HSWA

QUICK GUIDE

Keeping safe from harmful substances while inspecting or unpacking containers

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New Zealand Government

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CONTENTS

tables

figure

1.0 Introduction

This guidance provides advice to persons conducting a business or undertaking (PCBUs) on how to protect workers from harmful substances while unloading or inspecting containers.

To stop pests or diseases entering New Zealand, some containers are fumigated. Containers may contain high enough levels of the fumigant to make workers inspecting or unpacking (devanning) them seriously unwell either quickly (acute) or over a long period of time (chronic). Other harmful substances (called 'off-gases') may be present inside containers because of the goods being transported or packaging used.

What fumigants might be used?

The fumigant used depends on the goods inside the container and which country the container comes from. The most commonly used fumigants are methyl bromide and phosphine.

Table 1 (in Appendix 1) provides information about four common fumigants: methyl bromide, phosphine, hydrogen cyanide and chloropicrin.

What other substances may be inside containers?

Harmful off-gases, such as volatile organic compounds, may be inside containers. Off-gases come from the goods being transported and include but are not limited to formaldehyde, toluene, benzene, carbon monoxide, xylene and heptane.

Table 2 (in Appendix 2) provides information about common off-gases.

In this fact sheet the phrase 'harmful substances' refers to:

- the leftover fumigant that remains in the container after fumigation and/or
- off-gases.

What can you do before you inspect or unpack a container?

PCBUs have a duty to ensure, so far as is reasonably practicable, the health and safety of workers, and that others are not put at risk from their work. Risks must be eliminated so far as is reasonably practicable. If a risk can't be eliminated, it must be minimised so far as is reasonably practicable.

PCBUs must monitor workplace conditions and worker health, so far as is reasonably practicable, if exposure to a particular health risk warrants it (eg you are not certain on reasonable grounds whether your workers are being exposed to a substance above its workplace exposure standard level).

This guidance provides advice for PCBUs on how exposure monitoring can be carried out to minimise the risk to workers from harmful substances while unloading or inspecting containers.

For advice about exposure monitoring contact an experienced occupational health professional such as an occupational hygienist.

2.0 The good practice process

Figure 1 summarises a step-by-step process PCBUs may follow when unloading or inspecting containers.

This process involves first checking for harmful levels of substances inside containers (workplace monitoring) before workers enter. If harmful levels of substances are found, containers should be ventilated until they are safe to enter. These steps are explained more fully in this section.

Seek your workers' views when deciding how to eliminate or minimise risks. Give preference to control measures that protect multiple people at once.

You must ensure that workers are supervised or trained to be healthy and safe at work.

For training requirements see Part 1 of WorkSafe's General Risk and Workplace Management interpretive guidelines.

