



# Specialists in Tunnel Fire Protection



GASEOUS  
SUPPRESSION



WATER  
SUPPRESSION



FOAM  
SUPPRESSION



EXPLOSION  
PROTECTION



FIRE  
DETECTION



MILITARY  
& DEFENCE



SPECIAL  
APPLICATIONS



SUPPORT  
SERVICES

# Specialists in Tunnel Fire Detection

“EVERY SOLUTION FOR YOUR SPECIAL HAZARD PROBLEMS”

“Underground transport facilities are sensitive links in the economic chain that carry thousands of people and tons of goods every day and they are increasingly more important to society.”

A breakdown in operations can have catastrophic consequences, hence the need for comprehensive safety precautions and ensuring that the design, installation and maintenance of these systems is of the highest standard. By far the greatest risk is an uncontrolled fire as fires represent great danger to life due to toxic combustion gases, high temperatures and loss of visibility. In addition, the limited means of escape available together with panic reactions spell disaster for any tunnel operator and the future viability of the transport facility.

## PROTECTION OF TUNNELS

The protection of people against fire and other risks is one of the major tasks of tunnel designers and operators. Furthermore, the closing of a tunnel for days, weeks or even months after a fire incident can create huge economic losses not only for the operator but also for society as a whole. Intensive research work over the last decade has shown that commonly applied fire protection concepts for tunnels may not provide a sufficient level of safety.

Smoke ventilation systems are designed to deal with a specific, limited fire size. Passive fire protection is designed to withstand the effects of fires for a limited time only. It is now accepted that there is a more important need to provide protection for people that may be trapped and trying to escape the smoke and flames.

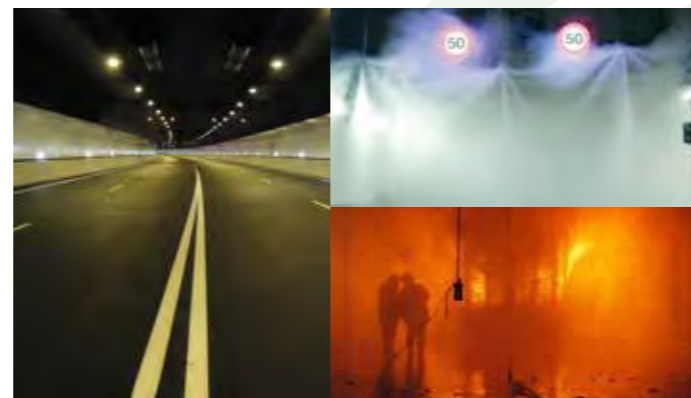
The logical and most effective way to provide suitable

protection for tunnels and its users is to install fixed fire fighting systems (FFFS) to mitigate the effects of fires. FOGTEC Tunnel Protection Systems are state of the art Water Mist Systems combining results of the latest research work with the reliability of long term tested components.

**Modern FFFS Technology with Low Investment Costs**  
FOGTEC technology makes it possible to reach a high safety level with low investment costs. Revolutionary cost benefit analyses have shown that investing in FFFS will give return on investment over the design lifetime of the tunnel. This is due to low life cycle costs of modern FFFS technology.

### FOGTEC's Tunnel Research

FOGTEC operates its own research facilities including fire test laboratories. A number of research projects specifically designed for the protection of tunnels have been carried out by FOGTEC over the last 10 years, providing a unique and proven basis for design.



## LIFE SAFETY & ASSET PROTECTION

### Purpose of (FFFS)

High pressure Water Mist Systems (WMS) are installed to improve both life safety and asset protection within tunnels. As WMS are active fire fighting methods they achieve this by:

1. *Improving the self-rescue conditions*
  - Immediate cooling effect to provide lower temperatures within the fire zone.
  - Reducing smoke production significantly by controlling and suppressing the fire.
  - Binding smoke and soot.
2. *Improving access and operating conditions for fire and rescue services*
  - Limiting Heat Release Rate (HRR) with suppression and control
  - Lower temperatures
  - Blocking radiant heat transfer.
3. *Prevention of fire spread between vehicles*
  - Limited fire area
  - Limited HRR.
4. *Limiting structural damages to the tunnel*
  - Lower temperatures

