Full-scale tunnel fire tests

The Applus+ TST facilities enable the performance testing and verification of both passive and active fire-protection systems in real tunnel-fire scenarios. To be able to provide this service, our facilities were custom-build in order to test fire in tunnels under controlled conditions, thereby guaranteeing the safety of test personnel as well as of the infrastructure itself.

The Applus+ TST technological centre in Asturias (Spain) is equipped with a specialist test tunnel designed to reproduce the conditions of a full-scale fire in a confined space such as a tunnel, shaft, mine, ship or other underground structure.
These full-scale tests, which go beyond mandatory conformity testing, aim to validate the adequacy of the fire-protection measures that are about to be installed at a particular site, be this a new construction or a project to upgrade the safety equipment in an operational tunnel.
This testing infrastructure enables us to assess the behaviour, in a real fire scenario, of:

- Ventilation and smoke-extraction systems
- Fire-detection systems
- Fire-extinction and fire-control systems (sprinklers, water mist, etc.)
- Building-material components used in tunnels
- Safety equipment
- Mobile equipment and materials
- Rolling stock

We can also corroborate theoretical CFD simulation models and ventilation calculations.

Key projects

Owing to the unique nature of our testing facilities, we set a global benchmark in tunnel fire tests. The many projects we have undertaken include the testing of the following fire-protection systems:

- Eurotunnel (France – UK)
- Mont Blanc Tunnel (France – Italy)
- Madrid's M30 tunnel (Spain)
- Road tunnel managed by the Land Transport Authority (Singapore)

Our test tunnel for full-scale fire testing

Applus+ TST has the only facility of its kind in Europe for reproducing tunnel-fire conditions. This facility includes a mock, 600-metre-long, concrete tunnel – the equivalent of a two-lane road tunnel or a railway tunnel – as well as two ventilation stations, an emergency and service shaft, four emergency exits and a second, 150-metre-long fire tunnel.

Ventilation systems

The test tunnel boasts four different ventilation systems so as to be able to test all of the most common ventilation systems on the market:

- Longitudinal systems
- Semi-transverse systems
- Mixed longitudinal and transverse systems
- Saccardo systems

Passive fire-protection systems

The tunnel is equipped with a passive fire-protection system featuring a 5cm-thick layer of fire-resistant concrete that is able to withstand powerful fires with a calorific value of over 200 MW.

Additional equipment

- A water-storage vessel with a total capacity of 600 m3
- A 150 mm-diameter pressure pipe on the outside of the tunnel at PK 300, powered by way of a pressure group running at a maximum pressure of 4 bars and with a capacity of 180 m3/h
- A 100 mm-diameter pressure pipe on the inside of the tunnel, with fire hydrants at 50-metre intervals. This system is supplied by a number of different tanks and powered by a 12-bar pressure group with a capacity of 72 m3/h

- A fibre-optic network: the data-acquisition and control system is a central component of the tunnel facility, used as much for the control and regulation of the various ventilation, fire-fighting and lighting systems as for the collection and storage of test data and images.

Training for firefighters and mine-rescue teams

As well as testing fire-protection products, the Applus+ testing tunnel is an ideal training environment for carrying out practical exercises and rescue maneuvers in tunnels. Our experts have conducted training courses in tunnel and mine fires for firefighters and mine-rescue teams from multiple countries.