EUROPEAN UNION

SPREP
Secretariat of the Pacific Regional Environment Programme

PacWastePlus
PACIFIC WASTE MANAGEMENT

This initiative is supported by **PacWastePlus**-a 72 month project funded by the European Union (**EU**) and implemented by the Secretariat of the Pacific Regional Environment Programme (**SPREP**) **to sustainably and cost effectively improve regional management of waste and pollution.**

Model Asbestos Management Code of Practice

This Waste data collation, analysis and reporting for the Cook Islands National Waste Audit Analysis Report was guided by the overarching Regional Waste Data Collection, Monitoring, and Reporting (DCMR) Framework for the Pacific Island Countries and Territories (PICT).

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Our vision: A resilient Pacific environment sustaining our livelihoods and natural heritage in harmony with our cultures.

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About PacWastePlus

The Pacific – European Union (EU) Waste Management Programme, PacWastePlus, is a 72-month programme funded by the EU and implemented by the Secretariat of the Pacific Regional Environment Programme (SPREP) to improve regional management of waste and pollution sustainably and cost-effectively.

About PacWastePlus

The impact of waste and pollution is taking its toll on the health of communities, degrading natural ecosystems, threatening food security, impeding resilience to climate change, and adversely impacting social and economic development of countries in the region. The PacWastePlus programme will generate improved economic, social, health, and environmental benefits by enhancing existing activities and building capacity and sustainability into waste management practices for all participating countries.

Countries participating in the PacWastePlus programme are: Cook Islands, Democratic Republic of Timor-Leste, Federated States of Micronesia, Fiji, Kiribati, Nauru, Niue, Palau, Papua New Guinea, Republic of Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu.

Key Objectives

Outcomes & Key Result Areas

The overall objective of PacWastePlus is "to generate improved economic, social, health and environmental benefits arising from stronger regional economic integration and the sustainable management of natural resources and the environment".

The specific objective is "to ensure the safe and sustainable management of waste with due regard for the conservation of biodiversity, health and wellbeing of Pacific Island communities and climate change mitigation and adaptation requirements".

Improved Data Collection

- Improved data collection, information sharing, and education awareness
- Policy & Regulation
- Policies and regulatory frameworks developed and implemented.
- Best Practices
- Enhanced private sector engagement and infrastructure development implemented
- Human Capacity
- Enhanced human capacity

Learn more about the PacWastePlus programme by visiting:

https://pacwasteplus.org/

About Regional Asbestos Project

The management and disposal of asbestos and asbestos containing materials (ACM) is an ongoing concern in the Pacific region. In seeking to improve the ways that asbestos and asbestos containing materials are managed, our project's focus is to prevent exposure to asbestos fibres in order the eliminate asbestos-related diseases.

Asbestos is a known health hazard and may be present in buildings and pipes throughout the pacific. A 2016 study estimated some 188,000m^2 of non-residential asbestos was present in Pacific islands, of which some 146,000 m^2 (78%) was confirmed as a high or moderate risk to human health (SPREP 2016).

When products containing asbestos are damaged or become degraded over time, asbestos fibres are exposed and may become airborne. Health risks are exacerbated in natural disasters, with destructive cyclones damaging products such as asbestos roofing and cladding, an issue of increasing concern as the impacts of climate change are experienced across the region.

The World Health Organisation (WHO) states that when a country stops using asbestos, their asbestos-related disease burden decreases over time. In contrast, countries continue to use asbestos are likely to have a substantial burden of asbestos-related disease in the future due to their past and ongoing asbestos use. Reducing exposure without addressing ongoing import and use are insufficient to eliminate asbestos-related diseases (Kameda et al, 2014).

PacWastePlus Regional Asbestos Project

The PacWastePlus Regional Asbestos Project will support countries in executing solutions, both legislative and policy driven, to preventing exposure to asbestos fibre, and thereby reduce asbestos-related diseases.

The activities to be delivered by the PacWastePlus Regional Asbestos Project are:

- Promote the understanding of asbestos exposure risks
- Implement legislative/regulatory bans on the manufacture, use, reuse, import, transport, storage, or sale of all forms of asbestos and ACMs
- Create and support the adoption of an ACM Code of Practice
- Provide support tools/documents to properly manage and control ACM.

The project will achieve these outcomes through direct work with countries, and development of tools and guidance as described in the following schematic.

The technical resources will be supported through the production and dissemination of a variety of community and government resources, and provision of training to government workers involved in the management of asbestos.

Foreword

The Secretariat of the Pacific Regional Environment Programme has been working with member countries for over a decade to effectively manage and eliminate asbestos from the region. We have long known of the terrible health impacts caused form asbestos exposure, and Pacific Island Countries have agreed at numerous International Forum to pursue on asbestos importation that would see it no longer able to enter the region.

The PacWastePlus Programme, through the continuous generous support of the European Commission, has progressed the regional work of asbestos management through the development of a suite of resources to assist member countries to strengthen their controls and management of Asbestos importation, use, transport, and disposal. This Model Asbestos Management Code of Practice (Model Code) being one of the most important tools to be developed and provided to members for their implementation.

This Model Code was developed in consultation with members and has drawn heavily from international instruments of a similar nature. Our thanks and congratulations are extended to New Zealand and Australia, who's Approved Codes of Practice greatly informed the development of this document.

The intent of the Model Code is to provide member Countries with a core document for their review, and tailoring to address their specific circumstances, and be able to act with confidence that other Pacific Island countries are seeking to utilise the same standards and controls, empowering the region to collectively manage the risk posed through asbestos usage.

The Model Code, once implemented, is designed to assist duty holders comply with their requirement to provide healthy and safe work for everyone who works with asbestos. It should also help make sure that other people do not have their health and safety adversely affected by asbestos.

An 'Asbestos Free Pacific' will ensure healthy and safe workplaces, organisations to strengthen their health and safety systems, and reduce incidents of asbestos related illness.

I encourage our member countries to engage with SPREP's Waste Management & Pollution Control Programme to adopt and implement this Template Code and realise the value that appropriate management of this material can bring to the region.

Mr. Sefanaia Nawadra

Director General

SPREP

How to Use This Document

This Model Code should be tailored to develop an Asbestos Management Code of Practice that meets the requirements of your jurisdiction. Guidance is provided in the following ways:

Instructions to drafters	Instructions on use of the Model Code will be provided in boxes like the example below. Instructions are provided in dotted boxes throughout the Model Asbestos Management Code of Practice. It is intended that all dotted boxes be removed from the final policy, as they are provided for development purposes only.
Specific text requiring modification to suit local context	Most text is expected to be suitable and relevant for use, specific areas where government consideration of language or inclusions is noted by grey highlighting and red test.
Guidance and considerations provided to assist tailoring of the Model Code to local context.	Drafting guidance for specific issues will be provided in boxes like the example below: **Drafting Guidance:** **Specific Guidance is included in Guidance Boxes like this.**

When utilising this Model Code to develop your specific Code, please note the following:

This Model Code sets out recommended minimum standards for the management of asbestos and asbestos containing materials (ACMs).

This Model Code is designed to assist Pacific Island Countries, and Timor-Leste to reflect the requirements of appropriate national Act and the Regulations, as they apply to managing the health and safety risks, and environmental risks posed by the presence and use of asbestos and ACMs.

The Model Code should be tailored to the individual legislative framework of the country seeking to adopt and implement the Code. As such, this Model Code is designed to provide base information, that is easily tailored to specific circumstances and legislation used in Country.

This document contains all critical elements needed to produce a defensible code of practice. However, depending on circumstances, some of the Model Code sections may not be needed. In those situations, those sections should be excised from the final code adopted. Depending on circumstances there may be additional information, restrictions, or controls that some jurisdictions wish to add to the Model Code prior to adoption.

The following table provides details for the use and modification of each section of the Model Code.

INTRODUCTION	This section is recommended to be included in its entirety
PART I: About Asbestos	Each Part is designed to assist in navigating challenging areas of asbestos regulation; offers consistent standards; is easily adapted to fit the diverse needs of PICTs. The Model Code provides the basis for a complete listing of appropriate best practices for asbestos management. In some jurisdictions these practices may not be appropriate and/or attainable due to a lack of experienced personnel or resources to undertake the practice set out in these parts. In some jurisdictions these practices may be superseded by more detailed practices. It is the intention for drafters to review and modify as needed for their specific circumstance.
PART II: Responsibilities when Working with Asbestos	
PART III: Air Monitoring when Working with Asbestos	
PART IV: Control Measures when Working with Asbestos	
Part V: Using an Enclosure During Asbestos Removal Work	
PART VI: Controls for Specific Asbestos Removal Work	
PART VII: Asbestos Waste Containment and Disposal	
PART VIII: Managing Asbestos In-Situ	
PART IX: Asbestos in Soils	
Appendix A: Glossary	These sections are recommended to be included in their entirety (not withstanding local tailoring for contextual accuracy).
Appendix B: Asbestos Removal Control Plan contents	
Appendix C: Example of a Clearance Certificate	
Appendix D: Examples of Asbestos Removal Work	
Appendix E: Asbestos in Building Materials	
References	

INTRODUCTION

Scope

A code of practice describes the principles to be followed when selecting the most appropriate techniques for the safe abatement of asbestos-containing materials. This Model Asbestos Management Code of Practice (Model Code) presents basic information on asbestos and asbestos products, health hazards, safe work procedures, inspection criteria, applicable legislation and competency profiles for those persons working with asbestos.

The Model Code includes recommended minimum standards for safety expected of the person responsible for a specific project, and provides guidance on:

1. who should be responsible for managing and controlling risks related to asbestos, consistent with legal requirements
2. how to identify asbestos containing materials (e.g. sampling and testing)
3. how to assess risks of exposure to airborne asbestos fibres for workers and the community (e.g. asbestos type, condition, location, potential disturbance)
4. how to eliminate or minimise the risk of exposure (based on the outcome of the risk assessment) applying the most effective control in the circumstances, with control options being removal or management in-situ
5. how to safely manage asbestos in situ (e.g. asbestos registers, management plans, safe work practices around asbestos, sealing, encapsulation methods)
6. how to safely remove, transport and dispose of asbestos.

Audience

The Model Code is designed to provide accessible, practical advice to a broad range of parties who have a responsibility or duty of care in regards of exposure to asbestos or Asbestos Containing Materials (ACM). This includes those with responsibility for or involvement in legislation, worker health and safety, and any Work Involving Asbestos.

Work involving asbestos is an over-arching term to cover all activities in the presence of asbestos including asbestos-related work, i.e., any work that does or may bring an individual into the presence of ACM, and asbestos removal work, i.e., specifically involving the removal of ACM which can be further subdivided into non-friable and friable removal work

An Asbestos Management Code of Practice advises regulatory bodies, practitioners, trades people and the public on how to undertake safe work requirements when working or encountering asbestos. It is a practical document that clearly provides information on aspects of working with asbestos, the risks associated and how to manage them.

The Model Code is designed to:

- assist the development of an asbestos abatement program; and
- the basis of a government monitoring and compliance programme to ensure appropriate practices are being employed. Further, the Model Code articulates the potential regulatory requirements concerning asbestos abatement work.

Safety officers may use this code as a guide when reviewing abatement work practices and employer specific work location practices. Alternate practices are acceptable if they provide workers with a level of safety equal to or greater than those practices presented in the Model Code.

PART I
About Asbestos

1. ABOUT ASBESTOS

1.1 What Is Asbestos?

Asbestos is the general term used for describing naturally occurring fibrous silicate minerals or any mixture containing one or more of these fibrous silicates at more than trace amounts. These can be categorised into six different types that have been commercially exploited: Chrysotile (white asbestos), Amosite (brown asbestos), Crocidolite (blue asbestos), Actinolite, Anthophyllite, and Tremolite.

1.2 Properties of Asbestos

Chrysotile is very flexible and less likely to be 'friable' (easily broken down into finer fibres) when compared to the amphiboles. Amphibole fibres are generally more brittle and accommodate less structural deformation during mechanical treatment or abrasion.

Industrial uses of asbestos take advantage of a combination of properties. The performance of the fibre as a reinforcing material is largely dependent on the length of the fibres. Other fibre properties that render them useful include flexibility, high tensile strength, non-combustibility, resistance to heat, low electrical conductivity, and resistance to chemical attack (see Table 1).

Table 1: Properties of Asbestos

Attribute	Description
Flexibility	Chrysotile fibres tend to be much more flexible than the amphibole fibres that tend to be straighter and more brittle.
Tensile Strength	Chrysotile, amosite, and crocidolite have high tensile strength, but tensile strength varies with temperature. Chrysotile is largely unaffected up to 550°C but amphiboles exhibit a decreasing tensile strength beginning at about 200°C.
Combustibility	Asbestos fibres will undergo chemical and physical changes at elevated temperatures, but they do not burn, resulting in widespread use as a fireproofing material.

Thermal Conductivity	All forms of asbestos are resistant to the transfer of heat, resulting in use as insulation and lagging products.
Resistance to Chemical Attack	Generally, amphibole asbestos types are much more acid resistant than chrysotile, with crocidolite being particularly resistant to acids. Conversely, with exposure to alkalis, chrysotile is the most resistant to chemical attack, with all the amphibole fibres being slightly less resistant.
Effects of Heat on Asbestos Types	As asbestos fibres are hydrated silicates, exposure to high temperature causes loss of water from the mineral (Dihydroxylation). Chrysotile is generally thermally stable up to about 550oC after which Dihydroxylation occurs. For amphiboles, Dihydroxylation occurs at temperatures between 400°C and 600°C. Thermal decomposition of amphiboles in the presence of oxygen leads to oxidation of iron present within the material. This leads to changes in colour (e.g. amosite changes from a pale brown to a dark brown colour). These colour changes and other changes in chemical composition may affect the optical properties of the fibre seen under polarised light microscopy and cause difficulties when analysing samples for the presence of asbestos.

Asbestos has been used in over 3000 widely used products for a variety of uses (see Appendix E – Asbestos in Building Materials).

1.3 Asbestos-Related Diseases

The World Health Organisation (WHO) (2014) estimates 125 million people globally are exposed to asbestos in the workplace, and more than 107,000 people die each year from asbestos-related lung-cancer, mesothelioma and asbestosis resulting from exposure at work (BOHS, 2016).

Asbestos is widely used in industry because its fibrous mineral properties make it extremely strong and resistant to heat and chemical attack. Unfortunately, these same properties make it a deadly occupational hazard and all types of asbestos can cause fatal health issues.

Asbestos fires split lengthways into smaller and smaller fibres that are too small to see with the naked eye. If asbestos is damaged, it releases these same fibres into the air where they can be inhaled. Once inhaled, the smaller fibres can lodge in the respiratory tract and the lungs, where their strength and resistance to chemical degradation make them difficult for the body's immune systems to break them down. This can lead to a few potentially fatal diseases and adverse health issues.

The most dangerous asbestos fibres are those that can be inhaled deep into the lungs where they lodge in the alveoli. These respirable fibres are defined as being:

- 5 microns long;
- < 3 microns wide; and
- With a length: width ratio of >3:1.

Most asbestos-related diseases can take up to 20 years before symptoms start to show but health risks increase when:

- More fibres are inhaled
- Exposure is more frequent
- Exposure occurs over a long period of time

The three most serious health issues associated with asbestos exposure are described in Table 2.

Table 2: Serious Asbestos related diseases

Asbestos Related Disease	Description
Asbestosis	When the small asbestos fibres are inhaled into the lungs, they can lodge in the alveoli where the bodies natural defence mechanisms attempt to fight the presence of the fibres. Due to the natural properties of asbestos fibres, the human body is not able to successfully 'digest' the fibres, which leads to release of enzymes and chemicals in the lungs. In turn, this leads to permanent alteration and scarring of the alveoli, causing hardening of the lung tissue around each fibre. There is no cure for asbestosis, which leads to progressive breathlessness and eventually respiratory and heart failure. There is a dose-response relationship between asbestos exposure and developing asbestosis. Asbestosis can be caused by all forms of asbestos but is only associated with high levels of exposure over many years, so is usually found in individuals involved in asbestos mining, manufacturing ACMs and those working with asbestos prior to regulations.
Lung Cancer	Lung cancer is a malignant tumour in the lung characterised by uncontrolled cell growth in the lung tissue. Symptoms appear when it has spread through the lungs and other parts of the body leading to low survival rates. The chances of developing lung cancer are increased by high levels of exposure over long periods of time. There is a delay between exposure and developing lung cancer, typically between 10 years and up to 40 years. There is a 'synergistic' effect between working with asbestos, smoking tobacco and developing lung cancer. The chances of developing lung cancer from asbestos are increased 53 times if the individual also smokes tobacco.
Mesothelioma	Mesothelioma is a form of cancer that effects the lung lining (pleural membrane). There is no known safe level of exposure with regards to mesothelioma, which can be caused by all three of the commercial asbestos types. Although chrysotile is known to cause mesothelioma, the amphibole asbestos types (amosite and crocidolite) are linked to an increased risk of developing mesothelioma. Minor exposure to asbestos can lead to mesothelioma. The latency period between first exposure and developing symptoms is typically in the range of 15 to 30+ years. There is no known synergistic link between asbestos exposure, tobacco smoking and developing mesothelioma.

1.4 Other Asbestos-Related Health Conditions

Asbestos can cause other health issues as described in Table 3.

Table 3: Other Asbestos related health conditions

Asbestos Related Disease	Description
Pleural Plaques	Pleural Plaques are areas of fibrous thickening on the lung lining, which take 20 to 30 years to develop. These do not usually lead to health problems but may harden causing pain or discomfort when breathing.
Pleural Thickening	Thickening of the lung lining (pleura) caused by scarring from damage caused by exposure to asbestos fibres. The thickening restricts the space between the

	lungs and the pleura, making breathing difficult and painful. This is a non-fatal condition. Pleural thickening can occur in as little as 12 months but usually takes 15 to 20 years to identify symptoms

1.5 Identifying Asbestos

The first and critical step in determining if there is a risk from asbestos is identifying if asbestos is present and its condition. The risk of exposure from the asbestos can then be identified so it can be adequately managed.

As discussed in the previous section the predominant risk associated with asbestos is exposure to airborne asbestos fibres. For any asbestos or ACM identified a risk assessment should be conducted to ascertain the risk posed by the asbestos or ACM item of releasing fibres into the air.

Once the asbestos has been identified an asbestos management plan should be developed as described below, indicating the presence of asbestos in the workplace and relevant control measures to manage the ACM. The asbestos management plan should include a process for incidental disturbance of asbestos or ACM.

1.6 Identifying Asbestos Risk

Identifying asbestos risk at the workplace will help those that do not need to work in any area where asbestos risk is present to avoid exposure to airborne asbestos fibres. Those that do need to work in these areas will know what to expect and the risk can be managed accordingly.

Disturbance of asbestos and ACM will greatly increase the risk of exposure and depending on the type of work being conducted, one of the following surveys may be required.

- Asbestos Management Survey
- Asbestos Refurbishment Survey
- Asbestos Demolition Survey.

Typical locations of asbestos are outlined in Figures 1 and Figure 2 below.

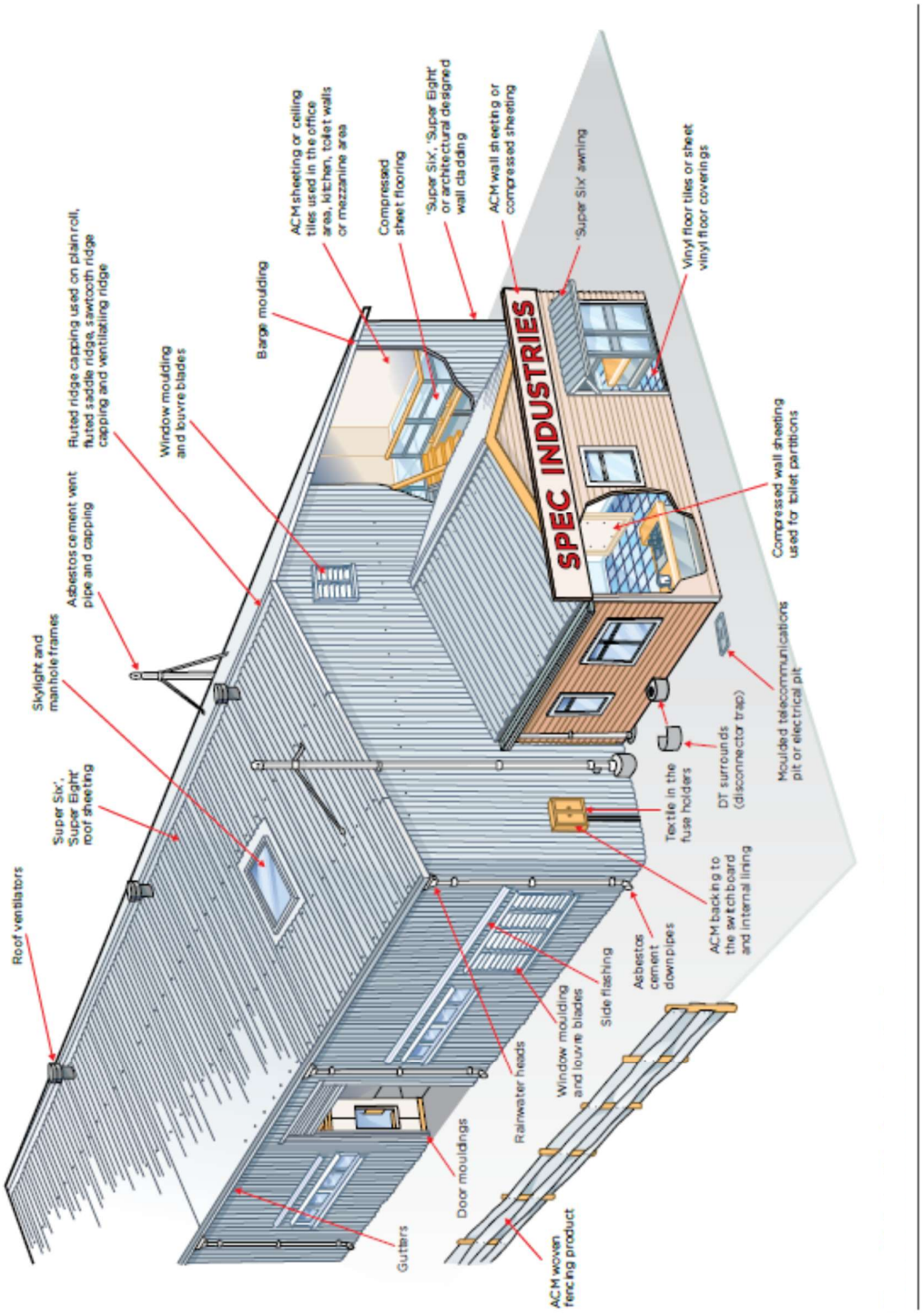

Figure 1: Typical locations of asbestos in an industrial building

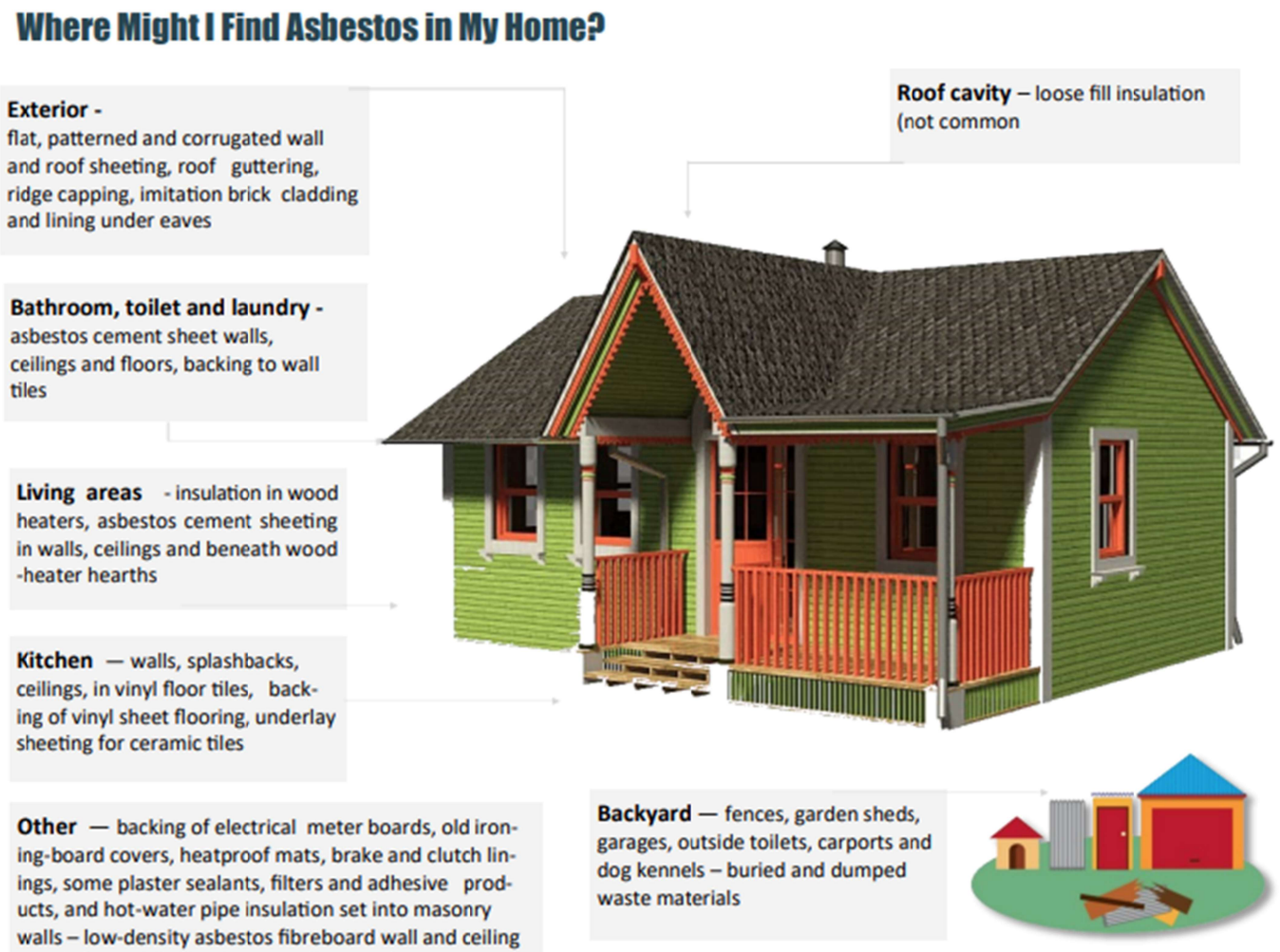

Figure 2: Typical locations of asbestos in a domestic building

1.7 Conducting an Asbestos Survey

A methodical and logical approach should be taken when conducting an asbestos survey to ensure all accessible areas and materials are assessed. There are multiple approaches which can be taken and a walkover of the entire site prior to surveying may assist coming up with a suitable method which ensures all areas are covered.

