

Working with diesel engine exhaust

Diesel Engine Exhaust (DEE) is created by burning diesel fuels. The resulting product is a mixture of gases, vapours, liquids, aerosols and soot. The solid part of DEE is known as Diesel Particulate Matter (DPM). Anyone working with or around diesel engines is at risk of exposure to DEE.

Who is at risk of DEE exposure?

In Australia, it is estimated that approximately 1.2 million workers are exposed to DEE. Certain occupations and tasks will increase your likelihood of DEE exposure. Industries where workers are more likely to be exposed include mining, construction, agriculture, transport and diesel engine vehicle maintenance. Other tasks or occupations increasing the likelihood of DEE exposure can include:

- Working with or around heavy vehicles that use diesel for fuel such as trucks, buses, trains, planes, tractors, ships, bulldozers and forklifts
- Working with or conducting maintenance on equipment and vehicles that use diesel in mines such as bucket lifts and excavators
- Working with or around diesel engines near busy railway lines or roadways, even if vehicles are not always in operation - this may include toll booth operators, traffic controllers, car park attendants, material handling operators, airline ground workers, railway workers, or emergency service workers
- Other workers such as farmworkers, dockside ferry workers, maritime workers, bridge and tunnel workers, landscapers, depot and warehouse workers, and those conducting maintenance of heavy diesel-powered equipment or engines.

How can you identify DEE in the workplace?

Air monitoring can help identify the presence of DEE. Poorly managed exposure to DEE can be identified in your workplace in a number of ways, such as:

- If diesel engines are left idle in enclosed spaces
- If walls and surfaces are covered in soot
- If blue, black or white smoke haze is visible
- If multiple engines are running at any given time
- The state of the engines, looking at manufacturing history
- Any health complaints by potentially exposed workers.

Why is DEE exposure harmful?

DEE has been classified as a Group One carcinogen, meaning exposure to DEE can cause lung cancer in humans.¹ Due to their small size, DEE components can remain airborne for long periods of time and become easily inhaled deep into the lungs. This can cause a range of short- and long-term health effects.

Very high levels of DEE exposure in an enclosed space can lead to asphyxiation or carbon monoxide poisoning, which can be fatal.



Short term (acute) respiratory health effects can occur soon after DEE exposure and may include symptoms such as:

- Coughing
- Wheezing
- Increased mucus
- Nausea
- Headaches
- Irritated eyes, nose and throat



Long term (chronic) respiratory health issues of ongoing DEE exposure may include:

- Reduced lung function
- Lung cancer
- Chronic Obstructive Pulmonary Disease (COPD)
- Occupational asthma
- Work-exacerbated asthma - worsening of already existing asthma symptoms

Exposure to DEE may also cause bladder cancer and heart disease. The risk of developing health effects depends on the amount of DEE you have been exposed to and for how long you were exposed to it.

How can you manage or reduce your risk of exposure to DEE?

All employers have a legal obligation to manage risks to workers' health and safety. Obligations may differ slightly between states and territories; however, your employer's duty to ensure you can work without risk to your health remains.

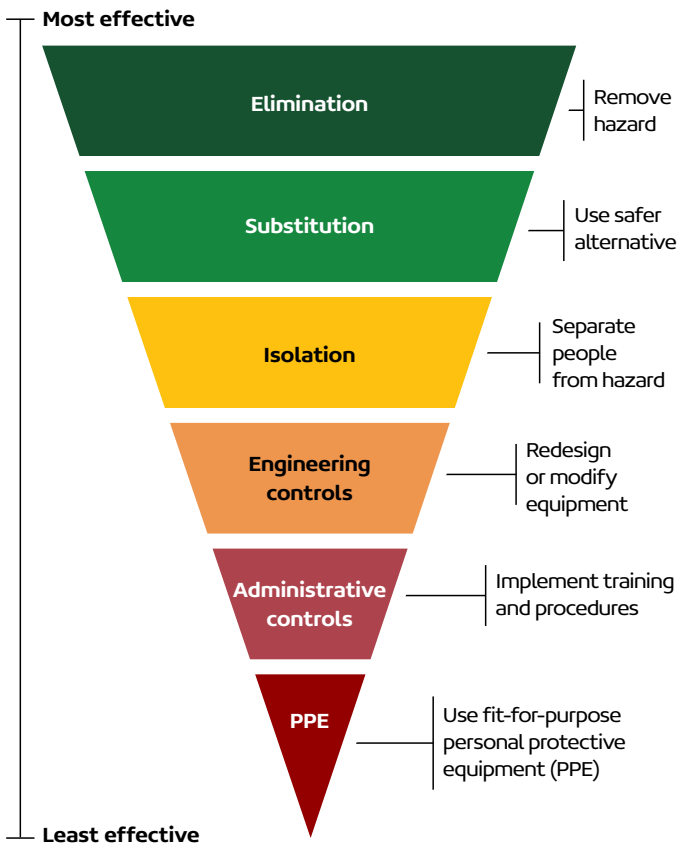
Hierarchy of Controls

The most effective way to reduce exposure to DEE in the workplace is by following the Hierarchy of Controls, which organises control measures from the highest level of effectiveness (Elimination) to the lowest level (Personal Protective Equipment). Below are some examples of control measures that may be used to reduce exposure to DEE. While your employer is responsible for implementing control measures, they must consult with workers about implementing controls to manage health and safety risks in the workplace.

