

**Natural Resources Conservation  
Authority**

**Guidelines for the Management of  
Asbestos**

Approved by the NRCA  
24 February 2014

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*The guidelines will be revised periodically following feedback from stakeholders using it, ensuring its ongoing relevance and reflecting advances in best practice as the result of regulator and industry experience. Comments are invited and should be sent via email to [pubed@nepa.gov.jm](mailto:pubed@nepa.gov.jm).*

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## Executive Summary

The NEPA Guidelines for the Management of Asbestos was developed to document the National Environment and Planning Agency's procedures and requirements for the abatement and removal of Asbestos Containing Materials. It is intended to support the Agency's environmental management, and applies to all parties responsible for premises that contain asbestos or are suspected to contain asbestos. The guidelines are also relevant to all contractors recognized by NEPA and approved to safely and professionally abate asbestos.

In summary, the document outlines the procedures and precautions to be taken for the management of asbestos. It indicates the Agency's notification requirements, gives minimum safety requirements, sampling requirements, quality control/quality assurance for taking and handling samples, reporting requirements and includes sections which discuss the procedures for testing and abating asbestos. The appendices contain supplemental information, as well as, form templates for reporting.

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## Definitions

**NOTE:** For clarity, some of the following definitions may have been abbreviated or simplified.

<i>TERM</i>	<i>DEFINITION</i>
Asbestos containing materials (ACM)	products that are known to be built from material containing or contaminated by asbestos
Abatement Workplan	a detailed plan that lists all steps and precautions employed during an asbestos removal exercise
All practicable steps	taking all practicable steps having regard to: <ul style="list-style-type: none"> <li>• the nature and severity of the harm that may be suffered if the result is not achieved;</li> <li>• the current state of knowledge about the likelihood of harm and severity if the result is not achieved;</li> <li>• the current state of knowledge about harm of that nature;</li> <li>• the current state of knowledge about the means available to achieve the result, and about the likely efficacy of each; and</li> <li>• availability and cost of each of those means.</li> </ul>
Asbestos	a material that contains, or is composed of amosite, chrysotile, crocidolite, fibrous actinolite, anthophyllite, or fibrous tremolite.
Asbestos fibre	a particle of asbestos that: <ol style="list-style-type: none"> <li>1. is not less than 5 micrometres and not more than 100 micrometres in length; and</li> <li>2. is less than 3 micrometres in width; and has a length to width ratio of not less than 3 to 1.</li> </ol>
Asbestos contractor	the business, entity, organization, company, partnership, venture or group that holds the appropriate knowledge and experience of asbestos hazards, processes and safe removal procedures to competently undertake the risk assessment, management, training and supervision for the safe removal of asbestos-contaminated material as outlined in this document.
Asbestos	the safe removal of asbestos-contaminated material.



<i>TERM</i>	<i>DEFINITION</i>
removal/abatement	
Asbestos supervisor	a person who holds a current Certificate of Competency issued by a competent recognized institution and undertakes the onsite, direct management and supervision of the safe removal of asbestos-contaminated material.
(NEPA approved ) Asbestos Contractor	an person or company which is recognized by NEPA to have the required knowledge and experience pertaining to restricted asbestos removal to undertake any removal or maintenance work safely.
Dust control equipment	equipment that, when used in satisfactory working order, suppresses the release of asbestos fibres into the air by any means, including the conveying of water or any other wetting agent to the asbestos containing material that would otherwise generate asbestos dust.
Emergency	An accidental situation involving the release or imminent release of dangerous goods or other substances that would result in serious adverse effects on the health/safety of persons or the environment. An emergency may be the result of man-made causes or natural occurrences such as, but not limited to process upsets, uncontrolled reactions, fire, explosions, threats, structural failures, tornadoes, earthquakes, floods and storms. Emergency also includes a situation when ACM needs to be removed immediately due to health risks from exposure to asbestos fibres. <sup>1</sup>
Employee	any person of any age employed by an employer to do any work for hire or reward.
Employer	a person who employs any person to do any work for hire or reward. <i>The term employer also includes a Principal and a Person in Control of a Place of Work.</i>
Encapsulant	a material used to enclose (something) in or as if in a capsule
Friable	asbestos that under ordinary conditions can be easily crumbled (i.e. ACM with the potential to release asbestos fibres)
Harm	illness, injury or both, including physical or mental harm caused by work-related stress.