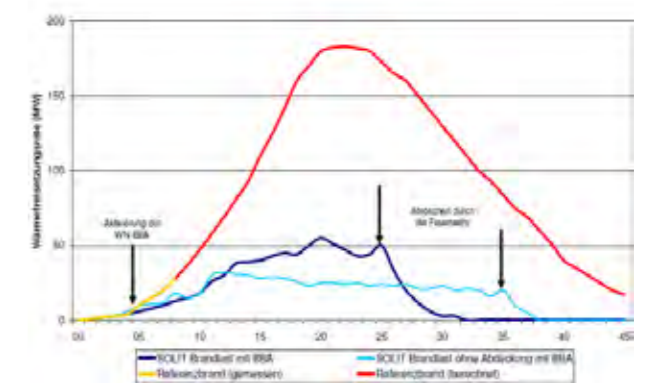
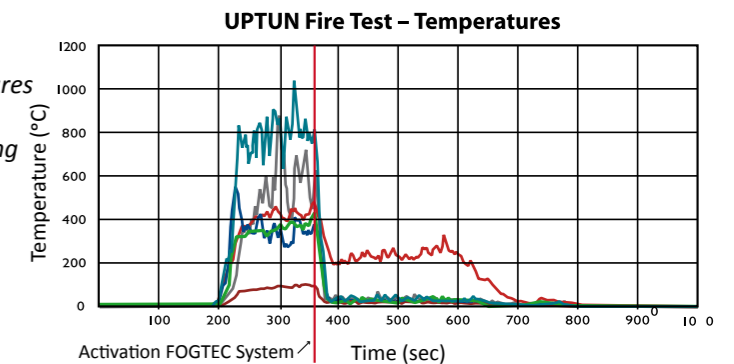
The benefits of FFFS are especially evident in cases where loaded semi-trailers or buses are involved in the fire. Both the UPTUN and SOLIT research programs showed the distinct benefits in such scenarios. The SOLIT research program used 150MW-200MW HRR (approx.) class A mock-up as the design fire load. Although the fire load represented a typical loaded semi trailer scenario similar to many catastrophic fires, all of the above mentioned objectives were successfully reached.

It has to be noted that modern FFFS are used for fire control and suppression purposes, therefore HRR can be even tens of megawatts in peak output. However, the fire is encapsulated with water mist and more importantly heat / temperatures are kept under control.

Watermist Systems are able to control/suppress even large fires and systems are capable of fire encapsulation and temperature limiting which provides safe conditions for emergency fire services.

## The Smarter Way of Fire Fighting with Water Mist

FOGTEC Watermist Systems for Tunnels generate a fine water mist around the fire. Very small water droplets provide an efficient cooling mechanism to mitigate the effects of the fire. High Pressure Water Mist nozzles are installed throughout the tunnel and are grouped in sections or zones that can be individually activated. As a result of the system's 200 bar pressure, long pipe runs are easily accommodated and costs are kept low due to smaller pipe sizes.

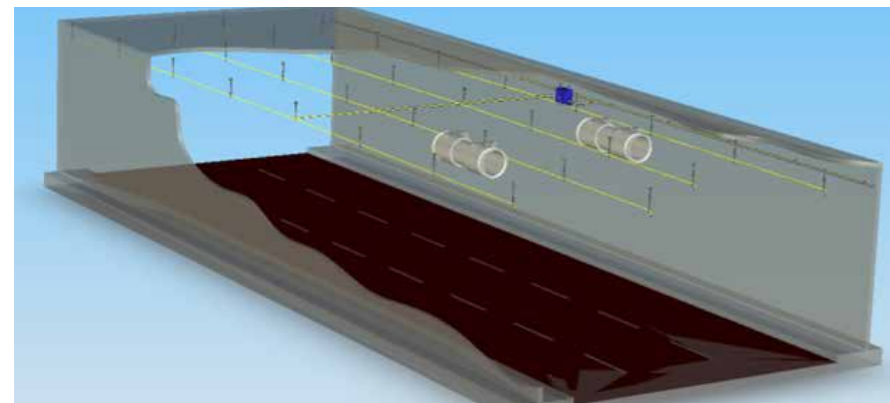
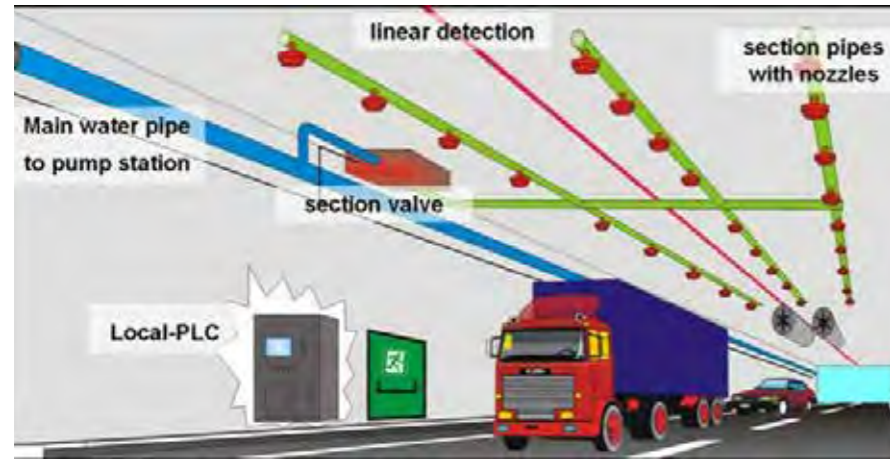


Pumping systems are available as diesel and electrically driven units. Compact state of the art design avoids the use of multiple small pumps being connected in parallel. Thus, reliability levels are high and service and maintenance requirements are low. FOGTEC Systems are easily integrated into tunnel management systems for optimal interconnection with other safety systems such as ventilation and emergency warning systems.



