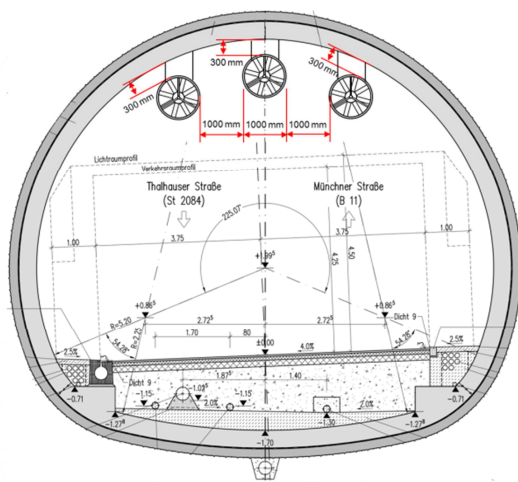
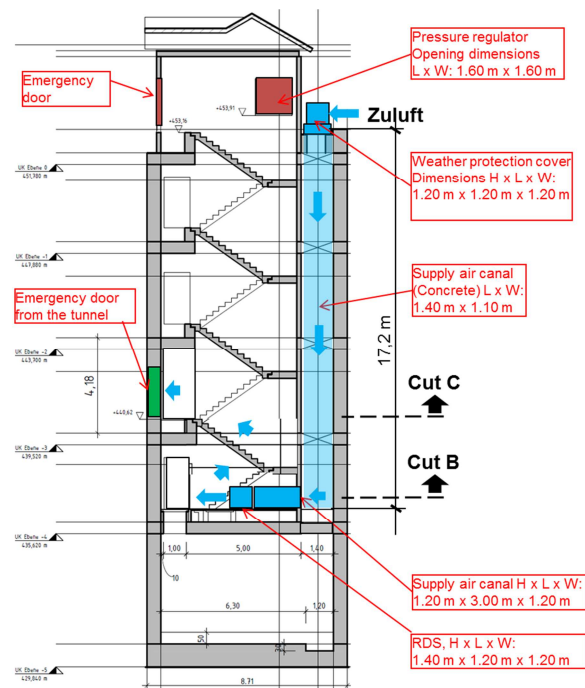


Collision and fire cumulative risk diagram



Arrangement of the jet fans in the tunnel



Arrangement of the positive pressure ventilation system in the emergency staircase

Description

The city of Freising should be bypassed in the west and southwest with the construction of a detour. On this route a single-tube 705 m tunnel is planned, carrying two-directional traffic.

The envisaged longitudinal ventilation system is composed of four groups of jet fans, each containing three fans.

For the self-rescue and for the rescue by emergency services, the tunnel is equipped with two emergency exits with adjacent staircases. A positive pressure ventilation system is used for the ventilation of the emergency staircases.

The longitudinal gradient of the tunnel is > 3% and comprises a special characteristic according to RABT. The safety of the tunnel was verified within the framework of a quantitative risk analysis.

Services

HBI Haerter Consulting Engineers was responsible for the design of the longitudinal and of the positive pressure ventilation systems and provided the following services:

- Expert opinion on tunnel ventilation according to RABT-2006
- Preparation of the design planning for the ventilation equipment
- Detailed design with the preparation of the bill of quantities and of the technical specifications of the longitudinal ventilation
- Preparation of the control system specifications as part of the invitation to tender

During the project progression the following services were necessary and were provided by HBI:

- Application of the Guideline for the Safety Assessment of Road Tunnels
- Ventilation risk analysis
- Quantitative risk analysis (QRA)
- Categorisation of Dangerous Goods transport according to ADR 2007