One example of a method is to start at an entrance of the building, turn left and always keep your left shoulder to the wall as you walk in and out of each area, looking at the floors, walls, and ceilings.

If a material could potentially be asbestos containing, it should either be sampled for laboratory analysis or presumed to be asbestos containing. The details of the material should be recorded and included within the asbestos survey report.

1.7.1 Asbestos Survey Planning

Prior to undertaking an asbestos survey, the surveyor should undertake a four-stage survey planning process:

- Step 1: Collect all relevant information to plan the survey
- Step 2: Undertake a desk-top survey
- Step 3: Prepare a survey plan including sampling strategy and how data will be recorded
- Step 4: Conduct a risk assessment for the survey.

1.7.2 Asbestos Management Surveys

The purpose of an asbestos management survey is to identify the asbestos risk in an everyday working environment or workplace. They are non-invasive / non-destructive and generally only include materials that people are likely to encounter during their normal working day. If asbestos containing materials are present, they may be considered a low risk depending on the type and condition of the asbestos or ACM and the likelihood of that material being disturbed.

All areas potentially accessible to people within the workplace should be surveyed and the findings of an asbestos management survey will help develop an asbestos management plan for the workplace.

Asbestos management surveys should include the following information:

- Type of asbestos containing material
- Condition of the material
- Friability of the material
- Location of the material
- A risk assessment taking into consideration the likelihood and severity of disturbance.

1.7.3 Asbestos Refurbishment Surveys

When refurbishing a structure or plant at a workplace, the PCBU intending to carry out the work must determine whether there is asbestos or ACM present so the associated risk of disturbance can be managed accordingly. In some instances, asbestos containing materials can be hidden in the framework of the building and refurbishment surveys may need to be intrusive / destructive depending on the scope of works for the refurbishment.

Asbestos refurbishment surveys should contain a recommendation of whether an asbestos containing material should be removed or if control measures should be implemented in order minimise the risk of exposure to airborne asbestos fibres during the works.

1.7.4 Asbestos Demolition Surveys

Asbestos containing materials must be removed prior to demolition of a structure or plant, except in certain special circumstances. Asbestos demolition surveys must be conducted to identify as much asbestos or ACM as possible so that it can be removed prior to demolition and will minimise the chance of incidental disturbance and the associated risk of exposure to airborne asbestos fibres during the demolition process.

Asbestos containing materials can be housed in the framework of the building and asbestos demolition surveys need to be intrusive / destructive. It may not be possible to conduct this type of surveying in occupied areas, in which case a two-stage approach may be considered. The first stage being non-intrusive while the building is occupied. The second stage being destructive once the building is vacated.

1.8 Sampling Asbestos Containing Materials

Materials can only be confirmed to be asbestos containing by laboratory analysis. If a potential asbestos containing material is visually identified during the survey, a sample may be collected for analysis to confirm or negate the presence of asbestos.

In some instances, it may be as effective to presume the material to be asbestos containing rather than have it sampled and analysed.

1.8.1 Asbestos Identification - Laboratory Assessment of Possible Asbestos-Containing Products

This section is intended to familiarise the reader with the procedures used for identification of bulk asbestos samples. It is not intended to provide all the information to competently perform asbestos identification. Information in this section is largely sourced from New Zealand, Australian and UK methodology, specifically:

- AS4964-2004 – Method for the Qualitative Identification of Asbestos in Bulk Materials (2004)
- BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil (2017)
- World Health Organisation – Determination of Airborne Fibre Number Concentrations: A Recommended Method, by Phase Contrast Optical Microscopy (Membrane Filter Method) (1997)
- Government of Western Australia - Environmental Health Directorate (2009) Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia
- Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC:3003(2005)]
- HSG248 – Asbestos: The Analysts' Guide for Sampling, Analysis and Clearance Procedures (2005)
- HSG264 – The Survey Guide (2012).

Qualitative analysis of asbestos-containing products is commonly performed using PLM techniques. PLM is used to classify fibrous components of a sample. The different types of regulated asbestos fibres differ slightly in composition and mineral structure, which causes variances in optical properties. These differences enable the analyst to distinguish between different asbestos fibre types and non-asbestos fibres, such as organics and synthetic mineral fibres.

The typical identification of the asbestos fibres in bulk, soil and swab samples is based on the following analytical sequence summarised from the UK Health and Safety Executive (HSE) Guidance Document, *HSG248: Asbestos: The Analysts' Guide for Sampling, Analysis and Clearance Procedures* (2005).

- A preliminary visual examination of the whole bulk sample is made to assess the product type and the required sample treatment (if any)
- Sample treatment is undertaken, if required, to release or isolate fibres
- A detailed, thorough search under a stereo microscope at 10x to 40x magnification is made to classify and record the fibre type present based on its morphological and physical properties
- The representative fibres are extracted and mounted in appropriate refractive index oils between a microscope slide and cover slip
- The different optical properties of the fibre are identified using PLM and dispersion staining techniques at a magnification of 100x or greater
- Asbestos identification is confirmed through meeting the optical properties of the fibre
- If no asbestos is identified by these procedures, trace analysis is performed by examining small, random portions of the sample under PLM. Other microscopic techniques may be used to enhance the visibility of fine asbestos fibres.

1.8.2 Dust Samples Collected on Swabs, Wipes, and Tapes

The analytical procedure for dust samples follows the same analytical sequence listed in Section 2.2.1.

Reducing the size of a dust sample is difficult to achieve in a representative manner without the potential of discarding the only potion of the sample that may contain asbestos. One of the key risk areas for analysis of dust samples is the increase of interfering substances, which can make analysis difficult.

Dust collected on wipes or swabs can be difficult to analyse without the sample undergoing ashing treatment. Swab and wipe samples are often wet to collect a larger sample proportion and as a safety measure for the sample. The difficulties analysts may experience analysing non-treated swab or wipe samples include interference from the organic matrix and wetness of a wipe or swab.

Dust collected on tape samples typically return a faster result, as these can often be analysed without sample treatment, depending on the experience of the analyst. Analysts may experience some difficulty analysing dust collected on tape samples when extracting small amounts of fibres without pressing them further into the tape adhesive, as the adhesive obscures the optical properties of the fibres when they are mounted on a slide for PLM analysis. Tapes that contain large portions of dust may interfere with extracting small amounts of asbestos fibres.

1.8.3 Sample Treatment

The purpose of sample treatment is to release fibres from the product matrix and remove interfering particles adhering to fibres, which can obscure the optical properties of the fibre and lead to fibre misidentification.

The three main sample treatment methods:

- Crushing and grinding typically, using a mortar and pestle
- Ashing the sample at 400°C to remove organic binders found in plastics, bitumen, resin or rubber
- Acid treatment using dilute acetic or hydrochloric acids to remove calcium carbonate and calcium silicate, which are commonly found in floor tiles, stipple coatings and insulation boards.

Combining sample treatments provides the analyst with a stronger probability of detecting asbestos and minimising false negatives. Combining sample pre-treatments provides the analyst with a stronger probability of detecting asbestos and minimising false negatives. (Ham et al., 2019). This will be necessary if the analyst does not have sufficient sample experience.

1.8.4 Sample Method Limitations

PLM is a qualitative technique. It does not provide accurate identification for airborne and water-borne asbestos. Depending on sample condition and fibre type, the detection limit of this technique is typically in the range of 1 in 1000 to 1 in 10000 parts by weight, equivalent to 1 to 0.1 g/kg. For methods such as the AS4964:2004, which is the most common method used by accredited laboratories for bulk identification in Australia and New Zealand, the stated detection limit is 0.1 g/kg.

Difficulties may be encountered in distinguishing between fine fibres (< 1 □m width), tremolite, and actinolite or between tremolite and anthophyllite. It may be necessary to send samples for analysis using electron microscopy with energy dispersive X-ray analysis and / or electron diffraction techniques should this be a requirement of the client.

Prolonged exposure of amosite and crocidolite to temperatures of 300°C to 500°C can change the fibre's typical optical properties due to disintegration from the heat, leading to higher risks of misidentification.

Analysts need to be aware of fibres with morphological and / or optical properties like asbestos. These include polythene, leather swarf fibres, spider web, talc fibres and other natural organic fibres, such as paper and feathers.

Analysts will need experience in understanding asbestos products, specifically the products seen in the Pacific region and relevant sample treatment requirements. Combining sample treatments provides the analyst with a stronger probability of detecting asbestos and minimising false negatives. This will be necessary if the analyst does not have sufficient sample experience.

1.9 Presuming Asbestos Containing Materials are Present

If a material visually appears to be potentially asbestos containing, it may be presumed to be asbestos containing rather than having it sampled and analysed.

Factors to consider when deciding if presuming a material to be asbestos containing will be effective may include:

- The proposed future use of the building (e.g. – demolition, refurbishment)
- The likelihood of disturbance to the material
- The indicative risk posed by the material
- The likelihood of the material to be asbestos containing
- Ease of access to a laboratory
- The cost to remove the material as asbestos.

If presuming a material to be asbestos containing, it must be treated as asbestos containing and a risk assessment must be conducted to determine an appropriate course of action, taking into consideration the likelihood and severity of disturbance.

Where there are reasonable grounds to believe asbestos may not be present, it may be presumed that asbestos is not present. For example, some materials such as wood, metal and glass are obviously not asbestos containing.

Table 4 may be useful for PCBUs who know, or ought reasonably to know, if there is a risk of exposure to respirable asbestos fibres in their workplace. It could be used to gather preliminary information before deciding if it is necessary to engage a person to conduct a more in-depth identification exercise.

Table 4: Guidance on likelihood of ACM presence in a building

Criteria	Guidance
When was the building built?	Asbestos was widely used as construction and insulation material in buildings until the mid-1980s. It was still used until stockpiles of the product ran out. Asbestos was possibly used in buildings constructed before 2000.
Were refurbishments or additions made to the building before 2000?	Any refurbishment or extensions to the original building before 2000 may have building materials containing asbestos. Even if the original parts of the building did not have asbestos, be aware that later additions may have it.
What was used to build the building?	If cement sheet was installed in the building before 2000, it is likely to contain asbestos. For example, a corrugated cement sheet roof is likely to contain asbestos. Areas of buildings prone to wet conditions may contain asbestos in the walls and floors, because it is hardy and has good waterproofing qualities. For example, bathrooms, toilets and laundries may have asbestos sheeting or vinyl tiles. Pipes that carry water and sewage may also contain asbestos.
Talk to designers, manufacturers, or suppliers of plant, or refer to design plans	Asbestos may be present in specific parts of workplace plant because it was used in gasket and friction brake products. Despite a large decrease in its use, white asbestos was still used in specific plant, including rotary vane vacuum pumps and gaskets for certain equipment. If plant was designed, built, and installed before 2000, consult the plant supplier, manufacturer, or designer to find out if asbestos is present. Preferably get this advice in writing. If this is not possible, review the design plans and seek advice from an experienced engineer or plant designer. Quality assurance systems or checks should confirm if asbestos is present.
Talk to experienced workers	Talking to experienced workers may help because they may know about the plant or building's history, including age, construction, renovation, or repairs, or where asbestos may be found.
Visually inspect the workplace to identify asbestos, ACM, and inaccessible areas	The person identifying the asbestos should conduct a thorough visual inspection of all areas of the workplace, including all buildings, ceiling spaces, cellars, shafts, storage areas and wall cavities. Otherwise, assume asbestos is present. The building or plant's design plans may help identify inaccessible areas. Talk to builders, architects, plant manufacturers and maintenance workers. Knowledge of the materials used in the building or plant's construction, or experience and findings from inspecting similar sections of the building or plant (or similar ones) may also help.
Take notes and photographs	Taking notes and photographs while conducting the inspection will help with producing asbestos records.
Previous records	Previous asbestos records, including from asbestos removal jobs (such as clearance certificates), can help with identifying all asbestos and ACM in the workplace.

PART II
RESPONSIBILITIES WHEN WORKING WITH ASBESTOS

2. RESPONSIBILITIES WHEN WORKING WITH ASBESTOS

Definitions relevant to this Part

The following definitions (see Table 5) will assist with the reading and understanding of elements of this Part of the Model Code of Practice

Table 5: Important Definitions

Term	Definition
Work Involving Asbestos	Work Involving Asbestos is '*asbestos-related work*' or '*asbestos removal work*', as some regulations only apply to asbestos-related work, and others only apply to asbestos removal work.
Asbestos-related Work	Asbestos-related work means work involving asbestos, other than asbestos removal work, such as maintenance work that involves disturbing asbestos.
Asbestos Removal Work	Asbestos removal work is any work that involves the removal of asbestos or asbestos-containing material from their place of installation.
So far as reasonably practicable	Throughout the code, many of the described legal requirements come with the phrase '*so far as is reasonably practicable*.' For example, the primary duty of care on a person working with asbestos is to ensure the health and safety of workers 'so far as is reasonably practicable.' In this context, something is reasonably practicable if it is reasonably able to be done to ensure health and safety, having weighed up and considered all relevant matters, including: 1. How likely are any hazards or risks to occur? 2. How significant could the harm that might result from the hazard or risk be? 3. What is known or ought to reasonably be known about the hazards or risks? 4. What are the ways of eliminating or minimising the risks? 5. How available and suitable are they? Lastly, weigh up these matters with the cost: 1. What are the costs of available ways of eliminating or minimising the risk? 2. Is the cost grossly disproportionate to the risk?

2.1 Duties For Person Working with Asbestos Including Property or Business Owners

This section provides practical guidance for persons working with asbestos on how to manage risks associated with ACM at the workplace and thereby minimise the incidence of asbestos-related diseases such as mesothelioma, asbestosis and lung cancer.

2.1.1 What Is Required of a Person Working with Asbestos to Identify and Manage Asbestos Containing Materials

Drafting Guidance:

Consider what the core requirements your legislation requires you to place on a person working with asbestos (or the appropriate term that is defined in your legislation) and include this specific information here. The text below is provided as the minimum practice in the instance your legislation does not provide definitional guidance.

There are several duty holders (see Table 6) whom have a role in managing risks associated with removal of asbestos and ACM at the workplace. These include:

- persons conducting a business or undertaking (PCBU)
- designers, manufacturers, importers, suppliers and installers of plant, substances, or structures, and
- officers.

Workers and other persons at the workplace also have duties, such as the duty to take reasonable care for their own health and safety at the workplace. A person can have more than one duty, and more than one person can have the same duty at the same time.

Early consultation and identification of risks can allow for more options to eliminate or minimise risks and reduce the associated costs.

Table 6: Roles and responsibilities for duty of care for managing asbestos and ACM

Role	Responsibility
A Person Conducting a Business or Undertaking (PCBU)	A PCBU must eliminate risks arising from asbestos removal, or if that is not reasonably practicable, minimise the risks so far as is reasonably practicable. PCBUs are required to manage the risks of hazardous chemicals, airborne contaminants, and plant, as well as other hazards associated with asbestos. PCBUs have a duty to consult workers about work health and safety and may also have duties to consult, cooperate and coordinate with other duty holders. The PCBU must also ensure so far as is reasonably practicable that exposure of people at the workplace to airborne asbestos is eliminated. If this is not reasonably practicable, the exposure must be minimised so far as is reasonably practicable. The PCBU must also ensure the exposure standard for asbestos is not exceeded at the workplace.
Officers	Officers, for example company directors, have a duty to exercise due diligence to ensure that the business or undertaking complies with the WHS Act and WHS Regulation. This includes taking reasonable steps to ensure that the business or undertaking has and uses appropriate resources and processes to eliminate or minimise risks that arise from asbestos removal work carried out as part of the business or undertaking.
Workers	Workers have a duty to take reasonable care for their own health and safety and to not adversely affect the health and safety of other persons. Workers must comply with reasonable instructions, as far as they are reasonably able, and cooperate with reasonable health and safety policies or procedures that have been notified to workers.

Role	Responsibility
Other persons at the workplace	Other persons at the workplace, like visitors, must take reasonable care for their own health and safety and must take reasonable care not to adversely affect other people's health and safety. They must comply, so far as they are reasonably able, with reasonable instructions given by the PCBU to allow that person to comply with the WHS Act.
Consulting Workers	A PCBU must consult, so far as is reasonably practicable, with workers 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. This duty to consult is based on the recognition that worker input and participation improves decision-making about health and safety matters and assists in reducing work-related injuries and disease.

2.1.2 Information, Training, and Instruction

A PCBU must ensure that information, training, and instruction provided to a worker are suitable and adequate having regard to:

- the nature of the work carried out by the worker
- the nature of the risks associated with the work at the time of the information, training and instruction, and
- the control measures implemented.

The PCBU must ensure, so far as is reasonably practicable, that the information, training, and instruction are provided in a way that is readily understandable to whom it is provided.

Workers must be trained and have the appropriate skills to carry out a particular task safely. Training should be provided to workers by a competent person. Information, training, and instruction provided to workers who carry out asbestos removal should include the proper use, wearing, storage and maintenance of personal protective equipment (PPE).

A PCBU must ensure that workers who may be involved in asbestos removal work in the workplace, or the carrying out of asbestos-related work, are trained in the identification, safe handling and suitable control measures for asbestos and ACM.

The training provided should include the following topics:

- purpose of the training
- health risks of asbestos
- types, uses and likely presence of asbestos in the workplace
- workers roles and responsibilities under an asbestos management plan
- where the asbestos register is located, how it can be accessed and how to understand the information contained in it
- processes and safe work procedures to be followed to prevent exposure, including exposure from any accidental release of airborne asbestos
- where applicable, the correct use of PPE including respiratory protective equipment (RPE)
- the implementation of control measures and safe work methods to eliminate or minimise the risks associated with asbestos to limit the exposure to workers and other persons
- exposure standard and control levels for asbestos, and

- purpose of any exposure monitoring or health monitoring that may occur.

This training is more general than the training that a worker undertaking licensed asbestos removal work would receive. Workers who are undertaking licensed asbestos removal work are required to complete specific units of competency.

Records of all training must be kept while the worker is carrying out the work and for five years after the day the worker stops working for you. These records must also be available for inspection by the regulator.

2.1.3 License requirements for asbestos removal work

[Ministry to add details of License requirements]

A PCBU who commissions the removal of asbestos at the workplace must ensure asbestos removal work is carried out only by a licensed asbestos removalist who is licensed to carry out the work, unless a Regulation specifies that a license is not required.

2.1.4 Health Monitoring Duties

A PCBU must ensure health monitoring is provided to a worker if they are at risk of exposure to asbestos when carrying out:

- licensed asbestos removal work
- other ongoing (unlicensed) asbestos removal work, or
- asbestos-related work.

Examples of ongoing (unlicensed) asbestos removal work or asbestos-related work can include undertaking maintenance work on ACM regularly as part of another job (for instance electricians or building maintenance staff in older buildings).

Health monitoring includes a medical examination to provide an initial baseline medical assessment. Health monitoring must include the following, unless another form of health monitoring is recommended by a registered medical practitioner):

- consideration of the worker's demographic, medical and occupational history
- consideration of records of the worker's personal exposure, and
- a physical examination of the worker with emphasis on the respiratory system, including standardised respiratory function tests, unless another form of health monitoring is recommended by a registered medical practitioner.

A PCBU must inform workers of any health monitoring requirements before they carry out work that may expose them to asbestos.

2.1.4.1 When should health monitoring occur?

The need for health monitoring for workers at risk of exposure to asbestos should be determined based on:

- the potential for exposure
- the frequency of potential exposure
- the duration of the work being undertaken.

If a worker is carrying out licensed asbestos removal work, the health monitoring must be conducted prior to the worker commencing the work. Health monitoring should also be provided to the worker

at regular intervals (at least once every two years) after the worker commences asbestos-related work where there is a risk of exposure to asbestos.

2.1.4.2 Who can carry out health monitoring?

The PCBU must ensure health monitoring is carried out by or under the supervision of a registered medical practitioner with experience in health monitoring. Prior to deciding who the registered medical practitioner will be, the PCBU must consult the worker.

2.1.4.3 Who pays for health monitoring?

The PCBU must pay all expenses relating to health monitoring.

If two or more PCBUs have a duty to provide health monitoring to a worker, they may choose one PCBU to organise health monitoring (known as the PCBU who commissions the health monitoring). The costs must be shared equally between each PCBU unless they agree otherwise.

2.1.4.4 What information must be provided to the registered medical practitioner?

The PCBU who commissions health monitoring must provide the following information to the registered medical practitioner:

- their name and address
- the name and date of birth of the worker
- a description of the work the worker is, or will be, carrying out that has triggered the requirement for health monitoring, and
- whether the worker has started the work or, if the worker has commenced, carrying out the work, how long this has been for.

2.1.4.5 Health monitoring report

The PCBU who commissions health monitoring must take all reasonable steps to obtain a report from the registered medical practitioner as soon as practicable after the monitoring is carried out.

The health monitoring report must include the following information:

- the name and date of birth of the worker
- the name and registration number of the registered medical practitioner
- the name and address of the PCBU who commissioned the health monitoring
- the date of the health monitoring
- any advice that tests results indicate the worker may have contracted a disease, injury or illness because of carrying out the work that triggered the need for health monitoring
- any recommended remedial measures, including whether the worker can continue to carry out the work, and
- whether medical counselling is required for the worker in relation to the work that triggered the requirement for health monitoring.

The PCBU who commissioned health monitoring must also give a copy of the report, as soon as reasonably practicable after obtaining it from the medical practitioner, to:

- the worker
- the regulator, if the report contains:

- any advice that tests results indicate that the worker may have contracted a disease, injury or illness because of the work that triggered the need for health monitoring, and
- any recommended remedial measures, including whether the worker can continue to carry out the work
- all other PCBUs who have a duty to provide health monitoring for that worker.

A PCBU must ensure health monitoring reports are kept as a confidential record for at least 40 years after the record is made and identified as a formal record for the worker.

The report and results must not be disclosed to anyone unless the worker has provided their written consent. However, a PCBU can disclose a worker's health monitoring record to a person who must keep the record confidential under a duty of professional confidentiality without the worker's written consent.

2.2 Duties for licensed asbestos removal work

Licensed asbestos removal work can differ greatly depending on the type, quantity and condition of the asbestos or ACM being removed. There are several duties required to ensure licensed asbestos work is carried out safely and without releasing airborne asbestos and exposing workers and other people.

Specific duties for licensed asbestos removalists include:

- ensuring an asbestos removalist supervisor is readily available or present when the work is being carried out
- providing appropriate training and ensuring the asbestos removal worker has undertaken the relevant units of competency associated with the asbestos removal
- telling various parties about the asbestos removal and providing them with appropriate information
- obtaining the workplace's asbestos register
- preparing an asbestos removal control plan
- notifying the regulator about the work before it starts
- displaying signs and installing barricades in the asbestos work area
- limiting access to the asbestos work area
- ensuring appropriate decontamination facilities are in place, and
- ensuring waste containment and disposal procedures are in place.

Additional duties apply to several duty holders including the person conducting a business or undertaking (PCBU) who commissioned the asbestos removal work, and the person with management and control of the workplace. These duties include:

- informing various persons about the asbestos removal and providing them with appropriate information
- ensuring clearance inspections are conducted and clearance certificates are issued, and
- ensuring air monitoring is conducted, where appropriate.

Licensed asbestos removalists might also have these duties if asbestos removal work is carried out in residential premises.

2.2.1 Asbestos removalist supervisor to be present or readily available

Include this section only if Asbestos Removal Licences are included in your regulatory framework

Licensed asbestos removalist must ensure one or more asbestos removal supervisors are named in the licence to oversee asbestos removal work.

A PCBU must ensure the named asbestos supervisor(s) hold the appropriate certification to supervise the type of licensed asbestos removal work being carried out.

If the asbestos removal work requires a licence, a named asbestos removal supervisor must be present at the asbestos removal area whenever the work is being carried out.

2.2.2 Certification and training

Drafting Guidance:

If your country has set training requirements for People working with asbestos, then these should be detailed below.

The following information has been drawn from the NZ Approved Code of Practice and is provided as guidance only. Countries should not consider adopting these standards if they do not have the ability to implement and manage compliance of these standards.

To reduce the potential for workers being exposed to asbestos it is important for them to be trained on the safe procedures for working with asbestos. The greater the training and qualifications in managing or removal of ACM, the greater the likelihood that the management or removal will be done effectively. For larger-scale, friable asbestos removal works, it is more appropriate for removal work to be undertaken by specialised and approved asbestos removal contractors.

Figure 3 describes the competency requirements, given increasing complexity of the removal or management works, and increased training required.

Figure 3: Competency Requirements for Asbestos-Related Work and Unlicensed Asbestos Removal

(Source: WorkSafe New Zealand (2016)).

In general, the training must be suitable for the work to be undertaken considering:

- The nature of the work to be undertaken
- The risks associated with the work to be undertaken
- The control measures to be put in place.

All workers who are managing or removing ACM should have the following training:

- How to recognise materials that may contain asbestos
- How to handle and work with asbestos and ACM safely
- Suitable control measures for specific tasks when undertaking asbestos-related work to reduce risks.

Instruction prior to any work involving asbestos (management of the material or removal) should be provided to the all the workers on-site from a supervisor who is experienced or suitably trained / qualified. The training should also go over the asbestos removal / management control plan (Section 8.4) which outlines the work to be undertaken and the controls to be put place so everyone working on the project understands their responsibilities. Pre-project start up training should include:

- Properties and health effects of asbestos
- Products and materials that may contain asbestos
- Operations that could result in exposure to asbestos
- Preventive controls
- Safe work practices and controls
- PPE and RPE
- Emergency procedures
- Decontamination procedures
- Waste disposal
- Medical examination requirements.

