

Air monitoring and the workplace exposure limits for airborne contaminants

Guide for PCBU's

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1. Key messages

1.1 Purpose of this guide

This guide provides information for [persons conducting a business or undertaking \(PCBUs\)](#) on using air monitoring to measure airborne contaminants and the application of exposure limits for airborne contaminants in the workplace.

A separate [Technical guide: Air monitoring and the workplace exposure limits](#) is available to assist people responsible for conducting air monitoring and explains many of the topics covered in this guide in more detail.

Safe Work Australia maintains model Work Health and Safety (WHS) laws. For these laws to become legally binding, the Commonwealth, states and territories must separately implement them as their own laws. Safe Work Australia does not regulate or enforce these laws. This guide, published by Safe Work Australia, therefore refers to duties and requirements in model WHS laws. The requirements in your jurisdiction may be different so you should check with your regulator.

In this guide, the word 'must' indicates a legal requirement that must be complied with. The word 'should' indicates a recommended course of action.

1.2 How to use this guide

This Chapter explains the process that you, as the PCBU, must follow in order to comply with your duties relating to air monitoring and the workplace exposure limits set out in the model WHS Regulations.

Chapter 2 explains the workplace exposure limits in more detail, and Chapters 3 – 5 walk through the process of having air monitoring conducted, as shown in Figure 1. Key terms are defined in Appendix A - Meaning of key terms.

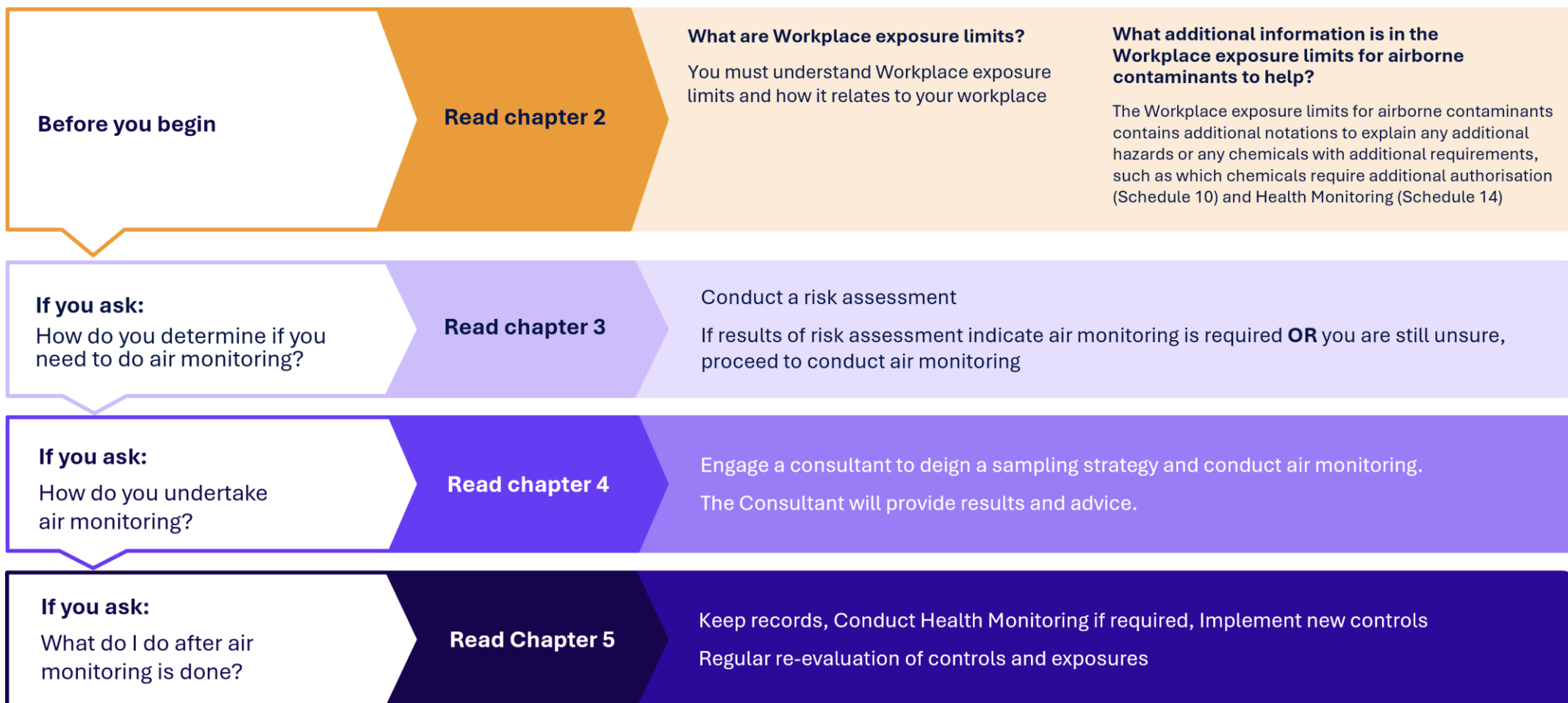


Figure 1: How to use this guide

1.3 What is air monitoring?

Air monitoring is the measurement of the concentration of airborne contaminants in the air workers are breathing. Airborne contaminants can be in the form of a fume, mist, gas, vapour, fibre or dust.

Measuring airborne contaminants can involve collecting samples of the contaminants from the air to send to a laboratory for analysis or can use electronic equipment that can give an immediate result. Air monitoring can be very complicated and generally requires specialised knowledge and equipment.