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## WATER MIST SYSTEM ARCHITECTURE



1. The water supply main is pre-pressurised to section (zone) valves in order to reduce water delivery time.
2. Each fire suppression zone is fitted with an automatic section (zone) valve.
3. Fogtec nozzles are specially engineered and fire tested for tunnel applications in extreme fire conditions, these nozzles are designed to generate fine water mist droplets that provide a superior cooling effect which is required to achieve a sharp reduction in the fire heat release rate.

### Example from real installations

These pictures show a typical water mist installation in the tunnel (3D model) and an activated system in the real tunnel.

## PARTICIPATION IN STANDARDISATION AND RESEARCH PROGRAMS

Fire Protection Technologies and FOGTEC are very active in Australia and throughout the world in tunnel societies and participate in a number of different research programs, standards, committees and working groups.

- \* NFPA 502 (Tunnels)
- \* NFPA 750 (Water Mist)
- \* ITA - COSUF
- \* Australasian Tunneling Society
- \* Technical Advisory Committee (TC23) Tunnel Fire Safety
- \* International Water Mist Association

M30 Tunnel Spain



Silver Forest Tunnel Russia



New Tyne Crossing UK



Eurotunnel France / UK



Authorised **FOGTEC** FIRE PROTECTION Distributor

## DETECTION IN TUNNELS



### Linear Heat Detection

In today's complex industrial environments, the potential for downtime and financial losses caused by overheating and fire can be disastrous if not detected and located quickly. Linear Heat detection is increasingly becoming the first choice in fire protection. With ever-increasing complex application and the potential for loss and downtime, the right choice is critical to business continuity. In many applications, traditional point-type detection is not used in the way and for the purpose they were designed. Linear heat detection has become a preferred alternative for many of these applications.



Digital linear heat detection cable is a conventional style heat detector which is capable of detecting a fire along the entire length of the cable and its versatility and simplicity is an economic way to provide rapid detection of fire at an early stage.

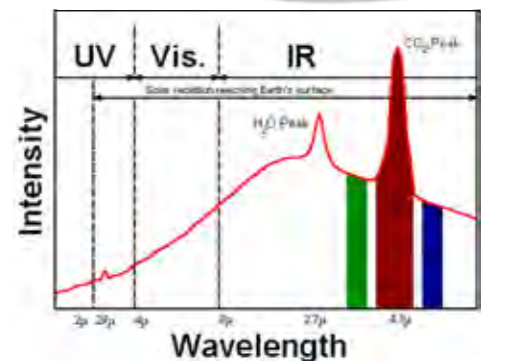
Intelligent linear heat detection systems are capable of recording temperatures along the entire length of the sensor cable, providing continuous real-time temperature profiles of the environment in which the system is installed. These systems are capable of detecting and locating a fire and overheating conditions over distances up to 10 km.

Intelligent linear heat detection systems are capable of rapidly and accurately detecting temperature changes of as little as  $\pm 0.1^\circ\text{C}$  along its length with multiple alarm thresholds including fixed point, rate of rise, and pre-alarm. The system controllers include the ability to program activation and interface with fire control and building automation systems to provide real-time data of any fire scenario or event to operational personnel as well as accurately triggering the fire suppression systems to activate where required.



### Flame Detection

Flame Detectors operate in the harshest environmental conditions and offer a solution for virtually any application where there is a fire risk to personnel and high-value plant and capital equipment. We offer flame detection solutions with fast response times, the best area coverage, the highest immunity to false alarms, and all the performance and safety approvals you need. Before you choose, you need to know the "pros and cons" of each type of detector. No single detector is suitable for every situation. Apart from hydrocarbon fires, our wide detector range can help with other special fire types, e.g. hydrogen, ammonia, silane... and much more. Industrial and commercial applications for flame detection include tunnels, offshore oil and gas platforms, FPSOs, oil and gas pipelines, petrochemical plants, refineries, aircraft hangars, flammable fuel storage tanks, hydrogen filling stations, munitions plants, and many more.