To provide evidence of a person's experience in work involving asbestos, training and work records should be kept. The individual or the company who they work for should keep these records so they can be assessed for which jobs they are suitable. The training records can also be used to determine what role a person should undertake on a project, e.g., supervisor, site manager, removalist.

2.2.2.1 Certification

Include this section only if Asbestos Removal Licences are included in your regulatory framework

Licensed asbestos removalist you must not direct or allow a worker to carry out licensed asbestos removal work unless you are satisfied the worker holds certification for the licensed asbestos removal work, they will be carrying out.

Workers (including asbestos removal supervisors) who are carrying out licensed asbestos removal work are required to acquire certification by completing units of competency to show they have the relevant training to be able to remove (or supervise the removal of) asbestos. The units of competency completed by the person will determine what type of asbestos work they can carry out. Asbestos removal supervisors will have additional units of competency to complete.

Registered training organisations conduct training and education for the specific units of competency for asbestos removal work as well as asbestos removal supervisor certification.

2.2.2.2 Training

Include this section only if Asbestos Removal Licences are included in your regulatory framework

As a licensed asbestos removalist, you must provide 'appropriate training' to a worker carrying out licensed asbestos removal work at the workplace to ensure the work is carried out in accordance with the specific asbestos removal control plan for that workplace.

This is additional training to the general training that is provided on the identification, safe handling, and appropriate controls for asbestos.

This is a requirement for each specific workplace. As a licensed asbestos removalist, you should provide this training before the commencement of each asbestos removal job. The training should include:

- the nature of the hazards and risks
- how asbestos can affect a person's health
- the risks arising from exposure to airborne asbestos
- the control measures in place and maintenance of the asbestos removal control plan for that job
- the methods and equipment that will be used to do the job properly
- choosing, using and caring for PPE and RPE
- decontamination procedures
- waste disposal procedures
- emergency procedures, and
- any other legal requirements (for example contaminated sites).

Additional training may be required if the worker is required to hold other licences for the task, for example a demolition licence.

2.2.3 Informing parties of the licensed asbestos removal

Drafting Guidance:

If your legislative framework does not include licensed asbestos removal, please consider the value of including the following issue, but removing reference to the "license".

The person with management or control of the workplace must be informed about the work and the date it is to commence before any licensed asbestos removal work is carried out.

Before commencing the asbestos removal work at residential premises, you must, so far as is reasonably practicable, tell the following people about the asbestos removal work and when it will commence:

- the person who commissioned the asbestos removal work
- other PCBUs at the workplace
- the occupier of the residential premises
- the owner of the residential premises, and

- anyone occupying premises in the immediate vicinity of the workplace.

The person with management or control of the workplace must then ensure the following people are told that the asbestos removal work is to be carried out and when the work is to commence:

- their workers and any other people at the workplace, and
- the person who commissioned the asbestos removal work.

The person with management or control of the workplace must also take all reasonable steps to ensure the following people are told that the asbestos removal work is to be carried out and when the work is to commence:

- any other PCBUs at or in the vicinity of the workplace, and
- anyone occupying premises in the immediate vicinity of the workplace.

2.2.3.1 Providing information to persons that may carry out licensed asbestos work

Drafting Guidance:

If your legislative framework does not include licensed asbestos removal, please consider the value of including the following issue, but removing reference to the "license".

A licensed asbestos removalist must provide the following information to a person who is likely to be engaged to carry out the work:

- the health risks and health effects associated with exposure to asbestos, and
- the need for and details of health monitoring of a worker carrying out licensed asbestos removal work.

2.2.4 Preparing an asbestos removal control plan

Drafting Guidance:

If your legislative framework does not include licensed asbestos removal, please consider the value of including Section 2.2.4, but removing reference to the "license".

A licensed asbestos removalist must prepare an asbestos removal control plan for any licensed asbestos removal work.

2.2.4.1 Purpose of an asbestos removal control plan

An asbestos removal control plan is a document that identifies the specific control measures used to ensure workers and other people are not at risk when asbestos removal work is being conducted. It is focused on the specific control measures necessary to minimise any risk from exposure to asbestos.

An asbestos removal control plan helps ensure the asbestos removal is well planned and carried out in a safe manner. An asbestos removal control plan is only required to be prepared for licensed asbestos removal work.

2.2.4.2 Scope and detail of an asbestos removal control plan

The asbestos removal control plan must include details of:

- how the asbestos removal will be carried out, including the method, tools, equipment, and PPE to be used, and
- the asbestos to be removed, including the location, type and condition of the asbestos.

Specifications or drawings relevant to the asbestos removal work should be attached to the asbestos removal control plan to provide additional information about the asbestos.

Appendix B provides further details of what can be in a comprehensive asbestos removal control plan.

2.2.4.3 Preparing the asbestos removal control plan

An asbestos removal control plan must, so far as is reasonably practicable, consult with the person who commissioned the work, the person with management or control of the workplace (if not the same person) and workers and/or their health and safety representatives.

If carrying out licensed asbestos removal work at residential premises, you must, so far as is reasonably practicable consult with the PCBU who commissioned the removal work. You should also consult with the owner or the occupier (if not the same person).

2.2.4.4 Access to the asbestos removal control plan

Once prepared, the asbestos removal control plan, must be:

- given to the person who commissioned the licensed asbestos removal work
- kept at the workplace until the completion of the asbestos removal work, and
- readily accessible on-site for the duration of the licensed asbestos removal work to:
    a. PCBUs at the workplace
    b. workers or their health and safety representatives, and
    c. the occupants of the premises (if the work is carried out in residential premises).

The asbestos removal control plan must also be made available for inspection by the regulator.

If a notifiable incident occurs in connection with the asbestos removal work to which the asbestos removal control plan relates, the licensed asbestos removalist must keep the plan for at least two years after the incident occurs.

2.2.5 Notifying the regulator of the licensed asbestos removal work

Drafting Guidance:

If your legislative framework does not include licensed asbestos removal, please consider the value of including Section 2.2.5, but removing reference to the "license".

A licensed asbestos removalist must notify the regulator in writing at least five days before the licensed asbestos removal work commences.

The following information must be included in your notification:

- name, registered business name, licence number and business contact details
- name and business contact details of the supervisor who will oversee the removal work
- name of the licensed asbestos assessor or competent person engaged to carry out a clearance inspection and to issue a clearance certificate for the work
- client name and contact details
- name, including registered business or corporate name, of the person with management or control of the workplace
- address of the workplace, including the specific location if it is a large workplace
- kind of workplace where the removal work will be performed (for example an office building or construction site)
- date of notification

- the start date of the removal work and an estimation of how long it will take
- whether the asbestos to be removed is friable or non-friable
- if the asbestos is friable, the way the removal area will be enclosed
- estimated quantity of asbestos to be removed
- number of workers who will perform the removal work, and
- details of each worker's competency to carry out removal work.

The notification may also include information on:

- the type of work that is carried out at the workplace, and
- the type of asbestos or ACM that are being removed (for example, asbestos cement (AC) sheeting, vinyl tiles, lagging, gaskets).

It may not be possible to provide five days' notice, and removal work may commence immediately in the following limited circumstances:

- a sudden and unexpected event, including a failure of equipment, that may cause persons to be exposed to respirable asbestos fibres, for example a burst pipe that was lagged with asbestos or a forklift crashing into an asbestos cement sheet wall, or
- an unexpected breakdown of an essential service that requires immediate rectification to enable the service to continue, for example gas, water, sewerage or telecommunications services.

If this is the case, the licensed asbestos removalist must notify the regulator:

- immediately by telephone, and
- in writing no more than 24 hours after providing notice by telephone.

2.2.6 Limiting access, displaying signs, and installing barricades

Drafting Guidance:

If your legislative framework does not include licensed asbestos removal, please consider the value of including Section 2.2.6, but removing reference to the "license".

A licensed asbestos removalist must ensure signs indicate where the asbestos removal work is being carried out and that barricades are erected to delineate the asbestos area. This will assist in limiting access to the asbestos removal work area.

If the PCBU who commissions the licensed asbestos removal work and the person with management or control of the workplace (if not the same person) are aware that licensed asbestos removal work is being carried out, they must ensure, so far as is reasonably practicable, that access to the removal area is limited to the following people:

- workers who are engaged in the removal work
- other people who are associated with the removal work, and
- people who are allowed to be in the asbestos removal area (for example inspectors, emergency service workers).

A PCBU may refuse to allow access to any of these people if they do not comply with a control measure implemented for the workplace in relation to asbestos, or a direction of the licensed asbestos removalist.

A combination of using signs and barricades may be necessary to limit access to the asbestos removal area, for example installing a fence and signs may be used as a method to inform people where the asbestos removal area is and to limit access. Using locking access doors may be appropriate as long it does not create an evacuation hazard.

All people who have access to the removal area must comply with any direction given by the licensed asbestos removalist.

2.2.7 Decontamination

A licensed asbestos removalist must ensure decontamination facilities are available to decontaminate the asbestos removal work area, any plant used in that area, workers carrying out the asbestos removal work, and other persons who have access to the asbestos removal area because they are associated with the asbestos removal work.

You must ensure items removed from the asbestos work area which are likely to be contaminated are:

- decontaminated before they are removed, or
- they are sealed in containers and the exterior of the containers are:
    - decontaminated, and
    - labelled in accordance with the Globally Harmonized System of Classification and Labelling of Chemicals, 7th revised edition (GHS) to indicate the presence of asbestos.

2.2.8 Waste containment and disposal

A licensed asbestos removalist must ensure that asbestos waste is contained and labelled in accordance with the GHS before it is removed from the asbestos removal area. ACM must be disposed of at a site authorised to accept asbestos waste, as soon as is practicable.

Examples of labels are provided in Section 7.1.4 of this Code

2.2.8.1 PPE

Disposable PPE that has been used in the asbestos work area and is contaminated with asbestos must be sealed and labelled in a container before being removed from the asbestos waste area and disposed of upon completion of the asbestos removal work.

- In some cases, it may not be reasonably practicable to dispose of PPE clothing. In this case, the PPE must be laundered at a laundry that is equipped to launder asbestos-contaminated clothing. If this is not practicable, you must ensure the clothing is kept in a sealed and labelled container until it is reused for asbestos removal purposes.
- It may also not be reasonably practicable to dispose of other PPE. If this is the case, the PPE must be decontaminated prior to it being removed from the asbestos removal area. If the PPE cannot be decontaminated in the asbestos removal area, it must be kept in a sealed and labelled container until it is reused for asbestos removal purposes.
- Where a sealed container has been used, it must be decontaminated and labelled in accordance with the GHS prior to it being removed from the asbestos removal area to indicate that it contains asbestos.

Section 4.2.5 of this Code provides guidance on the type of PPE that should be used.

2.2.9 Clearance inspection

Drafting Guidance:

If your legislative framework does not include licensed asbestos removal, please consider the value of including Section 2.2.9, but removing reference to the "license".

A PCBU who commissions licensed asbestos removal work at a workplace must ensure that once the licensed asbestos removal work has been completed:

- a clearance inspection is carried out, and
- a clearance certificate in writing is issued before the workplace can be re-occupied.

A licensed asbestos removalist must ensure this is done if the licensed asbestos removal work is carried out at residential premises.

Clearance inspections must be carried out and clearance certificates issued by **an independent licensed asbestos assessor or Regulator**, for work that must be carried out by a licensed asbestos removalist.

To be independent, the licensed asbestos assessor or competent person must:

- not be involved in the removal of asbestos for that specific job, and
- not be involved in a business or undertaking involved in the removal of the asbestos for that specific job.

In some cases, it may not be reasonably practicable for the licensed asbestos assessor to be independent from the person who carried out the asbestos removal work. If this is the case, the PCBU commissioning the asbestos removal work can seek the regulator to undertake the inspection.

The independent licensed assessor or competent person must not issue a clearance certificate unless they are satisfied that the asbestos removal area and the area immediately surrounding it are free from visible asbestos contamination. To do this, they must conduct a visual inspection for evidence of dust and debris. If air monitoring was conducted, the results of that test must show that any identified respirable asbestos fibre levels are below 0.01 fibres/ml.

If a clearance certificate has not been obtained, the asbestos removal area must not be re-occupied for normal use or other work activities. A clearance certificate must be issued before the area can be re-occupied for demolition or other work.

Unauthorised people cannot enter the asbestos removal work area prior to a clearance certificate being issued and any protective barricades should remain in place until the completion of all licensed asbestos removal work and the final clearance certificate is issued.

Appendix C provides an example of a clearance certificate.

PART III
AIR MONITORING WHEN WORKING WITH ASBESTOS

3. AIR MONITORING WHEN WORKING WITH ASBESTOS

Drafting Guidance:

Air monitoring may not currently be included in your legislative framework, but it is strongly recommended to consider its inclusion as the only way to ensure management of exposure of asbestos fibres is to monitor for the fibres.
The information provided in this Section is drawn from the New Zealand Approved Code of Practice and may be considered relevant within Pacific Island Countries.

Air monitoring is undertaken to assist in monitoring the effectiveness of control measures for preventing exposure to airborne asbestos fibres and in determining worker exposure to airborne asbestos fibres. Personal exposure limits for airborne fibres in workplace atmospheres have been established in many countries. These limits are expressed in terms of fibre number concentrations, i.e. the number of fibres in one millilitre (ml) of air.

3.1 Air Monitoring

An air monitoring sample can be taken as a personal sample (exposure monitoring) or as a static sample (also known as area or control monitoring). The typical air monitoring process includes a sample being collected by drawing a measured quantity of air through a membrane filter by means of a sampling pump.

- The filter is later transformed from an opaque membrane into a transparent, optically homogeneous specimen using acetone and glycerol triacetate (triacetin).
- The respirable fibres are then sized and counted in accordance with defined geometric criteria, using a phase contrast microscope (PCM) and calibrated eyepiece graticule.
- The result is expressed as fibres per millilitre (f/ml) of air, calculated from the number of fibres observed on a known area of the filter and the volume of air sampled.

3.1.1 Air Monitoring Standards

The airborne contamination standard for asbestos is an average concentration over any eight-hour period of 0.1 respirable asbestos f/ml

Where work is deemed to be sporadic and low intensity, the control limit for this type of trained work is 0.6 asbestos fibres per cubic centimetre of air (0.6 f/cm^3, equivalent to 0.6 f/ml), measured over a ten-minute period. Any work which is likely to result in exposures at or above this level cannot be sporadic and of low intensity.

The control limit is not a 'safe' level and work activities involving asbestos should be designed to be as far below the control limit as possible.

3.1.2 Air Monitor Sampling and Fibre Counting

Sampling Requirements are:

- Gridded membrane filter (mixed esters of cellulose or cellulose nitrate) with a 0.8-□m pore size and ideally a diameter of 25 mm
- Use of a non-conductive protective filter holder
- Portable battery powered sample pumps, capable of maintaining the required flowrate within ± 10% for the entire sample duration
- Flow rate of 0.4 to 8 litres / minute, such that a sample volume of 500 litres ± 20% is collected
- Sample time of 90 minutes (minimum) to preferably whole of an 8-hour work shift
- Enough samples to enable an assessment of the effectiveness of dust control measures.

The flow rate should be checked on loaded filter holders before and after each sampling period. If the difference is > 10%, the sample must be rejected. Calibration using a secondary flow meter (rotameter) is satisfactory (accuracy to ± 3%).

The membrane filter method is the most common method used to determine fibre concentration for comparison with exposure limits. Well established, documented methods include WHO 1997, NOHSC:3003 2005 and HSG248 2005.

Fibre counting using phase contrast microscopy (PCM) is widely used due to the fast turnaround of results after sampling and portability of equipment. Additionally, the mounted filter is undamaged by the analysis and can be recounted if required.

The basis of the method is that all objects noted during the microscopical examination of the filter that conform to certain size criteria are counted and assumed to be asbestos. Fibre counting using PCM cannot positively identify individual fibres as asbestos (or not). A countable fibre is defined as any object that is longer than 5 µm, less than 100 µm, with an average width less than 3 µm and having an aspect (length / width) ratio greater than 3:1.

Drafting Guidance:

At present, it is not possible to estimate the overall accuracy of the membrane filter method, which is to determine the exact fibre concentration of a given dust cloud. The difficulty arises from a range of systematic and random errors encountered during airborne monitoring and counting procedures. The errors can be minimised by strict adherence to the method and by participating in intra- and inter-laboratory quality assurance schemes.

The results ultimately determined will be greatly influenced by uncertainty in two areas:

- The uncertainty as to what is happening in the workplace
- The uncertainty surrounding the method of sampling and counting.

The sources of systematic errors are:

- Sampling (e.g., flow rate, sampling time, contamination of the filter)
- Analytical (e.g., miscalculation of the effective filter area, filter mounting and poorly set-up microscope).

The sources of random errors are:

- Sampling (e.g., fluctuations in any given dust cloud, flowrate variability)
- Analytical (e.g., random distribution of the fibres on the filter)
- Poisson error (the minimum inherent error of the method).

The estimates of error only provide for the uncertainties related to the sampling and counting and not to the workplace variability.

3.1.3 Air Control Monitoring

Drafting Guidance:

If your legislative framework does not include licensed asbestos removal, please consider the value of including Section 3.1.3, but removing reference to the "license".

Air monitoring involves collecting air samples to assist in assessing the levels of airborne asbestos fibres present in either:

- the **asbestos removal area** to assess the effectiveness of controls (control monitoring), or
- the **worker's breathing zone** to assess exposures to asbestos (exposure monitoring).

Air monitoring must be conducted in accordance with the *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres, 2nd Edition [NOHSC: 3003 (2005)]* (the membrane filter method).

Control monitoring requirements will vary depending on the type of asbestos being removed, the location and position of the asbestos, if an enclosure is used and whether the asbestos removal work is within a building or outside.

- **Friable asbestos removal**—control monitoring is mandatory for all friable asbestos removal. This includes prior to dismantling an enclosure and for the purposes of the clearance inspection.
- **Public location**—Air monitoring should be considered where the asbestos removal work is being undertaken in or next to a public location.

Air monitoring may be required when:

- it is not clear whether new or existing control measures are effective
- there is evidence (for example, dust deposits are outside the enclosure) the control measures have deteriorated because of poor maintenance
- modifications or changes in safe work methods have occurred that may adversely affect worker exposure, or
- there has been an uncontrolled disturbance of asbestos at the workplace.

Control monitoring must be conducted immediately before and during removal of friable asbestos. However, the glove bag removal technique is used, monitoring is not required immediately work commences. Control monitoring must be carried out within the enclosure used for removing friable asbestos before it can be dismantled, as well as outside the enclosure prior to, during and after the removal.

Control monitoring may be carried out before and during any asbestos removal work to ensure that controls being used to eliminate or minimise exposure to airborne asbestos are effective. Control monitoring results cannot be compared to the exposure standard for asbestos. Where there are concerns about possible worker exposure, exposure monitoring should be undertaken to ensure this risk is managed.

A PCBU who commissions licensed asbestos removal work must ensure that an independent licensed asbestos assessor undertakes air monitoring of the asbestos removal area at the workplace. If the workplace is residential premises, the licensed removalist must ensure that an independent licensed asbestos assessor undertakes air monitoring of the asbestos removal area of the premises. The independent licensed asbestos assessor must use the membrane filter method.

In relation to asbestos air monitoring for **Friable asbestos removal**, an independent licensed asbestos assessor must be engaged to carry out air monitoring when it is required.

Where control monitoring is otherwise required, for instance following an uncontrolled disturbance or release of asbestos at the workplace, an independent licensed asbestos assessor or competent person may carry it out. However, if the release involves friable asbestos, only an independent licensed asbestos assessor can carry out the air monitoring.

3.1.3.1 Results of the air (control) monitoring

A licensed asbestos removalist must act depending on the respirable fibre levels reported in control monitoring results. Where the results show that respirable asbestos fibre levels exceed the action levels outlined in Table 7, regardless of whether removal has commenced, action must be taken immediately.

Table 7: Air monitoring action levels

Action level	Control	Action
Less than 0.01 fibres/ml	No new control measures are necessary	Continue with control measures.
At 0.01 fibres/ml or more than 0.01 fibres/ml but less than or equal to 0.02 fibres/ml	1. Review	Review control measures.
	2. Investigate	Investigate the cause.
	3. Implement	Implement controls to eliminate or minimise exposure and prevent further release.
More than 0.02 fibres/ml	1. Stop removal work	Stop removal work.
	2. Notify regulator	Notify the relevant regulator by phone followed by a written statement that work has ceased and the results of the air monitoring.
	3. Investigate the cause	For example, conduct a thorough visual inspection of the enclosure (if used) and associated equipment in consultation with all workers involved with the removal work.
	4. Implement controls to eliminate or minimise exposure and prevent further release	For example, extend the isolated/barricaded area around the removal area/enclosure as far as reasonably practicable until fibre levels are at or below 0.01 fibres/ml, wet wipe and vacuum the surrounding area, seal any identified leaks (e.g. with expandable foam or adhesive (cloth or duct) tape) and smoke test the enclosure until it is satisfactorily sealed.
	5. Do not recommence removal work until further air monitoring is conducted	Do not recommence until fibre levels are at or below 0.01 fibres/ml.

Any information that is gathered from these actions can be referred to during future asbestos removal jobs (where applicable).

3.1.3.2 Communicating the results of the (air) control monitoring

The PCBU who commissions licensed asbestos removal work at the workplace must ensure the results of the control monitoring are given to the following people:

- workers at the workplace
- health and safety representatives for the workplace
- PCBUs at the workplace, and
- other people at the workplace.

The PCBU who commissions licensed asbestos removal work must ensure that the results of control monitoring are readily accessible to the workers and other persons who were in the work area during the time.

If the workplace is residential premises, you must ensure the results are given to the following people:

- the person who commissioned the work
- workers at the workplace
- health and safety representatives for the workplace
- PCBUs at the workplace
- the occupier of the residential premises
- the owner of the residential premises, and
- other people at the workplace.

PART IV
CONTROL MEASURES WHEN WORKING WITH ASBESTOS

4. CONTROL MEASURES WHEN WORKING WITH ASBESTOS

Exposure to asbestos fibres can be prevented by using engineering controls, work practice controls, and personal protective equipment. Engineering controls include isolating the exposure source or using other engineering methods, such as ventilation, to minimize exposure to asbestos are discussed below.

4.1 Controls applicable to all types of asbestos removal

4.1.1 Identifying hazards

A person conducting a business or undertaking (PCBU) and undertaking asbestos removal work must consider not only the direct hazards that are associated with that work but also those hazards related to the work activity and the work environment (for example demolition or construction). A listing of those hazards and management controls to minimize their impact are annotated in Table 8 below.

Table 8: Management Controls for General Work Hazards

Hazard	Management Controls
Confined Space	The removal of asbestos from a confined space should only occur where it is not possible to avoid working in that the confined space. A safe system of work should be developed for inclusion in the asbestos management plan or asbestos removal control plan. Friable asbestos removal requires the use of enclosures that are designed to eliminate or minimise the release of airborne asbestos spreading from the asbestos removal work area. Depending on the conditions inside the enclosure, an asbestos enclosure may also become a confined space.
Falls	Do not undertake work at heights if the task can be performed on the ground. Where working at heights is required, ensure appropriate controls, harnesses and safety systems are utilised to protect workers, and reduce asbestos exposure.
Heat Stress	Heat-related hazards can be created from working in enclosures or confined spaces or using PPE. Consider factors that can lead to heat stress, including temperature,

	humidity, air movement, exposure to a heat source, work activities and demands, how long the PPE must be worn, and individual physical factors. Control measures to help prevent heat stress include: • selecting appropriate PPE to reduce the build-up of heat • providing an adequate number of extraction units in enclosures • wearing cool cotton underclothing • scheduling appropriate work breaks • job rotation • making cool drinks readily available outside the vicinity of the asbestos removal work zone and decontamination zone • providing a cool, shaded rest area, and • educating workers about heat stress risks and controls.
Electrical Equipment	When undertaking asbestos removal work, you must control the risks to health and safety associated with electrical risks. Control measures include: • De-energising and removing electrical equipment from the asbestos removal work area. If the electrical equipment cannot be disconnected and removed, it must be de-energised. You must ensure the de-energised equipment is secured so it cannot be inadvertently re-energised. • Labelling any electrical cabling or equipment remaining in the asbestos removal area and protecting it from mechanical damage or the ingress of water. • Ensuring a licensed electrician safely removes and reinstalls electrical cables and equipment. • Where it is required, ensuring only a person able to do the following tasks is engaged to do that work: a. prior to asbestos removal work, remove and isolate the circuits and heads for electrical equipment, such as fire detectors, smoke detectors and thermal detectors b. replace, reactivate and test the system, prepare a certificate stating that the heads are operational and forward the certificate to you. All portable electrical tools and equipment, including flexible leads and any electrical installations used by workers during asbestos removal, should comply with any appropriate regulations

4.1.2 Indicating the asbestos removal areas

Signs and barricades must be used to clearly indicate the area where asbestos removal work is being performed. Signs must be placed in positions that indicate to people where the asbestos removal work area is and should remain in place until removal is completed, and a clearance certificate has been issued.

Responsibilities for the security and safety of the asbestos removal site and removal work area should be specified in the asbestos removal control plan.

4.1.2.1 Warning signs

Warning signs must be placed to inform all people nearby that asbestos removal work is taking place in the area. Signs should be placed at all the main entry points to the asbestos removal work area where asbestos is present.

These signs should be weatherproof, constructed of lightweight material and adequately secured so they remain in prominent locations (see Figure 4)

Figure 4: An example of an asbestos removal area sign

4.1.2.2 Barricades

Barricades assist with traffic control and prevent access to the asbestos removal work area. The purpose of barricades is to delineate and isolate the asbestos removal area. Barricades can take various forms, from high visibility PVC (polyvinylchloride) barrier tape to solid hoarding. The type of barricading should reflect the level of risk. For friable asbestos removal work, solid barricades should be used. PVC barrier tape may be appropriate for non-friable asbestos removal work of short duration.

The location of barricades will depend on the physical environment and the level of risk. An assessment of the asbestos removal work site should determine the appropriate placement of barricades.

