VENTILATION

Besides playing the key role in case of exhausting hazardous gases and smoke and guaranteeing a safe rescue path in case of fire in underground infrastructures, ventilation systems fulfill the important goal of providing fresh air and keeping the air quality above the required health safety levels during normal operation and maintenance modes of infrastructure facilities.

Tunnel ventilation systems can be designed for cooling the underground rail, road or metro systems. They can be put into operation to address issues such as environmental pollution, sudden condensation of car wind screen at road tunnels portals etc. The ventilation system for a road, rail, metro tunnel, underground cavern, shaft or any operational facility demands the definition of project specific aims and objectives in accordance with the national and international standards, guidelines and relevant research work. The project specific concepts, designs, and the choice of ventilation systems not only influence the overall operability of the system, but also affect the constructional and managerial aspects like cross-sectional area of the tunnel, number and size of ventilation shafts, position and dimension of the control centre buildings, the layout and size of land to be acquired etc.

MECHANICS

Emergency doors (bifurcating, swing and/or sliding) in road and rail tunnels are a key component for the safety of persons and that of the infrastructure. During normal operations, these doors have to fulfill project specific conditions in terms of reliability, pressure loads, air leakage etc. In case of emergency operations, these doors separate the place of emergency from the safe haven and provide an exit and access passage for the evacuees and rescue personnel. The doors should fulfill their safety requirements such as temperature resistance and guarantee operative availability in extreme cases.

A safe operation of underground systems also demands proper operation, appropriate design and testing of different closures, such as gates and fences.

YOUR REQUISITION?

We can help you out with following questions:

- Status evaluation
- Feasibility study
- Conceptional design
- Project planning
- Specialized construction / site management
- Ventilation and cooling systems (including constructional site ventilation and cooling)
- Concepts for service and maintenance
- Hot and cold smoke tests
- Measurements (climatic monitoring, volume flow, air tightness and leakage, pressure variation)
- Numerical simulations (fire and smoke propagation, aero-, thermo- and hydrodynamic simulations)
- People flow and evacuation analysis
SMOKE TESTS
Smoke tests using either hot or cold smoke are a proven method to check and validate the reliability and operability of the complete (exhaust) ventilation system including smoke detection, ventilation activation and control etc. Pöyry performs such hot and cold smoke tests in road and rail tunnels as well as in buildings using their “in-house developed” mobile testing facility. This testing facility has proved to help the clients to evaluate and plan their measures. Using this method of testing enables the designers and operators to disclose errors and flaws in their system, take adequate measures and appropriately fix them within a short period of time.

PROOF OF PROPER FUNCTIONALITY USING SIMULATIONS
Pöyry provides the proof of proper functionality of a planned system using numerical simulations. These simulations (aero-, thermo– and hydrodynamics) being case specific, are very conclusive especially for complex situations involving evacuation, fire and smoke propagation and are reliably accepted by the governing authorities.

REFERENCES

Gotthard Base Tunnel, Switzerland, 2016
AlpTransit Gotthard AG
Feasibility and case studies for preliminary and final design, construction and logistic concepts, interface co-ordination, project timeline planning, bid documentation, constructional supervision, commissioning, verification and validation of equipment, end documentation for ventilation, dampers, hoists, crane, door and gate installations

Cross-city Link Löwenstrasse, Mainstation Zurich, Switzerland, 2014
Swiss Railways (SBB) Ltd.
Edition and proposal submission project, detailed design project, project commissioning and execution, expert site supervision, acceptance work, duct leakage, fire and smoke tests, numerical simulation as proof of proper ventilation functionality

N01/03 Tunnel Gubrist, Zurich Switzerland, 2013
Swiss Federal Roads Office FEDRO
Provisional project, execution project, bid documentation, submission project, tender evaluation, contract award referral, construction supervision, ventilation cost control management, operability of service and safety equipment and refurbishment of tunnel ventilation, doors and gates

Ho Chi Minh City Metro Line 2, Vietnam, 2016
MAUR (Management Authority for Urban Railways), Ho Chi Minh City
Conception design of non-System E&M equipment for Tunnel, over-ground track, stations, depot. Fire and safety concept for complete metro line including stations

Guanjiao Tunnel, Qinghai-Tibet Railway Line, China, 2015
China Railway First Survey & Design Institute Group Co., Ltd. (FSDI), Xian, China
International independent design reviewer of ventilation system, evacuation facilities and safety equipment for the 32 km base tunnel. The review involved detailed people flow and smoke propagation analyses.

Follo Line Project, Norway, 2017
Acciona-Ghella Joint Venture (AGJV)
Conception and basic design of temporary ventilation during construction phase of 19 km long double tube tunnel. Definition of fire safety concept and activation matrix of safety related equipment in case of emergency during construction.

« Modern concepts as basis for safe and innovative solutions. »
« Every project is unique and therefore needs an individual solution. »