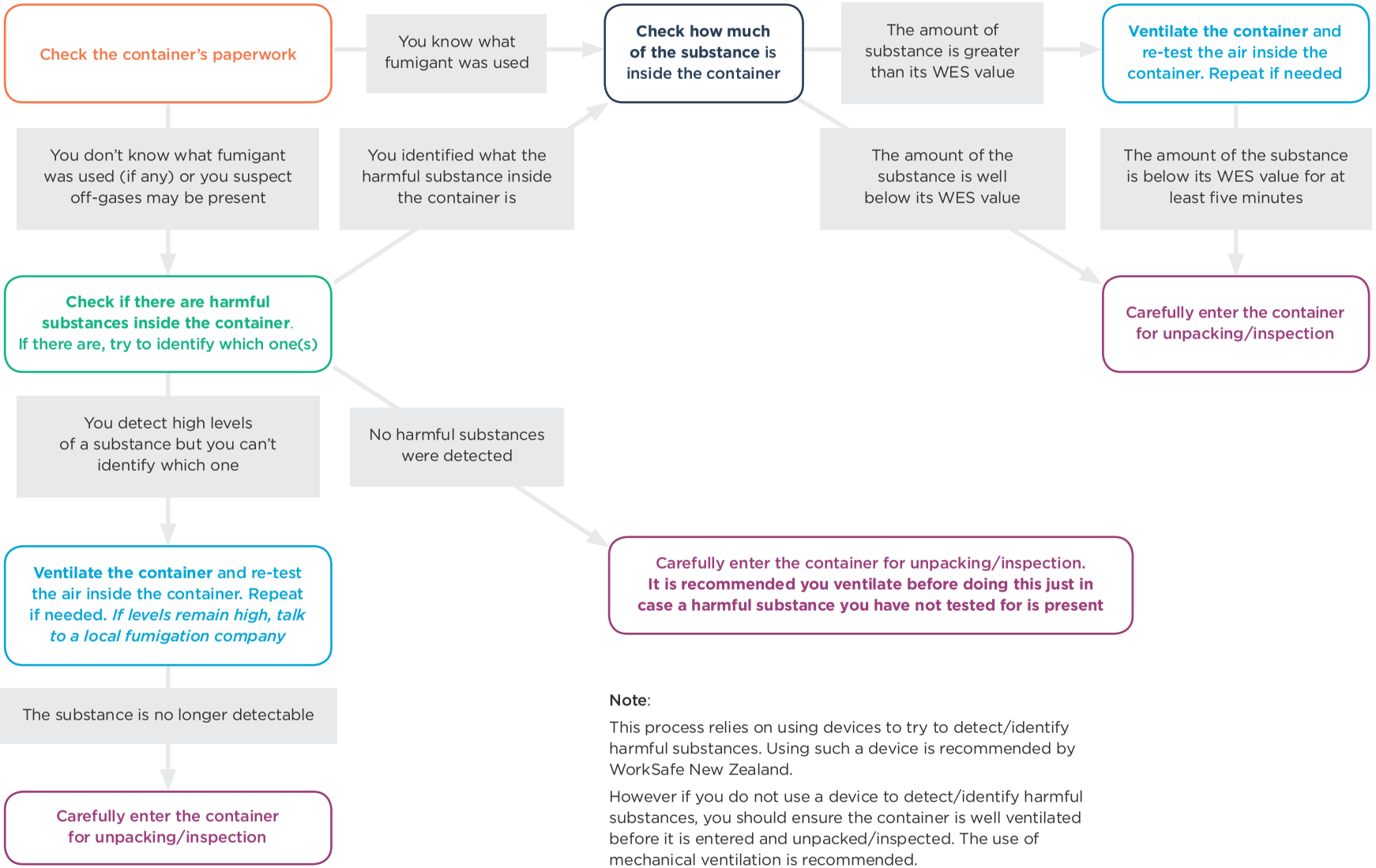

FIGURE 1: Good practice for safely entering shipping containers (using a device to identify and measure harmful substances)

How to check the container's paperwork

Check the container's paperwork

Use the container's paperwork to try to find out:

- if the container has been fumigated and if so, what fumigant was used
- what goods are being transported.

Is there evidence that the container has been fumigated?

Whether a container is fumigated, and what fumigant could be used depends on the goods inside it and which country it comes from.

Check for fumigation warning notices or other documents that may come with the container. If you are looking for evidence of fumigation, you may notice differences depending on whether the container was fumigated here or overseas. Do not assume that a container has not been fumigated simply because there is no fumigation signage on the outside.

For containers fumigated in New Zealand by local fumigation companies:

- There will be a sign on the container warning that it has been fumigated.
- Containers will have been ventilated – but because the fumigant will continue to be released from goods and packaging, there will likely still be fumigant and off-gases in them.

For containers fumigated before entering New Zealand:

There may be no warning signs on the container or anything in the container's paperwork to show that it has been fumigated.

Fumigant and off-gases may be inside the container.

What goods are being transported?

Some goods, including plastic and wood products or packaging, can release off-gases. It depends on what the goods are made of and how they are made.

For example some medium density fibreboard (MDF) furniture may release formaldehyde gas. This depends on how it was cured in the manufacturing process.

While it's important to know what goods are inside the container, you must not rely on this alone to judge whether off-gases could be inside the container.

What should you do next?

See Figure 1 for the next steps.

How to check if there are harmful substances inside the container

Check if there are harmful substances inside the container.
If there are, try to identify which one(s)

Test the air inside for harmful substances before entering the container. Do not sniff the air inside the container to try to work out if harmful substances are present – this is dangerous.