Section 1.9 of this guide sets out the requirements for when you need to do air monitoring under the WHS Regulations.

1.4 What are workplace exposure limits?

Workplace exposure limit means an exposure limit listed in the [Workplace exposure limits for airborne contaminants](#), and represents the airborne concentration of a particular substance or mixture (hereafter referred to as substance) above which a worker must not be exposed.

Exposure limits are the maximum concentration of an airborne contaminant that most (but not all) people can be exposed to without harm to their health. They do not identify the dividing line between an exposure that will or won't result in adverse health effects. They are not a target or safe level – you have a duty to keep exposure as low as reasonably practicable, not just below the limit.

Some people may have health effects at levels below the exposure limit, either due to individual differences or due to existing health conditions (such as cardiovascular disease).

Exposure limits apply to substances entering the body via inhalation. Exposure to substances in the workplace can also occur through skin absorption or ingestion (eating or drinking). More information on the risk from other routes of exposure is in Chapter 2.

1.5 Where can you find workplace exposure limits?

Safe Work Australia's [Workplace exposure limits for airborne contaminants](#) contains a list of mandatory exposure limits under the WHS Regulations.

If you cannot find a substance you are using in the [Workplace exposure limits for airborne contaminants](#) list using your search term, you should search using the CAS number or other names for the substance.

There are approximately 700 substances with an exposure limit, so the substance you are using may not have an exposure limit. If there is no exposure limit for the substance you are using, you are still required to minimise exposure as far as reasonably practicable.

Exposure limits are also available from the [Hazardous Chemicals Information System \(HCIS\) online database](#) or in Section 8 of the chemical's Safety Data Sheet (SDS).

1.6 What are your duties?

As a PCBU you have both general and specific duties under the WHS legislation in relation to airborne contaminants. Some of these duties are outlined below, in order of the [WHS Act](#) and [WHS Regulations](#).

Duties	Provisions
• ensure, so far as is reasonably practicable, workers and other people are not exposed to health and safety risks arising from the business or undertaking. • eliminate health and safety risks so far as is reasonably practicable, and if this is not possible, minimise those risks so far as is reasonably practicable.	WHS Act section 19(2) and WHS Act section 17
• identify and manage risks to health and safety from exposure to hazardous chemicals, including using the hierarchy of control measures to minimise risk.	WHS Regulations Part 3.1
• ensure that no person at the workplace is exposed to a substance or mixture in an airborne concentration that exceeds the exposure limit for the substance or mixture.	WHS Regulations regulation 49
• ensure that air monitoring is carried out to determine the airborne concentration of a substance or mixture at the workplace to which an exposure limit applies if: ○ the person is not certain on reasonable grounds whether or not the airborne concentration of the substance or mixture at the workplace exceeds the relevant exposure limit, or ○ monitoring is necessary to determine whether there is a risk to health. • ensure that the results of air monitoring carried out above are: ○ recorded, and kept for 30 years after the date the record is made, and ○ readily accessible to persons at the workplace who may be exposed to the substance or mixture.	WHS Regulations regulation 50

In addition to these duties, there are other specific requirements in the WHS Regulations for hazardous chemicals (Chapter 7 Part 1), lead (Chapter 7 Part 2), asbestos (Chapter 8) and silica (Chapter 8A).

Certain substances in the [Workplace exposure limits for airborne contaminants](#) are also listed in Schedule 10 (prohibited or restricted carcinogens, restricted hazardous chemicals) to the WHS Regulations. Additional duties apply to the use of these substances, due to their higher health risks.

Many substances, including those listed in Schedule 14 (health monitoring), may require health monitoring. More information on health monitoring can be found in Section 5.3 of this guide.

1.7 What is reasonably practicable?

Reasonably practicable means that which is, or was at a particular time, reasonably able to be done to ensure health and safety

Deciding what is 'reasonably practicable' to protect people from harm requires considering and weighing up all relevant matters, including:

- the likelihood of the hazard or risk occurring
- the degree of harm that might result from the hazard or risk
- knowledge about the hazard or risk, and ways of eliminating or minimising the risk
- the availability and suitability of ways to eliminate or minimise the risk, and
- after assessing the extent of the risk and the available ways of eliminating or minimising the risk, the cost associated and whether this is grossly disproportionate to the risk.

What is reasonably practicable depends on a range of factors and may be different for different workers or work roles within the same workplace. The process for managing risks will help you decide what is reasonably practicable, so that you can meet your duties under WHS laws. Further information on determining what is reasonably practicable is in the [Interpretive guideline](#).

1.8 What to do if there is no workplace exposure limit for a substance?

There are approximately 700 substances with an established workplace exposure limit, however, not all substances used in workplaces have an exposure limit. A substance should not be assumed to be safe just because it does not have an exposure limit.

Under the WHS Act, a PCBU has the primary duty to ensure, so far as is reasonably practicable, that the health and safety of workers and other persons are not put at risk from work carried out as part of the conduct of the business or undertaking. This applies both to airborne contaminants with exposure limits and airborne contaminants without exposure limits.

As a PCBU you have a duty to keep yourself, your workers and your workplace safe by identifying any airborne contaminants and managing the risks from exposure.

You do not need to undertake air monitoring to determine the best way to control the risks from exposure.

If there is a way to measure an airborne contaminant without an exposure limit, you may still conduct air monitoring to demonstrate exposure is minimised as far as is reasonably practicable.

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](#).

