Fact sheet

Phosphine and workplace exposure limits - information for grain growers on air monitoring

Workplace exposure limits

Workplace exposure limits (WELs) have replaced workplace exposure standards (WES) as Australia's framework for managing exposure to airborne workplace contaminants. For phosphine, the WEL is lower than the previous WES and is intended to provide greater protection for workers.

Current WES values (ppm)		Reduced WEL values (ppm) at 1 December 2026	
TWA	**STEL**	**TWA**	**Peak limit**
0.3	0.1	0.05	0.15

vThe use of phosphine is not banned. Phosphine can still be used to fumigate grain in accordance with Australian Pesticides and Veterinary Medicines Authority (APVMA)-approved product labels, and WHS legislation. Some product labels refer to a phosphine concentration of 0.3 ppm when determining whether ventilation has been completed and grain may be cleared following fumigation. That clearance value serves a different purpose from the WEL.

The WEL limits workers' exposure to phosphine in their breathing zone during work, to protect workers from harmful exposure to phosphine.

Implementation dates

Implementation arrangements for the phosphine WEL vary across Australian jurisdictions. Duty holders should check with their state or territory WHS regulator to confirm the applicable requirements and commencement arrangements in their jurisdiction.

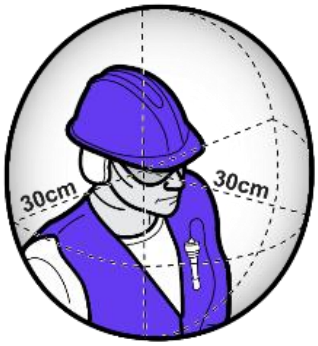
What is phosphine?

Phosphine is a highly toxic gas used to fumigate stored grain from insect pests. Workers may be exposed to phosphine during activities such as:

- applying fumigants
- working on or in, the vicinity of storage during fumigation or venting
- conducting ventilation activities
- handling treated commodities
- sampling grain
- removing and deactivating spent fumigant products
- opening storage structures
- transferring grain after fumigation
- tasks contradicting product label directions

What do the limits mean?

Workplace exposure limits apply to the concentration of phosphine in a worker's breathing zone. Employers may need to put in place controls to ensure their workers are not exposed to phosphine gas above the new limits. The reduced limits are:



- **8-hour Time Weighted Average (TWA): 0.05 ppm** - the maximum permitted concentration measured as an average for an 8-hour working day, 5 day week. Air is sampled from the worker's breathing zone for most or all of the shift.
- **Peak limitation: 0.15 ppm** - the maximum permitted concentration in a worker's breathing zone at any time. Compliance can be assessed using a real-time monitor that provides immediate results or by collecting air samples for laboratory analysis.

Breathing zone: the worker's breathing zone is within a 30cm radius extending in front of a person's face and measured from the midpoint of an imaginary line joining the ears, as shown above.

Peak limitation: 0.15 ppm

The peak limitation replaces the previous 15-minute Short-Term Exposure Limit (STEL) of 1.0 ppm. A key difference is that a peak limitation is not assessed in the same way as a STEL. A STEL means the airborne concentration of a particular substance is calculated as a time-weighted average over 15 minutes. Peak limitation is a maximum or peak airborne concentration of a particular substance determined over the shortest analytically valid time period, not exceeding (i.e. not longer than) 15 minutes. More information about analytical validity can be found in the *Technical guide: Air monitoring and the workplace exposure limits for airborne contaminants.*

What do businesses need to do?

Not all work involving airborne contaminants will require air monitoring, and you should conduct a risk assessment to determine if air monitoring is required. Air monitoring is best done after control measures have been put in place.

The 4 steps of the risk management process provide a framework for managing risk from exposure to phosphine. These steps are: identify hazards, assess risks, control risks and review hazards and control measures. You need to review hazards and control measures when anything changes in the workplace, which includes the change to the workplace exposure limit.

You should:

- Review your risk assessment
- Review your controls (see below)
- Consider options to eliminate or reduce risk through substitution, isolation and/or engineering controls
- Apply administrative controls
- Use personal protective equipment (PPE) (where risks remain, provide suitable respiratory protective equipment (RPE) and ensure workers are trained in its correct use, maintenance and storage.
- Consider air monitoring.

Air monitoring can be done to assess compliance with the WELs, or for other reasons, such as evaluating the effectiveness of the current risk control measures in place.

The WHS Regulations require you to do air monitoring if:

- you are not certain whether or not an exposure limit is likely to be exceeded, or
- monitoring is necessary to determine if there is a risk to health.

You may also choose to do air monitoring to:

- identify risks to workers' health from airborne contaminants, or
- evaluate the effectiveness of the controls in place to manage those risks.