What devices can be used to detect the presence of common fumigants or off-gases?

DEVICE	WHAT IS IT USED FOR?
Colorimetric gas detection tubes	These are for single use and change colour when certain substances are present. They can be used to identify specific substances.
Photoionisation detectors (PIDs)	These may be able to tell you that harmful substances are present and at what concentrations, but do not identify what they are.
Portable mass spectrometers	These devices can identify specific substances at low detection levels.
Electrochemical sensors	These devices can identify specific substances at low detection levels.

Tables 1 and 2 outline the testing equipment recommended for detecting specific fumigants or off-gases.

Workers who test for harmful substances must be trained to use the testing equipment and to interpret the results.

It is safest to test for harmful substances without opening the container. You can do this by inserting the sampling tube between the rubber seals of the door to sample the air inside the container. You will not usually need to wear safety gear to do this.

Be careful – the levels of gases may vary inside the container. For example, pockets of gas may be trapped inside or between the cargo.

If you need to open the door to sample the air, the person carrying out the testing should, wear an appropriate respirator for which the person has been fit tested.

An appropriate respirator is likely to be:

- a half or full face mask equipped with either a multi-gas filter or an organic vapour cartridge filter or
- Self Contained Breathing Apparatus (SCBA).

To work out which one to use, you could talk to a respirator provider or look at WorkSafe's fact sheet *Respiratory Protective Equipment – Advice for Persons Conducting a Business or Undertaking*. There are duties for PCBUs when respiratory protective equipment is used to minimise risks (including training requirements). See the above guidance for information about this.

If you detect substances inside containers, try to identify what they are.

What should you do next?

See Figure 1 for the next steps.

How to check how much harmful substance is inside the container

Check how much of the substance is inside the container

You should check the amounts of harmful substance(s) you identified inside the container to work out if it is safe for workers to enter and unpack/inspect.

However, if you decide not to take measurements and the presence of fumigants or off-gases cannot be discounted, the container should be well ventilated. The use of mechanical ventilation is recommended.

Workers who test for harmful substances must be trained to use the testing equipment and to interpret the results.

Tables 1 and 2 outline the testing equipment recommended for measuring the amounts of specific fumigants or off-gases.

It is safest to carry out this testing without opening the container. If you need to open the door to get an air sample, you should wear an **appropriate respirator** (see previous section).

Be careful – the levels of gases may vary inside the container. The levels may be higher than what is measured by the door. You may not detect all of the substances that could be inside the container.

For workers to safely enter the container, the amount of the harmful substance inside the container should be well below the **workplace exposure standard (WES)** value for the substance (see Appendices 1 and 2).

A **WES** for a substance refers to the airborne concentration of a substance at which it is believed nearly all workers can be repeatedly exposed to day after day without coming to harm. Compliance with the WES level does not guarantee that all workers are protected from discomfort or ill-health. The range of individual susceptibility to hazardous and toxic substances is wide, and it is possible that some workers will experience discomfort or develop work-related diseases from exposure to substances at levels below the WES. So PCBUs should aim to have airborne concentrations well below the WES value.

What should you do next?

See Figure 1 for the next steps.

How to ventilate the container

Ventilate the container and re-test the air inside the container. Repeat if needed

The container must be ventilated (aired out) until the level of the harmful substance drops. The container can be aired out naturally (**natural ventilation**), or by using fans or extractor units (**mechanical ventilation**).

Natural ventilation takes longer than forced ventilation. It is difficult to predict how long it will take to naturally ventilate a container as it depends on:

- the levels of harmful substances inside the container
- how tightly the container is packed
- the contents of the container (as some gases will absorb into the contents, these will be released more slowly).

When you decide what type of ventilation to use you should consider if there are any risks that may arise.

For example, if the container is inside a building with limited air flow, natural ventilation may cause harmful substances to accumulate outside the container which could be hazardous to other workers or bystanders.

Set up barricades and signs around the container's entrance before ventilating the container.

After ventilation, re-test the air inside the container. Wear an **appropriate respirator** if you enter the container.

If the container is tightly packed, partially unpack the container, air it out, and then retest the air inside the container before continuing with the unpacking/ inspection.

