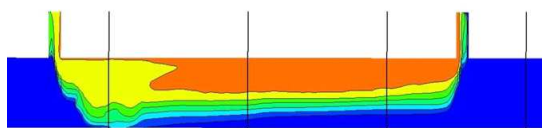
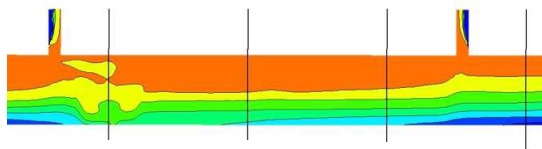


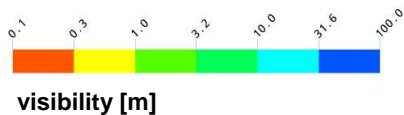
Visibility 10 min after the ignition of the fire (entire side view)



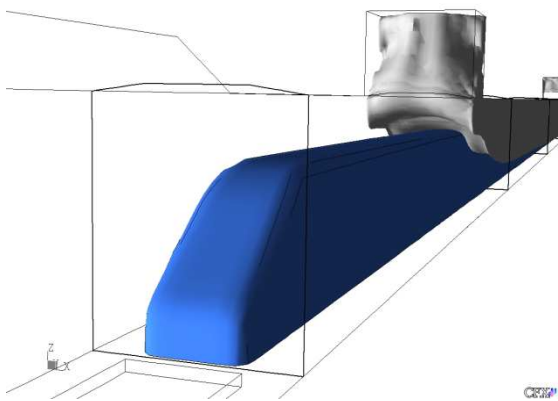
dampers



labyrinth elements



Visibility 10 min after the ignition of the fire (detail)



Natural smoke extraction (labyrinth elements in the extraction shaft) 10 min after the ignition of the fire

Description

The HSL Zuid project comprises a new high-speed rail line between Antwerpen in Belgium and Amsterdam in the Netherlands. The project is an integral part of the development of an European high-speed railway network and will considerably help to decrease the travel times between the European capitals. The required standards with respect to safety and availability are quite demanding.

HBI Haerter Consulting Engineers was appointed to carry out extensive CFD studies for the tunnel Rotterdam Noordrand. As a major result of the investigations, fundamental documents for the subsequent ventilation design were developed. With respect to safety, concepts and ventilation specifications for the civil design could be completed. The numerical investigations allowed a verification of the system for passive smoke extraction. The results were convincingly presented for the safety authorities.

Services

HBI professional services included the following aspects:

- Validation of CFD-model (Memorial Tunnel) including
 - o Investigation of model parameters (Models for turbulence and buoyancy)
 - o Parametric studies
 - o Study of fire model
 - o Study of grid model
- Definition of scenarios with client
 - o Entrance velocity of train
 - o Position of train stop
 - o Curve of heat release rate of fire
 - o Release rate of toxic gases
- 1D-calculations for the initial conditions of the CFD-calculation
- Instationary CFD calculations (10 min) for dampers and labyrinth elements in smoke relief shafts
- Analysis with respect to temperature, visibility, CO, HCl, HCN, NO_x
- Comparison of performance of different solutions