Monitoring exposure can be complicated and generally requires specialised knowledge and equipment. If you need to do air monitoring to assess workers' exposure, or determine compliance with the WELs, you should use a competent person, such as an occupational hygienist, to design and undertake the monitoring.

Personal real-time monitors with an alarm function may also be used to help control worker exposures. This sort of monitoring is unlikely to meet the threshold to be considered air monitoring to assess compliance with the WEL. Businesses may need to seek specialist advice to understand how and when air monitoring is required and what type of monitoring is appropriate, as this will depend on the nature of your work, the potential for exposure and the control measures in place.

Where can I find guidance on how to conduct a risk assessment?

A range of regulatory and industry guidance materials are available to help businesses and PCBUs in agricultural settings to undertake risk assessments, manage risks, select and implement control measures, and develop workplace procedures and work instructions.

Duty holders should consider relevant guidance applicable to their operations about phosphine use. See the "Further Information" section below for examples of available resources. Where additional assistance is required, advice should be sought from a suitably qualified and competent person such as an occupational hygienist. Guidance on how to do a risk assessment is available in the Guide for PCBUs: Air monitoring and the workplace exposure limits for airborne contaminants, and Code of Practice: How to manage work health and safety risks. Additionally, the Code of Practice: Managing risks of hazardous chemicals in the workplace includes information on who should conduct a risk assessment, the types of risk assessment, how to structure a risk assessment and things to consider in the risk assessment.

Monitoring equipment and methods

Personal exposure monitoring

Where monitoring is being used to assess a worker's exposure against the WELs, measurements should be representative of the worker's breathing zone, using an appropriate personal exposure monitoring methodology and equipment.

Personal real-time monitors

Personal real-time monitors worn within a worker's breathing zone may be used to assess personal exposure or to support control measures by providing early warning. Using personal real-time monitoring to assess exposure against exposure limits should be discussed with your regulator to determine if it can be used to assess compliance. When assessing exposure using personal real-time monitoring, the quality control measures described in the *Technical guide: Air monitoring and the workplace exposure limits for airborne contaminants* should be met.

An example of using a personal real-time monitor as a control measure is to have workers wear it during relevant work tasks. Preset alarm levels can trigger required actions or the implementation or escalation of controls, including the use of respiratory protective equipment, in line with site procedures and work instructions.

Other monitoring activities

The same or similar monitoring equipment may be used for other purposes, including fumigation management, environmental monitoring, process control, grain quality activities and clearance assessments. These monitoring activities may have different objectives and should not be interpreted as evidence of compliance or non-compliance with a workplace exposure limit.

What are examples of potential high-risk tasks for phosphine exposure?

It is important to consider tasks where workers may be exposed during fumigation and when handling grain after fumigation.

Phosphine can be absorbed by grain during fumigation and released again over time. This means phosphine may still be present in workers' breathing zones at lower levels during work tasks associated with storage, transport and grain handling activities, even after fumigation has been completed.

Common farm activities that may involve exposure

During fumigation

- applying phosphine tablets, pellets, blankets or bag chains
- checking fumigated storage
- opening storage after fumigation
- ventilating grain
- removing and deactivating phosphine products.
- working in the vicinity of storage during fumigation or venting

After fumigation

Even after ventilation, phosphine absorbed by grain can be released again over time, particularly during activities which disturb fumigated grain. Potential exposure may occur during:

- grain transfer
- grain sampling
- silo opening and inspection.

What should grain growers do?

Review fumigation practices

Consider:

- how phosphine is applied
- who needs to be in the area surrounding storage during fumigation and venting
- how storage is ventilated
- how fumigant residues are removed, deactivated and disposed of
- whether workers could be exposed during grain handling after fumigation.

Follow approved product labels

Always:

- follow label instructions, including the use of PPE
- maintain required exclusion zones
- observe ventilation and clearance requirements
- ensure workers understand safe handling procedures.

Check storage

Well-sealed storage improves fumigation effectiveness, reduce phosphine leakage, and help minimise worker exposure.

You should also pressure test storage and repair seals before fumigation.

Support workers

Ensure workers:

- understand the hazards of phosphine
- know when and where exposure may occur
- understand site procedures
- can use control equipment and respiratory protection correctly.

Monitor

Monitoring may help identify tasks where exposure could occur and confirm controls are working effectively. However, air monitoring must not be used as an alternative to putting in place control measures. Air monitoring is best done after the risk assessment and after control measures have been put in place.

Practical ways to comply with the workplace exposure limits

Employers must make sure workers are not exposed to phosphine gas above the WELs and must eliminate or minimise exposure so far as is reasonably practicable. The hierarchy of control measures is used to select the highest control measures to effectively manage risk.