1.9 How do you manage the risks from airborne contaminants?

Compliance with the WHS legislation will require being able to show all reasonably practicable control measures are in place (and working) to minimise risks of exposure, as well as ensuring exposure is not above the relevant exposure limit.

Eliminating the risk is the best control. If you can't eliminate, you must minimise the risk so far as is reasonably practicable. The hierarchy of control measures (Figure 2) is used to select the highest control measures to effectively manage risk.



Figure 2: Hierarchy of control measures

You must, so far as [reasonably practicable](#), consult with workers and health and safety representatives who carry out work for the business or undertaking and who are (or are likely to be) directly affected by a health and safety matter. More information about consulting workers can be found in the Code of Practice: [Work health and safety consultation, cooperation and coordination](#).

1.10 When should you do air monitoring?

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.

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.

If you need to do air monitoring to assess workers' exposure, you should engage a competent person, such as an occupational hygienist, to design and undertake the monitoring.

Details on each step of the process are given in Chapters 3 – 5 of this guide.

2. Workplace exposure limits

2.1 What are the types of workplace exposure limits and who are they intended for?

As a PCBU, you have a duty to eliminate or minimise the risks to health and safety from exposure to airborne contaminants for all persons at the workplace, as much as reasonably practicable. Exposure limits apply to all people in the workplace, including those not actively engaged in the work activity generating the airborne contaminant, such as other workers, customers, visitors or members of the public.

As noted in the [Workplace exposure limits for airborne contaminants](#), exposure limits are not necessarily protective of all people in the workplace. You should reduce exposure for each worker as much as reasonably practicable, which may be different for workers in different roles depending on which controls can be applied.

Exposure limits are not designed to be applied to situations outside of the workplace.

There are three different types of exposure limits. If an airborne contaminant has multiple types of exposure limit **all limits apply at all times**.

8-hour time weighted average exposure limit

An 8-hour time-weighted average (TWA) exposure limit is the maximum permitted concentration of an airborne contaminant calculated as a time weighted average for an 8-hour working day, based on a 5-day working week (40 hours). This is the most common type of exposure limit.

8-hour TWA exposure limits may require reduction where work shifts are longer than 8 hours, there is less recovery time between shifts, or if workers work more than 5 days in a week. The [Technical guide: Air monitoring and the workplace exposure limits](#) provides information on how to do this.

8-hour TWA exposure limits are not adjusted for shorter shift periods.

Because of the way many airborne contaminants are produced, the actual airborne concentration of an airborne contaminant can vary greatly over time. Even if the 8-hour TWA exposure limit is not exceeded, you should still control any short-term excursions over the 8-hour TWA.

A process is not considered to be reasonably controlled if short term exposures exceed 3 times the 8-hour TWA exposure standard for more than a total of 30 minutes per 8-hour working day, or if a single short-term value exceeds 5 times the 8-hour TWA exposure standard.

Short-term exposure limit

A short-term exposure limit (STEL) is the maximum permitted concentration of an airborne contaminant calculated as a time-weighted average over a 15-minute period. STELs are given when there is evidence that health effects can be caused by high short-term exposure.

A STEL must not be exceeded at any time during a working day even if the 8-hour TWA measurement is below the 8-hour TWA exposure limit.

Exposures at the STEL must not be longer than 15 minutes and cannot happen more than 4 times per day. There must be at least 60 minutes between each exposure at the STEL.

A STEL cannot be adjusted for longer or shorter working days.

Peak limitation

A peak limitation is the maximum or peak permitted concentration of an airborne contaminant measured over the shortest time possible, which cannot exceed 15 minutes. Exposure above the peak limitation can cause immediate and severe health effects, even if the exposure is very short. Exposure above the peak limitation is not allowed at any time.

If an airborne contaminant has both a peak limitation and a TWA limit, neither can be exceeded.

A peak limitation must not be exceeded for any amount of time.

A peak limitation cannot be adjusted for longer or shorter working days.

2.2 Units for exposure limits

Particulate contaminants

Exposure limits for fumes and dusts (particulate contaminants) are written in milligrams of contaminant per cubic metre of air (mg/m^3). For particulate contaminants, the exposure limit applies to the inhalable fraction of particles in the air, unless the [Workplace exposure limits for airborne contaminants](#) states that it applies to the respirable fraction.

The inhalable fraction is made up of small particles that can easily enter the nose, mouth and upper and middle lungs through breathing. The respirable fraction is the very fine particles within the inhalable fraction that can be breathed deep into the lower lungs. Examples of difference sized airborne contaminants are given in Figure 3.

Fibres

Some exposure limits for fibres, like asbestos and man-made vitreous fibres, are measured as fibres per millilitre of air (f/mL) for the respirable fraction.