<sup>1</sup> NRCA Guidelines for the Preparation of an Industry Emergency Response Plan

<i>TERM</i>	<i>DEFINITION</i>
Hazard	an activity, arrangement, circumstance, event, occurrence, phenomenon, process, situation or substance (whether arising or caused within or outside a place of work) that is an actual or potential cause or source of harm.
HEPA filters (High Efficiency Particulate Air Filter)	a type of air filter that can remove at least 99.97% of airborne particles 0.3 micrometres in diameter.
Insulant	insulating material, a material that reduces or prevents transmission of heat, sound or electricity.
Membrane filter method	a membrane filter using phase contrast microscopy for estimating airborne asbestos fibre concentrations.
Accredited laboratory	a laboratory that is currently accredited by local or international accreditation.
Notifiable work	any work involving the removal of asbestos contaminated/ containing waste. Notifiable work must be notified a minimum of three days prior to the commencement of an abatement activities.
Owners (property)	includes, where appropriate, lessees and managers or their agents.
Person who controls a place of work	<p>a person who is:</p> <ul style="list-style-type: none"> <li>• the owner, lessee, sub-lessee, occupier or any person in possession of a place of work; or</li> <li>• the owner, lessee, sub-lessee or bailee, of any plant in the place.</li> </ul> <p>This can include all or any of the Client, Principal, Employer and Contractor</p>
Place of work	<p>a place (whether or not within or forming part of a building, structure, or vehicle) where any person works or may work, for gain or reward; and, in relation to an employee, includes a place under the control of the employer (not being domestic accommodation provided for the employee):</p> <ul style="list-style-type: none"> <li>• where the employee comes or may come to eat, rest or get</li> </ul>

<i>TERM</i>	<i>DEFINITION</i>
	<p>first-aid or pay; or</p> <ul style="list-style-type: none"> <li>• where the employee comes or may come as part of the employee's duties to report in or out, receive instructions or deliver goods or vehicles; or</li> <li>• through which the employee may or must pass to reach a place of work.</li> </ul> <p>To avoid doubt, a person is in a place of work whenever and wherever the person performs work including in a place that:</p> <ul style="list-style-type: none"> <li>• the person moves through; or</li> <li>• itself moves.</li> </ul>
PPE	personal protective equipment.
Principal	a person who engages any person (otherwise than as an employee) to do any work for gain or reward.
Protective clothing	specifically designed protective clothing (including coveralls, gloves, underclothing and boots) that is to be used or is used in association with asbestos work that will limit the spread of asbestos contamination to the wearer, any other person or other environment.
Protective equipment	protective equipment that is to be used or is used in a place of work to prevent the spread of contamination from asbestos dust - for example, all appliances, tools and ventilation equipment.
Restricted asbestos work	<p>work in one or more of the following categories:</p> <ul style="list-style-type: none"> <li>• Work involving asbestos, if the asbestos concerned is friable and is, or has been used in connection with thermal or acoustic insulation, or fire protection, in buildings, ships, structures or vehicles;</li> <li>• Work involving asbestos, if the asbestos concerned is friable and is, or has been used in connection with lagging around boilers, ducts, furnaces or pipes;</li> <li>• The demolition or maintenance of anything, including a building or part of a building containing friable asbestos;</li> </ul>

<i>TERM</i>	<i>DEFINITION</i>
	<ul style="list-style-type: none"> <li>• The encapsulation of material containing friable asbestos;</li> <li>• The use on asbestos cement or other bonded product containing asbestos of:                             <ul style="list-style-type: none"> <li>○ A power tool with any kind of cutting blade or abrasive device, except when use with dust control equipment; or</li> <li>○ Any other equipment whose use may result in the release of asbestos dust except when it is used with dust control equipment</li> </ul> </li> </ul> <p>Dry sanding of floor coverings containing asbestos.</p>
Significant hazard	<p>a hazard that is an actual or potential source of:</p> <ul style="list-style-type: none"> <li>• serious harm; or</li> <li>• harm the severity of whose effects on any person depend (entirely or among other things) on the extent or frequency of the person's exposure to the hazard; or</li> <li>• harm that does not usually occur, or usually is not easily detectable, until a significant time after exposure to the hazard.</li> </ul>
Structure	<p>a plant, building, wall, chimney, fence, bridge, dam, reservoir, wharf, jetty, earthworks, reclamation, floating structure and tunnel.</p>
Vacuum cleaner	<p>Industrial Vacuum Cleaners for particulates hazardous to health or environment (or equivalent standard) are acceptable for use with asbestos work.</p>
Work involving asbestos	<ol style="list-style-type: none"> <li>1. Work involving the cleaning, disposal, handling, processing, storage, use, or working of asbestos; or</li> <li>2. Work involving the demolition or maintenance of anything, including a building or part of a building, containing asbestos; or</li> <li>3. Cleaning work carried out as a consequence of, or in connection with, work specified in (1) or (2).</li> </ol>