Control	Examples
Elimination: Not using processes that generate DEE	Eliminate the use of diesel-powered machines.
Substitution: Using alternative processes, machines or materials	Substitute diesel-powered machines or plants with electric power.
Isolation: Isolating workers from DEE	Separate workers from DEE. For example: <ul style="list-style-type: none">• Enclosing the worker in a sealed, air-conditioned cabin (being mindful of air quality inside the sealed cabin)• Modifying the layout of the workplace to separate where the DEE machines are operated to the remainder of the workplace and workers.
Engineering Controls: Redesigning or modifying equipment and processes	Using diesel exhaust gas after-treatment. For example: <ul style="list-style-type: none">• Catalytic converters to oxidise organic substances and gases• Catalysed and non-catalysed particulate traps to remove particulate matter• Using ventilation systems• Providing positive pressure ventilation.
Administrative Controls: Implementing training and procedures	Using processes or systems which will help to reduce the generation of DEE. For example, introduce training and policies around: <ul style="list-style-type: none">• Switching off engines where possible - instead of leaving them idling• Having regular engine maintenance on diesel equipment/machines• Fitting diesel engines with emission control devices (e.g., collectors, scrubbers, ceramic particle traps)• Regularly checking nearby cabins to ensure doors and windows are sealed to prevent DEE emissions from seeping in• Reducing the number of workers directly exposed• Reducing the period of exposure to DEE• Ensuring any office staff working adjacent to DEE are not exposed• Job rotation and scheduling work to minimise workers nearby when diesel machines/vehicles are operating• Information, training, instruction and supervision must be provided to workers on health hazards associated with DEE and use of control measures (including respiratory protection).
Personal Protective Equipment (PPE): Using fit-for-purpose PPE	PPE is the lowest form of protection on the Hierarchy of Controls and should not be relied on or used solely to protect against DEE exposure. Exposure to DEE is best controlled at the source. <ul style="list-style-type: none">• Respirators need to be properly stored, inspected, cleaned and maintained• Ensure filters and disposable respiratory protective equipment (RPE) is changed regularly• Workers should be fit-tested to use a respirator• Workers should be clean shaven to ensure proper fit and seal of RPE• Half or full-face respirators with a filter cartridge that protects against gases, organic vapours and particles• P2 disposable respirators may be suitable where there is a low concentration of DEE.

Note: Some of these measures might not be practical in all workplaces.

Hierarchy of Controls pyramid



exceeding the Workplace Exposure Standard (WES). Many of the gaseous components of DEE have a published WES such as carbon monoxide, carbon dioxide, nitric oxide and nitrogen dioxide.² At present, there is no WES for DPM exposure in Australia. However, the Australian Institute of Occupational Hygienists (AIOH) recommend that exposure to DPM is below 0.1mg/m³ time-weighted average over eight hours.³

What else can you do to protect yourself?

- Quit smoking and/or vaping to further protect your lung health
- Report your workplace exposure to your doctor, even if you are not experiencing symptoms. When your doctor is aware of your exposure, they can better monitor your lung health and overall wellbeing
- Speak to your employer about your workplace exposures and any health monitoring programs available that you and your coworkers should be participating in
- Follow all reasonable instructions given and work in compliance with any training that you have undertaken
- Make sure you understand how to implement workplace exposure controls and verify that they are effective with your employer or health and safety representative
- Use the appropriate PPE consistently and in accordance with the manufacturer's instructions.

Workplace Exposure Standard

Under legislation, a person conducting a business or undertaking (PCBU) must ensure that no person in the workplace is exposed to hazardous agents at a level



FURTHER INFORMATION

For more information on diesel engine exhaust, relevant to your state or territory, visit our **Occupational Lung Disease National Directory**.

- Find out more about DEE and ways to protect yourself at:
- Lung Foundation Australia - lungfoundation.com.au
- Safe Work Australia - safeworkaustralia.gov.au
- Australian Institute of Occupational Hygienists - aioh.org.au
- Breathe Freely - breathefreelyaustralia.org.au
- Your local state/territory workplace health and safety regulation body.

[Lungfoundation.com.au](https://lungfoundation.com.au) | Freecall 1800 654 301 | enquiries@lungfoundation.com.au

References:

1 <https://monographs.iarc.who.int/list-of-classifications>

2 <https://www.safeworkaustralia.gov.au/doc/workplace-exposure-standards-airborne-contaminants-2024>

3 <https://www.aioh.org.au/product/diesel/>

Note to reader: This information is intended as a general guide only and is not intended or implied to be a substitute for professional advice. While all care is taken to ensure accuracy at the time of publication, Lung Foundation Australia and its members exclude all liability for any injury, loss or damage incurred by use of or reliance on the information provided.