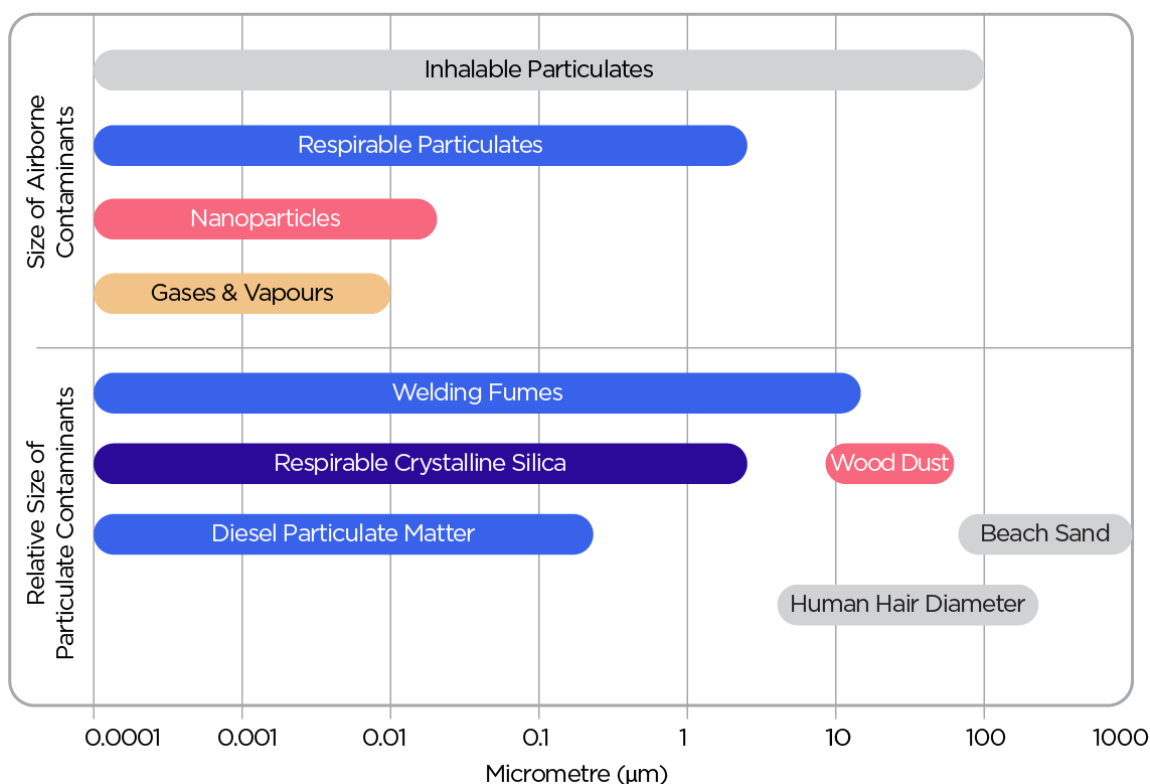


Figure 3: Size of airborne contaminants

Gases and vapours

Exposure limits for gases and vapours can be expressed as the number of parts of the vapour or gas contaminant per million parts of air (ppm) or as milligrams per cubic metre of air (mg/m³).

2.3 Advisory notations

Exposure limits only consider exposure via inhalation, but exposure to substances in the workplace can also occur through skin absorption or ingestion. The risks from these other routes of exposure must also be managed.

Some substances in the [Workplace exposure limits for airborne contaminants](#) have notations. Notations provide information about additional exposure risks.

There are 4 types of notations:

- [Sk: absorption through the skin may be a significant source of exposure](#)
- [DSEN: substances that cause sensitisation through dermal \(skin\) contact](#)
- [RSEN: substances that cause sensitisation through respiratory tract exposure](#)
- [OTO: ototoxic substance. Exposure can increase the risk of hearing loss.](#)

Notations are advisory only and do not cover all hazards related to the substance. Section 11 of the SDS is the best source of information for the hazard classification of a substance used in the workplace. [HCIS](#) can also provide information about hazard classifications of substances.

2.4 Other factors which should be considered

There are factors which can affect the level of workers' exposure, or the overall health effect that occurs because of exposure, which need to be considered in assessing workers' health risk. If any of these factors apply, the exposure limit may not be protective of all workers and additional controls may be required.

Some substances have secondary health effects which their assigned workplace exposure limits cannot protect against, because of the nature of these effects and the variability between individual people. Ensuring exposure is below the exposure limit may not protect against all health effects for these substances. These include sensitisers, ototoxins and simple asphyxiants.

For example, if there are multiple simple asphyxiants (a gas which displaces oxygen in a space) in the workplace, the concentration of each may be below the individual exposure limit. However, added together, there may be enough total gases to displace the oxygen in the space, which could lead to unconsciousness and death from a lack of oxygen (asphyxiation).

For more information on managing other factors affecting exposure, refer to the Code of Practice: [*Managing risks of hazardous chemicals in the workplace*](#).

These factors should be considered during the risk assessment. You may need to engage a consultant, such as an occupational hygienist, to assist in assessing risk where there are other factors affecting exposure.

Workload considerations

Exposure limits have been established on an 8-hour exposure timeframe, during work of normal intensity, under normal temperature and humidity and where there is a 16-hour break between shifts to allow time for the body to eliminate any absorbed substances.

If a person is exposed, the surrounding conditions can increase the amount of the substance the person absorbs and therefore the risk. For example, if someone is exposed during strenuous activity, they may breathe more heavily and can inhale more of the airborne contaminant.

If workers could be affected by working conditions that lead to a higher breathing rate while being exposed to airborne contaminants, you may need to implement additional controls to reduce the exposure risk. These controls could further reduce the concentration of the airborne contaminant or reduce the amount of time a worker is exposed to the airborne contaminant (e.g. job rotation).

Exposure to multiple airborne contaminants

Exposure limits are set based on evidence of exposure to individual pure substances. In practice, a workplace may contain multiple airborne contaminants and exposures.

Where work at your workplace may involve exposure to multiple or mixtures of airborne contaminants, multiple exposure limits may apply, and you should seek expert advice. The interaction of different substances should be assessed by occupational hygienists, toxicologists or occupational physicians considering all airborne contaminants involved.