## Acronyms

ACM	Asbestos Containing Materials
HEPA	High-efficiency particulate air
NEPA	National Environment and Planning Agency
NRCA	Natural Resources Conservation Authority
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment
PVA	Polyvinlyl Acetate
RPDs	Respiratory Protection Devices
WES	Workplace Exposure Standards
RAP	Remediation Action Plan
VA	Vinyl-asbestos

## 1.0 Introduction

### 1.1 Purpose

To document the NRCA procedures and requirements for the safe handling and management of asbestos containing materials (ACM).

### 1.2 Scope

The guideline document applies to all parties responsible for premises containing ACM and to those asbestos contractors authorized to handle ACM in Jamaica.

## 2.0 Acceptable Workplace Exposure Limits/Standards

This section contains a list of workplace exposure standards for asbestos (exposure standards). These Guidelines require a person conducting a business or undertaking at a workplace to ensure, so far as is reasonably practicable, that exposure of a person at the workplace to airborne asbestos is eliminated or minimized. If it is not reasonably practicable to eliminate exposure to airborne asbestos at the workplace, the person must ensure that the exposure is minimized so far as is reasonably practicable. The person must ensure that the exposure standard for asbestos is not exceeded at the workplace.

Exposure standards do not represent a fine dividing line between a healthy and unhealthy work environment. Natural biological variation and the range of individual susceptibilities mean that a small number of people might experience adverse health effects below the exposure standard. *Exposure standard* represents the airborne concentration of a particular substance or mixture that must not be exceeded. It is important to note that there are no safe exposure limits to asbestos fibres and all practicable steps must be taken to ensure that exposure to asbestos is kept and maintained as low as possible and under no circumstances exceed the WES.

Table 1 Acceptable Asbestos Work Exposure Standards

Form of Asbestos	Work Exposure Standards
Chrysotile	An average concentration over any 4 hour period of 0.1 fibre per millilitre of air; and
Amosite, crocidolite, fibrous actinolite, fibrous anthophyllite, and fibrous tremolite	An average concentration over any 4 hour period of 0.1 fibres per millilitre of air

## 3.0 Planning and Preparation for the Safe Removal of Asbestos

If it is suspected that ACM is present on premises, the following procedure should be followed:

1. Using the services of an authorized asbestos abatement contractor, determine whether the suspected ACM is friable or non-friable. If it is friable, and based on the recommendations of the contractor the area must be immediately vacated and quarantined so as to avoid the risk of inhalation of asbestos fibres. Special attention must be paid to possible exposure to children as they are more susceptible to lung scarring from ACM exposure.
2. Recruit one of the authorized asbestos abatement contractors to safely determine if the material is ACM. Sample collection and testing MUST be conducted by trained specialists.

If the material is confirmed to contain asbestos (by laboratory analysis), the contractors must submit a notification and the relevant documents as stipulated by an existing NRCA Permit being held by said contractor.

### ***3.1 Regulatory Requirements for Asbestos Abatement Professionals***

Prior to the commencement of any ACM abatement activities, contractors should obtain an Environmental Permit from the NRCA for the storage, treatment and/or transportation of hazardous wastes. The relevant application forms and requirements may be sourced from the Applications eCentre on the NEPA website at <http://www.nepa.gov.jm/ecentre/>.

The requirements for the removal of asbestos-contaminated materials can differ greatly depending on the specific asbestos removal task. Many factors can affect the execution of the removal activities including the type, location, quantity and condition of the asbestos-contaminated materials to be removed as well as proximity to workers or passersby. Public safety is also a significant concern.

