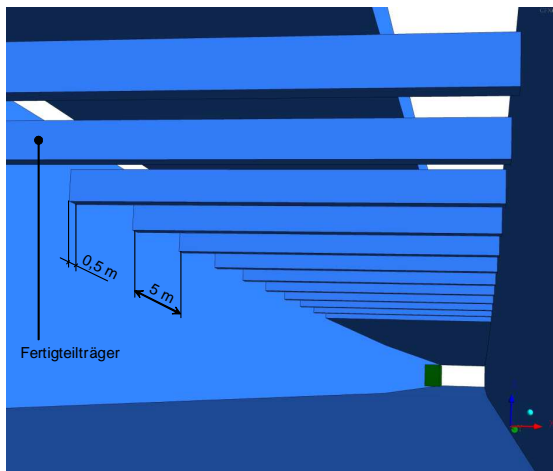
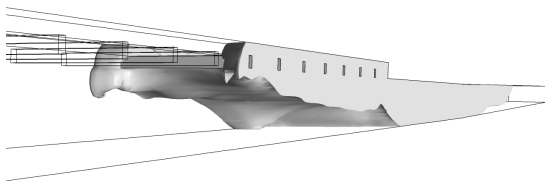


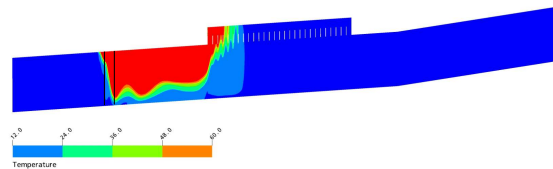
Tunnel cross-section with Züblin vents



CFD-model of tunnel cross-section



Natural ventilation: smoke control by Züblin vents



Temperature distribution along the tunnel

## Description

The noise protection gallery on the federal road B 28 Oberkirch-Lautenbach will be used as single tube tunnel for bi-directional traffic. The posted traffic speed will be 80 km/h. The tunnel length is 530 m with a 140 m long section with openings in the tunnel ceiling. The openings are of Züblin type.

## Services

HBI Haerter Consulting Engineers was tasked to verify the functionality of the Züblin vents with respect to natural smoke control during a tunnel fire. The design was based on requirements stated in RABT-2003. In case natural ventilation was not sufficient, a mechanical ventilation system would be required. For the study, a CFD model was developed and several test cases were calculated. The documentation includes a detailed description of methods applied and assumptions used for the model. Some test cases included effects from traffic and ambient wind on the smoke propagation. The fire model was built for two heat release rates, 30 MW according to RABT-2003 and furthermore a smaller fire of 5 MW. The test cases were calculated for several fire locations. In order to evaluate the behaviour under unfavourable conditions as well, test cases with significant longitudinal air flow were included.

The CFD-simulations undertaken by HBI have shown that in all scenarios, the natural smoke ventilation performed well. Smoke propagates from the fire location towards the section with Züblin vents. Further smoke propagation is inhibited. The tunnel section not affected by the fire remains smoke-free. Under the most unfavourable conditions, the smoke spreads over a length of 60 m in the Züblin section.

Based on the experience from other projects, HBI recommended natural ventilation also for normal tunnel operation. Based on the findings from the CFD study, it was decided, not to equip the tunnel with a mechanical ventilation system.