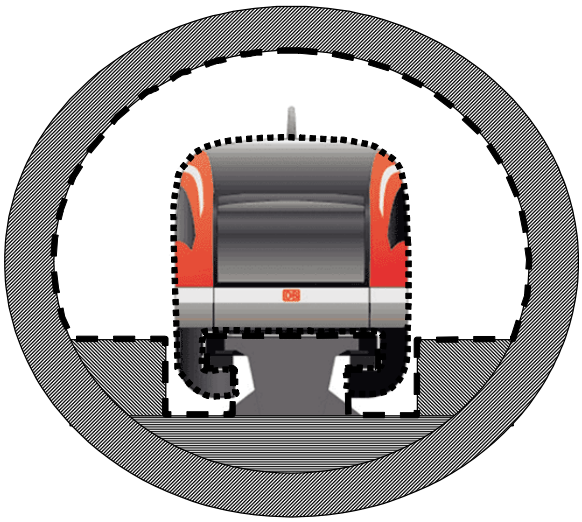
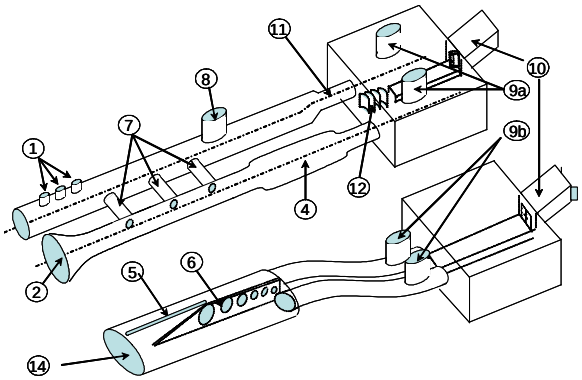
TRANSRAPID MAGLEV, Munich (DE)
Aerodynamics of tunnels

TRANSRAPID MAGLEV-train at airport Munich



Characteristic tunnel and vehicle cross-sections; relevant perimeters



Civil measures to influence the aerodynamic aspects in a tunnel and in a station box

Description

The TRANSRAPID MAGLEV high-speed line connects the airport with the main train station and the town centre of Munich. The distance between the 2 dead-end, underground stations is about 38 km. Between the stations, 3 tunnels sum up to about 8 km of double tube, single track underground line. The vehicles reach a maximum velocity of 350 km/h which results in a 10 min travel time.

In 2004, the detail design for the project started which included an extensive investigation of the tunnel aerodynamics. HBI Haerter Consulting Engineers designed the civil measures to ameliorate the aerodynamic conditions (portals, draught relief shafts, platforms, ducts, entrances to station, etc.). In addition, various requirements for the tunnel equipment and the vehicles were specified. The work was based on complex numerical, 1- and 3-dimensional simulations.

Services

HBI investigated various aerodynamic issues and designed several civil measures resulting in acceptable aerodynamic conditions in the vehicles, in the stations and in the tunnels. Selected topics of the design tasks were:

- Limitation of pressure fluctuations to conform to international health standards
- Reduction of pressure fluctuations for sufficient passenger and staff comfort
- Elimination of non-acceptable micro-pressure waves at portals and station boxes (sonic-boom)
- Simulation of air velocities on platforms for comfort reasons
- Calculation of structural loads in the tunnel due to increased air velocities and pressure fluctuations
- Determination of the required traction power of the vehicles
- Evaluation of pressure forces acting on structure of vehicle, tunnel and tunnel equipment
- Design of measures to mitigate the effects of tunnel fires