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POSITION PAPER

# IMPLEMENTATION OF AN EXPOSURE STANDARD FOR DIESEL PARTICULATE MATTER IN NSW MINES



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# IMPLEMENTATION OF AN EXPOSURE STANDARD FOR DIESEL PARTICULATE MATTER IN NSW MINES

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## Scope

Diesel exhaust emissions contain a range of chemicals, gases and diesel particulate matter. The adverse health impacts of diesel emissions are well known. Studies indicate the particulate matter component of diesel exhaust can contribute to acute and chronic health conditions.

In 2012, the International Agency for Research on Cancer classified diesel particulate extract as carcinogenic to humans, based on evidence from human and animal studies.

Since the mid-1980s, an exposure standard for diesel particulate matter was thought to be necessary, particularly for the mining industry. However, conflicting epidemiological studies and the absence of historical quantitative exposure data has meant that a nation-wide exposure standard for diesel particulate matter has not been implemented in Australia to date.

In September 2019 the NSW Resources Regulator released a discussion paper to seek industry feedback on a proposal to legislate an exposure standard for the elemental carbon fraction of diesel particulate in the NSW mining industry. Five submissions were received (including submissions from the NSW Mineral Council and Coal Services), with no objections raised on the proposed introduction of an exposure standard for diesel particulate matter.

Our position on workplace exposure to atmospheric concentrations of diesel exhaust emissions in the NSW mining industry encompasses:

- the introduction a personal exposure standard of 0.1 mg/m<sup>3</sup> for diesel particulate matter, measured as elemental carbon, introduced into legislation on 1 February 2020 and effective from 1 February 2021 after a 12-month transitional period.

This change was implemented through an amendment of clause 39 (1) of the Work Health and Safety (Mines and Petroleum Sites) Regulations 2014.

This position paper details our regulatory approach during the period January to December 2021 to assist the NSW mining industry in managing compliance with the new exposure standard.

## Background

Diesel engines were introduced into the NSW coal industry in the early 1950s, followed by metalliferous mines in the 1960s, with peak usage reached in the mid-1980s. During this time, a large number of workers were exposed to the complex mixture of toxic gases, organic substances and particulate matter found in the raw diesel exhaust emissions.

The chemicals in diesel emissions can cause adverse health outcomes, including acute and chronic pulmonary and cardiovascular diseases. Additionally, studies have demonstrated a link between occupational exposure to diesel exhaust and an increase in the risk of lung cancer. Complaints of eye, throat and bronchial irritation and neurophysiological symptoms such as headache, light headedness, nausea, vomiting as well as numbness and tingling of the extremities have also been associated with exposure to diesel exhaust emissions.

Australian studies in underground coal and metalliferous mines have noted that the level of eye and upper respiratory tract irritation is significantly reduced at diesel particulate matter exposure concentrations of 0.2 mg/m<sup>3</sup> or less (approximately 0.1 mg/m<sup>3</sup> submicron elemental carbon).

To date, regulatory authorities and many mine operators have adopted the exposure value recommended in the Australian Institute of Occupational Hygienists (AIOH) guidelines, that a worker's exposure to diesel particulate matter should be controlled to below 0.1 mg/m<sup>3</sup> measured as submicron elemental carbon.

SafeWork Australia's Workplace Exposure Standards for Airborne Contaminants list (WESFAC) does not currently include diesel emissions, however it references the AIOH recommendations for use as a workplace exposure standard.

Similarly, the NSW government publication Mining Design Guideline 29 (2008) recommends an eight-hour time-weighted average exposure standard of 0.1 mg/m<sup>3</sup> (as submicron elemental carbon, sampled by NIOSH 5040 methodology) in underground environments.

Currently, the NSW Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 requires that an operator of a mine identifies the risks of diesel emission exposure, assesses the extent of the risk, and prepares and implements a management plan for that risk.

Our introduction of a prescribed exposure limit of 0.1 mg/m<sup>3</sup> for diesel particulate matter, (measured as elemental carbon) to the NSW Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 is

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considered achievable and within acceptable limits. The implementation of this limit will reduce the exposure and therefore the risk of occupational illness to mine workers.

## Exposure standard for diesel particulate

NSW is the first mining jurisdiction in Australia to implement an exposure standard for diesel particulate matter.

**The exposure standard of 0.1mg/m<sup>3</sup> for diesel particulate matter, measured as elemental carbon, came into force on 1 February 2021 after a 12-month transitional period.**

Mines and petroleum sites will need to adhere to the regulatory requirements of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014, as described in clause 39 (1) (c).

**39 Ensuring exposure standards for dust and diesel particulate matter not exceeded (cl 636 model WHS Regs)**

- (1) The operator of a mine or petroleum site must, so far as is reasonably practicable, minimise the exposure of persons at the mine or petroleum site to dust and diesel particulate matter and must ensure that no person at the mine or petroleum site is exposed to 8-hour time-weighted average atmospheric concentrations of airborne dust and diesel particulate matter that exceed—
  - (a) for respirable dust—3 milligrams per cubic metre of air, or in the case of a coal mine, 2.5 milligrams per cubic metre of air, or
  - (b) for inhalable dust—10 milligrams per cubic metre of air, or
  - (c) for diesel particulate matter—0.1 milligram per cubic metre (measured as sub-micron elemental carbon).
- (2) The *Workplace Exposure Standards for Airborne Contaminants* apply in relation to a concentration referred to in subclause (1) as if that concentration were an exposure standard referred to in that document.
- (3) In this clause—  
**8-hour time-weighted average** has the same meaning as in the *Workplace Exposure Standards for Airborne Contaminants*.

