

## Your air in road tunnels

### Summer 2019

We recognise air quality is important to the local community when designing our road tunnels. Our tunnels are built to meet strict air quality requirements using modern ventilation and tunnel design.



**Did you know NSW air quality requirements are among the most stringent in the world? This ensures that air pollution levels are appropriately managed inside and outside the tunnel.**

#### Vehicle emissions

Vehicle emissions continue to reduce, despite there being more cars on the road. This is a result of advances in vehicle technology and design, as well as government initiatives to reduce emissions at the source.

#### Modern tunnel ventilation

While vehicle emissions are a source of air pollution, modern tunnel ventilation design ensures the operation of our tunnels meet strict air quality requirements set by the Department of Planning, Industry and Environment and the Environment Protection Licence issued by the Environment Protection Authority.

Our modern tunnels are designed to achieve:

- strict in-tunnel air quality
- no emissions from portals
- emissions from ventilation outlets that result in little, if any, change to the quality of the air people breathe.

## Your air in road tunnels

### In-tunnel air quality

The NSW Government has set strict in-tunnel air quality requirements. These are addressed by ensuring sufficient air flow through the tunnel to prevent the build up of vehicle emissions. This air flow is achieved through a combination of:

- traffic flow: the turbulence created by traffic flow naturally draws air into the tunnel
- tunnel size: larger diameter tunnels enable more air to be drawn in by both traffic and fans
- ventilation design: jet fans are used to draw in additional air when the traffic slows down.

### Portal emissions

Recent NSW tunnels longer than one kilometre are required to have zero emissions from portals. Outside Australia almost all road tunnels have portal emissions.

To achieve zero portal emissions, we use jet fans to draw in air from the exit portal, with all tunnel air being removed via the elevated ventilation outlet as shown in the diagram below. This is most efficiently done when the ventilation outlet is positioned near the exit portal.

### Ventilation outlets

Elevated ventilation outlets are very effective at ejecting tunnel air high into the atmosphere through a combination of buoyancy and speed. This occurs by the warmer tunnel air (heated by vehicles using the tunnel) being ejected upwards at speed through the outlet by axial fans. This warm air continues to rise high into the atmosphere through natural buoyancy as it is warmer than the surrounding air.

Once in the atmosphere, the ejected tunnel air dilutes hundreds of times as it mixes with the surrounding air before mixing down to ground level resulting in little, if any, change to the quality of the air people breathe.

The tunnel ventilation systems are designed to operate effectively under all traffic and weather conditions.

### Monitoring

Air quality within major NSW tunnels is continuously monitored along the tunnel and at the ventilation outlet to control the ventilation system. This ensures the strict air quality limits outlined in the approval conditions are complied with at all times.

The ventilation outlets of all current and future operating motorway tunnels in NSW require an Environmental Protection Licence issued by the NSW Environment Protection Authority. These licences require tunnel operators to meet air quality limits and undertake air quality monitoring.

Since the Lane Cove Tunnel, air quality monitoring data is required to be made publicly available on the tunnel's website, which is a requirement of the approval conditions.



*Modern tunnel ventilation ejects tunnel air high into the atmosphere*

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### Tunnel filtration

In Australia, there are no tunnels which uses filtration systems to manage in-tunnel and ambient air quality.

There are also few tunnels internationally which have filtration systems installed, and of these, few are routinely operated<sup>1</sup>. This is due to concerns regarding effectiveness and limited benefits, including:

- technologies are pollutant specific therefore no combination of available filtration systems are capable of removing all tunnel air pollutants, and ventilation and dispersion is still required
- systems are only able to treat a very small proportion of vehicle emissions present in the ambient air which provides has limited, if any, effectiveness in improving local air quality

Filtration also requires significant investment in equipment and additional ventilation requirements, which makes them highly energy intensive and expensive to operate.

Studies have found that filtration systems would not provide any measurable improvement to air quality in the surrounding community.

The Advisory Committee on Tunnel Air Quality is chaired by the NSW Chief Scientist & Engineer and consists of a range of experts in fields related to road tunnels, air quality and human health. This includes the NSW Chief Health Officer, and an independent, international air quality expert.

The Committee's "Initial Report on Tunnel Air Quality" found that:

- *"emissions from well-designed road tunnels cause a negligible change to surrounding air quality, and as such, there is little to no health benefit for surrounding communities in installing filtration and air treatment systems in such tunnels."*

The best approach to reducing community exposure to motor vehicle emissions is to continue to adopt cleaner fuels and vehicles to reduce emissions at the source, rather than attempt to filter them out of the air once they have been released.

<sup>1</sup> An international assessment of tunnel air treatment published in 2017 by the French Government

### For more information



[nswroads.work/airquality](https://nswroads.work/airquality)



1800 789 297



[motorwaydevelopment@rms.nsw.gov.au](mailto:motorwaydevelopment@rms.nsw.gov.au)



Customer feedback, Transport for NSW  
Locked Bag 928, North Sydney NSW 2059

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### Reducing Emissions at the Source

The best approach is to continue to adopt cleaner fuels and vehicles to reduce emissions at the source, rather than attempt to filter them out of the air once they have been released.

Although there are more cars on the road, the developments outlined below have resulted in substantial reductions in total vehicle emissions in the past two decades. Total emissions from motor vehicles are set to continue to fall over the next decade due to the new cleaner vehicles replacing older technology vehicles. This is despite an expected increase in the number of cars in Sydney over the next 20 years as the population grows.

Current emission reduction initiatives and developments include:

- improvements in technologies and design e.g. electric powered vehicles
- clean fleet program
- smoky vehicle camera systems
- vehicle import duties on second-hand cars
- National Clean Air Agreement.

The NSW Government will continue to support initiatives to further reduce emissions at the source and monitor tunnel and roadside emissions to appropriately manage them.

### Further reading

#### Road Tunnel Ventilation Systems

<https://www.chiefscientist.nsw.gov.au/reports/advisory-committee-on-tunnel-air-quality>

#### CETU (Cente d'Etudes des Tunnels) (2017)

[www.cetu.developpement-durable.gouv.fr/IMG/pdf/cetu\\_di\\_traitement\\_de\\_l\\_air-en-19\\_07\\_2017.pdf](http://www.cetu.developpement-durable.gouv.fr/IMG/pdf/cetu_di_traitement_de_l_air-en-19_07_2017.pdf)

#### Climate Change Authority

[www.climatechangeauthority.gov.au/reviews/light-vehicle-emissions-standards-australia/opportunities-reduce-light-vehicle-emissions](http://www.climatechangeauthority.gov.au/reviews/light-vehicle-emissions-standards-australia/opportunities-reduce-light-vehicle-emissions)



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