Efectis is an independent third party assessing the fire performance of products, systems, designs and constructions. We can help you worldwide.

EFECTIS - LEADER IN LARGE SCALE TUNNEL FIRE TESTS

LARGE SCALE TESTING

Efectis has been a prominent partner in realizing fire tunnel tests by providing solutions for conducting tests and performing measurements. Understanding the thermal behaviour of concrete and fire protection systems is one of the core specialities of Efectis as thousands of tests are being performed in multiple test labs of Efectis across Europe every year. Being a committee member of NFPA502[1] and a co-developer of the globally acknowledged RWS/Efectis fire testing procedure for concrete tunnel linings[2] allow us to follow the state-of-the-art of developments and to take the lead in the testing procedure in concrete and tunnel industry.

Efectis continues to apply its experience on the tunnel tests such as:

- Large scale tunnel VHGV fire tests in 2020
- UltraFog / Applus+TST, 2018 VID-FireKill
- VID-FireKill / LTA Singapore 2012[3]
- RG-System high pressure water mist in tunnels on HGV and pool fires in 2012
- Tyco cable tunnel test campaigns in Malaysia in 2015[4] and 2016
- Class A and B fires in ad-hoc tunnel in Rijswijk (NL) in 2009
- BLEVE risk study of an LPG tank in Runehamar test tunnel with Sintef-NBL in 2007

FIT, **DARTS** and **UPTUN** are the primary European tunnel fire research programmes Efectis took part with the aim of expanding the understanding of fire science[5].

[1] ***NFPA502*** - *Standard for Road Tunnels, Bridges, and Other Limited Access Highways*

[2] ***Efectis-R0695:2020*** - *https://efectis.com/app/uploads/2020/09/Efectis_R0695_2020_Fire_Testing_procedure_concrete_tunnel_linings.pdf*

[3] ***LTA*** - *https://efectis.com/en/references/singapore-fire-test-program-for-road-tunnels-with-fire-suppression/*

[4] ***Tyco*** - *https://efectis.com/en/efectis-conducts-large-scale-fire-tests-for-a-cable-tunnel-in-singapore/*

[5] *https://efectis.com/app/uploads/2016/07/Fire-Safety-in-Tunnels-brochure-Efectis-Group-October-2021.pdf*

"Efectis is a global player in fire science and covers all fire safety expertise in testing and modelling, certification, inspection, education and expertise."

LARGE SCALE TUNNEL FIRE TESTS

FFFS PERFORMANCE TESTING

Efectis tests sprinkler, water mist or any other innovative fixed water-based fire-fighting systems (FFFS) with respect to their design environments and performance goals. A 600 m long tunnel dedicated to fire tests is an example where FFFS systems can be installed, and their performance is then evaluated by Efectis by performing large scale fire tests. Parameters in these kinds of tests are:

- **Number of activated water zones**
- **Ventilation type and velocity:** longitudinal; transversal; semi-transversal
- **Fuel type:** wooden and/or plastic pallets (Class A); pool fires (Class B); batteries, cargo units, storages etc.
- **Fire size:** passenger car: 8 MW; bus: 30 MW; heavy goods vehicle: 150 MW; very heavy goods vehicle: 200 MW
- **Detection system:** different detection systems and delay times
- **Tunnel cross-section:** rectangular (with false ceiling); arched

By means of all configurations, the FFFS systems can be optimized for either fire control, fire suppression or other custom performance criteria such as tenability (visibility, CO, FED or thermal) or structural integrity.

COMMON PERFORMANCE GOALS IN FIRE TESTS

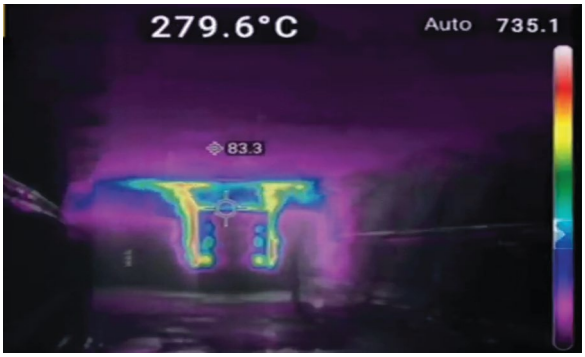
LIFE SAFETY

Certain environmental conditions sought are mostly applicable to road tunnels for scenarios of evacuation. It is necessary to have certain conditions for a safe escape. This is investigated in downstream and upstream of the fire in any type of ventilated tunnel. Thermal and toxic levels as well as visibility are observed and evaluated with respect to globally practiced limits.

FIRE CONTROL

Performance requirement of the FFFS depends on the tunnel design and fire safety strategy. The system may be required to suppress as well as control the fire. This may either prevent the damage, fire spread and/or help fire intervention services. Efectis uses oxygen depletion method to calculate the heat release rate (HRR) generated by the fire.

Evaluation of HRR in time reveals the performance of the FFFS compared to potential maximum HRR or a free burning reference test.



STRUCTURAL SAFETY

Consequences of a fire can lead to long and costly repair durations which render the tunnels out of service. It is possible to evaluate the risk of damage during a fire test by means of several methods. Measuring heat flux, temperature, as well as placing test sample at wall or ceiling allows us to investigate the thermal effects. Heat penetration over time is recorded at varying depths of a concrete test sample which is placed near the tunnel structure .

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