For example, a non-friable asbestos cement removal job where the asbestos cement is in good condition may use a wall located three metres from the asbestos removal area as the barrier. A friable sprayed asbestos removal job being performed dry due to electrical restrictions may require a barricade 15 metres from the asbestos removal area.

the following should be considered in determining the distance between barriers and the asbestos removal area:

- whether the asbestos is friable or non-friable
- activity around the asbestos removal area (for example other workers, visitors, neighbours, the public) to determine the risk of other people being exposed
- the method of asbestos removal
- any existing barriers (walls, doors)
- the quantity of asbestos to be removed, and
- the type of barrier used (for example hoarding or PVC tape).

4.2 Asbestos Removal

There are a few techniques available to remove asbestos, the technique used should be chosen to ensure the elimination or minimisation of generation of asbestos fibres so far as is reasonably practicable. The method chosen, should be the one that is most effective at minimising fibre release at the source.

4.2.1 Removing Friable Asbestos

A licensed asbestos removalist removing friable asbestos must ensure, so far as is reasonably practicable:

- the asbestos removal area is enclosed to prevent the release of respirable asbestos fibres
- negative pressure is used, provided the enclosure being used has been tested for leaks
- the wet method of asbestos removal is used
- the asbestos removal work does not commence until the air monitoring is started by an independent licensed asbestos assessor, provided the enclosure has been tested for leaks
- air monitoring is undertaken during the asbestos removal work at times decided by the independent licensed assessor undertaking the monitoring, and
- any glove bag used to enclose the asbestos removal area is dismantled and disposed of safely.

However, if the glove bag method is used, you are not required to conduct air monitoring prior to the work commencing or to use negative pressure during the asbestos removal work. In this instance, the enclosure must not be dismantled until air monitoring results are received from:

- **if the friable asbestos is removed from a residential premises**—the independent licensed asbestos assessor who undertook the air monitoring, and
- **in any other case**—the person who commissioned the asbestos removal work.

The results must show that the respirable asbestos fibre level is below 0.01 fibres/ml.

So far as is reasonably practicable, the enclosure must be decontaminated prior to dismantling it to minimise the release of respirable asbestos fibres. The PCBU who commissions the removal of the friable asbestos at the workplace must obtain a clearance certificate from the licensed asbestos assessor after the enclosure has been dismantled.

Removal methods are listed in preferred order:

- **Wet spray method**—asbestos fibres are significantly suppressed; however, they are not eliminated so the use of RPE is as essential.
- **Saturation and water injection method**—used during friable asbestos removal.
- **Dry method**—can only be used if the wet spray method is not suitable, for example if there are live electrical conductors or if equipment could be permanently damaged or made dangerous by contact with water.

4.2.1.1 Wet spray method

The wet spray method is the preferred asbestos removal method and should be used for the removal of asbestos from structures and plant (see Figure 5). The wet spray method requires the use of a constant low-pressure water supply for wetting down asbestos and related items to suppress asbestos fibres—i.e. water should be in the form of a fine spray or mist. This can be achieved with a mains-supplied garden hose fitted with a pistol grip. If no water supply is readily available, a portable pressurised vessel (for example, a pump-up garden sprayer) may be used.

The design of the spraying equipment will depend on the availability of a water supply and access to the area to be sprayed.

When using the wet spray method, apply a fine water spray to the asbestos in a manner that ensures the entire surface of the asbestos is saturated and the run-off is minimised. Ensure asbestos is maintained in a wet condition throughout the removal.

A wetting agent (surfactant), for example detergent, may be added to the water to facilitate more rapid wetting of the asbestos. For very small areas, a small spray water bottle may be sufficient. In all cases, the use of water should be in the form of a mist to minimise the potential to generate respirable dust.

The asbestos should be wetted through to its full depth and the water spray should be directed at the site of any cuts that are made. The wetted material should be removed as the cut is progressed.

Immediately after the asbestos is removed from its fixed or installed position, spray should be directed on sides previously not exposed.

The wet friable asbestos removed in sections should immediately be placed in suitably labelled asbestos waste containers and properly sealed with adhesive tape (cloth tape is generally more durable and suitable than duct tape) along with any small sections dislodged as the asbestos is cut.

Wherever reasonably practicable, a high efficiency particulate air (HEPA) filtered H-class industrial vacuum cleaner should be used in conjunction with the wet spray method. The vacuum cleaner should be used prior to spraying asbestos with water and for the collection of any dust spread over a large area.

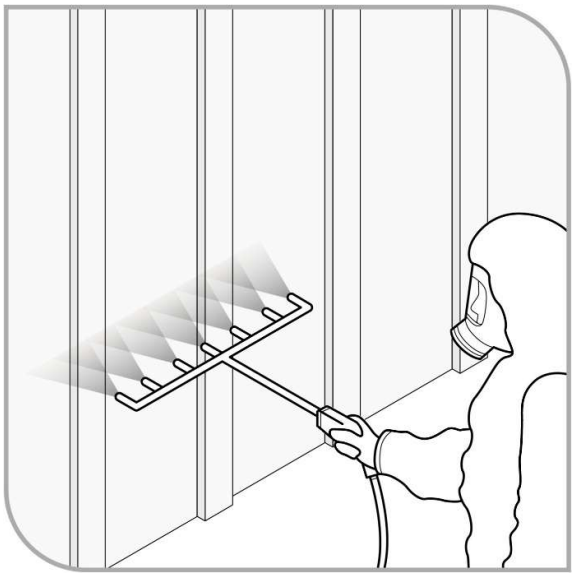

Figure 5: Person using the wet spray method on asbestos

Airborne asbestos fibres are significantly suppressed when the wet spray method is used; however, they are not eliminated, so effective PPE including RPE is also essential.

Consideration should be given to applying a polyvinyl acetate (PVA) emulsion as it may be more effective than water, with or without a wetting agent, in minimising fibre release. Water alone may not be sufficient. For example, PVA can be applied and allowed to dry on AC roofing prior to its removal as an alternative method to prevent slip hazards.

4.2.1.2 Saturation and water injection method

If the asbestos is so thick that the spray method will not suppress the release of asbestos significantly during removal work, you should soak the asbestos until total saturation is achieved. This method involves injecting water or a water-based solution directly into friable asbestos (see Figure 6). You will need to undertake specific training to use the process and the required equipment.

The asbestos is soaked by the introduction of water or other wetting agents through an appropriate applicator that consists of an injection head with numerous side holes or outlets through which the water or wetting agent is fed to the asbestos.

To facilitate more rapid wetting of the asbestos, holes or cuts should be made in the outer covering to enable the water or wetting agent to be injected in a manner that ensures the asbestos is saturated but not washed out—i.e. it is not carried away by run-off.

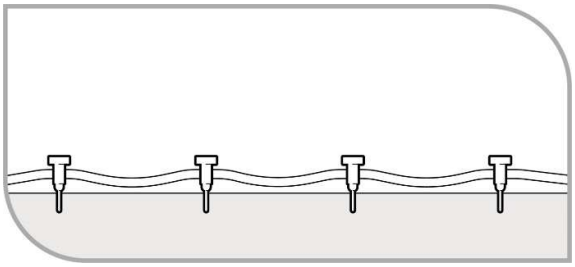

Figure 6: Saturating asbestos using the water injection method

The soaking should be done before removal. The quantity of water or wetting agent and the time to soak will depend on the thickness of the asbestos, access to the asbestos and location of the holes.

The saturated asbestos should then be removed in sections, placed in a properly labelled container, sealed, and disposed of as described in Section 7.

Dry method

The dry method is not preferred as there is a much greater potential for airborne asbestos fibres to be generated. Only use the dry removal method if the wet spray or soaking methods are not suitable, for example if there are live electrical conductors or if major electrical equipment could be permanently damaged or made dangerous by contact with water.

If the dry removal method is used, the following controls should be employed:

- **Non-friable removal**—Enclose the asbestos removal work area as far as is reasonably practicable.
- **Friable removal**—Fully enclose the asbestos removal work area with heavy duty polyethylene, (also known as polythene) sheeting (minimum 200 µm thickness) and maintain at a negative pressure [at least 12 Pa (water gauge)]. Ensure all workers involved in the removal operation wear full-face positive-pressure supplied air-line respirators.
- **Friable and non-friable removal**—The asbestos should be removed in small, pre-cut sections with minimal disturbance to minimise the generation of airborne asbestos fibres as much as possible. Wherever reasonably practicable, a HEPA filtered H-Class industrial vacuum cleaner should be used.
- **All waste** material should be immediately placed in appropriate wet containers which are wetted to suppress creation of dust and airborne fibres.

4.2.2 Tools and equipment

When removing asbestos, specific tools and equipment are prohibited from use as they can generate dust and liberate asbestos fibres into the air. Prohibitions, and the proper use and decontamination guidance for tools and equipment is set out below.

Prohibited tools and equipment

A PCBU or their workers must not use **high-pressure water sprays** or **compressed air** on asbestos or ACM, unless for firefighting or fire protection purposes.

Other tools and equipment that generate dust such as **high-speed abrasive power and pneumatic tools** (e.g. angle grinders, sanders, saws, and high-speed drills) and brooms and brushes (unless brushes are used for sealing) must also not be used on asbestos, unless the use of the equipment is controlled. This means the equipment is enclosed when used, or the equipment is designed or used in a way that captures or suppresses airborne asbestos fibres.

Use of tools and equipment

Tools and equipment that you can use during asbestos removal work include HEPA filtered H-Class industrial vacuum cleaners and manually operated hand tools and equipment that have been designed to capture or suppress respirable dust or are used in a way that is designed to capture or suppress respirable dust.

Tools and equipment that cause the release of asbestos, including power tools and brooms, must only be used on asbestos or ACM if the equipment is enclosed and/or designed to capture or suppress asbestos fibres and/or the equipment is used in a way that is designed to capture or suppress asbestos fibres safely, for example:

- enclosing the tool or instrument
- using engineering controls such as extraction ventilation, and
- using the tools and instruments within an enclosed removal area (for example full enclosure or small enclosure).

Controls are assumed to be effective if exposure monitoring results are less than 0.05fibres/ml or control monitoring results are less than 0.01fibres/ml. Should test results show that either of these values have been exceeded, you must cease the asbestos removal work and review and, if necessary, improve control measures to ensure the levels of airborne asbestos do not exceed these levels.

In addition to any equipment required to complete a particular task, the following equipment may be required on site before the work begins:

- disposable cleaning rags
- bucket of water and/or a misting spray bottle
- sealant
- suitable asbestos waste container, and
- warning signs and/or PVC barrier tape.

Inspection and maintenance of equipment

After the asbestos removal work is completed, tools must be decontaminated. All equipment used for the removal of asbestos should be inspected before the commencement of the asbestos removal work, after any repairs and at least once every seven days when it is continually being used. A register with the details of these inspections, the state of the equipment and any repair details should be maintained.

At the completion of the asbestos removal work, the tools and equipment must be decontaminated, placed in sealed, labelled containers and if necessary, disposed of as asbestos waste.

4.2.3 HEPA Filtered H-Class Industrial Vacuum Cleaners

Include this section only if you have access to and will mandate the use of HEPA filtered H-Class Vacuum Cleaners

Best practices and procedures for using and maintaining industrial vacuum cleaners for use during asbestos abatement actions:

- HEPA filtered H-Class industrial vacuum cleaners should not be used on wet materials or surfaces. Attachments with brushes should not be used as they are difficult to decontaminate.
- Filters for these vacuum cleaners should conform to the requirements of AS 4260–1997: High efficiency particulate air (HEPA) filters – Classification, construction, and performance or its equivalent.
- Household vacuum cleaners should never be used where asbestos is or may be present, even if they have a HEPA filter.
- Asbestos vacuum cleaners can only be used for collecting small pieces of asbestos dust and debris. Larger pieces should be picked up and placed in suitable waste containers and should never be broken into smaller sizes for vacuuming.
- The asbestos vacuum cleaner and attachments must be decontaminated before they are removed from the asbestos removal area.
- Ensure that procedures are established for the general maintenance, including emptying, of asbestos vacuum cleaners in a controlled environment.
- Vacuum cleaners should be cleaned externally with a wet cloth after each task, the hose and attachments should be stored in a labelled impervious bag, and a cap should be placed over the opening to the asbestos vacuum cleaner when the attachments are removed.
- PPE should be worn whenever an asbestos vacuum cleaner is opened to change the bag or filter or to perform other maintenance.

- The emptying of asbestos vacuum cleaners can be hazardous if the correct procedures are not followed. Asbestos vacuum cleaners should only be emptied by a competent person wearing the correct PPE, in a controlled environment and in compliance with the manufacturer's instructions.
- The asbestos vacuum cleaner and attachments must also be decontaminated before they are removed from the asbestos removal area. The bag and filter must be removed in accordance with the manufacturer's instructions and disposed of as asbestos waste.
- Asbestos vacuum cleaners should be hired only from organisations that provide vacuum cleaners specifically for work involving asbestos and the asbestos vacuum cleaner has been previously decontaminated. If hired, the asbestos vacuum cleaner should be decontaminated before it is returned.
- When the minor maintenance work is completed the asbestos vacuum cleaner should be resealed in the storage container provided, and the sealed storage container should then be decontaminated by wet wiping before it is removed from the asbestos removal work area and returned to the hire organisation for decontamination and maintenance.

Organisations that hire out asbestos vacuum cleaners should ensure all their asbestos vacuum cleaners are decontaminated, maintained in good working order and the hirers are competent in their safe use. It is suggested that asbestos vacuum cleaners are only hired out to asbestos removal supervisors or licence holders.

4.2.4 Spray equipment

Spray equipment includes wet sprays with water mist or wetting solution. A constant low-pressure water supply is required for wetting down asbestos and related items to suppress airborne asbestos fibres.

Wet spray can be achieved with a mains-supplied garden hose fitted with a pistol grip. If no water supply is readily available, a portable pressurised vessel (such as a pump-up garden sprayer) may be used. For very small areas, a small spray water bottle may be sufficient. In all cases, the use of water should be in the form of a mist to minimise the potential to generate airborne dust.

4.2.5 Personal Protective Equipment

PPE must be always worn during the work in the asbestos removal area. PPE includes clothing, for example coveralls, gloves, and safety footwear, as well as RPE. PPE should be selected to minimise risk to health and safety by ensuring it is:

- suitable for the nature of the work and any hazard associated with the work
- a suitable size and fit and reasonably comfortable for the person wearing it
- maintained, repaired, or replaced so it continues to minimise the risk, including ensuring that the PPE is clean and hygienic and in good working order, and
- used or worn by the worker, so far as is reasonably practicable.

Workers must be provided with information, training, and instruction in the proper use and wearing of PPE, and the storage and maintenance of PPE. A worker must, so far as reasonably able, wear the PPE in accordance with any information, training, or reasonable instruction. Table 9 below annotates the appropriate criteria for PPE selection as well as its use and maintenance in asbestos abatement activities.

The effectiveness of PPE relies heavily on workers following instructions and procedures correctly, as well as fit, maintenance, and cleaning. If PPE must be used for long periods, if dexterity and clear vision are needed for the task, or if workers have not been adequately trained on how to fit and use PPE properly, workers might avoid using it.

The best way to determine this is to observe workers performing the task. If they discard the PPE or do not use it, this may indicate that it does not fit, is uncomfortable or is a hindrance in the work. Workers should be observed after the task is completed, to ensure that the PPE they have used is stored and maintained correctly.

As asbestos removal is a high hazard activity, appropriate PPE should be worn regardless of other control measures in place.

PPE should be made from materials that provide protection against fibre penetration and not from wool or other materials that attract fibrous dusts.

All PPE used for the removal of asbestos should be inspected before the commencement of the asbestos removal work, after it undergoes any repairs and at least once every seven days when it is continually being used. A register with the details of these inspections, the state of the equipment and any repair details should be maintained. At the end of the asbestos removal work and upon leaving the asbestos removal work area you must ensure that all PPE is:

- disposed of as asbestos waste, or
- decontaminated and stored in sealed double bags before being removed from the asbestos removal site to be laundered by a laundry with facilities for laundering asbestos-contaminated materials.

PPE should be thoroughly wet before being placed in bags.

Table 9: Appropriate use and maintenance of PPE for asbestos abatement activities.

PPE	Guidance
Coveralls	Coveralls should be: • of a suitable standard to prevent tearing or penetration of asbestos fibres so far as is practicable—disposable coveralls rated type 5, category 3 (EN ISO 13982–1) would meet this standard • one size too big, as this will help prevent ripping at the seams, and • fitted with hood and cuffs, ensuring that: a. if cuffs are loose, they are sealed with adhesive (cloth or duct) tape b. coverall legs are worn over footwear as tucking them in lets the dust in, and c. the fitted hood is worn over the respirator straps. Additionally, coveralls should: • not be made of material that is easily torn • not have external pockets or Velcro fastenings because these are easily contaminated and difficult to decontaminate • never be taken home • never be reused, and • be disposed of as asbestos waste after a single use. If it is not reasonably practicable to provide coveralls that can be disposed of after a single use, the coveralls may be laundered at a commercial laundry equipped to launder asbestos-contaminated clothing by prior arrangement. The coveralls must be sealed in a decontaminated container before they are removed from the asbestos removal work area. Laundering of asbestos-contaminated protective clothing is not recommended because decontamination cannot be guaranteed. It is recommended that such re-usable coveralls should only be used in limited instances, for example in emergency services where the coveralls must be inflammable to protect against fire hazards and continual disposal and replacement is not practicable. In some cases (particularly dusty jobs) double coveralls should be used, with the outer coverall being removed a predetermined distance from the final decontamination area. Disposable coveralls should be wrapped in a double layer of heavy-duty polyethylene sheeting (minimum 200 µm thickness) or double

PPE	Guidance
	bagged before disposal as asbestos-contaminated waste after the removal task is completed.
Gloves	Gloves should be worn when conducting asbestos removal work. If significant quantities of asbestos fibres may be present, single-use disposable nitrile gloves should be worn. If latex gloves must be used, low protein (powder free) gloves should be provided. Gloves used for asbestos removal work should be disposed of as asbestos waste. Workers should clean their hands and fingernails thoroughly whenever leaving the asbestos removal work area. However, as with coveralls, if it is not reasonably practicable to use disposable gloves, then re-usable gloves may be used in limited circumstances and must be laundered appropriately.
Safety Footwear	Safety footwear (for example steel-capped, rubber-soled work shoes or gumboots) should be provided for all workers removing asbestos. Safety footwear should be lace less, as laces and eyelets can be contaminated and are difficult to clean. The footwear should remain inside the barricaded area or dirty decontamination area for the duration of the asbestos removal work and should not be shared for hygiene reasons. Avoid using disposable overshoes unless they are of a design that has an anti-slip sole. When safety footwear is not in use, it should be stored upside down to minimise asbestos contamination inside the footwear. Storage facilities should be provided to the shoes. At the end of the removal work and each time the worker leaves the asbestos removal work area, safety footwear must be: • decontaminated • sealed in containers (e.g. double bags) for use on the next asbestos removal site (but not for any other type of work), or • sealed in containers (e.g. double bags) and disposed of as asbestos waste.
Respiratory protective equipment (RPE) **See *Note 1* for details on RPE maintenance.**	Ensure that all workers engaged in asbestos removal work wear RPE conforming to requirements of local regulations. The type of respiratory protection depends on the work to be conducted. The type of respiratory protection and supplied air respirators should be determined by a competent person. The selection of suitable RPE depends on the nature of the asbestos removal work, the probable maximum concentrations of asbestos fibres expected and any personal characteristics of the wearer that may affect the facial fit of the respirator (for example facial hair and glasses). Disposable RPE may be used but it is not preferred as it provides little protection after short-term use. If used, it should be stored in a suitable and clean location before use and disposed of as asbestos waste after a single use. A competent person may change the level of RPE required at any stage during the asbestos removal job after assessing asbestos fibre levels in the asbestos removal work area. For example, during the final clean-up after the removal of friable asbestos the use of air lines may no longer be considered necessary. If a medical condition precludes the use of negative pressure respirators (RPE fitted with filters or cartridges), workers should be provided with a continuous-flow, positive pressure respirator wherever possible.

PPE	Guidance
	A fit test should be performed to ensure the RPE fits the individual and provides a good face seal between the worker's skin and the face piece. Fit tests should be repeated when changing from different model of RPE or a different sized face piece.
Air-Line Respirators	Air-line respirators should be used when the asbestos being removed is friable and the dry method is being used. When in use, the air line should incorporate a belt-mounted back-up filter. If a failure of the air supply system occurs, workers should leave the asbestos removal work area using normal decontamination procedures; the use of a belt-mounted back-up filter device allows for adequate respiratory protection during this process. Manifolds should be provided where the number of workers wearing air-line respirators inside the enclosure is likely to result in the tangling of air lines and to assist workers in moving around the enclosure. The capacity of the compressor should be adequate for the number of air lines, and the location of the compressor's air intake should be assessed to ensure appropriate air quality and avoid contamination. Air from a compressor must be filtered before supply to a respirator.

4.2.6 Respiratory Protective Equipment

Ensure RPE is always worn in the asbestos removal area and until the appropriate stage of personal decontamination has been completed. Ensure that RPE is taken off last at the end of a shift or at a break as part of the decontamination process.

At every asbestos removal job, ensure all workers undertaking any asbestos removal work receive instruction and training in:

- fit testing/checking
- the importance of a correct facial fit
- the correct method of using their respirators
- the procedures for regular cleaning, inspection, and maintenance of respirators before use, and
- when to stop asbestos removal work and leave the area if they think their RPE is not working properly.

Workers must be instructed that RPE must be worn in accordance with the manufacturer's instructions and the coverall hood should go over the straps of the RPE. RPE should be examined in accordance with the manufacturer's instructions before use to ensure that it is not damaged and is in good working order. All parts, including filters, valves, and seals; should be inspected before and after each use. RPE defects should be reported immediately to the asbestos removal supervisor for repair or replacement.

The pre-use examination should include an inspection of:

- the condition of the straps and face piece, including the seal and the nose piece
- the condition of the exhalation valve, and
- a fit check.

Non-disposable RPE must be decontaminated before it is removed from the asbestos removal area. If it is not practicable to decontaminate the RPE, it must be kept in a sealed container until it is re-used for asbestos removal purposes.

A system of regular cleaning, inspection and maintenance of non-disposable respirators should be in place to ensure they are clean and in a safe working condition.

Records of all respirator issues, uses and maintenance should be kept up to date.

The length of time a particulate filter can be used for the asbestos removal work depends on the resistance to breathing and damage to the filter. The filter should be replaced if damaged or when resistance increases. A damaged filter must be replaced before resistance begins to increase. The replacement should be done according to the manufacturer's instructions.

Some types of filters may not be usable after being exposed to certain conditions, such as a full decontamination shower. Specific advice should be sought from the supplier regarding the effectiveness of a filter after being subjected to certain conditions.

4.3 Decontamination

Decontamination for the work area, workers, PPE, and tools used in asbestos removal work is an important process in eliminating or minimising exposure to airborne asbestos fibres, particularly to people outside the asbestos removal work area.

You should assess the risks of each individual asbestos removal job to determine the appropriate decontamination procedure.

4.3.1 Decontamination of the asbestos removal work area

There are two types of decontamination process:

- **Wet decontamination**, or wet wiping, involves the use of damp rags or wet wipes to wipe down contaminated areas. Rags should only be used once, although they may be refolded to expose a clean surface. The rags should be used flat and should not be wadded. If a bucket of water is used, the rags should not be re-wetted in the bucket as this will contaminate the water. If the water is contaminated, it must be treated as asbestos waste. Care should be taken to avoid any potential electrical hazards when using this procedure.
- **Dry decontamination** involves carefully rolling or folding up and sealing polythene sheeting and/or vacuuming the asbestos removal area with a HEPA filtered H-Class industrial vacuum cleaner. Dry decontamination should only be used where the wet method is not suitable or poses a risk because of hazards such as electricity or slipping.

Contaminated items, tools, equipment, and clothing must not be removed from the removal work area unless they have been decontaminated or placed in sealed containers labelled in accordance with the GHS. If an item is not able to be decontaminated, or is not suitable for decontamination, it should be placed in an appropriately labelled and sealed container and disposed of as asbestos waste. The sealed container must be decontaminated before it is removed from the asbestos removal work area.

If asbestos removal work involves friable asbestos, the decontamination procedures must include decontamination units. 'Glove bag' and 'wrap and cut' methods are exceptions where personal decontamination procedures are likely to be satisfactory and decontamination units will not be necessary. Mini-enclosure removals may require a combination of personal decontamination and decontamination units if used for friable asbestos removal.

4.3.2 Decontamination of tools

Ensure all tools used during asbestos removal work are fully dismantled (where appropriate), cleaned under controlled conditions and decontaminated using either the wet or dry decontamination procedures described above before they are removed from the asbestos removal work area. The method chosen will depend on its practicality, the level of contamination and the presence of any electrical hazards.

If tools cannot be decontaminated in the asbestos removal work area or are to be re-used at another asbestos removal work area, they should be put into containers (e.g. double bagged) labelled in accordance with the GHS to indicate the presence of asbestos before being removed from the asbestos removal work area. The exteriors of these containers must also be decontaminated.

The containers used for storing the tools must remain sealed until decontamination or the commencement of the next asbestos maintenance or service task where the equipment can be taken into the asbestos removal work area and re-used under full control conditions.

PPE should be worn when opening the bag to clean or re-use the equipment or tools, and decontamination should only be performed in a controlled environment.

In some circumstances it may be better to dispose of contaminated tools and equipment as asbestos waste, depending on the level of contamination and the ease of replacement.

4.3.3 Personal decontamination procedures

Personal decontamination involves the removal of all visible asbestos dust/residue from PPE and RPE. Ensure personal decontamination is undertaken each time a worker leaves the asbestos removal work area and at the completion of the asbestos maintenance or service work. Personal decontamination should be done within the asbestos removal work area to avoid the worker re-contaminating themselves or contaminating adjacent areas. Personal decontamination should be carried out even where a decontamination unit is not necessary, such as during minor or small-scale asbestos removal and maintenance work.