If you need to close up the container after ventilation:

- place a notice on the container stating that ventilation has occurred
- keep a record of what you have done.

3.0
If someone shows symptoms of exposure

If workers or bystanders show symptoms of exposure you should follow the site's emergency procedures.

Symptoms of exposure to common fumigants and off-gases are listed in Tables 1 and 2.

Emergency procedures should describe where the exposed person should be moved to, what immediate first aid should be given, how to seek medical advice, and how to prevent others from being exposed to the harmful substance (eg barriers, signs).

It may not be safe to enter or go near the container without breathing apparatus. Ask emergency services or a local fumigation company for advice.

After exposure to a harmful substance (through skin absorption, inhalation or ingestion), WorkSafe must be notified under certain circumstances.

WorkSafe must be notified if the person exposed:

- is admitted to hospital as an in-patient for immediate treatment
- requires immediate treatment (other than first aid) for:
  - amputation
  - serious head injury
  - serious eye injury
  - serious burn
  - separation of skin from underlying tissue
  - spinal injury
  - loss of bodily function (including loss of consciousness)
  - serious lacerations
- requires medical treatment within 48 hours of the exposure.

To notify WorkSafe, ring 0800 030 040, email healthsafety.notification@worksafe.govt.nz or go to the WorkSafe website: www.worksafe.govt.nz

4.0
When should worker health be monitored?

Even if you follow good practices, workers who routinely deal with containers that have been fumigated or carry goods known to produce off-gases may still be exposed to harmful substances.

You have a primary duty to monitor worker health, so far as is reasonably practicable, if exposure to a particular health risk warrants it.

Health monitoring is a way to check if the health of workers is being harmed from exposure to hazards while carrying out work, and aims to detect early signs of ill-health or disease. Health monitoring can show if control measures are working effectively. Monitoring does not replace the need for control measures to minimise or prevent exposure.

Talk to your workers to get their views before making decisions about health monitoring.

For advice about health monitoring contact an experienced occupational health professional.

Note: You should consider whether your workers should undergo biological exposure monitoring. This is a type of exposure monitoring, not health monitoring.

Biological exposure monitoring involves qualified professionals taking samples, like blood or urine, from workers, and looking for the harmful substance. This can be used to check if workers are being exposed to substances such as methyl bromide, toluene, xylene and carbon monoxide.

5.0
Further information

For more information about PCBU duties, see WorkSafe's special guide I*ntroduction to the Health and Safety at Work Act 2015*.

For more information about exposure and health monitoring requirements, see the WorkSafe website: www.worksafe.govt.nz

For advice about which testing equipment and processes to use, or health or biological exposure monitoring contact an experienced occupational health professional or an occupational hygienist.

You can check the Yellow Pages® for the services available in your area or look at the websites of professional bodies such as the New Zealand Occupational Hygiene Society: www.nzohs.org.nz

Appendix 1: Commonly used fumigants

SUBSTANCE	WHAT IS IT?	EXPOSURE SYMPTOMS INCLUDE	EQUIPMENT TO DETECT IT IN CONTAINERS	EQUIPMENT TO MEASURE HOW MUCH IS IN CONTAINERS	WHAT IS THE WES VALUE[1]?
Methyl bromide	– It's a colourless gas – It's practically odourless but has a sweet chloroform-like smell at high levels (over 21 ppm) – It's toxic if you breathe it, ingest it or absorb it through the skin	– Headaches, dizziness, nausea, vomiting, tremor, slurred speech – Irritation to eyes, respiratory system and skin (eg blistering) – Death at high doses	– Colorimetric gas detection tubes – Halogen leak detector – Methyl bromide-specific gas detectors (electrochemical sensor) – this may give the most accurate results (*recommended*) – Portable mass spectrometer (*recommended*)	– Photoionisation detectors (PIDs) – *these must be set up correctly and regularly calibrated for methyl bromide* – Colorimetric gas detection tubes – Methyl bromide-specific gas detectors (electrochemical sensor) – Portable mass spectrometer	5 ppm (19 mg/m^3) averaged over 8 hours*
Phosphine	– It's a colourless gas that's produced when moisture in the air reacts with aluminium phosphide or magnesium phosphide – It may smell like garlic. But just because you can't smell it doesn't mean that it's not there – It's extremely toxic if you breathe in the gas – It's also toxic if you ingest solid phosphine or absorb it through the skin – You may find a greyish white powder in the container left over from the fumigation. *This is usually a non-harmful residue. However if you find this you should contact a local fumigation company. They will usually mix it with detergent and water to react any aluminium phosphide left. As this will produce phosphine gas this should be done safely.*	– Headaches, dizziness, nausea, vomiting, irregular heartbeat, double vision, breathing problems – Heart, liver or kidney damage – Anaemia, speech and motor problems, and weight loss (with longer term exposures)	– Colorimetric gas detection tubes – Halogen leak detector – Phosphine-specific gas detectors that are used at low sensor range (0-20 ppm, 0.1 ppm resolution) (*recommended*) – Portable mass spectrometer (*recommended*)	– PIDs – *these must be set up correctly and regularly calibrated for phosphine* – Colorimetric gas detection tubes – Phosphine-specific electrochemical sensor – Portable mass spectrometer (*recommended*)	0.3 ppm (0.42 mg/m^3) averaged over 8 hours*