Asbestos removal work includes:

- the removal of asbestos-contaminated materials from buildings and structures including demolition/excavation sites;
- the removal of asbestos-contaminated materials from plant and equipment including friction products; and
- cleaning up asbestos dust and debris.

Whatever the circumstances, it is essential for an asbestos removal plan to be developed by the asbestos contractor and implemented whenever any ACM is to be removed. An asbestos removal plan includes:

- the location, type and condition of the asbestos to be removed (this can usually be gathered from the asbestos survey (if any));
- entity which will be removing the asbestos-contaminated materials;
- equipment to be used to remove the asbestos-contaminated materials;
- how it will be removed safely;
- any enclosures that will be constructed and method of construction (including site layout)
- decontamination procedures for personnel, facilities and equipment;
- clearance procedures once removed;
- dismantling of any enclosures/decontamination facilities.
- procedures for re-entry of occupied building

All practicable steps must be taken to ensure that workers and others in the areas are not exposed to asbestos fibres.

## **4.0 Safe Removal of Friable Asbestos**

This section applies to the removal of, or work on:

- friable asbestos, including sprayed asbestos coatings used for thermal and acoustic insulation in buildings;
- decorative coatings in buildings;
- fire-damaged asbestos-contaminated materials, including sheeting/cladding material; and
- asbestos-based lagging on boilers and other industrial plant.

### ***4.1 Planning and Programming Considerations***

As the removal of friable asbestos by an asbestos contractor is done under contract or tender, the precise nature of the work to be done should be understood by both the contractor and client.



## ***4.2 Information to be supplied by the Property Owner, Occupier or Agents (Client), including Principals and Persons in Control of a Place of Work***

It is the responsibility of the owner to ensure an asbestos contractor carries out the removal of ACM. If in doubt, the owner or their agent should contact NEPA to obtain a list of NEPA approved Asbestos Abatement contractors before any ACM removal.

The owner or their agent should supply the asbestos contractor with precise details of the scope of the work to be done prior to commencement of any work. However, it is recognised that in some cases the full extent of Asbestos-contaminated materials present will not be known until after the removal is underway.

In the preparation of the job specification, the following considerations should be addressed:

Location:

- a. indoors;
- b. outdoors but protected;
- c. outdoors exposed to weather;
- d. enclosed in ducts or trenches below ground level;
- e. difficult or unusual site conditions, which will influence the selection or application of removal methods, particularly in regard to transport, scaffolding or weather protection;
- f. technical description of the material to be removed with details of the type of asbestos present and any special or unusual materials or circumstances; and
- g. any issues that may affect the safety of workers or the public.

The extent of the removal work should be adequately detailed on drawings, preferably coloured, to indicate areas for removal. Otherwise, information of the following nature should be provided:

- a. surface dimensions of flat or large curved areas, thickness of insulation, external diameters of pipes, length of each size pipe, and number and type of pipe fittings - e.g. flanged joints, valves, tees, expansion bends. Particular detail is to be provided if asbestos is to be removed from any part of the building's air-conditioning system;

- b. details of any pipe-work sections that are steam or electrically heated and the arrangement of its insulation;
- c. details of any section or materials to be left in place;
- d. confirmation and details of residual heat that will remain in pipe-work, boilers, turbines or refinery equipment;
- e. any unusual or specific hazards associated with the removal job;
- f. temperature considerations - normal working temperature at the removal area;
- g. conditions of substrate surfaces - special requirements, such as the removal (or otherwise) of protective paint or lacquer from pipe-work or for the application of paint or other protective coatings to the substrate from which the asbestos-contaminated materials have been removed;
- h. types of fittings and supports and whether or not these may be removed or disposed of with the waste;
- i. type of finish required or specification for re-insulation;
- j. special service requirements - e.g. where there is any potential hazard from contact with live electrical equipment in use in the removal area, attention should be drawn to this fact;
- k. site occupancy restrictions and conditions;
- l. cleaning of adjacent areas (adjacent areas that are to be cleaned or are to be protected from airborne dust and are to be cleaned on completion);
- m. safety practices to be followed under relevant legislation;
- n. location of any relevant electrical cables; and
- o. location of any relevant in-ground services.

