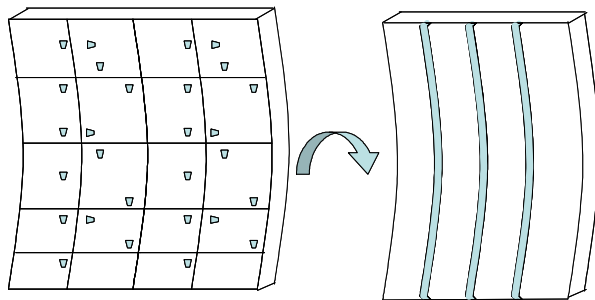




Talgo 102 at 350 km/h ready to pass Guadarrama tunnel between Soto del Real and Segovia in Spain



South portal of Guadarrama Tunnel



Analysis of wall friction of tunnel lining

Description

The Guadarrama tunnel between Soto del Real and Segovia is part of the high-speed railway line linking Madrid with the northwest of Spain. The 28 km long tunnel is built as a double bore, single-track tunnel. The design speed of up to 350 km/h required an accurate analysis of the aerodynamic effects. Climate studies and detailed specification of the related requirements for the civil construction and the equipment in the tunnel were necessary.

HBI Haerter Consulting Engineers designed civil measures to ameliorate the aerodynamic conditions (portals, draught relief shafts, etc.). In addition, various requirements for the tunnel equipment and the vehicles were specified. The work was based mainly on complex numerical simulations, experience gained from several high-speed tunnels of different rail lines and from several aerodynamic measurements.

Services

HBI studied the aero- and thermodynamics of the tunnel with the following purposes:

- to calculate the structural loads in the tunnel and on the rolling stock due to considerable air velocities and pressure fluctuations
- to determine the required traction power of the rolling stock
- to assess the comfort and health conditions due to train induced pressure fluctuations
- to forecast the tunnel climate
- to determine the influence of the tunnel lining on the friction of the air flow
- to provide proposals for the design of the cross-passage ventilation system
- to propose and evaluate the design of the cross-passage doors, cabinets and the gates in the portal region
- to design the portals in order to prevent recirculation of tunnel air