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## FOAM FIRE FIGHTING SYSTEMS

FireDos is the revolutionary proportioning system that operates without any external power supply. Drive for the unit is provided solely by the water supply being used to fight the fire. The rotation speed of the drive motor is proportional to the volumetric flow rate, thereby enabling the FireDos unit to accurately proportion product concentrations from as low as 0.1% up to 6%. It is capable of handling practically any fluid from a flow rate of 10 l/min. to 20,000 l/min. and is not affected by fluctuations in flow or pressure. FireDos is cost effective and will also eliminate the need for installation of expensive foam concentrate pumps, bladder tanks and associated equipment.



The foam hose reel and Hydrant cabinet system shown below is specifically designed for use in tunnel environments and utilise the FireDos proportioning system to ensure accurate proportioning of foam concentrate regardless of fluctuation in the supply pressure and flow.



## VIDEO FLAME & SMOKE DETECTION

SigniFire cameras can see and recognize smoke and flames overlooking large spaces at great distances, whilst also providing video surveillance capabilities as a bonus. They can detect fire within seconds, supply vital situational awareness in the form of live video to remotely located guards, trigger fire alarms, and provide vast amounts of pre-recorded video forensic evidence for future fire investigations. SigniFire cameras can detect:

- Presence of flames within the field of view.
- Reflected fire light when flames are obstructed.
- Presence of pluming smoke clouds.
- Presence of ambient smoke.
- Unauthorised Intrusion.

SigniFire is deployed in conjunction with the Fike FSM-IP advanced Network Video Recorder (NVR) platform that can address immediate security needs of your organisation. Large capacity internal storage provides continuous digital video recordings with instant access to current and archived events from virtually anywhere over local and public networks.



# Australian & New Zealand Tunnel Projects

Fire Protection Technologies have provided and continue to provide design, engineering, fire suppression products, fire detection products, and commissioning services for new tunnel projects, upgrades and refurbishments. Our experienced design and engineering team is intimately aware of the stringent engineering requirements that apply to tunnels. West Conne m4tunnel



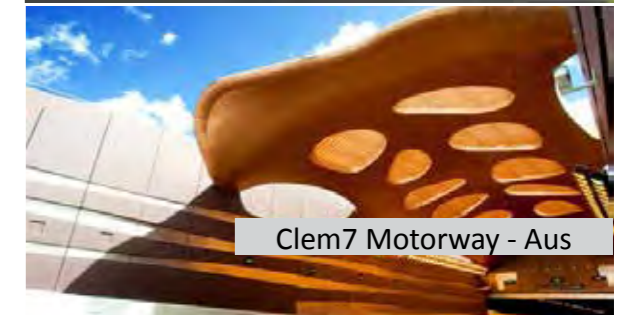
WestConnex M4 Tunnel - Aus



Brisbane Busyway Network - Aus



Eastern Busway - Aus



Clem7 Motorway - Aus



Airport Link - Aus



Victoria Park Tunnel - NZ



Mount Victoria - NZ



Terrace Tunnel - NZ

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## PRODUCTS:

### *Gaseous Suppression*



Inert Gas (IG-01, IG-55, IG-100, IG-541)  
Novec 1230™ Fluid (FK-5-1-12)  
FM-200® / NAF S 227 (HFC-227ea.)  
Ecaro 125® / NAF S 125 (HFC-125)  
Carbon Dioxide (CO<sub>2</sub>)  
Hybrid Systems (N<sub>2</sub> / Water)  
Pressure Relief Vents  
Enclosure Integrity Testing Equipment  
Pipe & Fittings

### *Water Suppression*



Water Mist - High Pressure  
Water Mist - Intermediate Pressure  
Water Mist - Low Pressure  
Hybrid Systems (Water / N<sub>2</sub>)  
Monitors & Delivery Systems  
High Speed Deluge

### *Foam Suppression*



Foam Concentrates  
Foam Proportioning  
Foam Delivery Systems  
Foam Concentrate Testing

### *Explosion Protection*



Explosion Suppression  
Explosion Isolation  
Explosion Vents & Pressure Relief  
Spark Suppression  
Explosibility Testing

### *Fire Detection*



Linear Heat Detection - Digital  
Linear Heat Detection - Fibre Optic  
Linear Heat Detection - Micro Chip  
Flame Detection  
Video Imaging Detection  
Spark Detection  
Control & Indicating Equipment  
Thermal Imaging Detection  
Aspirating Smoke Detection

### *Military & Defence*



Military Vehicles  
Naval Vessels

### *Special Applications*



Micro Environment  
Oxygen Reduction  
Kitchen Protection Systems  
Dry Chemical  
Vehicle Systems  
Compressed Air Foam  
Marine & Offshore  
Vapour Mitigation

### *Support Services*



Design / Engineering  
Technical Support  
Services & Testing

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**'Every solution for your special hazard problems'**