Where electrical switch gear or panels are to be sealed, consideration should be given to the provision of supplementary ventilation to dispose of potential heat build-up and consequent fire risk.

### ***4.3 Information to be supplied by the Asbestos Contractor***

Restricted work involving asbestos **must** be notified to the NEPA. Please see **Appendix A** for the contents of the Asbestos Abatement Work Plan that must be submitted to the Agency prior to commencement of activities. Contractors must also provide proof of award of asbestos abatement contract.

### 4.3.1 Asbestos Abatement Work Plan

The asbestos contractor should develop a site-specific abatement plan before commencing any asbestos removal work. The purpose of each **Asbestos Abatement Work Plan** is to help ensure the removal is well planned and carried out in a safe manner. The asbestos removal control plan should include specifications and/or drawings addressing at least all of the items in **Appendix A** which are relevant to the particular removal job. Additional information should be included for each individual removal job as necessary and submitted to NEPA for approval.

The Abatement Plan should be finalised in consultation with the client and subsequently submitted to NEPA before abatement exercises begin. Consideration should be given to the removal of all asbestos from a building at one time. Piecemeal removal often leads to the contamination of other work areas thus placing other persons at risk. As the removal of asbestos may be dependent upon progress of other contractors at the site, details of planning schedules that will control the work and allow for effective removal without other personnel being present in the removal areas should be agreed upon. Conversely, the work of other contractors should be scheduled to preclude them working near to, or accidentally breaking into the asbestos removal area.

### 4.4 Planning for Emergencies

**NOTE:** *It is important to remember that ambulance services should not enter into any area where their staff may be put at risk, including an asbestos-contaminated workplace. Therefore, in the event that a worker may need to be stretchered out of the workplace, other procedures may need to be developed and practiced.*

Workers involved in ACM removal should be trained for emergency situations, particularly if they involve confined spaces or friable asbestos removal, where specialist skills may be required.

Emergency planning should include provisions for emergency and fire evacuation, including exit arrangements and emergency communications such as audible alarms. The alarms should be used for emergencies only.

Emergency exit arrangements need to be adequate for the risks involved. Barriers and signs or other warning devices can be used to communicate emergency arrangements.

A first aid kit and first aid officer should be readily available at all times and sufficient suitable fire extinguishers and hoses should be available at strategic locations. The locations of fire extinguishers and hoses should be displayed in written and/or graphic format.

## **4.5 General Training Requirements**

Persons carrying out asbestos removal work should be trained so they can carry out this work safely and without risk to their own health and others. This training must reflect the specific type of asbestos work to be undertaken.

This training must include information in the site-specific asbestos removal work plan (refer to **Appendix A**), specifically:

- safe work procedures;
- correct decontamination procedures;
- emergency procedures; and
- correct wearing and general maintenance of all PPE and RPE.

Asbestos contractors must also provide the following information to all of their asbestos removal workers and to all applicants for employment as an asbestos removal worker:

- the health risks associated with exposure to asbestos; and
- the need for, and details of, health surveillance, including medical examinations, and these guidelines.

Asbestos contractors should keep a written record of all training provided to each of their asbestos removal workers and ensure that these records are readily accessible.

The asbestos contractors must ensure that the removal is continually supervised and that the operation is carried out in a safe and proper manner, in accordance with the precautions listed in these guidelines.

## **4.6 Supervisory Personnel**

The asbestos contractor must ensure that persons supervising the removal of asbestos-contaminated materials defined as "restricted" must carry a Certificate of Competency in such work.

The asbestos contractor must ensure that supervisory personnel have a detailed knowledge of the precautions and procedures outlined in these guidelines. With this knowledge and at least two years' practical experience, they should assume the following responsibilities:

- implement the planned removal procedure;

- perform the pre-removal setting up;
- perform the actual removal and final cleaning operation;
- ensure that all necessary measures are taken to reduce the airborne concentration of asbestos dust to the lowest practicable level;
- ensure that asbestos fibres and asbestos-contaminated materials do not contaminate adjacent areas;
- arrange for, and assess results of air monitoring where appropriate;
- ensure that all workers under their supervision are adequately trained in the safe working practices outlined in these guidelines;
- ensure that the removal is continually supervised and that the operation is carried out in a safe and proper manner in accordance with the precautions listed in these guidelines;
- ensure that personal protective equipment (PPE) is used and maintained in good condition;
- ensure that the removal site is maintained in a clean condition and that waste is quickly and properly disposed of;
- ensure personal hygiene procedures are continually observed;
- maintain copies of all records;
- establish decontamination procedures