An asbestos removalist must ensure that asbestos-contaminated PPE is not transported outside the asbestos removal work area unless it is decontaminated or placed in a sealed container labelled in accordance with the GHS. Before work clothes and safety footwear worn during asbestos removal work are removed from the asbestos removal work area for any reason, they must be decontaminated. They should be thoroughly vacuumed with a HEPA filtered H-Class industrial vacuum cleaner to remove any asbestos fibres, and the safety footwear should also be wiped down with damp rags or wet wipes.

RPE should be used until all contaminated disposable coveralls and clothing have been vacuum cleaned and/or removed and bagged for disposal and personal washing has been completed. Any PPE used while carrying out asbestos removal work must not be taken home by a worker.

Personal hygiene and careful washing are essential. Particular attention should be paid to the hands, fingernails, face, and head.

A checklist of activity follows:

- Never leave the asbestos removal work area until decontamination is complete.
- Remove any visible asbestos dust/residue from protective clothing using a HEPA filtered H-Class industrial vacuum cleaner or wiping down with damp rags or wet wipes.
- Warning: do not reuse or resoak damp rags or wet wipes.
- Carefully remove disposable protective clothing and place into bags (RPE must still be worn).
- Place rags and cloths into heavy duty polyethylene asbestos disposal bags (minimum 200 µm thickness).
- Take disposable coveralls off and place into disposal bags (RPE must still be worn).
- Use damp rags or wet wipes to wipe down safety footwear and place rags or wet wipes into asbestos disposal bag.
- Seal all asbestos disposal bags with adhesive (cloth or duct) tape and place each into a second asbestos disposal bag (double bagging).
- Seal this second asbestos disposal bag and ensure it is labelled/marked as ‘Asbestos Waste’.
- Use damp rags or wet wipes to wipe external surfaces of the asbestos disposal bags to remove any dust before they are removed from the asbestos removal work area.
- Remove non-disposable PPE and place in container labelled as containing asbestos.
- Remove RPE and double bag, seal with adhesive (cloth or duct) tape and ensure it is labelled/marked as ‘Asbestos Waste’.
- Ensure the outside of each bag is decontaminated by using a damp rag or wet wipes.
- Place the damp rag or wet wipes into asbestos disposal bags.
- Dispose of asbestos waste at the appropriate waste facility as soon as practicable.

4.3.4 Setting up personal decontamination areas outside the asbestos removal work area

Ensure specific areas are set up for people to personally decontaminate themselves and any tools and equipment when they are entering and leaving the asbestos removal work area to eliminate or minimise airborne asbestos being released from the asbestos removal work area. Several best practices are annotated in Table 10 below.

These areas are:

- a dirty decontamination area that includes:
    a. a suitable rack for air lines to be stored on at the entrance of the area
    b. equipment for vacuum cleaning or hosing down (by use of a fine mist) contaminated clothing and footwear
    c. storage for contaminated clothing and footwear
    d. labelled waste bags/bins for disposing of protective clothing, and
    e. shower area with an adequate supply of hot and cold water and toiletries.
- a clean decontamination area that includes:
    a. storage for individual RPE in containers or lockers
    b. airflow towards the dirty decontamination area, and
    c. shower area with an adequate supply of hot and cold water and toiletries.
- a clean changing area that includes:
    a. storage for clean clothing
    b. separate storage for clean and dirty towels, and
    c. airflow towards the clean decontamination area.

Following is an example of how a person would enter and leave a removal work area.

Table 10: Best Practices for Entering and Leaving Asbestos Abatement Work Areas

Specific Area	Guidance
Entering the asbestos removal work area	
Clean Change Area	Change into clean work clothes and put on clean protective clothing. Store any removed clothing in a dust-proof container. Move into clean decontamination area.
Clean Decontamination Area	Put on RPE. Check that it is working properly and there is a good facial seal, such as a fit check. Move to the dirty decontamination area.
Dirty Decontamination Area	Put on any additional PPE that has been stored in the dirty decontamination area such as safety footwear. Connect the RPE to the air-line supply if required. Move from the decontamination unit to the asbestos removal work area.
Leaving the asbestos removal work area	
Asbestos Removal Area	Use a HEPA filtered H-Class industrial vacuum cleaner and PVA/water spray to remove any obvious signs of asbestos dust from protective clothing. Remove safety footwear and leave shoes/boots inside the asbestos removal area next to the decontamination unit (footwear should be stored upside down to minimise further contamination). Proceed into the dirty decontamination area.
Dirty Contamination Area	If shoes/boots have not already been removed, remove them and store upside-down within the dirty decontamination area. Disconnect the air line if being used and connect the RPE to the back-up filter during decontamination. Shower while wearing protective clothing and RPE. Leaving RPE on, remove protective clothing and place in labelled disposal bags. Remove wet underclothing, such as t-shirts or shorts, while showering and place in the storage unit provided within

Specific Area	Guidance
	the dirty decontamination area. Pass through the airlock into the clean decontamination area.
Clean Decontamination Area	Shower and remove RPE. Thoroughly wash hands, fingernails, face, head, and respirator. Store RPE in a suitable container within the clean decontamination area. Move to the clean change area.
Clean Change Area	Change into clean clothing.

4.3.5 Decontamination units attached to an enclosure

A risk assessment should be conducted to determine the number of units required based on the number of workers in the asbestos removal work area. As a guide, one decontamination unit (See Figure 7) should be provided for every six workers in the asbestos removal work area.

Where men and women are required to use the same decontamination unit, you need to implement a system of work to enable them to access the unit separately.

In many instances, the only satisfactory way of providing appropriate changing facilities is to provide a mobile or specially constructed on-site decontamination unit.

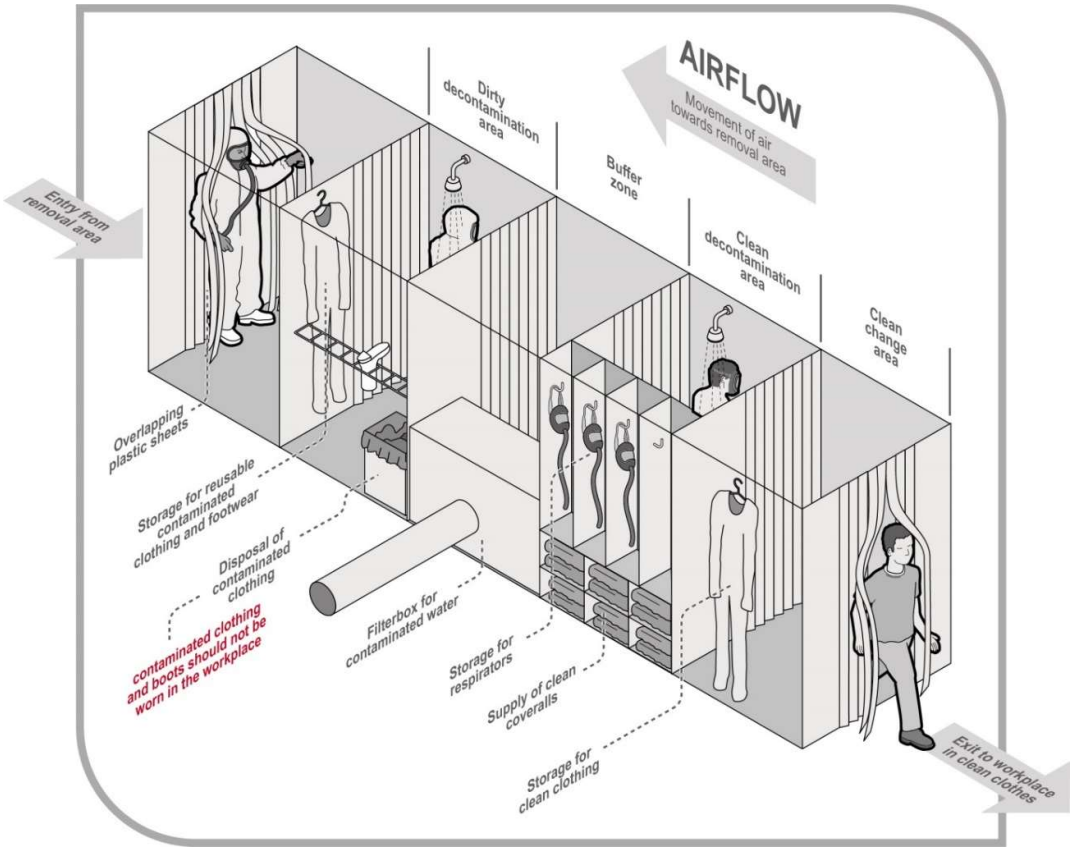

Figure 7: Decontamination unit

The decontamination unit should be immediately adjacent to and directly connected to the enclosed asbestos removal work area. It should be located as far away as practicable from workplace facilities such as a lunchroom.

The decontamination unit should include a dirty decontamination area, a clean decontamination area, and a clean changing area. These areas need to:

- be large enough to enable workers to adequately decontaminate themselves
- be separated by suitable airlocks or buffer zones, and
- have doors with large openings with overlapping, hinged flaps operating as a one-way valve to ensure there is sufficient airflow through the decontamination unit.

Towels and soap should be provided to allow workers to appropriately decontaminate themselves.

All water from the decontamination facility should pass through a particulate filter or other trap before it passes into sewer mains. The filter or trap should be capable of capturing particles down to 5 µm.

Workers should not smoke, eat, or drink in any part of the decontamination unit.

A worker should be stationed outside an enclosure for the duration of the asbestos removal work to liaise with the asbestos removal supervisor, communicate with personnel inside the work enclosure, and instigate emergency/evacuation procedures if necessary.

Daily records about these activities should be maintained.

4.3.6 Remote decontamination units for friable asbestos removal

Remote decontamination units are decontamination units not attached to an enclosure which should be used when friable asbestos is being removed. Remote units are not located next to the asbestos removal work area and can only be used if a decontamination unit cannot be located immediately adjacent to the asbestos removal work area.

When a remote decontamination unit is to be used (See Figure 8), additional transiting procedures will be required to minimise asbestos contamination of pathways leading from the enclosure to the decontamination unit. These procedures are longer and more complex than non-transiting. This involves the use of 'transiting' PPE and additional facilities to enable the worker to carry out preliminary decontamination before travelling to the decontamination unit for full decontamination.

This may include a three-stage airlock isolated changing area, which should be specially constructed and made of heavy-duty polyethylene sheeting (minimum 200 µm thickness). The area should be attached to the enclosure and should comprise three compartments separated by weighted sheets to minimise the spread of dust between the compartments.

Before workers enter this changing area, all obvious signs of asbestos dust need to be removed from their protective clothing using a HEPA filtered H-Class industrial vacuum cleaner in the enclosure. The isolated changing area is then used to discard outer garments, including coveralls and overshoes, before workers put on fresh outer/protective clothing for the journey to the remote decontamination unit. RPE should be worn until the appropriate phase of the decontamination procedure within the remote decontamination unit.

The route of access from the asbestos removal area to the decontamination unit should be suitably signposted and barricaded to restrict public access.

Air monitoring must be conducted in the immediate vicinity of this access route and at other suitable locations outside the asbestos removal area.

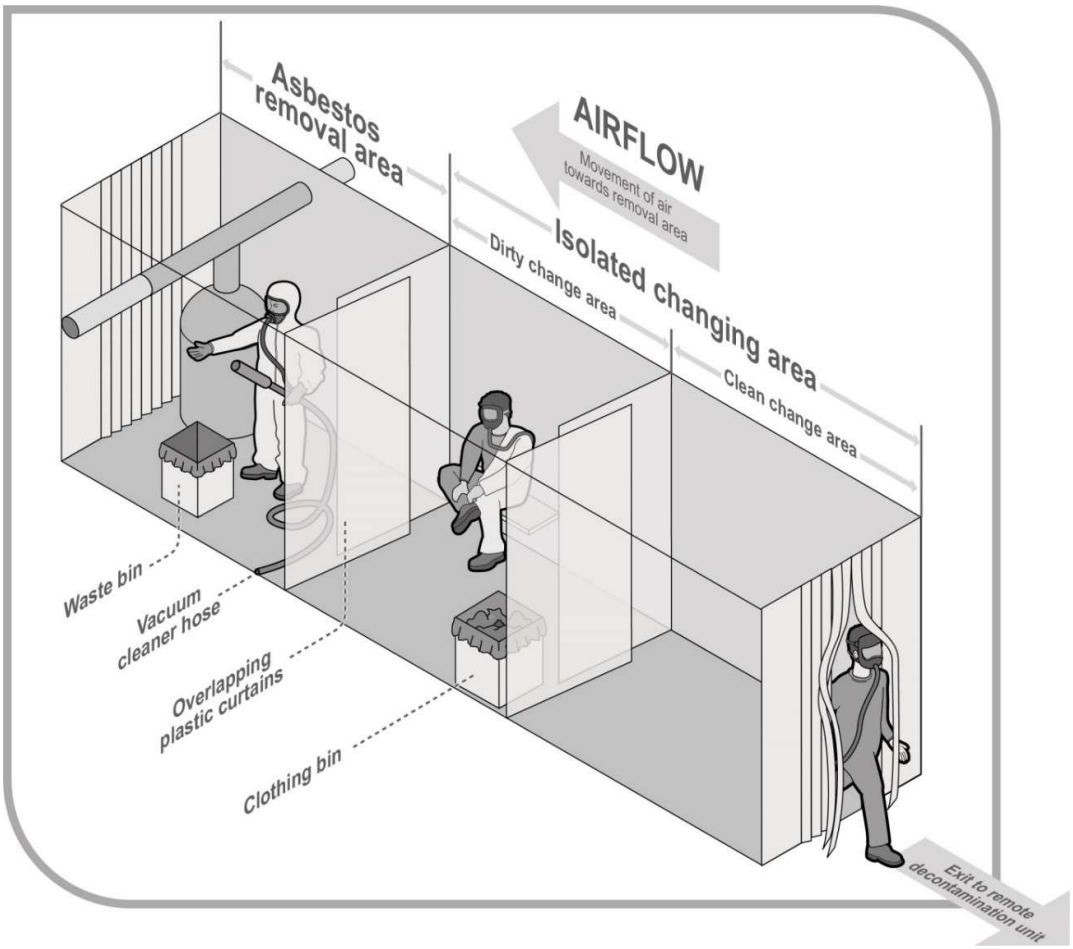

Figure 8: Preliminary decontamination procedure where a remote decontamination unit is used

4.3.7 Laundering clothing

Disposable coveralls should be used as protective clothing unless it is not reasonably practicable to do so. When non-disposable protective clothing is used, ensure the contaminated clothing is laundered in a suitable laundering facility that is equipped to launder asbestos-contaminated clothing. Contaminated protective clothing must not be laundered in homes. Any clothing worn under coveralls must be disposed of or suitably bagged for laundering as asbestos-contaminated clothing.

The laundering facility that is equipped to launder asbestos-contaminated clothing:

- should be informed of the asbestos contamination
- should have a management plan in place to control the release of respirable fibres
- should be constructed of smooth surfaces that are able to be lined with heavy duty polyethylene sheeting (minimum 200 µm thickness) or easily wiped clean
- may use conventional washing machines provided they are not used for other clothing
- may need to have a laundry room that is under negative pressure to eliminate or minimise the release of airborne asbestos fibres during the laundering process– this can be determined during the risk assessment, and
- should have procedures established for cleaning up spills and for the prevention of flooding of neighbouring areas.

The contaminated clothing should:

- be removed by workers when damp and then thoroughly wetted, placed in impermeable containers or bags the outside of which are decontaminated and labelled to indicate the presence of asbestos before being sent to the commercial laundering facility, and
- not be allowed to dry out before washing.

At the laundry facility:

- the containers and bags holding the asbestos-contaminated clothing should be opened in the washing machine while being further saturated. A minimum P1 respiratory protection must be worn while unloading clothes into the washing machine, and
- the empty containers or bags should be disposed of as asbestos waste. Wastewater must be filtered and the filtering medium disposed of as asbestos waste.

PART V
USING AN ENCLOSURE DURING ASBESTOS REMOVAL WORK

5. USING AN ENCLOSURE DURING ASBESTOS REMOVAL WORK

Large scale asbestos removal includes removal that occurs on a frequent basis, is generally of a longer duration, usually generates a significant amount of airborne asbestos fibres and may pose a serious risk both to workers and others.

So far as is reasonably practicable, the asbestos removal work area should be enclosed (sometimes referred to as the 'bubble') to eliminate or minimise the release of airborne asbestos fibres. When large-scale friable asbestos removal work is being undertaken, you must ensure the asbestos removal work area is enclosed and under 'negative pressure' with the use of negative air pressure units.

A risk assessment to determine if enclosures should be used for large scale non-friable asbestos removal.

5.1 Designing and installing an enclosure

The design and installation of the enclosure should consider:

- methods used to contain the asbestos removal work area
- provision and locations of decontamination/changing facilities and negative pressure exhaust units
- precautions to be implemented to eliminate or minimise the spread of asbestos contamination outside the asbestos removal work area
- air quality within the enclosure
- types of lighting, whether natural or artificial
- temperature within the enclosure to avoid heat stress, and
- any other hazards in the enclosure (these must be identified and the risks controlled before any asbestos removal work commences).

The enclosure should:

- be constructed of heavy-duty polyethylene sheeting (200 µm minimum thickness) and enclose all the walls, windows and doors. Wooden cleats may be used to anchor the polyethylene sheeting to walls. Recycled polyethylene sheeting should not be used

- have viewing panels placed in appropriate locations so that the asbestos removal work area can be seen from outside the enclosure, and
- have adequate lighting within the enclosure, either:
    a. naturally, using clear plastic or Perspex panels in the enclosure walls, or
    b. artificially, preferably from outside the enclosure using clear plastic or Perspex panels.

During the masking up and later removal of the enclosure sheeting, all workers must wear appropriate PPE, for example coveralls, and, as a minimum, a half-face respirator with P1 filters. Full 'A' class PPE is recommended.

Where the asbestos removal work area connects either to the outside environment or to the rest of the building (for example through windows, ducts, wall cavities and lift entrances), it should be enclosed so that an airtight seal is maintained for the duration of the asbestos removal work.

All movable items should be removed from the asbestos removal area. If this is not possible, move the items from the immediate asbestos removal work area and cover with two layers of polyethylene sheeting with a minimum overlap of 300 mm between the layers. Both layers should be double taped.

All non-movable items such as fixtures and fittings should be covered with polyethylene sheeting and the joints sealed.

Airlocks should be placed at the entry points to the decontamination/change area and constructed using double sets of overlapping polyethylene with suitable provisions for ensuring a seal.

All floors should be protected with at least one layer of woven polyethylene to prevent penetration during the asbestos removal work. The joints should overlap by 300 mm and be sealed with double-sided tape and adhesive (cloth or duct) tape.

If the asbestos removal area is next to areas occupied by unprotected people, priority should be given to:

- greater isolation of the asbestos removal area, and/or
- performing the asbestos removal work during periods when these areas are unoccupied.

Consideration should be given to the use of hoarding to form a barrier between the asbestos removal work area and the adjoining occupied areas. A barrier lined with heavy duty polyethylene sheeting should be erected within this hoarding and a buffer area should be reserved between the hoarding and occupied areas.

Platforms and fixed scaffolding should be erected during the early stages of the work. These structures should ideally be erected on the outside of the enclosed area. Any platforms or fixed scaffolding within the enclosed area must be decontaminated and visually inspected at the end of the asbestos removal work.

All tools and equipment used for asbestos removal work, including HEPA-filtered H-Class industrial vacuum cleaners, must remain within the asbestos removal work area until the completion of the job.

All the polyethylene sheeting and tape used for the enclosure must be disposed of as asbestos waste. Temporary structures must be disposed of as asbestos waste if they cannot be decontaminated. An inspection by a competent person will confirm if the structures are free of any visible asbestos or ACM.

Work methods should be adapted for the work environment within the enclosure. For example, rest breaks need to be based on a risk assessment considering factors such as the weather and heating/cooling requirements.

5.1.1 Security and checks when using an enclosure

A licensed asbestos removalist should ensure an employee is stationed outside the asbestos work area for the duration of the asbestos removal work to:

- liaise with the project supervisor
- check and maintain negative air units, compressor units, decontamination units and hot water service
- ensure security of the area is maintained
- communicate with personnel inside the work enclosure, and
- instigate emergency or evacuation procedures if necessary.

Daily records of these checks should be made and kept.

5.2 Testing an enclosure

Prior to the asbestos removal work commencing, the licensed asbestos removalist should ensure the enclosure is tested by an independent licensed asbestos assessor and must ensure that any enclosure used in removing friable asbestos is tested for leaks.

An independent licensed asbestos assessor should visually inspect and conduct smoke testing to ensure there are no leaks or deficiencies in the enclosure before the asbestos removal work commences.

- While smoke is generated within the enclosure, a worker should be outside the enclosure to check for leaks.
- Only smoke-generating devices incorporating non-oil-based, non-toxic smoke fluids can be used. Flares should not be used.
- Smoke (fire) detection devices in the immediate vicinity of the asbestos removal area should be isolated for the duration of the smoke test.
- The results of the smoke test should be documented, and a copy provided to the licensed asbestos removalist.

Negative pressure exhaust units should not be used while the smoke test is being conducted.

The effectiveness of the enclosure should be regularly monitored while asbestos removal work is underway (for example, a visual examination, air-monitoring results, and negative pressure readings).

If leaks or deficiencies are found during the initial testing of the enclosure, they must be rectified. An expandable foam sealant, adhesive (cloth or duct) tape or equivalent may be used. Additional smoke tests must be performed until no leaks or deficiencies are identified.

A supply of expandable foam sealant, polyester insulation or equivalent should be kept on site for sealing leaks.

5.3 Negative pressure exhaust units

To prevent the escape of airborne asbestos fibres from an enclosed asbestos removal work area, exhaust extraction fans should be installed to create a 'negative' air pressure of approximately 12 Pa (water gauge) within the enclosed area. This may require the use of more than one negative pressure exhaust unit.

Units should incorporate warning devices for filter integrity/overload and power failure and should have a manometer or magnehelic gauge and an audible and visual alarm system.

The negative pressure exhaust unit should be positioned opposite the decontamination unit to enable laminar (smooth) air flow.

- The air entering the asbestos removal work area passes through the decontamination unit or point-of-entry while the air extracted passes through a HEPA filter to remove any asbestos before it is discharged to the outside.
- If this is not possible, consideration should be given to how to set up the enclosure, decontamination unit and negative pressure exhaust unit to enable optimum smooth flow of air through the enclosure to minimise dead air pockets. Discharge of the air from the enclosure should be at a location away from other working areas, air-conditioning inlets or breathing air compressors.

The HEPA filter must comply with AS 4260–1997: High efficiency particulate air (HEPA) filters – Classification, construction and performance or its equivalent.

- A coarse pre-filter should be installed on the air intake side of the negative air unit to prolong the useful life of the HEPA filter.
- These pre-filters may need to be changed once per work shift or more frequently depending on dust loads.
- Used pre-filters must be disposed of as asbestos waste.

- A process of regular inspection of the integrity of the HEPA filter and seal fittings in conjunction with a static pressure alarm should indicate failures in the system.

The negative air units should operate continuously (24 hours a day) until all asbestos removal work and decontamination within the enclosure has been completed, a clearance certificate issued, and the enclosure dismantled. If the units stop during removal work, the licensed asbestos removalist must ensure all removal work ceases immediately until the problem is rectified and the required number of units are in operation. To minimise the risk of airborne asbestos fibres escaping the enclosure, the delay should be as short as possible to avoid interruption. Consideration should be given to backup negative pressure exhaust units and the use of a generator.

Maintenance work on these units should only be performed after they have been thoroughly decontaminated, or the work may be carried out under controlled conditions, such as in an asbestos removal enclosure while wearing appropriate PPE.

5.4 Bulk stripping and cleaning within an enclosure

Sprayed asbestos insulation needs to be wet thoroughly using a fine water spray. Aim to achieve maximum saturation with minimum run-off to minimise any subsequent clean-up and slip hazards.

Wetting, scraping, and vacuuming methods need to be used wherever reasonably practicable. Where the asbestos or ACM is covered with cloth, metal cladding or wire reinforcing, it should be wet thoroughly during the removal process.

Once a competent person has determined the removal area is clean, as a licensed asbestos removalist you should, wherever reasonably practicable, spray clean surfaces within the removal area with tinted PVA or a similar acrylic emulsion, using airless spraying equipment. This includes any layer of polyethylene sheeting forming the inner surface of the enclosure to ensure any loose asbestos fibres on the polyethylene sheeting are firmly adhered to prior to its dismantling.

After the PVA has dried and sufficient time has elapsed for fumes to dissipate, air (clearance) monitoring should take place, where required. The polyethylene enclosure must not be dismantled until a satisfactory visual inspection and air monitoring by a licenced asbestos assessor has taken place.

5.5 Dismantling an asbestos removal enclosure

As a licensed asbestos removalist, you should only dismantle a structure used to enclose an asbestos removal area once all the following are done:

- asbestos removal work has been completed
- visual inspection by an independent competent person is satisfactory, and
- air monitoring by a licensed asbestos assessor, in the case of friable asbestos removal, is found to be less than 0.01 fibres/ml.

The polyethylene sheeting that formed the enclosure must be disposed of as asbestos waste along with any other contaminated material that assisted in forming the enclosure. In some cases, structures used in building the enclosure (other than the polyethylene sheeting that formed the enclosure) may be wrapped and sealed in polyethylene sheeting and not opened until in a similar controlled environment, such as another asbestos removal enclosure (for example collapsible rods used to form the enclosure frame).

The area from which the enclosure was dismantled must be thoroughly cleaned and inspected. This should be followed by further air monitoring demonstrating the levels are below 0.01 fibres/ml.

Ropes, warning signs and protective polyethylene sheeting isolating public areas should not be removed until:

- the enclosure has been dismantled and removed as asbestos waste
- satisfactory air-monitoring results have been achieved, and
- the removal area and its surrounds have been visually inspected by an independent competent person and found to be satisfactory for reoccupation.

5.5.1 Security and checks when using an enclosure

A licensed asbestos removalist you should ensure an employee is stationed outside the asbestos work area for the duration of the asbestos removal work to:

- liaise with the project supervisor
- check and maintain negative air units, compressor units, decontamination units and hot water service
- ensure security of the area is maintained
- communicate with personnel inside the work enclosure, and
- instigate emergency or evacuation procedures if necessary.

Daily records of these checks should be made and kept.