Individual worker variability

The individual characteristics of the worker, such as heart rate, breathing rate, how fast their body breaks things down, and whether they are a smoker can also be factors that increase the risks for workers. Where possible, you should consider the possibility of variability in these factors when assessing risks to workers who may be exposed.

Skin absorption

Some substances can penetrate unbroken skin and be absorbed into the body. Often there will be no visible skin damage and for some substances skin absorption can pose more danger than inhalation exposure.

Skin absorption can result from a splash onto skin or clothing, indirect skin contact with contaminated surfaces or objects, or, in rare cases, from exposure to high concentrations of vapour or fume. In addition, some substances like solvents can accelerate or alter the rate of skin absorption.

The workplace exposure limits only consider absorption via inhalation and are only protective for workers if significant skin absorption does not occur. For some substances, special measures may be required to prevent absorption through the skin. These substances are specified by the notation 'Sk' in the [Workplace exposure limits for airborne contaminants](#).

You should refer to Section 8 of a chemical's SDS for information on the skin protection required for a hazardous chemical, such as which glove material is suitable for the specific substance. If you do not have a SDS (e.g. if the substance is produced through work processes) you may need to engage a consultant, such as an occupational hygienist, to assist in managing skin exposure risks.

Sensitisers

Some substances are sensitisers and can cause a specific immune response, like an allergic reaction, in some people, which is called 'sensitisation'. Over time, sensitisation can occur to even low concentrations of a substance, but for some substances a single high-level exposure can trigger sensitisation.

After sensitisation occurs, an affected person may react to a very small amount of the substance. The reaction could be a skin rash or asthma, and in some people this reaction can be extremely severe.

Sensitisers are divided into 2 categories: dermal (skin) sensitisers and respiratory sensitisers, with notations in the [Workplace exposure limits for airborne contaminants](#):

- DSEN: A substance or mixture that will induce an allergic response following skin contact.
- RSEN: A substance or mixture that induces hypersensitivity of the airways following inhalation of the substance or mixture.

Because workers could become sensitised to the substance at any level of exposure, the exposure limit cannot be set at a level that protects for this outcome. As exposures at the level of the exposure limit may not stop sensitisation from happening, additional controls may be needed to keep exposure to sensitisers as low as possible.

If a worker is sensitised to a substance, they should not be further exposed to that substance because exposure to any amount of the sensitiser could lead to an allergic reaction. Compliance with the exposure limit may not provide adequate protection for people who have become sensitised to a substance. Alternative work may need to be found for sensitised people.

Ototoxins

Exposure to some substances, called ototoxins, can result in hearing loss. Hearing loss is more likely to occur if a worker is exposed to both noise and ototoxic substances than if exposure is just to noise or ototoxic substances alone.

Substances that have been found to have potential ototoxic effects have the notification 'OTO' in the [Workplace exposure limits for airborne contaminants](#). Some of these substances can also be absorbed through the skin.

The Code of Practice: [Managing noise and preventing hearing loss at work](#) provides more information on managing the risk of ototoxic substances.

Simple asphyxiants

Simple asphyxiants are non-toxic gases which can displace or dilute oxygen in the atmosphere. Unconsciousness and death can rapidly occur in an environment which is low in oxygen. Exposure limits can't be set for asphyxiation risk, but it is essential oxygen concentration is maintained in a work environment. Having multiple asphyxiants at concentrations below their exposure limits may still be able to displace oxygen and cause asphyxiation.

Most simple asphyxiants are odourless, and oxygen-deficient atmospheres don't provide sensory warning of danger. Part 4.3 of the [WHS Regulations](#) and the Code of Practice: [Managing risks of hazardous chemicals in the workplace](#) provide information on controls for this hazard.

The Code of Practice: [Confined spaces](#) provide information on controls for managing simple asphyxiants in confined spaces.

2.5 Carcinogens

A carcinogen is a substance which can cause cancer.

A diagnosis of cancer may not be made until long after exposure ends. The incidence of cancer is usually dose related – the greater the exposure to the carcinogen, the higher the risk of developing cancer. However, for some carcinogens – called non-threshold genotoxic carcinogens (NTGCs) – a practical, protective exposure level cannot be determined due to limited data and the nature of their health effects.

Where a carcinogen has a determined threshold for health effects, an exposure limit can be established. If an exposure limit has been established, it will be in Appendix A of the [Workplace exposure limits for airborne contaminants](#).

NTGCs do not have exposure limits but are included in Appendix B of the [Workplace exposure limits for airborne contaminants](#) for information.

If NTGCs are present, you must either:

- eliminate them from the workplace,
- if elimination is not possible, replace them with a safer alternative if possible, or
- if safer alternatives are not possible, reduce the risk as much as reasonably practicable in accordance with the hierarchy of control measures.

2.6 Odour thresholds are not an indicator of exposure

Many substances have a distinctive odour which indicates the presence of the substance in the workplace, but this cannot be relied upon as an indicator of exposure risk. The use of odour thresholds is not reliable because the presence or absence of an odour is not related to a substance's harmful effects.

The absence of an odour does not indicate a 'safe' workplace; you should always conduct risk assessment and engage a consultant if unsure about the risk.

3. How do you determine if air monitoring is required?

3.1 Undertaking a risk assessment

Demonstrating workers are protected against the risk from exposure to hazardous chemicals will require being able to show all reasonably practicable control measures are in place (and working) to minimise risks of exposure, as well as ensuring exposure is not above the relevant exposure limit.

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.