#### ***4.7 Non-Removal Persons Entering the Removal Enclosure***

In some cases, non-removal persons may be required to enter the removal enclosure - for example, to undertake inspections or monitoring. In these instances, the asbestos contractor must ensure that these persons receive the appropriate training, supervision and PPE required ensuring their safety and health while in the removal area.

The information provided should be site-specific and include:

- general information about the removal works;
- the hazards and control methods implemented during the removal process;
- the types of asbestos-contaminated materials being removed, the health hazards from exposure and the controls to protect their health;
- the PPE required to work within the removal enclosure;

- site decontamination procedures;
- emergency procedures; and
- any other information required to ensure their health and safety.

If they provide and wish to use their own PPE, such as respirators, the asbestos contractor should check these to ensure that they are free from defects and suitable for the types of asbestos being encountered.

#### ***4.8 Site Preparation for the Removal of Friable Asbestos from Buildings and other Structures***

There are two "asbestos removal boundaries" for asbestos removal work: the boundary of the **asbestos work area** and the boundary of the **asbestos removal site**. The asbestos work area is the immediate site in which removal work of ACM is taking place. The asbestos removal site is the region surrounding and adjacent to the asbestos work area.

The asbestos work area and the asbestos removal site should be clearly defined. The boundaries of the two should be determined by a competent person and should be based on a risk assessment. All interested parties must agree on the asbestos removal boundaries before any asbestos removal work may commence.

If a workplace and the type of asbestos removal work involved are both similar to those at a previously determined site, the same boundaries can be applied after a reassessment for each site.

In determining the asbestos removal boundaries, consideration needs to be given to the:

- use and suitability of various enclosures and asbestos removal methods; and
- impacts of the asbestos removal work, including potential exposures, in the surrounding region.

In all cases, the procedures adopted for the removal of friable asbestos must be designed to contain the asbestos and minimize airborne exposure. The steps required to be taken will vary from job to job but in all cases:

- access to the asbestos removal area must be restricted to those involved in the removal work;
- contamination of flooring furnishings with asbestos-containing dust must be avoided;

- the drift of airborne fibres must be restricted by ensuring that the removal area is effectively screened off from adjacent areas. This is usually achieved by extracting air from the removal area to ensure that it remains at negative pressure with respect to surrounding areas; and
- the precautions taken must be sufficient to ensure that any asbestos contamination in the air or surrounding areas is maintained below 0.01 fibres/ml (over a period of time outside the enclosure area) at all stages during and after the asbestos work.

The steps to be taken will be determined by the likelihood of asbestos fibre release and the size of the job in terms of time taken to complete it and the area involved.

In the following sections, the site preparation that is considered appropriate for three commonly performed removal tasks are discussed. These are:

1. the removal of fireproofing, thermal or acoustic insulation applied to structural steel or ceilings, or other similar major asbestos removal jobs;
2. the removal of decorative coating containing relatively low percentages of asbestos;
3. small-scale jobs such as the removal of minor amounts of asbestos pipe lagging.

#### ***4.9 Electrical and Lighting Installations***

The risk of electrical injury, particularly when water is involved, must be addressed prior to removal of any asbestos-contaminated materials. The best control is de-energization (turning the power off) and removal of electrical installations from the asbestos work area. If electrical installations cannot be disconnected and removed, they must at the very least be de-energised. The de-energised installation must be tagged and locked out so it cannot be inadvertently re-energised. Any electrical cabling or equipment remaining in the asbestos removal area must be labelled and protected from mechanical damage or the ingress of water, and in accordance with local standards and regulations (wiring rules).

A licensed electrician must perform the safe removal and reinstallation of electrical cables and electrical equipment and ensure that any electrical cabling or equipment is safe prior to re-energization. If there are smoke, thermal or fire detectors in the asbestos work area, a competent person should remove the heads and isolate the circuits as required prior to the removal works commencing.