SUBSTANCE	WHAT IS IT?	EXPOSURE SYMPTOMS INCLUDE	EQUIPMENT TO DETECT IT IN CONTAINERS	EQUIPMENT TO MEASURE HOW MUCH IS IN CONTAINERS	WHAT IS THE WES VALUE[1]?
Hydrogen cyanide	– It's a colourless gas – It may smell like almonds. However some people can't smell it at all – It's extremely toxic if you breathe in the gas, or ingest it or absorb it through the skin – It can affect all organs because it stops the supply of oxygen to them	– Irritation to eyes, nose, throat and skin (at low doses) – Flushing of the face, headaches, nausea, vomiting and breathing problems. Convulsions and death can follow (at high doses) – Nervous system, thyroid, heart and lung damage (with long term exposure)	– Colorimetric gas detection tubes – Hydrogen cyanide-specific gas detectors (electrochemical sensor) – this may give the most accurate results (*recommended*) – Portable mass spectrometer (*recommended*) *PIDs cannot be used to detect the presence or levels of hydrogen cyanide*	– Colorimetric gas detection tubes – Hydrogen cyanide-specific electrochemical sensor – Portable mass spectrometer *PIDs cannot be used to detect the presence or levels of hydrogen cyanide*	10 ppm (11 mg/m^3) (ceiling)*
Chloropicrin (tear gas)	– It has a pungent smell at even very low levels – It's extremely toxic – It's not approved for use with other fumigants in New Zealand	– Severe irritation to eyes, lungs and skin – Blindness (with long term exposure)	– Colorimetric gas detection tubes – Chloropicrin-specific gas detectors (electrochemical sensor) – this may give the most accurate results (*recommended*) – Portable mass spectrometer (*recommended*) *PIDs should not be used to detect the presence or levels of chloropicrin as they don't provide good accuracy*	– Colorimetric gas detection tubes – Chloropicrin-specific electrochemical sensor – Portable mass spectrometer *PIDs should not be used to detect the presence or levels of chloropicrin as they don't provide good accuracy*	0.1 ppm (0.67 mg/m^3) averaged over 8 hours*

TABLE 1: Commonly used fumigants

* For short term activities such as inspections and unpacking, ceiling WES values should be used for comparison. However for those substances that do not have ceiling values, the eight hour values should be used instead as a guide for risk assessment.

[1] Check that these WES values are the most up-to-date values at the WorkSafe website. Search using the phrase 'Workplace Exposure Standards and Biological Exposure Indices'.