The first step of your risk assessment is to identify the hazards – review all substances you use, handle, store or generate at your workplace, not just those you already know are hazardous.

You should consider the risk to all people who might be exposed to an airborne contaminant, not just the people working directly with the substance.

Just because an airborne contaminant is not visible in the air does not mean it isn't present. Airborne contaminants can often travel throughout your workplace, settle and be re-aerosolised easily meaning anyone in your workplace may be at risk of exposure even if they are not directly involved in the work or could still be at risk long after the work generating the airborne contaminant has stopped.

Once you have identified any possible hazards you can continue with assessing the risks associated with them. Guidance on how to do a risk assessment is available in the Code of Practice: [How to manage work health and safety risks](#).

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.

Some hazards have specific risk assessment requirements in the [WHS Regulations](#) such as lead (Part 7.2), asbestos (Chapter 8) and crystalline silica substances (Chapter 8A). Further information can be found in the Code of Practice: [How to manage and control asbestos in the workplace](#) and Code of Practice: [Managing risks of respirable crystalline silica in the workplace](#).

What to consider in a risk assessment of exposure

The assessment of health risks from airborne contaminants involves understanding situations where people can be exposed to the substance, including the extent of exposure and how often this can occur.

Exposure risk depends on the severity of the hazard and level of exposure and so depends on both the type of substance and the nature of the work itself.

Factors which should be considered in the risk assessment include:

- substances used or generated
- routes of entry – can the substances be breathed in and/or absorbed through the skin?
- properties of the substance, such as volatility or toxicity
- who could be exposed and when
- data from previous air monitoring
- other factors affecting exposure listed in Section 2.4 of this guide, and
- the controls already in place to minimise exposure.

Information on many of these factors can be found in a chemical's SDS.

3.2 Using the findings of a risk assessment

A risk assessment will help you to:

- identify which workers are at risk of exposure
- determine what sources and processes are causing that risk
- identify if air monitoring is necessary
- identify if and what kind of control measures should be implemented, and
- check the effectiveness of existing control measures.

Where the hazards and associated risks are well-known and have established and accepted control measures, you may not need to undertake a risk assessment. If, after identifying a hazard, you already know the risk and how to control it effectively, you may simply implement the controls.

Documenting risk assessments is not mandatory but may help to show that you have considered and implemented suitable controls and can help when reviewing to identify where improvements can be made.

3.3 Using the risk assessment to decide if you need to do air monitoring

Once you have investigated the substances used or generated, you can estimate the level of exposure based on:

- the quantities used in or generated by work processes
- the frequency and duration of exposure
- the effectiveness of the controls already in place, and
- whether workers are working directly with the substance.

To rate the risk of exposure or harm from the exposure, you should compare the likelihood of exposure and the severity of the consequences to determine the level of risk. Information on determining these two factors can be found in the Code of Practice [How to manage work health and safety risks](#).

If you can be reasonably certain based on assessment of the risk, that exposure to a substance will not exceed the workplace exposure limit and monitoring is not required to determine the risk to health, you do not need to conduct air monitoring.

If your risk assessment shows the exposure limit is likely to be exceeded, you must implement controls. Once you have implemented controls, if you are now uncertain if exposure is above the exposure limit or you no longer know the risk to health, you must conduct air monitoring to confirm the controls are effectively managing the risk. In all cases, best practice is to implement controls prior to undertaking air monitoring.

Under Regulation 50 (1), air monitoring must occur if:

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

If you are having difficulty determining with reasonable certainty whether the exposure limit is likely to be exceeded, or if there is a risk to health from the exposure, you should engage a suitably qualified person, like an occupational hygienist. They can help you determine if air monitoring is required, and if so, design and undertake monitoring to assess workers' exposure.

More information on conducting a risk assessment for hazardous chemicals is available in the Code of Practice: [*Managing risks of hazardous chemicals in the workplace*](#).

4. How do you get air monitoring done?

4.1 Finding a consultant

If you engage a consultant to undertake air monitoring, they should be competent. To confirm this, you should ask to see evidence of their qualifications and experience. An example of a competent person may be an occupational hygienist.

An occupational hygienist (sometimes also known as an industrial hygienist or exposure scientist) is a professional who uses science and engineering principles to anticipate, recognise, evaluate, and recommend controls for health hazards in the workplace to protect workers.

Occupational hygienists can help identify hazards, assess exposure risks, and recommend effective control strategies tailored to your workplace. They can also evaluate the effectiveness of any current controls you have in place.

The [Australian Institute of Occupational Hygienists](#) can be contacted to find a qualified occupational hygienist.

4.2 What the consultant should do

Gathering information

Before coming to your workplace, a consultant will ask you questions about the types of work you do, work processes, known hazards (including any substances used), and what controls you currently have in place. Talking to your workers will help you identify any concerns and how work processes could be improved to reduce risk.

A consultant can assess whether the airborne concentration of the substance exceeds the exposure limit in a variety of ways, which may not always include air monitoring.

Once they have the basic information, a site visit will be organised, where they may conduct air monitoring and gather any additional information. This could include:

- a walkthrough survey of your workplace
- asking you and your workers questions about your work processes
- reading safety data sheets for materials that release airborne contaminants
- inspecting control measures such as ventilation, personal hygiene facilities and respiratory protective equipment
- observing work tasks and processes to understand the risks and hazards
- performing other tests as required, and
- conducting air monitoring, if the above show it's needed – using personal samplers to measure levels of airborne contaminants

Conducting air monitoring

If air monitoring is required, the consultant will use their judgement to work out a suitable air monitoring strategy, which will include:

- the number of workers sampled
- the work roles and tasks assessed, and
- required sample periods.