5.6 Methods for Small-Scale Removal Work, e.g., Mini-Enclosures

Small scale friable asbestos removal work usually generates enough airborne asbestos fibres to require the use of PPE and generally is carried out only in short periods, for example minor maintenance work. Small scale removal work involves using mini enclosures, 'glove bag' and 'wrap and cut' techniques.

Mini enclosures, see Figure 9 below, are suitable for asbestos removal work in areas with restricted access, such as ceiling spaces, and for emergency asbestos removals. Hazards and work procedures that should be considered for large enclosures should also be considered for mini enclosures.

5.6.1 Building the mini enclosure

To build a mini enclosure (see Figure 9), the following process should be used:

- Off-the-shelf mini enclosures can be used or alternatively other materials such as PVC or timber can be used to build a frame. The frame of a mini enclosure can be made from a variety of materials but must be strong enough to support the polyethylene sheeting that forms the enclosure.
- Heavy-duty polyethylene sheeting (minimum 200 µm thickness) should be used for making the enclosure. Do not use recycled polyethylene.
- Make the enclosure large enough to do the work safely, allowing for movement inside the enclosure and all the equipment needed for the removal work such as tools for the task including a bucket of water, rags, sprayer, vacuum cleaner nozzle and hose.
- Machinery that emits exhaust fumes should not be placed in a mini enclosure.
- Attach the polyethylene sheeting inside the frame with adhesive tape (cloth tape is preferable to duct tape). The adhesive tape used should be strong enough to securely hold the polyethylene sheeting to the frame.
- Attach the polyethylene sheeting to the ceiling with cloth tape or masking tape. Attach it to non-asbestos surfaces with duct tape.
- Make an entry slit in one wall of the enclosure and reinforce this with adhesive (cloth or duct) tape from inside the enclosure. Attach a polyethylene sheet above the entry slit to cover it.
- Check all seals inside the enclosure for leaks with a smoke test, using smoke tubes for mini enclosures. The competent person, usually the licensed asbestos supervisor, should check for leaks outside the enclosure and seal all leaks.

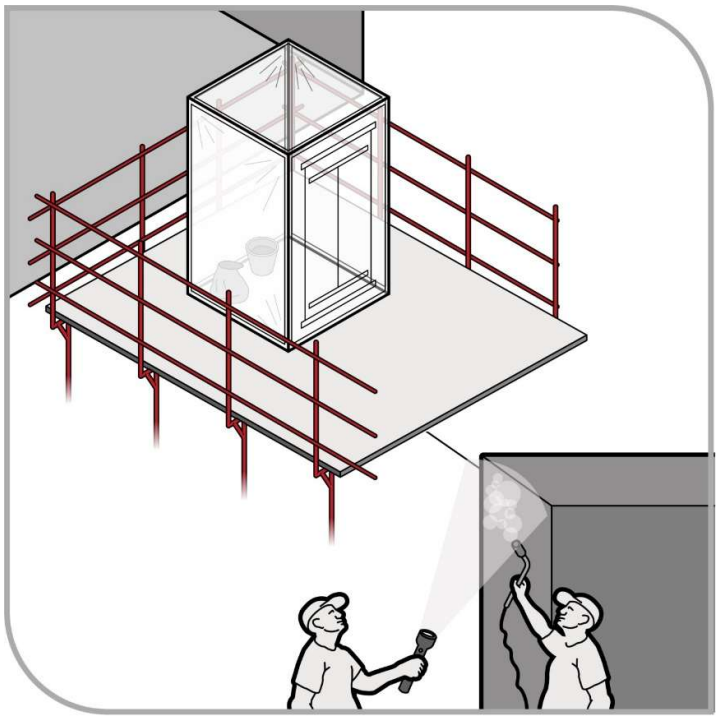

Figure 9: Building and using a mini enclosure

5.6.2 Dismantling the mini enclosure

To eliminate or minimise airborne asbestos fibres escaping when dismantling the mini enclosure, the following process should be used:

- Put the asbestos waste in a heavy-duty polyethylene bag with an asbestos warning sign or label to indicate the presence of asbestos.
- Clean the enclosed area with a HEPA filtered H-Class industrial vacuum cleaner.
- Clean the equipment and polyethylene sheeting with damp rags or wet wipes.
- Workers leaving a mini enclosure must follow personal decontamination procedures.
- Inspect the enclosure visually for cleanliness.
- Ensure that a clearance inspection is conducted by an independent licensed asbestos assessor or competent person and a clearance certificate is issued.
- Spray the polyethylene sheeting with PVA sealant.
- Remove the sheeting from the framework and put it in the labelled asbestos waste container.
- Remove PPE and put it in the labelled asbestos waste container, taping the container closed.
- If the framework was fully protected and had been decontaminated and inspected by the asbestos removalist, it can be reused.

5.7 Glove bag asbestos removal work

The glove bag (see Figure 10) removal technique is suitable for the removal of small amounts of asbestos lagging from individual valves, joints, and piping. Glove bags:

- are designed to isolate small removal jobs from the general working environment and provide a flexible, easily installed and quickly dismantled temporary enclosure for small removal work

- are single-use bags constructed from transparent, heavy-duty polyethylene (minimum 200 µm thickness) with built-in arms and access ports; glove bags are about one metre wide and 1.5 metres deep
- contain all waste and contamination within them, eliminating the need for extensive PPE and decontamination; a limitation in using glove bags is the volume of waste material they can contain, and care should be taken to prevent overfilling the bag with waste, and
- should not be used for hot pipe work due to difficulties in sealing the glove bag to the pipe or maintaining a seal.

The process below should be followed when using the glove bag removal technique:

- Equipment and removal tools for the asbestos removal work should be placed into the glove bag at the start of the job. The tools used to remove the asbestos depend on the nature of the material to be removed.
- A P1 filtered respirator, and disposable coveralls need to be worn as a minimum while using glove bags in case a bag ruptures or leaks.
- The glove bag should completely cover the pipe or object. The lagging on either side of the bag should be sound enough to support the weight of the bag and its wet contents.
- Cut the sides of the glove bag to fit the size of the pipe from which asbestos is to be removed. Attach the glove bag to the pipe by folding the open edges together and securely sealing them with adhesive (cloth or duct) tape, or an equivalent.
- Seal all openings in the glove bag with adhesive tape, including the bottom and side seams, to prevent any leakage if there is a defect in a seam.
- Saturate the asbestos with a wetting agent and then remove it from the pipe, beam or other surface. The wetting agent should be applied with an airless sprayer through a pre-cut port, as provided in most glove bags, or through a small hole cut in the bag. Asbestos that has fallen into the bag should be thoroughly saturated.
- Asbestos or ACM is generally covered with painted canvas and/or wire. Any canvas and/or wire should be cut and peeled away starting from beneath the pipe, valve or joint and then the ACM removed. If the asbestos or ACM is dry, it should be re-sprayed with the wetting agent before it is removed.
- Clean the pipe or surface once the asbestos or ACM has been removed using a wire brush or similar tool and wet wipe it until no traces of the asbestos or ACM can be seen. Wash down the upper section of the bag to remove any adhering asbestos.
- Seal edges of asbestos exposed by the removal or by maintenance activity to ensure the edges do not release respirable asbestos fibres after the glove bag is removed.
- Rinse any non-disposable tools that are in the glove bag, and grasping them in one hand, pull the hand out, turning the sleeve inside out, and release allowing the tools to remain in the glove.
- Twist and tape the glove containing the tools, then cut through the centre of the taped area.
- When the asbestos has been removed and sealed, insert a vacuum hose from a HEPA-filtered H-Class industrial vacuum cleaner into the glove bag through the access port to remove any air in the bag that might contain respirable asbestos fibres. When the bag has been evacuated, squeeze it tightly (as close to the top as possible) and twist and seal it with adhesive tape, keeping the asbestos safely in the bottom of the bag.
- Remove the vacuum line from the bag and then remove the glove bag from the workplace for disposal as asbestos waste.
- When the asbestos removal is complete, the worker must follow the procedures to personally decontaminate and decontaminate tools according to the decontamination requirements.
- The asbestos waste in the bag should be sealed and disposed of according to the waste disposal procedures (see section 7 of this Code).

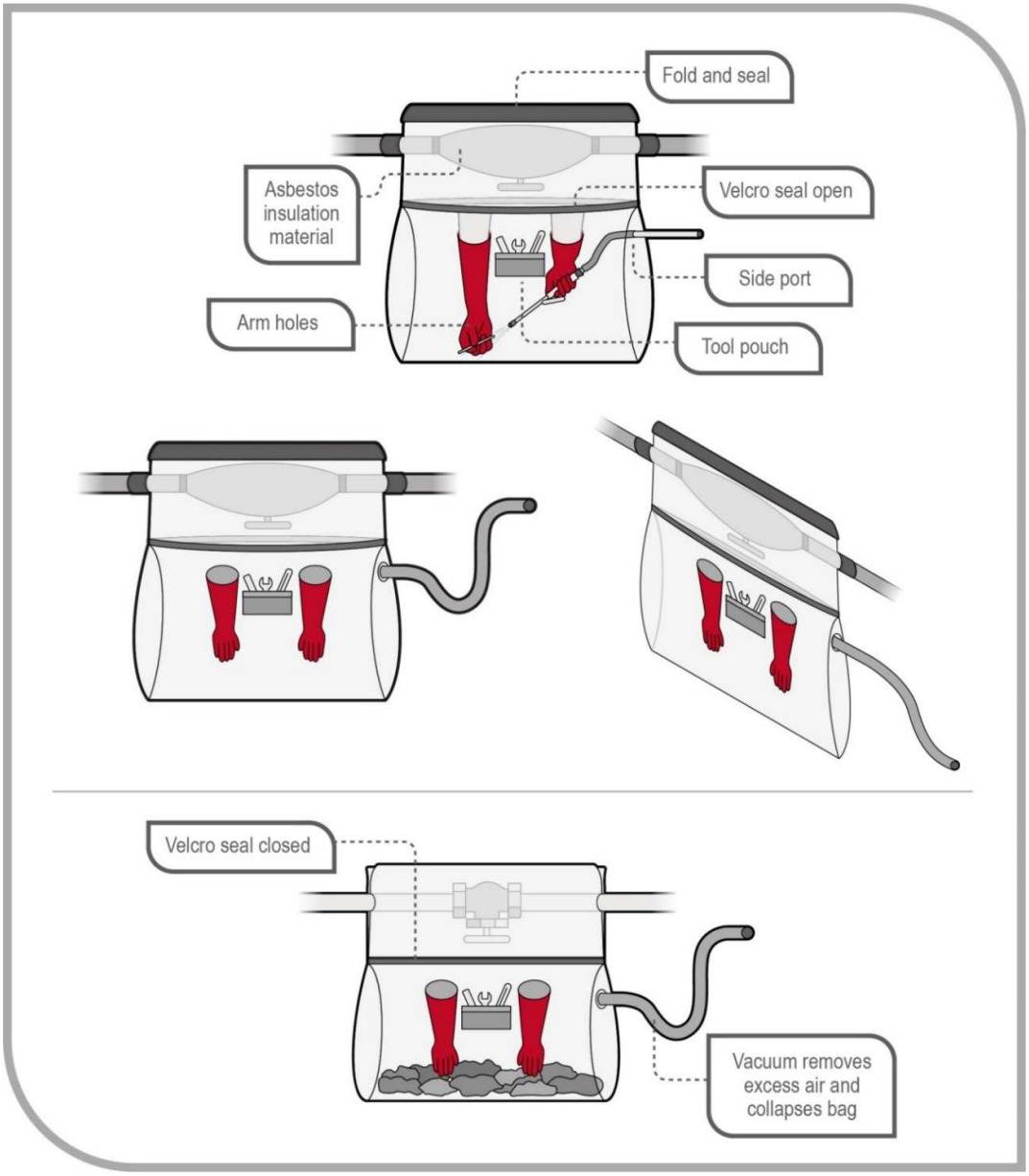

Figure 10 Using a glove bag

5.8 Wrap and cut asbestos removal method

The 'wrap and cut' technique of removal produces the lowest levels of respirable asbestos fibres. This technique is used instead of full containment procedures when removing a small amount of non-friable asbestos or ACM which is in good condition and not damaged. This method is most appropriate when the entire component is to be removed, such as redundant plant and equipment covered with lagging.

The process below should be followed when using the wrap and cut removal technique:

- The plant or equipment to be removed should be vacuumed with a HEPA-filtered H-Class industrial vacuum cleaner and/or wiped with damp rags or wet wipes (which should be disposed of as asbestos waste).
- The plant or equipment should be double wrapped with heavy duty polyethylene sheeting (minimum 200 µm thickness) and taped so that the asbestos is totally sealed within the polyethylene sheeting.

The wrapped plant or equipment is cut from the rest of the plant and equipment using mechanical shears or oxy-cutting tools.

- Only exposed metal can be cut, and care should be taken to ensure the polyethylene sheeting is not punctured or melted. The cut section is then removed as asbestos waste.
- If lagging must be removed to allow a pipe to be cut, the glove bag removal method may be used to expose the metal at the point to be cut and for a sufficient length on either side. The pipe is then cut at the centre of the exposed section.
- A P1 filtered respirator, and disposable coveralls should be worn as a minimum while doing wrap and cut removal work. If the lagging is in very poor condition, such that significant airborne asbestos fibres might be generated, a higher level of respiratory protection may be required or the method of asbestos removal reconsidered.
- On completion of the removal work, workers need to follow personal decontamination procedures and dispose of the waste according to asbestos waste disposal procedures (see 7 of this Code).

PART VI
CONTROLS FOR ASBESTOS REMOVAL WORK IN SPECIAL SITUATIONS

6. CONTROLS FOR ASBESTOS REMOVAL WORK IN SPECIAL SITUATIONS

6.1 Removing asbestos-contaminated soil

Asbestos-contaminated soil comprises non-attached pieces of asbestos cement products and other material containing asbestos uncovered in soil during other work activities.

Contamination can be detected during building and road construction and excavation, waste disposal, damage following a severe weather event such as a hailstorm, weathering over time, or when asbestos is poorly handled or damaged during removal jobs.

A risk assessment by an independent licensed asbestos assessor or competent person, including contaminated site risk assessment practitioners, should determine the most appropriate control measures and remediation strategies.

Asbestos-contaminated soil is also subject to requirements of other regulatory agencies such as *(Ministry to provide details of the relevant legislation and/or regulation)*

Removal of asbestos from contaminated soil will require a licensed asbestos removalist for any friable asbestos to be removed.

For all asbestos removal requiring an asbestos removal licence, an air-monitoring program must be implemented to ensure the control measures do not release airborne asbestos fibres. When all visible asbestos has been removed, and the air-monitoring program indicates that the level of respirable asbestos fibres does not exceed 0.01 fibres/ml (10 per cent of the asbestos exposure standard), the independent licensed asbestos assessor must complete the clearance certificate.

All asbestos and any contaminated soil removed must be disposed of as asbestos waste according to the appropriate Regulations.

6.1.1 Immediate action

If the soil is suspected of containing asbestos, the person with management or control of the workplace should assume the soil contains asbestos and cease work immediately. A competent person should take samples of the material for analysis to confirm or refute that assumption.

If confirmed, the person with management or control of the workplace must ensure control measures are implemented to minimise the release of airborne asbestos. Control measures may include:

- preparation of an asbestos management plan for the site
- setting the boundaries of the contamination as determined by an independent licensed asbestos assessor or competent person
- ensuring there is minimal disturbance of the contaminated soil until the asbestos management procedures have been implemented
- isolating and securing the removal work site using signs and barriers
- controlling dust with dust suppression techniques (such as water and wetting agents)
- providing PPE based on the level of contamination and the control measures implemented
- sampling and/or air monitoring
- providing education and training for workers on hazards and safe work practices to minimise airborne dust exposure, and
- implementing decontamination procedures for the workers and the equipment.

6.2 Removing friable asbestos from hot surfaces

Friable asbestos in or on hot metal or machinery presents one of the worst conditions for removal, as airborne asbestos fibres can spread on convection currents in the air and the potential for burns is high.

Removal of asbestos from hot surfaces should be avoided. If possible, the removal should be scheduled and planned around shutdowns, with sufficient time being allowed for the metal or machinery to cool down before removal is attempted. Hot metal removal should be used only in emergency situations as the use of water sprays may create steam, making the removal task unsafe or more difficult.

In the limited circumstances where the dry removal of asbestos from hot surfaces is the only option (for instance in emergency situations), particular care should be taken in the selection of dust extraction equipment to cope with the convection currents involved, and the selection of appropriate PPE also becomes even more important.

Heat stress should be considered when preparing the asbestos removal control plan, particularly in the selection of PPE and the design of the work program.

Arrangements for the removal of asbestos from hot plant and equipment should be factored into the asbestos management plan for the workplace. This should include cooling requirements and/or the shutdown periods required to achieve adequate cooling.

6.3 Removing asbestos in plant and pipes or pits

Asbestos products include gaskets reinforced with asbestos that are used in plant and equipment between flanges on pipes to control the temperature and pressure. Asbestos rope was used for lagging pipes and valves and for sealing hatches. Asbestos is also found in friction products such as brake linings and cylinders.

It is likely that the asbestos in gaskets and rope and friction products will be friable asbestos, and a licensed asbestos removalist will be required to remove the asbestos using methods required or recommended for friable asbestos. For example, friable asbestos may be removed using the ‘glove bag’ or ‘wrap and cut’ method.

PART VII
ASBESTOS WASTE CONTAINMENT & DISPOSAL

7. ASBESTOS WASTE CONTAINMENT & DISPOSAL

Waste asbestos should be safely removed, handled, packaged, stored, transported, treated, and disposed in an appropriately controlled (and licenced) facility. During any of these stages, there should be no discharge of visible emissions to the outside air from asbestos-containing waste material.

7.1 Waste asbestos containment and disposal

The route for removal of the asbestos waste bags or containers through the asbestos removal work area should be designed prior to commencement of the asbestos removal work. Only unused heavy duty polyethylene bags (minimum 200 µm thickness) and heavy-duty polyethylene sheeting can be used. Bags labelled for asbestos waste should not be used for any other purpose.

When developing a waste disposal program, take the following into account:

- the containment of waste to eliminate the release of airborne asbestos fibres
- details of any asbestos or ACM to be left in situ
- the types of fittings and supports and whether removal and disposal of these items is part of the work specifications
- the location and security of waste storage on site
- the transport of waste within the site and off site
- the location of the waste disposal site
- ensure that the proposed location for the storage and asbestos removal work area and the surrounding area will be unoccupied for the duration of the removal
- approvals needed from the relevant local disposal authority, and
- any local disposal authority requirements that may apply to the amount and dimensions of asbestos waste.

The development of the waste disposal program and methods used to transport waste through a building needs to be determined by a competent person (usually the asbestos removal supervisor) following discussions with the person with management or control of the workplace. In occupied workplaces, all movement of waste containers through a building should take place outside normal working hours.

7.1.1 Removal work area waste containment

A waste disposal program in the asbestos removal control plan should specify the method of transport and routes to be used for removing waste from the asbestos removal area before the commencement of each removal.

Loose asbestos waste must not accumulate within the asbestos removal work area. The loose asbestos waste should be placed in labelled asbestos waste bags or wrapped in heavy-duty polyethylene sheeting (minimum 200 µm thickness) and labelled. Once the labelled asbestos waste has been removed from the asbestos removal area, it should either be:

- placed in a solid waste drum, bin or skip which should only be used for asbestos waste and labelled for secure storage and eventual disposal, or
- removed immediately from the site by an Environment Protection Agency (EPA) approved/licensed carrier for disposal.

The asbestos waste must be disposed of at a licensed asbestos waste disposal site. The disposal process must occur in a manner that eliminates the release of airborne asbestos fibres—this can be done by ensuring:

- bagged asbestos waste is securely packaged in labelled containers
- waste containers are secured during transport, and
- waste is unloaded at the landfill site using waste disposal procedures which prevent the tearing of the polythene lining.

The asbestos waste must be disposed of as soon as reasonably practicable, whether that is:

- at the end of the removal job (providing the asbestos waste is secured on site at the end of each day to prevent unauthorised access)
- when the waste containers are full, or
- at the end of each day if the asbestos waste cannot be secured at the removal site.

7.1.2 Asbestos waste bags

Ensure all asbestos waste, friable asbestos, and small pieces of non-friable asbestos is contained to prevent exposure to airborne asbestos fibres. New heavy duty polyethylene bags (minimum 200 µm thickness) that are no more than 1200 mm long and 900 mm wide should be used to prevent manual handling injuries.

Controlled wetting of the asbestos waste should be carried out to minimise asbestos dust emissions when polyethylene bags are sealed or during any subsequent rupture of the bag or wrapped bundles. The bags must be twisted tightly, the neck folded over and then secured with adhesive (cloth or duct) tape (referred to as goose-necking).

To minimise the risk of a bag tearing or splitting and to assist in manual handling, asbestos waste bags should not be filled more than half full (depending on the weight of the items) and excess air should be gently evacuated from the waste bag in a way that does not cause the release of dust.

The bags should be labelled in accordance with the GHS to indicate they contain asbestos, and that dust creation and inhalation should be avoided.

The external surface of each bag should be cleaned to remove any adhering dust before the bag is removed from the asbestos removal work area and double bagged outside the asbestos removal area immediately following the decontamination process.

7.1.3 Polyethylene sheeting for containing asbestos waste

Asbestos sheeting and redundant asbestos-lagged pipes and equipment should be double wrapped in heavy duty polyethylene (polythene) sheeting (minimum 200 µm thickness) and adhesive (cloth or duct) tape applied to the entire length of every overlap to secure the bundles and minimise the risk of the polyethylene sheeting tearing or splitting.

Polyethylene sheeting should be new (not recycled) as recycled sheeting can have flaws in it.

Once wrapped in polythene, the bundles need to be labelled to indicate they contain asbestos so they can be treated appropriately.

Once the waste has been removed from the asbestos removal work area, you should ensure it is either:

- placed in a solid waste drum, bin or skip that has been signposted as asbestos waste for secure storage and eventual disposal, and
- immediately removed from the site by the relevant Government Authority approved/licensed carrier for disposal.

7.1.4 Labels for waste containers and drums

Ensure all containers containing a hazardous chemical such as asbestos comply with labelling elements (see Figure 11). The waste drums or bins should be lined with heavy duty polyethylene sheeting (minimum 200 µm thickness), and labels warning of the asbestos waste should be placed on the top and side of each drum or bin with the words, 'Danger: Asbestos Do not break seal' or a similar warning.

Figure 11: Example of an asbestos waste label

7.1.5 Asbestos waste drums or bins

Ensure all drums or bins used for the storage and disposal of asbestos waste are in good condition with lids and rims in good working order and free of hazardous residue.

The drums or bins should be:

- placed in the asbestos removal work area or located as close to the asbestos removal work area as possible before removal work commences
- be lined with heavy duty polyethylene sheeting (minimum 200 µm thickness), and
- have their rims sealed and their outer surfaces wet-wiped and inspected before they are removed from the asbestos removal work area.

Ensure labels warning of the asbestos waste are placed on the exterior of each drum or bin.

Controlled wetting of the waste during drum or bin filling should be carried out to minimise asbestos dust emissions.

Drums or bins used to store asbestos waste must be stored in a secure location when they are not in use. They should not be moved manually once they have been filled. Trolleys or drum lifters should be used.

If the drum or bin is to be re-used, the asbestos waste should be packed and sealed so that when the drum or bin is emptied there is no residual asbestos contamination. The drum or bin should be inspected after each use to ensure there is no asbestos residue.

7.1.6 Asbestos waste skips, vehicle trays and similar containers

If the volume or size of the asbestos waste cannot be contained in asbestos waste bags, drums, or bins; a waste skip, vehicle tray, or similar container that is in good condition should be used.

The asbestos should be sealed in double-lined, heavy duty polyethylene sheeting (minimum 200 µm thickness) or double bagged before it is placed in the skip, tray, or similar container. However, non-friable asbestos waste may be placed directly into a skip or vehicle tray that has been double lined with polyethylene sheeting provided it is kept damp to minimise the generation of airborne asbestos.

Once the skip, tray or similar container is full, its contents should be completely sealed with the polythene sheeting. If the skip is emptied at a waste disposal site, waste disposal procedures which prevent the tearing of the polythene lining should be developed.

If asbestos waste cannot be disposed of immediately, the skip may be used for storing the asbestos waste on site over time, provided that the contents are secured (for example using a lockable lid or locating the skip in a secure area) to prevent unauthorised access.

7.1.7 Transport and disposal of asbestos waste

Disposal of asbestos waste is the final step in the process of asbestos removal work. It is therefore the last point at which the exposure to risks associated with asbestos is likely to occur. The asbestos waste must be disposed of as soon as is practicable at a licensed asbestos disposal site.

The transport of asbestos waste requires proper classification, packaging, labelling and documentation as required by the local transport authorities, to ensure the safe and legal transportation of this.

Asbestos waste should be transported in an enclosed vehicle, an enclosed carrying compartment, a canvas covering that is sufficient to contain the transported waste, skip or freight container. A suitable receptacle should be used to transport the asbestos waste, to ensure that any bags, wrapping and packaging do not become damaged or open during transit and release asbestos material or asbestos fibres.

Vehicles that use compactors to reduce waste volume should not be used because these will cause the waste containers to rupture.

Prior to uplift, the driver should be responsible for checking / inspecting the following:

- The packaging to ensure it is of an appropriate standard (if not, the material should not be collected or transported)
- The asbestos waste is properly contained in leak-tight containers with appropriate labels
- The outside surfaces of the containers are not contaminated with asbestos debris adhering to the containers.

Once the transporter is satisfied with the condition of the asbestos waste and agrees to handle it, the containers should be loaded into the transport vehicle in a careful manner to prevent breaking of the containers. Similarly, at the disposal site, the asbestos waste containers should be transferred carefully to avoid any possible fibre release.

If there is reason to believe that the condition of the asbestos waste may allow significant fibre release into areas along the route during transport, the transporter should not accept the waste. Similarly, if it is suspected that the vehicle transporting the asbestos has become contaminated, then the vehicle should be decontaminated.