Upon completion of the asbestos removal work, a competent person should replace the heads, reactivate and test the system and prepare a certificate stating that the heads are operational and forward this to the person in control.

#### **4.10 In-Ground Services**

Care must be taken to identify and locate all in-ground services (such as water, gas or sewer pipes) in the asbestos work area or the asbestos removal site. If necessary, appropriate action must be taken to ensure that these services do not present a hazard to asbestos removal workers. Conversely, it must also be established that asbestos fibres do not contaminate any such services, possibly by disconnecting those services for the duration of the removal work.

#### **4.11 Preparation of a Site for a Major Removal Programme<sup>2</sup>**

Wherever practicable, enclosed "negative pressure" asbestos work areas should be established for any large-scale removal of friable asbestos-contaminated materials. Similar large enclosures can also be used for the removal of non-friable asbestos-contaminated materials if a risk assessment concludes that enclosure is an effective control for the risks involved.

The design and installation of the enclosure should take account of:

- the methods used to contain the asbestos work area;
- the provision and locations of decontamination and changing facilities;
- the precautions that must be implemented to prevent the spread of asbestos contamination outside the asbestos work area;
- air quality within the enclosure - for example, there must always be sufficient oxygen within the enclosure;
- the temperature within the enclosure (especially to avoid heat stress); and
- any other hazards in the enclosure. These hazards must be identified and control measures implemented before any asbestos removal work commences.

Work methods may also need to be adapted for the work environment within the enclosure.

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<sup>2</sup> This section has been largely adopted and adapted in parts from WorkSafe New Zealand; <http://www.business.govt.nz/worksafe/information-guidance/all-guidance-items/new-zealand-guidelines-for-the-management-and-removal-of-asbestos-3rd-edition/safe-removal-of-friable-asbestos> (Accessed January 2014)



Heavy duty plastic sheeting - minimum **200µm (microns)** - should be used for the enclosure. Recycled or reusable plastic must not be used. Every location where the asbestos work area connects to the outside environment or the rest of the building (such as windows, ducts, wall cavities, conduits and lift entrances) should be enclosed so that an airtight seal is maintained for the duration of the asbestos work. Vertical shafts should be properly sealed off to prevent the thermosyphon effect spreading asbestos fibre throughout the building.

Existing floor coverings should be removed where practicable. A double layer of plastic sheeting (suitably fixed by double-sided tape or adhesive to prevent movement between layers) should be used on the floor of the containment area and a turn-up should be used where the floor joins the side walls. The plastic sheeting should enclose all the walls, windows and doors. Wooden cleats may be used to anchor the plastic sheeting to the walls.

#### **4.11.1 Airlocks**

Airlocks should be provided at the entry points to the changing area. These airlocks should be constructed using double sets of overlapping plastic with suitable provisions for ensuring a seal.

#### **4.11.2 Viewing Panels**

Viewing panels are installed in enclosures to allow for inspection of removal operations and should be placed in appropriate locations.

#### **4.11.3 Lighting Requirements**

Adequate lighting needs to be provided within the enclosure, either naturally, using clear plastic or Perspex panels in the enclosure walls, or artificially, preferably from outside the enclosure and again using clear plastic or Perspex panels. Lights within an enclosure can increase the temperature within the enclosure.

#### **4.11.4 Lift Shafts**

Where asbestos is removed from an entire floor of a multi-story building, all passenger lifts should be prevented from stopping at the floor from which asbestos is being removed. Removal workers may gain access to the floor via the fire stairs or from a lift dedicated for this purpose. Where a lift is used for access, all exit doors to other floors should be sealed. It is important that emergency escape exits are available when blocking off such areas.

#### **4.11.5 Furniture and Fixtures**

All movable furniture, plant and fittings (such as curtains, desks, mats and false ceiling tiles) must be removed from the asbestos removal area. The immovable items should be fully wrapped and sealed in suitable plastic sheeting so that they are effectively isolated from the removal area. In regions of heavy traffic or high wear, additional masking or barricading may become necessary.

#### **4.11.6 Masking and Preparation of Enclosure and Other Equipment**

Where masking operations may liberate asbestos fibres, all persons in the removal area must wear respiratory protective devices approved for asbestos. This precaution is particularly applicable when removing existing barriers or partitions such as false ceiling tiles, or the erection of scaffolding.