To assess exposures against an exposure limit, personal exposure measurements must be taken by having workers wear a monitor in their breathing zone. If respiratory protective equipment is worn, air monitoring samples should be taken outside the respiratory protective equipment.

You should explain to your workers why the consultant is there and the purpose of the testing.

Static sampling, also known as environmental sampling, is where the monitor is in a fixed location within the workplace (e.g. on a tripod), rather than in a worker's breathing zone. It cannot be used to determine compliance with the exposure limit, but can be used for other purposes, like determining if controls are adequate, testing new controls, and to identify sources of airborne contaminants.

Delivering a report and advice

Following testing and data collection, a consultant will determine the exposure risk, and assess compliance with the exposure limit, if required. They will also form any necessary recommendations to reduce the risk, if it is present. They will provide you with a report that documents the results of any monitoring undertaken and an assessment of their findings.

A detailed written report should contain information on:

- what hazards were identified
- what tasks and processes were analysed
- what tests were done, and why
- how data and samples were taken and tested
- how and where samples were analysed
- the results of all monitoring conducted, with an explanation of what the results mean in the context of health risks and compliance
- whether any measured exposures exceed workplace exposure limits or other relevant guidelines, and
- any recommendations for health and safety improvements. This could include short-term controls, which can be implemented quickly to lower exposure, and long-term controls which will be more effective but will take more time to implement. You may need to look at a combination of controls to effectively minimise exposure.

The advice should be clear, and explain the methods, results, and tools used in a way that others can understand or repeat the process. You should be provided with recommendations on any new controls or changes to current controls that you should consider, including suggested timeframes for implementation.

If assessing whether workers' exposures exceed the exposure limit, your consultant may be able to take into account the use of respiratory protective equipment, provided certain conditions are met. Further information on these conditions is available in the [*Technical guide: Air monitoring and the workplace exposure limits*](#).

5. What should you do after air monitoring?

5.1 Implementing additional controls

As the person responsible for ensuring the health and safety of workers, it is up to you to implement recommendations made by a consultant. Consultants may provide multiple options for controls, including short- and long-term controls. It is up to you as the PCBU to choose the most appropriate controls for your workplace.

If a consultant's report shows that your current controls are inadequate to keep the risk from exposures as low as reasonably practicable you should revise them as necessary until you have reduced exposure to airborne contaminants as much as reasonably practicable.

You may need to implement different types of controls to protect different groups of people in the workplace. For example, the controls you might use to minimise exposure to welding fumes would be different for a welder compared to a receptionist in the same workplace.

Where results of air monitoring show concentrations of airborne contaminants approaching the exposure limit (for example concentrations that are more than half the exposure limit, often described as the action level), you should review your control measures. Even if monitoring indicates that exposure is below the exposure limit, some workers may still be at risk, and additional controls may need to be considered. You must also consult your workers about any new controls you implement.

For more information on implementing controls for airborne contaminants, refer to the Code of Practice: [*Managing risks of hazardous chemicals in the workplace*](#).

When introducing new control measures, you must also consider if this introduces any new or different risks that also need to be controlled. You will also need to review the effectiveness of the implemented control measures to check they are working as intended.

5.2 Keeping records

Under WHS regulation 50, you must ensure that the records and results of air monitoring are kept for 30 years and are readily accessible to persons at the workplace who may be exposed to the substance. Workers who have worn personal sampling devices should receive a written copy of their individual results.

Some airborne contaminants have additional requirements for reporting results. You should check requirements with your regulator.

5.3 Health monitoring

For some hazardous chemicals, the WHS Regulations have specific requirements for when you must provide health monitoring to workers, regardless of any requirements for air monitoring.

Additionally, the results of your air monitoring may show that health monitoring of your workers is required. Health monitoring involves a registered medical practitioner with experience in health monitoring examining and monitoring the health of your workers to see if the exposure to hazardous chemicals at work is affecting their health.

Health monitoring is not a control and cannot be used in place of implementing control measures for airborne contaminants.

Health monitoring may be recommended by the consultant doing your air monitoring or by the WHS regulator. Safe Work Australia has more information about specific requirements in the [health monitoring guides](#).

5.4 Maintain and review control measures

As part of your ongoing duties as a PCBU, you should regularly review your control measures to ensure they are effective and being maintained. The Code of Practice: [How to manage work health and safety risks](#) provides guidance on reviewing controls, including when controls should be reviewed. This may include re-evaluating worker exposures by conducting air monitoring.

After conducting air monitoring, your consultant may provide a recommendation on when air monitoring should be repeated, based on the exposure risk. You must review your controls before anything changes in the workplace that is likely to give rise to a new or different risk, or if you update your control measures.

A change at the workplace includes:

- a change to the workplace itself or any aspect of the work environment, and
- a change to a system of work, a process or a procedure.

To re-evaluate worker exposures, you should start by updating your risk assessment, implementing new controls if you identify new or increased risks, and undertaking air monitoring if:

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

Regular re-evaluation of worker exposures and reviewing control measures will help you to make sure risks posed by exposure to substances in the workplace are kept as low as is reasonably practicable.

