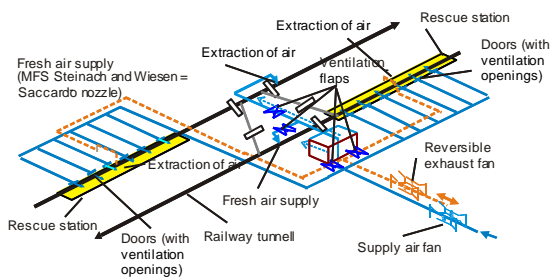
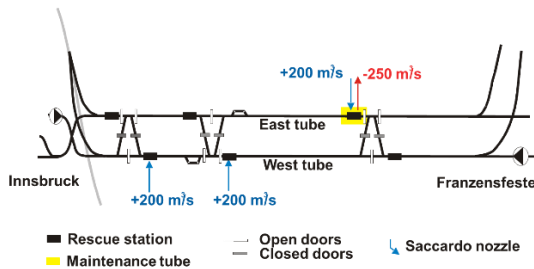


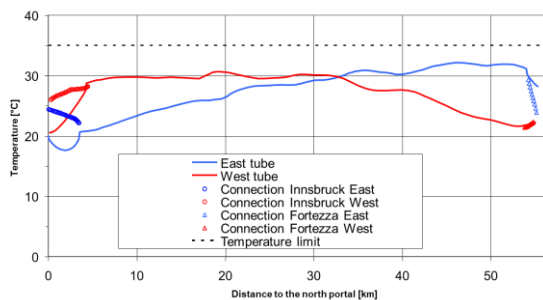
Scheme of tunnel system



Scheme of ventilation and the rescue station showing airflow of fresh air in blue and extracted air in orange



Example of ventilation during an incident in the rescue station in the northern tube (MFS Wiesen)



Temperature and relative humidity in the tunnel in summer after five years

## Description

The Brenner Base Tunnel between Innsbruck and Franzensfeste is a key element in the railway line between Munich and Verona. The tunnel being under construction at the moment has a length of approximately 55 km. It consists of two single-track rail tubes. The portals of the tunnel are arranged in a staggered position in the longitudinal direction to prevent tunnel air from recirculation. The tunnel system consists of the following main elements:

- three multifunctional stations
- the deviation tunnel, the connecting tunnel to the base tunnel
- three access tunnels to the MFS
- the cross passages of 35 m length at regular distance of approximately 333 m between the two main tunnels

## Services

HBI Haerter Consulting Engineers provided the following services:

- Definition of the ventilation concept for three operation modes: Normal operation, maintenance operation and emergency operation
- Several 1-dimensional, instationary simulations for the verification of the fulfilment of the ventilation objectives for all ventilation modes
- Thermodynamic simulations for the verification of fulfilment of climate criteria in the tunnel system
- Calculation of the flow rates for the three ventilation stations to reach the ventilation objectives, as specified by the client
- Planning of the details of the ventilation system for the three multifunctional stations
- Development of a ventilation system for the cross passages to maintain the climate criteria of the technical equipment in the cross passages
- Cost analysis