There will always be some element of risk involved with the transportation of asbestos waste; therefore, it is recommended the following details are received and kept for a period:

- The name of the asbestos waste transporter
- How the waste is contained
- The estimated quantity of asbestos waste
- How the waste will be transported
- Where the waste will be transported to
- How correct disposal shall be verified, such as tip dockets.

7.2 Disposal Location Requirements

The disposal of asbestos waste is the final step in the work process and is therefore the concluding point at which exposure to asbestos risk may occur. The disposal of this waste should be in accordance with any local regulations and at a landfill authorised to accept asbestos waste. Asbestos contaminated waste should never be disposed of in the general waste system or by burning.

Disposal involves the isolation of asbestos waste material to prevent fibre release to air or water. The main option for disposal locally would be at a secure hazardous substance landfill if facilities exist and sufficient measures are in place to prevent the release of these asbestos fibres.

All asbestos waste disposal areas at a landfill should be within their own dedicated special waste location, which is situated a sufficient distance away from the edge of the landfill and an adequate distance from other landfill activities to minimise the risk of exposure. These areas should be appropriately marked.

Landfill burial is recommended as an environmentally sound isolation method because asbestos fibres are virtually immobile in soil. At the landfill, the waste asbestos should be immediately buried and covered with 0.5 m of cover material, such as locally available soils, refuse or other materials (provided the asbestos containment is not ruptured). The excavated soils from the trench should then be used to cover the asbestos waste to the required depth.

7.3 Requirements of International Conventions

Drafting Guidance:

The Conventions, particularly the Basel Convention, contain procedures detailing the requirements for transboundary movement of hazardous and other waste

Remote and geographically dispersed countries with relatively small populations have limited options for waste disposal, especially for hazardous or asbestos-contaminated waste. Therefore, the effect of international conventions governing the transporting asbestos waste for disposal should be strongly considered.

The Basel and Waigani Conventions exist to control the transboundary movements of hazardous wastes by reducing and eliminating these movements and minimising the production of hazardous and toxic wastes in the Pacific region. The Conventions also ensure disposal of wastes in the Convention area is completed in an environmentally sound manner.

Under the Conventions, a transboundary movement means 'any movement of hazardous wastes or other wastes:

- From an area under the national jurisdiction of one State; and
- To or through an area under the national jurisdiction of another State, or to or through an area not under the national jurisdiction of any State, provided at least two States are involved in the movement'.

The Conventions also require that only those persons authorised or allowed to transport or dispose of wastes, undertake such operations. It also states that wastes subject to a transboundary movement be packaged, labelled, and transported in accordance with generally accepted and recognised international rules and standards.

PART VIII
MANAGING ASBESTOS IN-SITU

8. ASBESTOS WASTE CONTAINMENT & DISPOSAL

All items that are managed in situ require inspection in accordance with the requirements of a management plan. The inspection of the item will include an update of the risk assessment to identify whether the material has deteriorated or the potential to disturb the material has changed. Once the re-inspection and assessment has been completed, a review of the controls must be undertaken, and the management plan must be updated.

8.1 In-Situ management options for Asbestos

Management and control of all 'in situ' ACM is essential. The well-known adverse health consequences of exposure to airborne asbestos fibres can be prevented if precautions are taken and appropriate procedures are followed. The sections below describe options for management ACM.

8.1.1 Encapsulation

Encapsulating an asbestos product involves coating the asbestos material with a product that penetrates the material, binding the fibres together as a hardened matrix to reduce the potential for fibre release (e.g. a glue-like product can be sprayed onto areas where asbestos dust is present. The product binds the dust together onto the surface and hardens, reducing the potential for asbestos fibres to be generated).

Encapsulation may be suitable for use if the original asbestos bond is still intact, and it would create a greater risk to remove the asbestos. Encapsulation helps protect the asbestos from mechanical damage, increases the length of the product's serviceability and may also be used to prevent the release of airborne asbestos during its removal.

Encapsulation is often used if the material is in a poor condition, and it is not possible to remove the asbestos. Encapsulation can also be used if there is a lower potential of disturbing the asbestos or if a short-term management technique is required prior to a removal.

Encapsulation is not advised on water-damaged material, as the process may not be effective. Significantly damaged asbestos items and items that have been identified as deteriorating should be removed as opposed to encapsulated.

8.1.2 Sealing

Sealing an asbestos product involves coating the asbestos material with a product that creates a barrier on the product (e.g. a protective coating can be applied around an existing asbestos pipe insulation to reduce the potential of asbestos fibre release).

Sealing is often used as temporary measure to reduce an immediate risk until a more permanent management technique can be applied.

Sealing is often used if the material is in a poor condition, and it is not possible to remove the asbestos. Sealing can also be used if there is a lower potential of disturbing the asbestos or if a short-term management technique is required prior to a removal.

The asbestos material will remain on site and still require ongoing maintenance. As the work of sealing includes the disturbance of asbestos materials, safe work practices will need to be developed, including the potential for an enclosure with clearances.

Sealing is not advised on water-damaged material, as the process may not be effective. Significantly damaged asbestos items and items that have been identified as deteriorating should be removed as opposed to sealed.

8.1.3 Enclosure

Enclosure is placing a physical barrier between site occupants and the ACM (e.g. a solid wall is constructed in front of an asbestos cement sheet wall that has minor damage and has been repaired. Cones are placed in front of the wall. This provides a visual warning along with a physical barrier that will reduce the potential for the material from being disturbed).

An enclosure is used to reduce the potential of asbestos material being accidentally disturbed or damaged. A well-constructed enclosure with contain asbestos fibres behind the enclosure wall, making access impossible.

Enclosures are often used when asbestos is difficult to remove, and fibres can be fully contained within the enclosure. Enclosures can only be used on areas that will never need to be accessed, as the enclosure cannot be removed once established, unless for asbestos removal purposes or emergency response work.

An enclosure cannot be used if the enclosure is likely to be damaged or the asbestos cannot be fully enclosed.

PART IX
ASBESTOS IN SOILS

9. ASBESTOS IN SOILS

Managing asbestos in soil has implications for the current and future occupants of the land and/or any workers employed on the site. The guidance provided applies principally to legacies from poor historical onsite management of asbestos materials, and not to illegal disposal or landfilling activities related to waste generated offsite.

Exhaustive work has been done on this subject over the last few years. One may wish to review the following guidance documents for additional information on this topic. The principles underlying the guidance in this document are reflective of these documents:

- New Zealand Guidelines for Assessing and Managing asbestos in Soil (BRANZ Ltd, November 2017) https://www.baybuildinginspections.co.nz/wp-content/uploads/2020/01/Asbestos-In-Soil-.pdf
- Managing Asbestos in or on soil (NSW Government Safework) https://www.safework.nsw.gov.au/resource-library/asbestos-publications/managing-asbestos-in-or-on-soil
- Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western (Government of Western Australia, May 2009) Australia. https://www.health.wa.gov.au/~/media/Files/Corporate/general%20documents/Asbestos/PDF/Guidelines-Asbestos-Contaminated%20Sites-May2009.pdf

The objective of the approach outlined here is to ensure that proportionate and practicable controls are applied in a manner commensurate with actual risk.

9.1 Factors that influence how asbestos in soil is managed

The site history and information about how it came to be contaminated with asbestos provide useful insight into the nature of the issue and what further information may be needed. The principal considerations in determining how to manage asbestos in soil include:

- the form of the asbestos containing material, and how readily it generates airborne fibres
- the extent or scale of asbestos contamination on the property
- whether the asbestos is predominantly on the surface or is buried at depth

- the current and possible future uses of the affected land and whether these uses may materially affect the risk posed from the asbestos containing material.

9.2 Assessing asbestos in soils and its risks

Asbestos only poses a risk to human health when elevated levels of asbestos fibres are breathed in. The likelihood of exposure occurring depends upon the potential for the asbestos material to release fibres, whether the asbestos material is contained or covered, and any operational control measures or personal protective equipment which have been applied to limit the generation and/or inhalation of airborne fibres.

Non-friable asbestos, in sound condition, represents a low human health risk. However, friable asbestos materials or damaged, crumbling asbestos, have the potential to generate, or be associated with, free

asbestos fibres and therefore must be carefully managed to minimise the release of asbestos fibres into the air.

9.2.1 Desktop review and site visit

A desktop review and site visit should be performed to establish potential sources of asbestos on the site and surrounding land with the potential to affect the subject site. The following is typically completed for an initial assessment prior to completing intrusive assessments:

- Establish the area of concern and review evidence produced to date – i.e. photographs of stockpiled presumed asbestos containing pipe material in a gully brought to the attention of environmental compliance team or it could be the intention to redevelop a site that previously contained large 1950's warehouse.
- Establish previous, current land use and proposed land use.
- Review site documentation in relation to usage and building history – previous refurbishments, demolitions undertaken on-site.
- Review aerial photography – google earth or in country geographical information systems.
- Review mapped geological records including regional, local and site-specific investigation borehole logs if available.
- Understand site receptors – who can come into contact with the presumed asbestos contamination currently and in the future?
- Produce a preliminary conceptual site model and qualitatively assess the risk posed.
- If a site visit is feasible at this stage, and initial soil and ACM sampling can be completed then this should be reported in the initial report.
- Initial indication of presumed or confirmed ACM distribution on the site and likely or confirmed asbestos fines and fibres.
- Photographs captured during the site visit should be appended as should interview notes.

Field screening can be completed to establish the amount of ACM within a representative area or soil horizon.

A known volume of soil (minimum 10L) and sieving this through a 10 mm sieve. The retained ACM is then collected and weighed and the percentage of asbestos in soil calculated based on the calculation in Figure 22.

$$\%\ \text{soil asbestos} = \frac{\%\ \text{asbestos content x ACM (kg)}}{\text{soil volume (L) x soil density (kg/L)}}$$

Figure 22: Calculation of percentage asbestos in soil from ACM

The above should be documented in a site assessment report completed in accordance with local regulations The report should assess the potential risk to identified receptors, existing data gaps and recommendations for further assessment if necessary.

9.2.2 Investigation criteria guidelines for asbestos in soils

The Building Research Association New Zealand (BRANZ, 2017) Guideline asbestos investigation criteria are presented in Table 11 and can be adopted as investigation and remediation criteria for assessing risk posed by asbestos in soil.

Table 11: Asbestos Investigation Criteria (BRANZ 2017)

Form of asbestos		Soil guideline values for asbestos (w/w)			
		Residential[1]	High-density residential[2]	Recreational[3]	Commercial and Industrial[4]
ACM (bonded)		0.01%	0.04%	0.02%	0.05%
Fibrous Asbestos and/or Asbestos Fines[5]		0.001%	0.001%	0.001%	0.001%
All forms of asbestos – surface		No visible asbestos on surface soil[6]	No visible asbestos on surface soil[6]	No visible asbestos on surface soil[6]	No visible asbestos on surface soil[6]
Capping requirements for residual contamination above selected soil guideline value					
Depth[7]	Hard cap	No depth limitation, no controls – except for long-term management	No depth limitation, no controls – except for long-term management	No depth limitation, no controls – except for long-term management	No depth limitation, no controls – except for long-term management
	Soft cap	≥0.5 m	≥0.5 m	≥0.5 m	≥0.2 m

1) **Residential**: Single dwelling site with garden and/or accessible soil. Also includes day care centres, preschools, primary and secondary schools and rural residential.
2) **High-density residential**: Urban residential site with limited exposed soil / soil contact, including small gardens. Applicable to urban townhouses, flats and ground-floor apartments with small ornamental gardens but not high-rise apartments (with very low opportunity for soil contact).
3) **Recreational**: Public and private green areas and sports and recreation reserves. Includes playing fields, suburban reserves where children play frequently and school playing fields.
4) **Commercial and industrial**: Includes accessible soils within retail, office, factory and industrial sites. Many commercial and industrial properties are well paved with concrete pavement and buildings that will adequately cover/ cap any contaminated soils.
5) **FA and/or AF:** Where free fibre is present at concentrations at or below 0.001% w/w, a proportion of these samples should be analysed using the laboratory analysis method described in section 5.4.4 of the BRANZ guideline (≥10% of samples). This is due to limitations in the AS 4964-2004 and WA Guidelines 500 ml sample method for free fibre (see section 5.4 of the BRANZ guideline for more information).
6) **Surface**: Effective options include raking/tilling the top 100 mm of asbestos-contaminated soil (or to clean soil/ fill if shallower to avoid contaminating clean material at depth) and hand picking to remove visible asbestos and ACM fragments or covering with a soft cap of virgin natural material (VNM) 100 mm thick delineated by a permeable geotextile marker layer or hard cap. Near-surface fragments of ACM can become exposed in soft soils such as sandy pumiceous soils after periods of rain.
7) **Depth**: Capping is used where contamination levels exceed soil guideline values. Considerations of depth need to incorporate the type and likelihood of future disturbance activities at the site and site capping requirements (see section 6.1 of the BRANZ guideline). Ideally, any capping layer should be delineated by a permeable geotextile marker layer between the cap and underlying asbestos/contaminated material.

Institutional controls must be used to manage long-term risks, particularly where the cap may be disturbed (see section 7 of the BRANZ guideline). Two forms of capping are typically used:

a. Hard cap comprises surfaces that are difficult to penetrate and isolate the asbestos contamination, such as tar seal or concrete driveway cover. This would typically not include pavers or decking due to maintenance and coverage factors.

b. Soft cap consists of a layer(s) of material which either comprise virgin natural material or soils that meet the asbestos residential soil guideline value from an on-site source. Use of on-site soils may require resource consent.

9.2.3 Asbestos in soil exposure pathways

Although other routes of exposure are possible (e.g. dermal contact, ingestion), inhalation is the only route that has been established as causing harm, this is the same for when asbestos is present in soil. Other exposure routes such as dermal contact or clothing contamination may contribute to secondary exposure i.e. subsequent re-release of fibres into the air and inhalation following the initial exposure and are therefore important.

Numerous studies (Addison et al 1988, Swartjes and Tromp, 2008) have evaluated the potential for airborne concentrations of asbestos fibres from various types and degrees of asbestos contaminated soil. Although there are several gaps in the literature and research still to be completed, the data currently indicates that significant soil contamination is required to exceed regulatory control limits. This Model Code, and particularly the levels of personal protective equipment, respiratory protective equipment and decontamination has therefore been selected with this likely lower exposure and risk threat.

Current analytical evidence and studies available within the ground investigation and remediation industry suggest that significant visible quantities of non-friable ACMs such as asbestos cement would need to be present in the soil to result in airborne asbestos concentrations over the trace level of 0.01f/ml, equivalent to one tenth of the control limit. However, should more friable ACMs be present, and should they be subject to mechanical processes (e.g. crushing, soil screening and compaction and grading) of asbestos containing soil and should sufficient controls not be adopted then it may result in airborne asbestos above trace or control limits.

Two important studies, Addison et al 1988 and Swartjes and Tromp, 2008 have evaluated the potential for airborne concentrations of asbestos fibres from various types and degrees of asbestos contaminated soil. Although there are several gaps in the literature and research which are still to be completed, the data currently indicates that significant soil contamination is required to exceed regulatory control limits.

The Swartjes & Tromp (2008) evaluated the concentration present in soil and the airborne concentration under several scenarios. Their study data is presented in Figure 23 and includes field and modelled data. The study concluded that airborne asbestos concentrations were unlikely to exceed 0.01 fibres / millilitre (f/ml) of air while soil concentrations were at 0.01 % w/w.

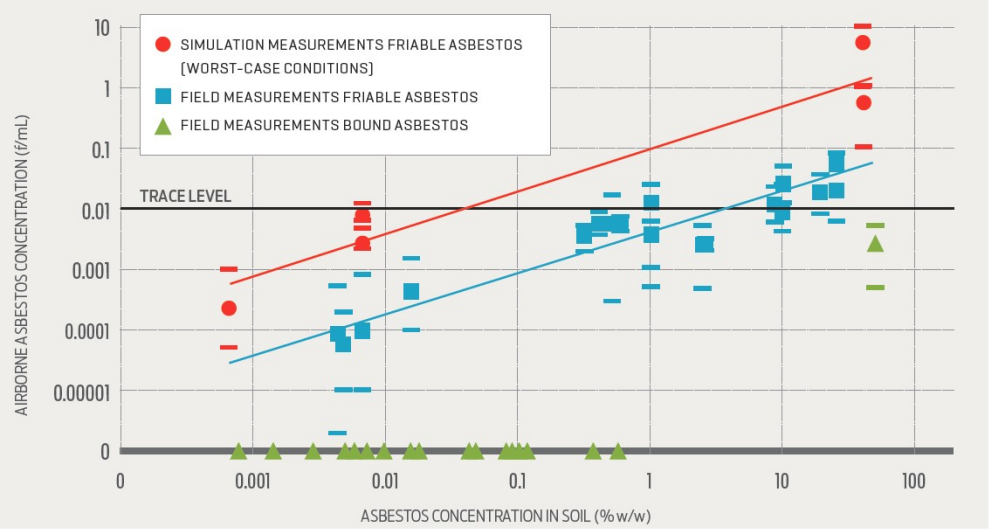

Figure 23: Anticipated airborne asbestos concentrations Swartjes & Tromp (2008). *Source: BRANZ (2017)*

9.2.4 Form of asbestos and potential to generate airborne asbestos fibres

The potential for materials containing asbestos to generate airborne asbestos fibres (at which point asbestos may become a human health risk) varies significantly depending upon the form of the asbestos material.

Non-friable asbestos is asbestos bound in a matrix such as cement or resin. 'Fibro' is the most common form of non- friable asbestos. When in a sound condition, the potential for these materials to release fibres is relatively low.

Friable asbestos is usually in the form of loose asbestos that is not bound together. The most common forms of friable asbestos are thermal lagging used on steampipes, boilers, as fire protection, ceiling insulation and the like, and raw asbestos waste from asbestos products manufacturing. Friable asbestos can usually be broken up or crumbled using hand pressure to generate free fibres. If it is disturbed, friable asbestos has the potential to generate significant quantities of airborne fibres, and because of this requires a high level of control.

9.2.5 Assessing and managing 'non-friable' asbestos in or on soils

Where fragments of non-friable asbestos are identified on the soil surface, then the fragments may be removed by hand-picking, tilling or screening (applying suitable work health and safety practices).

- A grid pattern should be applied to ensure a structured and systematic approach to assessment and removal
- Upon completion, no visible asbestos fragments should be present on the surface
- The top 10cm of wetted soil should be gently raked to expose any residual asbestos fragments
- The collected material should be securely wrapped in plastic sheeting and taken to an appropriate landfill.

Soil sampling for the detection of asbestos fibres released from fragments of non-friable asbestos such as fibro is not required where the non-friable asbestos product is in good condition – i.e. it is not weathered or damaged and is unlikely to release fibres unless carelessly handled.

9.2.6 Assessing and managing 'friable' asbestos in or on soils

If friable asbestos is identified in or on soil, all the following actions shall be taken:

- isolate and secure the area by installing warning signs and a temporary barricade (e.g. marker tape) around the affected area to prevent anyone from accidentally disturbing the materials and generating airborne asbestos fibres
- to minimise the release of fibres into the air keep soil damp (but not flooded); and, if it is safe to do so, cover the area with plastic sheeting
- engage an asbestos removal licence holder permitted to conduct asbestos removal work or asbestos related work that involves friable asbestos. All workers involved in friable asbestos removal work must hold current certification in relation to the approved friable removal course.
- undertake air monitoring, risk assessments and issue clearance certificates for removal work.

9.2.7 Asbestos materials buried at depth in soil

Asbestos only presents a risk if fibres may become airborne and breathed in. Where nonfriable or friable asbestos is present in soil at depth (greater than 0.5 metres below the soil surface), the asbestos material should not be disturbed unless it is for the purpose of site remediation, redevelopment or site management. Any remediation work should be conducted in a controlled manner in accordance with protocols for contaminated sites assessment and management.

For sites where asbestos is found at depths between 10cm and 0.5 metres, a site-specific assessment should be undertaken to determine an appropriate management strategy.

9.3 Abatement/remediation options assessment

Prior to commencing any remedial works, the remedial objective and remedial goals needs to be confirmed. This is essentially stating:

- The asbestos contamination being addressed.
- What remediation is hoping to achieve.
- How the remedial team will know when remediation has been completed.

Examples of remedial objectives include removing all asbestos in the upper 0.5 m of soil across the unsealed areas of the site. The associated remedial goals could be no visible ACM within the upper 0.5 m of soil and all surface soil samples and wall soil validation samples to contain less than 0.001% w/w asbestos fibres in soil.

The method of asbestos removal is dependent upon several factors including, but not limited to the following:

- Location of site, sites within a heavily built-up area with sensitive receptors such as schools, childcare facilities or other public buildings or spaces may pose additional remediation considerations
- Location on-site, is the asbestos easily accessible or within a crawl space beneath a building or adjacent to services or sensitive watercourses
- Depth of contamination needs to be established before remediation commences if a successful soil validation process is to be completed
- Size of area impacted.

The type of asbestos contamination is also very important for selecting the most appropriate remedial method. If the asbestos contamination is, predominately large broken pieces of ACM on the soil surface then manual hand pick and rake may be the most appropriate. The opposite end of the scale, highly friable lagging material found for example on hospital hot water pipes in the crawl space or external pipes would require excavation under high level risk controls as indicated in earlier sections of this Model Code.

As with all contaminated land remediation assessments, the remediation strategy, and potential remedial options available should be considered and outlined so that the preferred option can be selected. A remedial options appraisal should be completed once asbestos contamination has been identified and communicated to all stakeholders and regulators in the Nation responsible for community health or workplace health and safety. For all asbestos contamination scenarios, once identified, access to the area should be restricted to prevent unwitting exposure to site occupants and to prevent the spread of asbestos further.

The remedial options appraisal should outline the contamination to be remediated, including impacted area and volume calculations, the remedial methodologies available, each options anticipated timeframes, and a cost benefit analysis of each option. The cost benefit analysis should consider health and safety requirements of those completing the remedial work, financial implications of each option, sustainability factors including carbon emissions and water quality impacts. The cost benefit analysis should consider both short term and long-term outcomes for the selected remedial option. This then allows the decision makers to select the most appropriate remedial method. For significant asbestos contamination scenarios in public spaces or those presenting a high risk of exposure, best practice is that regulators are involved throughout the project and especially in the remedial selection process.

9.4 Site controls to address hazards of asbestos in soils

Site controls dealing with asbestos in soils are generally the same as for any ACM abatement activities.

9.4.1 Engineering site controls

Prior to adopting PPE as a control, steps should be taken to eliminate the hazards via engineering and administration controls. Engineering controls for work with asbestos contaminated soil may include steps such as the following:

- Water de-misting units stationed around perimeter of remedial area
- Spraying of exposed soil with encapsulating polymer emulsion sprays

- Fencing with HDPE lining to prevent airborne asbestos leaving remedial area
- HDPE barrier placed over remedial area when earthworks are not in progress
- Installation of sumps and stormwater barriers to contain runoff
- Installation of clean pads for earthwork machinery to operate on rather than directly on contaminated soil
- Installation of wheel wash facilities for earthwork machinery
- Manual removal of worst impacted ACM areas
- Erection of a decontamination unit.

Once engineering controls have been planned and adopted, administrative controls should also be employed on projects involving asbestos in soil.

9.4.2 Administrative site controls

Administrative controls are measures put in place to alter the way remedial work is completed, for example procedures or policies that are intended to control exposure.

Administrative controls for asbestos soil remediation projects can include the following:

- Health and safety documentation including job safety analysis for each task and the hazard mitigation controls required for each task
- Project induction material and daily safety briefing requirements
- Appropriate signage to prevent unauthorised access and to demark the asbestos remediation zone and PPE requirements for each zone
- Hazard warning boards and sign in and out registers
- Site set out plan with zones to outline the removal area, waste disposal area, decontamination zone, transition zone, emergency shelter area
- Waste disposal procedure and waste manifest and disposal certificates
- Decontamination procedure and signage
- Air monitoring and clearance procedures.

Once all the engineering and administrative controls have been employed, if a risk of exposure to airborne asbestos cannot be eliminated then the risk should be minimised via the selection of appropriate PPE.

9.5 Transport and disposal of asbestos impacted soils and debris

Management of asbestos contaminated soils for disposal generally follows in the same fashion as with any ACM.

9.5.1 Asbestos Impacted Soil

Waste soil excavated from the remedial site should be deposited directly into the removal truck. Care should be taken to avoid generating dust and potentially airborne asbestos during the deposition of soil into the truck. This can be achieved by reducing the drop height from the bucket to the base of the truck as much as reasonably practical and ensuring volumes within the bucket are approximately ¾ of the bucket capacity therefore reducing the potential for soil to fall from the bucket. A mist spray facing into the excavator bucket or over the truck may assist with ensuring the soil to be tipped will be damp.

The position of the truck loading bay should be as close as possible to the remedial zone for project efficiency but also to avoid unnecessary tracking of the excavator within the remedial zone and avoiding the increased potential for dust to be generated. The truck loading bay should preferably be on a non-impacted part of the site or on a temporarily covered part of an asbestos impacted site. This is so the truck will not encounter asbestos contaminated soil and therefore can avoid significant decontamination procedures. If the truck is required to

enter the remedial zone, 200µm thick HDPE or a sacrificial layer of gravel or other similar alternative could be laid as 'clean' road base for the trucks to utilise while on-site. This may also be required if the site conditions are wet and boggy and would likely assist with reducing the tracking of soil to other areas of the site or potentially off-site.

Owners of vehicles that transport waste asbestos must hold an appropriate waste transport permit that meets local requirements The permit shall stipulate the necessary controls for the safe handling, transport and disposal of waste asbestos. Packaging material must be protected and remain intact during transport and unloading. Any packaging that is damaged must be replaced or repaired prior to disposal.

Asbestos, must be containerized for transport and disposal as follows:

- Containers are 6-mil thick, plastic bags sealed to make them leak-tight.
- Minimize the void air space in the bags upon sealing, to reduce any fibre emissions should the bags burst under pressure
- Double bagging, plastic-lined cardboard containers or plastic-lined metal containers provide more thorough containerization
- The first and second set of bags should be colour coded to facilitate identification

Once the soil transport removal process is complete, the trucks should be thoroughly decontaminated both in the cabs and exterior. Ideally truck drivers do not need to leave the cab during the collection of waste as this can lead to soil entering the cab area.

