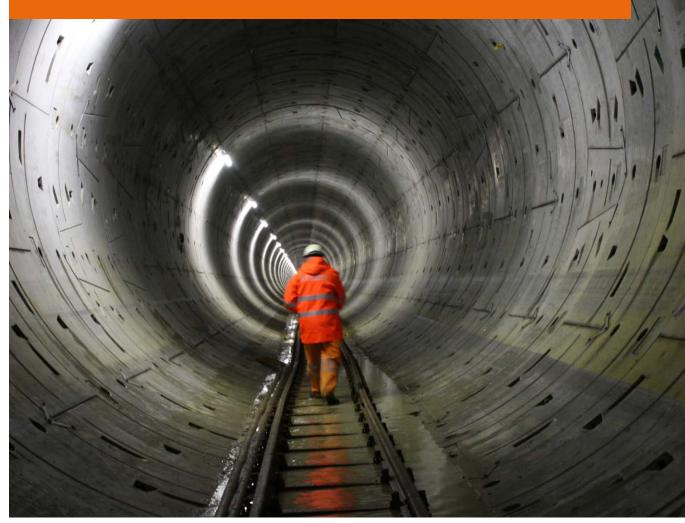
# EUROPEAN X-RAY LASER SYNCHROTRON



# European X-Ray Laser Synchrotron Facility, Hamburg, Germany

In 2000, the construction of the X-ray laser synchrotron, XFEL (X-Ray Free-Electron Laser) has been launched (European and international research project). The main component of the project are 3 linear acceleration tunnels.

#### Scope

- 3 tunnels Ø 6.17 m, total length 3'085 m
- 8 tunnels Ø 5.48 m, total length 2'697 m
- 8 pits / shafts with max. depth of 40 m
- Various research halls, partially very large

#### Challenges

- Complex ground conditions, high groundwater level, cover only between 6 m and 38 m
- Under passing of buildings, settlement sensitive, works in urban area
- Stringent requirements for the position accuracy of the tunnels
- Very deep pits with complex reinforcements
- Complex coordination with physical research requirements

#### **Amberg Services**

- Project design within a joint venture
- Basic assessment and conceptual design
- Basic design
- Tender design
- Detailed design and structural engineering
- Site supervision
- Site management





Top view of XFE-Project at Hamburg



Installation of shield TBM



Shield area of TBM

# AMBERG FACTS

#### **Contracted value Amberg**

■ Total Amberg 1.43 Mio. €

#### Project Phases & Duration

- Start of planning
- Construction works
- Technical Installations
- Commissioning

# **Project Details**

#### Tunnel

Use of slurry shield TBM's and segmental lining

2001

2012

2016

2009 - 2015

#### **Pits and Shafts**

- Pits and shafts with underground caverns with 400 - 4'500 m<sup>2</sup>, 15 - 40 m deep
- Very deep excavation pits using diaphragm wall construction with up to 45 m length, 1.5 m thickness and underwater concrete base
- Complex extensions for physical research

#### **Research halls**

- Subsurface research halls for physical experiments with areas of 400 – 4'500 m<sup>2</sup>, 15 – 40 m deep
- Complex coordination with research requirements of the physical experiments with high demands

# **CLIENT FACTS**

#### **Overall costs**

- Total construction: 1.22 Bn. € (incl. commissioning)
- Construction cost for planning services: 300 Mio. €

### **Overview Project**

- X-Ray Free-Electron Lasers, XFEL, for physical research
- 3 Tunnels Ø 6.17 m, total length 3'085 m
- 8 Tunnels Ø 5.48 m, total length 2'697 m
- 8 pits and shafts with max. 40 m depth
- Various, partially very large research halls

#### Geology

- Difficult ground consisting of fine silicate sands and boulder clay layers
- High ground water level

#### **Key person**



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