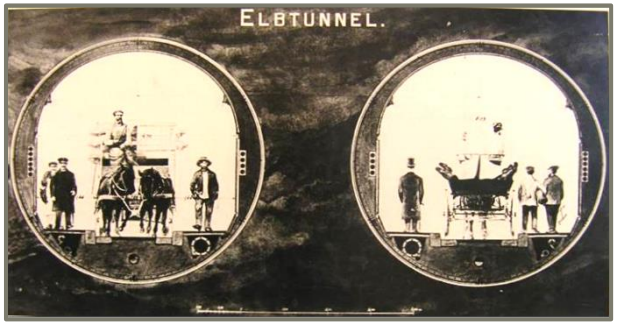
- Antique section drawing of Elbtunnel

- Deterioration of tunnel, utilities and steel segments



- New sealing and utility ducts in roadway area

ENGINEERING APPROACH



- Antique drawing of east and west tunnel profiles

- Removal of lining concrete

- After restoration, showing new installations (safety)

TECHNICAL SOLUTIONS

- View of subsurface tunnel portals

- Corroded steel segments after concrete stripping

- Surface portal with elevator at entrance shaft

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