In consideration of the carcinogenic nature of diesel particulate matter and other irritant effects, it is our position that the introduction of an exposure standard is appropriate, and compliance is achievable through the application of the hierarchy of controls.

## Notification of an exceedance

Mine operators are required to notify us of certain incidents under clause 128 (5) of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014. It is the intent of the Regulator to require a mine operator to notify us in the event of an exceedance of the diesel particulate matter exposure standard specified in clause 39 (1) (c). The implementation of such a requirement will be considered during future regulatory reviews.

## Obligations of mine operators

Clause 9 of the WHS (M&PS) Regulation stipulates that mine operators are required to manage risks to health and safety at a mine site, including risks in relation to diesel exhaust emissions.

Areas and tasks where workers may be exposed to diesel exhaust emissions should be identified and effectively controlled through risk assessment. Using the hierarchy of controls, appropriate control measures should be implemented to eliminate or minimise the risk of worker exposure to diesel exhaust emissions. Control methods to minimise workplace exposure to diesel emissions are readily available, as are commonly employed atmospheric monitoring and personal exposure monitoring strategies.

Mine operators should consider:

- identifying areas of exposure risk
- controlling diesel exhaust emissions at the source
  - use of low emission diesel engines / equipment selection
  - use of emission reduction devices (i.e. particulate filters, catalysts)
  - use of low emission fuels and quality lubricants
  - worker training on driving behaviour and effect on emissions
  - robust maintenance strategy and exhaust gas emissions testing
- controlling exposure to airborne diesel emissions
  - good ventilation strategies and systems
  - provision of air conditioned (filtered) operators' cabins
  - control of diesel engines in areas of identified risk

- minimise number of diesel engines operating at same time
- information and training of workers
- use of appropriate respiratory protective equipment
- workplace area atmospheric monitoring / ventilation monitoring.
- the review and monitoring of risk control measures to ensure compliance with the exposure limit and maintenance of atmospheric concentrations to as low as reasonably practicable
- maintaining awareness of best practice methodologies and new technological innovations.
- audit site practices.

Further guidance for managing diesel exhaust exposure is available in the NSW government publication *Mining Design Guideline 29 Guideline for the management of diesel engine pollutants in underground environments* (2008).

The controls identified in the risk assessment must be included in the principal hazard management plan for air quality or dust or other airborne contaminants. The development of the exposure standard should also trigger the review of this PHMP.

## **Monitoring diesel particulate exposure**

Under clause 50 of the Work Health and Safety Regulation 2017, a person conducting a business or undertaking (PCBU) is required to conduct air monitoring to determine the concentration of air contaminants to which an exposure standard applies. Clause 39 of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 stipulates the requirement for personal exposure monitoring of workers to diesel particulate matter.

Where a risk of worker exposure to diesel particulate is identified, mine operators should undertake personal exposure monitoring of workers. An ongoing exposure monitoring program may also be required to measure the level of personal exposure where an ongoing risk is identified. The monitoring frequency and methodologies of an exposure monitoring program should be determined by the risk, with consideration given to the following:

- monitoring people who are more likely to be exposed to diesel particulate
- monitoring over a range of standard operational processes in addition to exposure which occurs during abnormal mining operations

- the inclusion of static positional monitoring to determine airborne concentrations of diesel particulate matter, and for determination of the effectiveness of implemented control measures
- samples collected in accordance with Australian Standard sampling methodologies under the direction of a suitably competent Occupational Hygienist independent to the mine, and subsequent analysis undertaken by a NATA accredited laboratory using the NIOSH Method 5040
- where results indicate personal exposure in excess of 0.1mg/m<sup>3</sup> elemental carbon
  - an investigation should be carried out and a resample taken after any corrective actions
  - the mine should review the principle hazard management plan for air quality or dust or other airborne contaminants
  - workers should be advised of the occurrence and recommendations to prevent a reoccurrence.
- records held by the mine for 30 years (as per clause 50 WHS Regulation).

## Industry engagement

With the implementation of a new exposure standard for diesel exhaust emissions, airborne contaminants will continue to be a focus area during 2021. We will be particularly active in engaging with the mining industry during this period. This will include:

- planned inspection programs focusing on the management of diesel particulate matter
- consideration for the introduction of diesel particulate matter exposure exceedances as a notifiable incident
- provision of details on monitoring and analysis requirements and sampling frequencies
- informing industry stakeholders of the new exposure standard, and providing guidance material on how to manage the health risks associated with diesel exhaust emissions
- presentations at industry forums, seminars and industry roadshows
- publication of fact sheets and other guidance material

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- industry roadshows
- correspondence to mine operators, introducing the new exposure standard and the need to review and modify systems and processes to achieve compliance.

## Conclusion

We are committed to ensuring that the NSW mining industry understands its obligations and our expectations.

Improving conditions relating to the health and safety of workers and reducing the potential risk of all airborne contaminants is necessary. We expect that all mine operators will actively work toward reducing exposure to diesel particulate emissions, not only to below the prescribed maximum, but to as low as reasonably practicable.