Appendix 2: Common off-gases that may be present inside containers

SUBSTANCE	WHAT IS IT?	EXPOSURE SYMPTOMS INCLUDE:	EQUIPMENT TO DETERMINE IF IT IS PRESENT INSIDE CONTAINERS	EQUIPMENT TO MEASURE HOW MUCH IS INSIDE CONTAINERS	WHAT IS THE WES VALUE[2]?
Formaldehyde	– It has a pungent distinctive smell – It's toxic if you breathe in high levels – It may be released from foam insulation, MDF products, plastics, fabrics, glues and resins used on products, building materials, carpets and upholstery	– Irritation to eyes, nose and throat – Headaches, nosebleeds, dizziness and tiredness – Wheezing and chest pains (at high doses)	– Colorimetric gas detection tubes – Formaldehyde-specific gas detectors (electrochemical sensor) – *this may give the most accurate results (recommended)* – Portable mass spectrometer (*recommended*) *Commonly used photoionisation detectors (PIDs) (with a 10.6eV lamp) cannot be used to detect the presence or levels of formaldehyde*	– Colorimetric gas detection tubes – Portable mass spectrometer – Formaldehyde-specific electrochemical sensor *Commonly used PIDs (with a 10.6eV lamp) cannot be used to detect the presence or levels of formaldehyde*	0.5 ppm (averaged over 8 hours)* Ceiling 1 ppm*
Toluene	– It has a sweet pungent smell – It's toxic if you breathe in high levels – It may be released from shoes, electronics, wood, toys, consumables, textiles, food, polyresin, rubber, packaging plastics, fabrics, building materials, carpets and upholstery	– Irritation to eyes, nose and throat – Headaches, nausea, sleepiness, dizziness and tiredness – Central nervous system effects at high doses – Death	– Colorimetric gas detection tubes – Portable mass spectrometer (*recommended*) – Toluene-specific electrochemical sensor	– Colorimetric gas detection tubes – PIDs – Portable mass spectrometer – Toluene-specific electrochemical sensor	50 ppm (188 mg/m^3) averaged over 8 hours*
Benzene	– It's toxic if you breathe in high levels – It may be released from shoes, electronics, wood, toys, consumables, textiles, food, polyresin, rubber, packaging plastics, fabrics, building materials, carpets and upholstery	– Sleepiness, dizziness, irregular heartbeat, headaches and tremors – Bone marrow or the immune system effects at high doses	– Colorimetric gas detection tubes – Portable mass spectrometer (*recommended*) – Benzene-specific electrochemical sensor	– Colorimetric gas detection tubes – PIDs – Portable mass spectrometer – Benzene-specific electrochemical sensor	1 ppm (3.19 mg/m^3) averaged over 8 hours*

SUBSTANCE	WHAT IS IT?	EXPOSURE SYMPTOMS INCLUDE:	EQUIPMENT TO DETERMINE IF IT IS PRESENT INSIDE CONTAINERS	EQUIPMENT TO MEASURE HOW MUCH IS INSIDE CONTAINERS	WHAT IS THE WES VALUE[2]?
Xylene	– It's toxic if you breathe in high levels – It may be released from shoes, electronics, wood, toys, consumables, textiles, food, polyresin, rubber, packaging plastics, fabrics, building materials, carpets and upholstery	– Irritation to eyes, nose and throat – Dizziness, headaches irregular heartbeat, nausea and vomiting. – Central nervous system effects at high doses	– Colorimetric gas detection tubes – Portable mass spectrometer (*recommended*) – Xylene-specific electrochemical sensor	– Colorimetric gas detection tubes – PIDs – Portable mass spectrometer – Xylene-specific electrochemical sensor	50 ppm (217 mg/m^3) averaged over 8 hours*
Carbon monoxide	– It's a colourless, odourless gas – It's toxic if you breathe in high levels – It blocks the ability of red blood cells to deliver oxygen throughout the body – It may come from unloading a container with a petrol-, diesel- or LPG-powered fork hoist. This can cause carbon monoxide to build up inside the container	– Headaches, dizziness, nausea, vomiting and confusion – Death	– Colorimetric gas detection tubes – Carbon monoxide-specific gas detectors (electrochemical sensor) *– this may give the most accurate results (recommended)*	– Colorimetric gas detection tubes – Carbon monoxide-specific electrochemical sensor	25 ppm averaged over 8 hours 400 ppm (ceiling)*

* For short term activities such as inspections and unpacking, ceiling WES values should be used for comparison. However for those substances that do not have ceiling values, the eight hour values should be used instead as a guide for risk assessment.

[2] Check that these WES values are the most up-to-date values at the WorkSafe website. Search using the phrase 'Workplace Exposure Standards and Biological Exposure Indices'.

Disclaimer

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