Demonstrating that workers are protected from the risks of exposure to phosphine requires employers to show that all reasonably practicable control measures are in place and effective, and that worker exposure does not exceed the relevant WEL.

Eliminating the risk is the most effective control measure. Where elimination is not reasonably practicable, risks must be minimised so far as is reasonably practicable. The hierarchy of control measures should be used to identify and implement the highest level of control that is reasonably practicable and effective in managing the risk.

The following controls provide examples of measures that may be used to minimise worker exposure to phosphine during fumigation and grain-handling activities following fumigation. They should be considered during the risk management process along with approved phosphine product labels, Safety Data Sheets (SDS), relevant state and territory regulatory guidance, and applicable industry best-practice guidance. A combination of controls may be required, depending on the work being undertaken. Employers should implement controls appropriate to their workplace and review them regularly to ensure they remain effective.

Hierarchy of controls

Elimination and substitution
At present, eliminating or substituting phosphine for fumigation is generally not practicable. Businesses should continue to monitor developments in alternative fumigation products and treatment methods and consider their adoption where suitable and reasonably practicable.
Isolation
Complete isolation of workers from phosphine is generally not practicable due to the nature of fumigation activities and storage design. However, worker exposure should be minimised by separating people from phosphine and fumigated grain which could off-gas phosphine, wherever reasonably practicable.
Engineering controls
Where reasonably practicable, consider systems that reduce exposure to phosphine, such as ground-level application points, remote gas sampling and aeration fans for ventilation.
Ensure storage, including temporary storage, are adequately sealed and pressure tested where required prior to commencing fumigation.
When purchasing or constructing new permanent storage, consider designs that enable effective sealing and allow workers to be separated from phosphine exposure where reasonably practicable.
Administrative controls
Establish fumigation exclusion zones, including warning signage and access controls, to prevent unauthorised entry. Ensure workers and visitors are aware of the associated hazards and site requirements.
Entry into fumigation exclusion zones should only occur when necessary, by authorised and appropriately trained workers, and where appropriate controls, including the use of suitable PPE, RPE and monitoring equipment, have been implemented.
Always follow the instructions on approved product labels, including safety precautions, product application, dosage and concentration rates, ventilation, clearance, product removal, and disposal Ensure work procedures reflect these requirements.
Ensure workers are appropriately trained and, where required, licensed in the safe use of the specific phosphine products used within the business and understand the required control measures.
Ensure workers maintain the competencies required for their role and are appropriately supervised to verify work processes and control measures are followed correctly.

Use real-time monitors with an alarm function to alert workers to elevated concentrations of phosphine. Use of monitors should be supported by worker training and documented procedures for responding to alarms.
Where reasonably practicable, use work rotation and task planning to reduce the time individual workers spend in areas where phosphine may be present, or when undertaking tasks that disturb fumigated grain.
Never fumigate grain in transit.
If exposure is still expected to be over the workplace exposure limit or there is uncertainty
Provide PPE to exposed workers. Workers should wear all PPE identified on the approved label and SDS. In particular consider: • Respirator fitted with correct filter type for phosphine exposure and suitable for likely or known exposure risk for task being undertaken (full-face filter respirator or self-contained breathing apparatus with combined dust and suitable gas filter). • PVC gloves when dispensing pellets, tablets, bag chains or blankets by hand to prevent contact between the chemical and the moisture in the air or in a worker's skin.

Where can I get help?

Consultants like occupational hygienists can help identify hazards, assess exposure risks, evaluate the effectiveness of your current controls and recommend further controls tailored to your workplace. If required, they can also carry out air monitoring in your workers' breathing zones to ensure they are below the exposure limit. You can search for an expert via the Australian Institute for Occupational Hygienists list of certified consultants.

You can also get information from the WHS regulator in your state or territory: WHS regulators and workers' compensation authorities contact information | Safe Work Australia.

More Information

Information on air monitoring and the workplace exposure limits for airborne contaminants see the Safe Work Australia website Guide for PCBUs: Air monitoring and the workplace exposure limits for airborne contaminants | Safe Work Australia.

Guidance on managing risks from hazardous chemicals can be found in the Code of Practice: How to manage work health and safety risks and the Code of Practice: Managing risks of hazardous chemicals in the workplace.

Further information is also available from state and territory work health and safety regulators, including guidance on risk assessment and risk management, phosphine, hazardous chemicals, air monitoring, workplace exposure limits, and regulatory requirements. Duty holders seeking additional advice should contact the appropriate work health and safety authority for their jurisdiction.

Industry best practice guidance and other recognised technical resources may also assist duty holders to identify hazards, assess risks, select appropriate control measures, and implement effective systems for the safe use and management of phosphine and other hazardous chemicals.