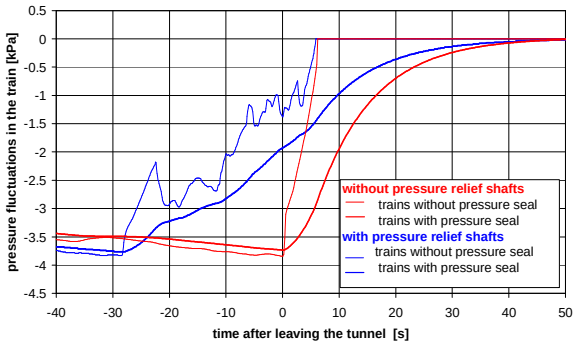
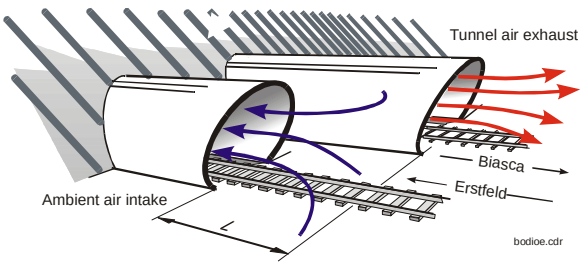
Gotthard base tunnel (CH)
Aerodynamic design of portals

Model for the optimisation of the position of portals in the wind tunnel



Pressure fluctuation in a passenger train leaving the tunnel



Staggered arrangement of portals for reducing air recirculation, i.e. the intake of warm and humid waste air from the exit tube into the entrance tube is reduced

Description

The following issues have to be taken into account for the design of the portals of the Gotthard Base Tunnel:

- During the operation, partly high temperatures and humidities are expected in the tunnel. Recirculation, i.e. the intake of warm and humid waste air from the exit tube into the entrance tube, must be prevented as far as possible in order to improve the tunnel climate.
- During the passage of passenger trains at high-speed through portals characteristic and strong pressure fluctuations are generated, which can affect the comfort of train passengers. Therefore, the pressure fluctuations must be attenuated with suitable measures.
- To ensure safety on roads passing near the portals, fog generated by waste air must be avoided as far as possible.

Services

HBI Haerter Consulting Engineers provided the following services:

- Optimisation of portal positions by measuring recirculation with a model in the wind tunnel
- Field measurements of outside temperature, humidity and wind speed at a tunnel portal as a pre-requisite for wind tunnel experiments and for judgement of the risk of fog formation
- Modelling pressure fluctuations in trains passing the portals
- Evaluation of different measures to reduce pressure fluctuations such as widening of portals, perforation of the tunnel lining, pressure relief shafts, as well as pressure relief ducts between the tubes
- Determination of conditions for fog formation. Estimation of the evolution of foggy clouds and evaluation of measures such as ventilation shafts to reduce fog formation in the area of the portals
- Evaluation and integration of the results in the project