6. Appendix A - Meaning of key terms

Term	Definition
Airborne contaminant	A fume, mist, gas, vapour, fibre or dust suspended in the air that can be harmful to health when breathed in. They may not be visible to the naked eye or detected by odour.
Breathing zone	A hemisphere of 300 mm radius extending in front of a person's face and measured from the midpoint of an imaginary line joining the ears.
Carcinogen	A substance or a mixture which can cause cancer.
Dusts	Solid particles dispersed into the air by, for example, handling, crushing and grinding of organic or inorganic materials such as rock, ore, metal, coal, wood or grain.
Exposure limit	An exposure limit in the <i>Workplace exposure limits for airborne contaminants</i> . It represents the airborne concentration of a particular substance or mixture that must not be exceeded.
Excursion	A short, temporary airborne concentration above the level of the exposure limit. Limited, controlled excursions above the exposure limit may be permitted, provided they meet the requirements specified in Section 3.1 of the Workplace exposure limits for airborne contaminants. Excursions above the peak limit are not allowed at any time.
GHS	The <i>Globally Harmonised System of Classification and Labelling of Chemicals (GHS)</i> , 7th Revised Edition, published by the United Nations as modified by Schedule 6 to the WHS Regulations.
Hazard	A situation or thing that has the potential to harm a person.
Hazardous chemical	Any substance, mixture or article that satisfies the criteria for any one or more hazard classes in the GHS (including a classification referred to in Schedule 6 of the WHS Regulations), unless the only hazard class or classes for which the substance, mixture or article satisfies the criteria are any one or more of the following: ○ acute toxicity—oral—category 5 ○ acute toxicity—dermal—category 5 ○ acute toxicity—inhalation—category 5 ○ skin corrosion/irritation—category 3 ○ aspiration hazard—category 2 ○ flammable gas—category 2 ○ acute hazard to the aquatic environment—category 1, 2 or 3 ○ chronic hazard to the aquatic environment—category 1, 2, 3 or 4 ○ hazardous to the ozone layer. Note: The Schedule 6 tables replace some tables in the GHS.
Fumes	Extremely fine particles - usually less than 1.0 micrometer in diameter. Fumes are formed when the material from a volatilised solid condenses in cool air. In most cases the hot vapour reacts with the air to form an oxide. Fumes are often associated with molten metals, especially in processes like welding. At high fume concentrations, agglomeration of particles may result in particles with much larger dimensions.

Term	Definition
Gases	A state of matter with neither fixed volume nor shape. Gases are formless and particles move freely, expanding or compressing to occupy the space in which they are confined.
May	'May' indicates an optional course of action.
Mists	Suspended liquid droplets generated by condensation of vapour back to the liquid state or by breaking up as a liquid into a dispersed state, such as by splashing or atomising. Mist is the term applied to a finely divided liquid suspended in the atmosphere. Examples are an oil mist produced during cutting and grinding operations, acid mists from electroplating, acid or alkali mists from pickling operations, and the condensation of water vapour to form a fog.
Mixture	A combination of, or a solution composed of, 2 or more substances that do not react with each other. For readability the term 'substance' has been used to refer to both 'substances' and 'mixtures' throughout this guide.
Must	'Must' indicates a legal requirement exists that must be complied with.
Ototoxin	A substance which can cause hearing loss.
Peak limitation	The maximum concentration of an airborne contaminant measured over the shortest time possible, and not exceeding 15 minutes. A peak limitation must not be exceeded at any time.
Person conducting a business or undertaking (PCBU)	A PCBU is an umbrella concept which intends to capture all types of working arrangements or relationships. A PCBU includes a: • company • unincorporated body or association • sole trader or self-employed person. Individuals who are in a partnership that is conducting a business will individually and collectively be a PCBU. A volunteer association (defined under the WHS Act) or elected members of a local authority will not be a PCBU.
Personal monitoring	Air monitoring samples collected over the duration of a working shift, within the breathing zone of the worker. This method of sampling is intended to capture a representative sample of the air a worker breathes in during their working shift, or whilst performing specific tasks.
Risk	The possibility harm (death, injury or illness) might occur when exposed to a hazard.
Sensitiser	A substance that causes an allergic response following skin contact or induces hypersensitivity of the airways following inhalation.
Short term exposure limit (STEL)	The airborne concentration of a particular substance calculated as a time-weighted average over 15 minutes, that may not be reached more than 4 times over the duration of a shift, with a 60-minute break between exposures.

Term	Definition
Should	'Should' indicates a recommended course of action.
Static monitoring	For the purpose of this guide, static monitoring means samples of air taken at fixed locations, commonly between 1 and 2 metres above floor level.
Substance	A chemical element or compound in its natural state or obtained or generated by a process: a. including any additive necessary to preserve the stability of the element or compound and any impurities deriving from the process; but b. excluding any solvent which may be separated without affecting the stability of the element or compound or changing its composition. For readability the term 'substance' has been used to refer to both 'substances' and 'mixtures' throughout this guide.
8-hour time-weighted average (TWA)	The maximum permitted concentration of an airborne contaminant calculated as a time weighted average for an 8-hour working day, based on a 5-day working week (40 hours).
Vapour	The gaseous form of a substance which is normally in the solid or liquid state at room temperature and pressure.
Worker	Any person who carries out work for a person conducting a business or undertaking, including work as an employee, contractor or subcontractor (or their employee), self-employed person, outworker, apprentice or trainee, work experience student, employee of a labour hire company placed with a 'host employer' or a volunteer.
Workplace	Any place where work is carried out for a business or undertaking and includes any place where a worker goes, or is likely to be, while at work. This may include offices, factories, shops, construction sites, vehicles, ships, aircraft or other mobile structures on land or water.