9.5.2 Segregation of soil and building material

Building material present at a site may have become contaminated with asbestos dust due to several reasons. Weathering or damage of the material such as external cladding or roofing, because of the building use and or from inappropriate removal and management of the asbestos. Depending upon the extent and volume of asbestos contamination of the building material it may be possible to segregate, assess, decontaminate and dispose of separately. Segregation and disposal of building material, if it is to occur, should be discussed in the remedial options assessment or remedial action plan.

Segregation and assessment for the presence of asbestos via swabbing of each building material type may be a cost effective and suitable strategy for reducing the amount of waste classed as asbestos containing.

Building materials frequently encountered during earthworks on asbestos contaminated sites may include large volumes of building materials such as concrete from foundation slabs or pavements, bricks from wall cladding, wood from cladding and framing and metal from roofing materials. Certain materials are more likely to retain asbestos fibres, such as wood and insulation products, while others will lend themselves to being decontaminated with water and potentially H type HEPA vacuums or large-scale vacuum trucks installed with H type HEPA vacuums.

The time and cost taken to complete segregation and assessment of the materials would need to be offset the disposal costs of the material. Other factors which may be of importance during the decision-making process would be the impact of additional waste disposal traffic to and from the site, the importance of material re-use and sustainability to the client and the additional time required to segregate the material.

Appendix A—Glossary

Term	Explanation
Abatement	Asbestos abatement is the legal and safe removal of asbestos from a building, home, or worksite.
ACM	Asbestos-Containing Material
ACD	Asbestos-Containing Dust
ACOP	Template Pacific Region Asbestos Management Code of Practice
Air Monitoring	Airborne asbestos fibre sampling to assist when assessing exposure and to assist in the monitoring of the effectiveness of control measures implemented during the asbestos removal process.
ARCP	Asbestos Removal Control Plan
Asbestos	Naturally occurring fibrous hydrated silicate minerals belonging to the serpentine and amphibole mineral groups that have crystallized in the asbestiform habit, causing them to be easily split into long, thin, flexible, strong fibres when crushed or processed. These minerals possess high tensile strength, flexibility, resistance to chemical and thermal degradation, and electrical resistance.
Basel Convention	Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1992)
Bonded Asbestos Materials	Materials that contain asbestos, which is 'locked' into the matrix of the material, e.g., cement.
BRANZ	Building Research Association of New Zealand
Breathing Zone	An imaginary 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. Breathing zone samples are usually obtained by fastening a filter holder to a jacket lapel of the worker.
Bulk Samples	Manufactured or processed products, including solid and dust matrices, or naturally occurring materials such as ores and soils
Competent Worker	A person or employee who has received adequate information, instruction and training for the task being done and can demonstrate an adequate and up-to-date understanding of the work, required control measures and appropriate law. They must also have enough experience to apply this knowledge effectively. A training course on its own will not make an individual competent. Competence is developed over time by implementing and consolidating skills learnt during training, on-the-job learning, instruction and assessment.
Duty Holder	Any person who owes a work health and safety duty under Health and Safety legislation (including PCBUs).
EHO	Environmental Health Officer

Term	Explanation
EU	European Union
Friable Asbestos	Friable asbestos or ACM is asbestos or ACM in powder form, or able to be crumbled, pulverised, or reduced to a powder by hand pressure when it is dry. This is the condition for asbestos or ACM that presents the greatest hazard. (WorkSafe NZ).
Hazard	An event or occurrence that could cause harm
Homogenous Samples	Those that exhibit an overall uniform distribution of fibres (of any type) through the entire sample, or in each discernibly discrete layer of the sample. Examples include sprayed asbestos, asbestos-cement, asbestos pipe lagging, asbestos millboard, asbestos-containing mastic, vinyl-asbestos floor tiles, and asbestos-containing sprayed vermiculite. (Referenced from AS 4964-2004 Part 4.5)
Identifiable Asbestos Fibres	Fibres that can be unequivocally identified by polarised light microscopy and dispersion staining
MAP	Model Accreditation Plan (MAP) mandates safety training for those who do asbestos works
µm	Micrometre
Mineral Fibre of Unknown Type	Those fibres which exhibit some optical characteristics of asbestos fibres, but which cannot be unequivocally identified with dispersion staining, which is required for asbestos identification.
Non-Friable Asbestos	Non-friable asbestos or ACM is, as the phrase suggests, not friable. Non-friable asbestos or ACM is usually safer than friable asbestos or ACM, because asbestos fibres bond into the product. However, non-friable ACM is likely to release fibres if it is disturbed or manipulated. (WorkSafe NZ).
Organic Fibres	Natural organic fibres are a heterogeneous group of compounds of animal or vegetable origin and may at times be confused with asbestos. These include natural organic fibres such as cellulose, hemp, cotton, flax, jute, and wool; and man-made organic fibres such as polypropylene, polyester, nylon, Kevlar and acrylics.
PACM	Potentially Asbestos-Containing Material
PCBU	Person Conducting a Business or Undertaking (analogous to Duty Holder)
Phase Contrast Optical Microscopy	Is a contrast enhancement technique that allows for greater definition and visibility of fine virtually transparent and colourless specimens such as airborne asbestos fibres from background.
Polarising Light Microscope (PLA)	A microscope with a polariser, analyser, first order red compensator plate and a rotating stage fitted with X and Y controls. The polariser, analyser and first-order red compensator plate shall be capable of being used independently of each other.
PPE	Personal Protective Equipment

Term	Explanation
Respirable Asbestos Fibres	Fibres less than 3 µm in width and greater than 5 µm and less than 100 µm in length, and with an aspect ratio (length to width) of greater than 3:1.
Risk	Risk is the possibility of one or more hazards resulting in harm occurring
RPE	Respiratory Protective Equipment
Synthetic Mineral Fibres	A general term used to describe fibrous materials made from glass, rock, alumina, and silica. Some of these products are composed of a mixture of fibres. Generally referred to as SMF, they are also known as Machine Made Mineral Fibres (MMMFs).
Trained Worker	As a minimum uncertified training should include: Health effects associated with asbestos; Asbestos identification, including products and materials that may contain asbestos; Safe handling of asbestos, including operations that could result in exposure to asbestos fibres; Suitable controls to manage asbestos risk including safe work practices, personal protective equipment (PPE), respiratory protective equipment (RPE) and decontamination procedures; emergency procedures; and waste disposal procedures.
Waigani Convention	Convention to Ban the Importation into Forum Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement of Hazardous Wastes within the South Pacific Region (2001)
Waste Asbestos	A general term for asbestos and ACMs that are no longer useable for their intended purpose and is therefore being set aside for storage, recycling, or disposal. This includes building materials, dust, rubble, disposable personal protective equipment, rags used for cleaning, plastic drop sheets, and disposable tools. Asbestos waste is typically defined as waste material with greater than 1% asbestos by weight.

Appendix B—Asbestos Removal Control Plan Contents

	Buildings & structures		Plant & equipment	
	Friable	Non-friable	Friable	Non-friable
Notification				
Notification requirements have been met and required documentation will be on site (e.g. removal licence, control plan, training records)	Yes	Yes	Yes	Yes
Identification				
Details of asbestos to be removed identified (e.g. the locations, whether asbestos is friable/non-friable, its type, condition and quantity being removed)	Yes	Yes	Yes	Yes
Preparation				
Consult with relevant parties (health and safety representative; workers; person who commissioned the removal work, licensed asbestos assessors)	Yes	Yes	Yes	Yes
Assigned responsibilities for the removal	Yes	Yes	Yes	Yes
Program commencement and completion dates	Yes	Yes	Yes	Yes
Emergency plans	Yes	Yes	Yes	Yes
Asbestos removal boundaries, including the type and extent of isolation required and the location of any signs and barriers	Yes	Yes	Yes	Yes
Control of other hazards including electrical and lighting installations	Yes	Yes	Yes	Yes
PPE to be used, including RPE, identified	Yes	Yes	Yes	Yes
Removal				
Details of air-monitoring program Control and clearance	Yes	No	Yes	No
Waste storage and disposal program	Yes	Yes	Yes	Yes
Method for removing the asbestos (wet and dry methods)	Yes	Yes	Yes	Yes
Asbestos removal equipment (e.g. spray equipment, HEPA-filtered H-Class industrial vacuum cleaners, cutting tools)	Yes	Yes	Yes	Yes
Details of required enclosures, including their size, shape, structure, etc., smoke testing of enclosures and the location of negative pressure exhaust units	Yes	No	Yes	No

	Buildings & structures		Plant & equipment	
	Friable	Non-friable	Friable	Non-friable
Details on temporary buildings required by the asbestos removalist (e.g. decontamination units) including details on water, lighting and power requirements, negative pressure exhaust units and the locations of decontamination units	Yes	May be required depending on the job	Yes	May be required depending on the job
Other risk control measures to prevent the release of airborne asbestos fibres from the asbestos removal work area	Yes	Yes	Yes	Yes
Decontamination				
Detailed procedures for workplace decontamination, the decontamination of tools and equipment, personal decontamination and the decontamination of non-disposable PPE and RPE	Yes	Yes	Yes	Yes
Waste disposal				
Method of disposing of asbestos wastes, including details on: the disposal of protective clothing	Yes	Yes	Yes	Yes
the structures used to enclose the removal area	Yes	No	Yes	Yes
Clearance and air monitoring				
Name of the independent licensed asbestos assessor or competent person engaged to conduct air monitoring (if any)	Yes	No	Yes	No
Consultation				
Consult with any people who may be affected by the removal work, including neighbours	Yes	Yes	Yes	Yes

Appendix C—Example of a Clearance Certificate

Where asbestos removal work requires a Class A licence, an independent licensed asbestos assessor must carry out a clearance inspection and complete a clearance certificate once they are satisfied that the area is safe to reoccupy.

Section A—Clearance inspection details

Client details	Details
Name of client:	Click here to enter text.
Client contact details:	Click here to enter text.
Removal work details	
Date removal work carried out:	Click here to enter text.
Site address where removal work is being carried out:	Click here to enter text.
Details of the specific asbestos removal work area(s):	Click here to enter text.
Name of licensed asbestos removalist:	Click here to enter text.
Name and contact details of licensed asbestos removalist supervisor (if different to removalist):	Click here to enter text.
Inspection details	
Date of clearance inspection:	Click here to enter a date.
Time of clearance inspection:	Click here to enter text.

Section B—Asbestos removal work paperwork

	Yes	No
Do you have a copy of the asbestos removal control plan?	☐	☐
Do you have a copy of the notification form?	☐	☐
Is the removal work (e.g. use of enclosures, decontamination facilities, waste facilities) consistent with the control plan and the notification form?	☐	☐

Section C—Asbestos removal work area
Visual inspection

	Yes	No
Inspection of the specific area detailed in Section A found no visible asbestos remaining because of the asbestos removal work carried out.	☐	☐
Is air monitoring required? (if no, proceed to Section E)	☐	☐

Can the area be reoccupied?	☐	☐
Has additional information been attached? (e.g. photos, drawings, plans)	☐	☐

Air monitoring

	Yes	No
Air monitoring was carried out as part of the clearance inspection. The result was below 0.01 fibres/ml.	☐	☐
Has the air-monitoring sample been analysed by a NATA-accredited laboratory or a laboratory approved by the WHS regulator?	☐	☐
Is the air-monitoring report attached?	☐	☐
Can the area be reoccupied?	☐	☐

Section D—Enclosures
Prior to dismantling the enclosure

	Yes	No
The area within the enclosure and the area immediately surrounding the enclosure were inspected and no visible asbestos was found.	☐	☐
Air monitoring was carried out as part of the clearance inspection. The result was below 0.01 fibres/ml.	☐	☐
Is the air-monitoring report attached?	☐	☐
Can the enclosure be dismantled?	☐	☐

Number of samples collected: Click here to enter text.

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Results					

After the enclosure was dismantled and removed

	Yes	No
An inspection of the area in which the enclosure was erected and the area immediately surrounding the area where the enclosure was erected was inspected and no visible asbestos was found.	☐	☐

Air monitoring was carried out as part of the clearance inspection. The result was below 0.01 fibres/ml.	☐	☐
Is the air-monitoring report attached?	☐	☐
Can the area be reoccupied?	☐	☐

Number of samples collected: Click here to enter text.

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Results					

Section E—Clearance declaration

I declare that:

the former enclosure, asbestos removal work area and the surrounding area are free from any visible asbestos

the transit route and waste routes are free from any asbestos, and

all asbestos in the scope of the removal work has been removed and any known asbestos is intact.

…… ……

Signature of licensed asbestos assessor/competent person

Assessor licence number (if applicable)

……

Name of licensed asbestos assessor competent/person

Appendix D—Examples of Asbestos Removal Work

This appendix does not address other hazards that may be present at a workplace, for example falls from heights or electrical hazards. These hazards must also be identified and the associated risks controlled.

This appendix provides guidance on how to perform a specific task associated with asbestos removal work. With all tasks, some general requirements include the following:

- Obtain the asbestos register prior to commencing asbestos removal work.
- Depending on the type of asbestos removal work, follow the requirements outlined in Chapters 2–4 of this Code (for example, laying polyethylene sheeting, isolating the work areas, signs and barricades, PPE, cleaning up site decontamination).

Asbestos cement products

Asbestos cement products consist of approximately 15 per cent asbestos fibres by weight. A wide range of products have been commonly found—including roofing, shingles, exterior cladding on industrial, public and some residential premises, corrugated/profile sheets as well as flat sheets—that have been used for exterior flexible building boards.

If possible, you should remove the asbestos cement products whole. If some sections have been damaged prior to removal, these may be strengthened, for example by using adhesive (cloth or duct) tape. Applying water and PVA glue mixture to the damaged section may assist in minimising the release of asbestos fibres.

Identify the method by which the asbestos cement product is held in place, then use a method that would minimise airborne dust generation in removing the product. For example:

fasteners: dampen then carefully remove using a chisel.
bolts: dampen then use bolt cutters (or an oxy torch)—do not use an angle grinder.
screws: dampen then carefully unscrew with a screwdriver.
nails: dampen then carefully lever the panel or punch through if necessary.

Avoid breaking the asbestos cement products. If breakage is necessary to remove or dislodge the product, dampen the material and minimise breakage.

Remove the asbestos cement product after wetting or dampening it by applying a fine water spray, unless this creates an electrical risk.

Once the asbestos cement product has been removed from its position, spray the back of the product with a fine water spray. Frequent application of a fine water spray may be required depending on the circumstances (for example on a very hot day) but be careful not to create a slip hazard.

Asbestos cement roof sheeting

Asbestos cement can become brittle with age, so any removal work on roofs should address the risk of fall hazards. If lichen is encountered on roof sheeting, caution should be exercised in the use of water and the choice of workers' footwear because lichen can be slippery, especially when it is wet.

The removal of asbestos cement roof sheeting must be performed in accordance with the WHS Regulations.

Angle grinders should not be used because of the potential for damage to the asbestos cement and subsequent fibre release. Anchoring screws/bolts should be removed from the roof sheeting using an oxy torch or another suitable device, such as a screwdriver or cold chisel that will not significantly damage the sheet.

If the system of removal involves walking on the roof to remove roof sheeting (this should be the last option when choosing a method to remove roof sheeting), spray the asbestos cement roof sheeting with a PVA solution prior to removal. Ensure the PVA is dry before removing it to avoid a slip hazard. Once removed, spray the back (underside) of the asbestos cement with either a fine water spray or the PVA solution.

Where the asbestos roof sheeting requires lowering to the ground, ensure this is done in a manner that will minimise the generation of respirable dust. Do not use chutes, ramps or similar gravity-dependent devices. Examples of appropriate lowering methods for roof sheeting include:

- by hand, over short distances
- loading the wrapped sheets on to a cradle for support
- using scissor lifts or similar devices, and
- using scaffolds.

You should follow the decontamination (section 4.6), waste containment and disposal procedures (section 4.8) in this Code once the asbestos roof sheeting has been removed.

Where the asbestos roof sheeting to be removed covers an area greater than the size of an average domestic house or where considerable dust will be generated, you should use a decontamination unit.

Ensure that clearance of the area has been completed, and a clearance certificate has been issued prior to reoccupation of the area.

Personal decontamination must be carried out in accordance with the WHS Regulations. See Section 4.6 of this Code.

Removal of floor tiles

Flooring products such as polyvinyl chloride (PVC or vinyl) tiles often contain a few per cent (5–7 per cent) of very fine chrysotile asbestos. Black and brown thermoplastic tiles containing larger amounts of chrysotile, often in visible clumps, were also produced. Sheet floor coverings including sheet vinyl were sometimes backed with a thin layer of chrysotile paper. Some underfelts, such as hessian underlays for carpets and linoleum, were also manufactured containing asbestos. The mastics which were used to bond the floor covering to the surface could also contain asbestos. Some hard-wearing composite floors (for example magnesium oxychloride) also contain about 2 per cent of mineral fibres, which could be asbestos.

Place a tool (such as a scraper or wide blade) or use a heat gun between the tiles and lift the tile away from the floor, being careful to minimise breakage. A hammer or mallet can be used to tap the tool under firmly adhered tiles to assist in separating the tiles from the floor.

Minimise dust by spraying fine water mist under tiles as they are lifted.

Place the tiles into heavy duty polyethylene sheeting (minimum 200 µm thickness) asbestos waste bag or suitable alternate waste container dedicated for asbestos waste that is clearly labelled as asbestos waste.

Use the scraper to remove any adhesive that is left adhered to the floor after each tile has been removed and place this waste into the asbestos waste bag or suitable waste container.

The vinyl can be cut into strips prior to its removal to facilitate bagging, or it can be rolled into one roll and wrapped securely with polyethylene sheeting, making sure it is totally sealed.

If a heat source is used to soften the adhesive beneath a vinyl tile, care should be taken not to scorch or burn the tile. Burning or scorching vinyl tiles can result in the release of toxic decomposition products and generate a fire hazard. In some cases, the adhesive may contain asbestos.

Follow decontamination (section 4.6), waste containment and disposal procedures (section 4.8) in this Code once the tiles have been removed.

Ensure that a clearance inspection of the area is conducted by a licensed asbestos assessor and a clearance certificate has been completed prior to reoccupation of the area.

Personal decontamination must be carried out in accordance with the WHS Regulations. See section 4.6 of this Code.

Removing bituminous (malthoid) products

Bituminous (malthoid) products are generally regarded as non-friable and include bitumen products such as roofing felts and damp-proof courses that have been widely reinforced by the addition of asbestos, usually in the form of chrysotile paper. Bitumen-based wall and floor coverings were also produced.

Some mastics used to stick the bitumen products commonly had asbestos added to them for flexibility. Other sealants also had asbestos added to improve the performance of the product. When removing bituminous products:

- seal access points (for example skylights) with material such as heavy-duty polyethylene sheeting (minimum 200 µm thickness) using adhesive (cloth or duct) tape
- where there is exhaust vents from gas fired equipment in the area, it is dangerous to seal over them. Turn the gas off if possible
- cut and remove manageable sections. Place cut pieces in a lined skip or wrap in polyethylene sheeting
- remove adhering material by dampening and gently scraping. Consider using an HEPA-filtered H-Class industrial vacuum cleaner while scraping
- remember that mastics are flexible and may require removal by using scraping and chipping tools. The pieces removed should be kept as intact as possible
- if heating is used to soften the material to enable the material to be peeled, it is important not to burn the material, as this can release respirable asbestos fibres. Excessive heating is also likely to generate toxic fumes and gases and generate a fire hazard, and
- collect all debris and dispose of waste according to the waste disposal procedures.

Personal decontamination must be carried out in accordance with the WHS Regulations. See section 4.6 of this Code.

Removal of ceiling tiles

False ceiling tiles or suspended ceilings sometimes need to be removed so maintenance work can be performed. If asbestos has been used on structural materials above a false ceiling, there could be contamination on the upper surface of the tiles.

The minimum RPE suitable for this operation is a P1 or P2 filter with a half-face piece respirator. If considerable amounts of asbestos dust or debris are likely to be involved, full-face air-purifying positive pressure respirators should be worn.

Any surface below the tiles that might be contaminated should be covered with heavy duty polyethylene sheeting (minimum 200 µm thickness).

The first tile should be lifted carefully to minimise the disturbance of any asbestos fibres. The top of each tile should be thoroughly vacuumed and wet wiped, where possible, prior to removing subsequent tiles.

Where non-asbestos ceiling tiles are to be re-used, they should be covered with polyethylene sheeting as they are removed from the ceiling to prevent further dust settling on them.

Wrap the asbestos ceiling tiles in a double layer of polyethylene sheeting.

Waste containment, disposal and a clearance inspection must be carried out in accordance with the WHS Regulations. See sections 4.8 and 3.10 of this Code.

Personal decontamination must be carried out in accordance with the WHS Regulations. See section 4.6 of this Code.

Removal of gaskets and rope seals

Gaskets and rope seals containing asbestos are generally regarded as friable. If there is any doubt, advice should be sought from a person with knowledge and experience in dealing with asbestos.

Gaskets reinforced with asbestos were once used extensively in plant and equipment exposed to high temperatures and/or pressures. These gaskets were typically used between the flanges of pipes.

Asbestos rope was often used for lagging pipes and valves and for sealing hatches. It is likely gaskets and rope from plant and equipment will contain friable asbestos. When removing gaskets and rope seals:

- ensure the plant or equipment is shut down and isolated

- dismantle the equipment carefully. Protect any other components with heavy duty polyethylene sheeting (minimum 200 µm thickness)
- ensure the plant and equipment has been made safe (pipework emptied, electrical supply isolated and equipment shut down, etc.)
- unbolt or unscrew the flange or dismantle the equipment
- once accessible, dampen the asbestos with a fine water mist or similar. Continue dampening the asbestos as more of it is exposed/accessible
- ease the gasket or rope seal away with the scraper and place into the asbestos waste container positioned directly beside/beneath it. Keep the area damp and scrape away any residue, and
- consider using a HEPA filtered H-Class industrial vacuum cleaner while scraping.

Personal decontamination must be carried out in accordance with the WHS Regulations. See section 4.6 of this Code.

Pipe lagging (small section)

Asbestos was widely used to insulate pipes, boilers and heat exchangers.

There are several types and forms of insulation, often with multi-layer construction. Pre-formed sections of asbestos insulation were made to fit the diameter of the pipe. These would be strapped on and calico-wrapped and sometimes painted (for example, 'Decadex' finish) or sealed with a hard plaster (often asbestos-containing) to protect against knocks and abrasion. Other types of asbestos-containing felts, blankets, tapes, ropes and corrugated papers were also used. For bends and joins, ensure the plant and equipment has been made safe (for example pipework emptied, electrical supply isolated and equipment shut down).

Set up/attach the glove bag and perform the removal work as described in section 6.2. Remove and dispose of waste according to the relevant parts of section 4.8.

Personal decontamination must be carried out in accordance with the WHS Regulations. See section 4.6 of this Code.

Fire retardant material

Fire retardant material is normally a homogeneous coating sprayed or trowelled onto reinforced concrete or steel columns or beams as fireproofing. Sprays were also commonly used on the underside of ceilings for fireproofing and sound and thermal insulation in many high-rise premises. Warehouses and factories commonly had sprayed asbestos applied to walls, ceilings and metal support structures for fireproofing.

Some fire doors contained loose asbestos insulation sandwiched between the wooden or metal facings to give them the appropriate fire rating. Loose asbestos was also packed around electrical cables, sometimes using chicken wire to contain it.

Mattresses containing loose asbestos were widely manufactured for thermal insulation. Acoustic insulation has been provided between floors using loose asbestos in paper bags, and in some areas near removal works it is known that loose asbestos has been used as a readily available form of loft insulation.

Asbestos textiles were manufactured for primary heat (for example insulation tapes and ropes), or fire protection uses (for example fire blankets, fire curtains and fire-resistant clothing). Asbestos textiles were also used widely as a reinforcing material in friction products and composites.

It will depend on where the fire-retardant material is located and the quantity of the material as to how the removal process is conducted. However, the asbestos is friable, and a Class A licensed asbestos removalist must perform the asbestos removal work.

An asbestos removal control plan must be developed.

- Establish the extent of the removal area and move all items out of the area or cover them with heavy duty polyethylene sheeting (minimum 200 µm thickness) if they could be contaminated during the removal work.
- Develop an enclosure that allows smooth flow of air from the decontamination unit to the negative air units. In constructing the enclosure, pay particular attention to penetrations through the floor

and ceiling/roof. Set up the enclosure and decontamination unit and remove and dispose of asbestos.

- Ensure all air-conditioning equipment has been shut and isolated/blanked from this area.
- Maintain regular checks on the negative air unit and decontamination unit. An independent licensed asbestos assessor must conduct/control air monitoring throughout the asbestos removal work.
- Clearance monitoring by an independent licensed asbestos assessor and the issue of a clearance certificate is required before re-entry into the removal work area.

Personal decontamination must be carried out in accordance with the WHS Regulations. See section 4.6 of this Code.

Removal of asbestos-backed vinyl and millboard from beneath a vinyl floor

As asbestos millboard is typically 100 per cent asbestos and very friable, a full enclosure with negative air extraction units must be used for this type of asbestos removal work.

The asbestos millboard should be wetted down as the vinyl is peeled from the floor, preferably with the millboard attached. The vinyl can be cut into strips prior to its removal to facilitate bagging, or it can be rolled into one roll and wrapped securely with heavy duty polyethylene sheeting (minimum 200 µm thickness), making sure it is totally sealed. If the vinyl sheeting cannot be removed without leaving some of the asbestos millboard on the floor surface, the remaining asbestos millboard should be wetted down and, when thoroughly soaked, scraped off the floor surface.

Sufficient water should be used to dampen the asbestos millboard, but not so much that run-off or pools of contaminated water will occur.

If a heat source is used to soften the adhesive beneath a vinyl tile, care should be taken not to scorch or burn the tile. Burning or scorching vinyl tiles can result in the release of toxic decomposition products and generate a fire hazard.

Alternative removal methods should only be used if they do not result in excessive fibre release from the asbestos millboard and do not result in any additional hazard.

Personal decontamination must be carried out in accordance with the WHS Regulations. See section 4.6 of this Code.

Appendix E—Asbestos in Building Materials

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