#### **4.11.7 Ceiling Spaces**

Where asbestos materials may have fallen onto a false ceiling, the ceiling should be removed only under full removal conditions. Any utility or service line which penetrates into the ceiling space must be sealed.

Ceiling spaces may be sealed by constructing a plastic-lined frame within the ceiling space. This frame should be removed only after the completion of the final clearance inspection. Aside from specific asbestos extraction units, all ventilation and air-conditioning networks servicing the removal area should be closed down for the duration of the removal job. All vents should be thoroughly masked to prevent the ingress of asbestos fibre into the duct network. Upon completion and after final cleaning of the removal area, all mechanical ventilation filters for re-circulated air should be replaced.

Additional care must be taken to ensure that asbestos fibres cannot escape at points where pipes and conduits pass out of the removal area. Greater attention to masking and compliance testing should be given in these regions, particularly if service riser-shafts pass through the removal area.

If the asbestos work area is adjacent to areas occupied by unprotected persons, priority should be given to performing the removal work during periods when these areas are unoccupied or to a greater isolation of the removal area. In addition, hoarding should be constructed to form a barrier between the asbestos work area and the adjoining occupied areas. A plastic-lined

barrier should be erected within this hoarding. A buffer area should be reserved between the hoarding and occupied areas.

Any platforms and/or fixed scaffolding required for the safe removal of the asbestos-contaminated material should be erected during the early stages of the work. Where it is necessary to construct platforms and fixed scaffolding within the enclosed area, decontamination and visual inspection of these structures will be necessary at the end of the removal work.

#### **4.11.8 Air Inlets**

Air inlets are needed to help maintain a suitable volume of negative air pressure. If the Negative Air Units (NAUs) are turned off, air inlets should be filtered to prevent the escape of dirty air out of the inlets into the environment.

**NOTE:** *Air inlets into the enclosure will be required to balance the air flow because too much negative air pressure can cause the enclosure to implode or seals to fail.*

#### **4.11.9 Extraction Units (Negative Air Units or NAUs)**

To prevent the escape of airborne asbestos fibres from the removal area enclosure, an exhaust extraction fan should be installed in a position to create a negative air pressure of approximately 12 Pascals (water gauge) within the removal area. While accepting that the measurement of this pressure is not always possible, a good guide to the effectiveness of the system can be gauged from the inwards effect on the plastic tenting. If there is a visible bellowing inwards, there is good negative pressure. In this arrangement, the major and usually only route of air into the removal area would be through the decontamination unit. Where plastic tenting has not been used, the correct flow of air should be verified by using smoke testing.

The extraction units must be run continuously (i.e. 24 hours a day) until all asbestos removal and decontamination tasks have been completed and clearance given. Below is a basic formula for calculating the number of air handling units required based on the volume of the space to achieve a pre-determined number of air changes per hour:

Volume of air space (V) = (Width x Length x Height)

CFM Rating (cubic feet/minute) (R) = found on the air handling size unit

In this example the predetermined number of air changes = **4** and is over a **60** minute period:

$$V \times 4 = 4V$$

$$R \times 60 = 60R$$

$$4V / 60R = \text{Number of Units Required}$$

The calculated amount should be rounded to the nearest full number.

#### 4.11.10 Extraction Unit Filtration

The air extracted by this system should pass through an appropriate High Efficiency Particulate Air (HEPA) filter to ensure removal of any asbestos fibres. Ideally, air extraction units should be situated so that access to the filters can be gained from the removal area. This expedites the otherwise difficult decontamination of these units and allows another unit to be brought into service in the event of a breakdown. Where it is not possible to change the filter within the removal area, a temporary enclosure should be constructed around the unit during the filter replacement.

Every employer must take all practicable steps to ensure that dust control equipment used in the course of the asbestos work is inspected for defects at least once every seven days by a person who has:

- a. the relevant knowledge, experience, and skill to inspect dust control equipment for defects; and
- b. either:
  - i. a relevant qualification; or
  - ii. a certificate issued by his employer as evidence that he is in possession of the required knowledge, experience, and skill.

The HEPA filter should comply with a minimum 99.97% efficiency requirement. A coarse pre-filter should be installed on the air intake side of the negative air unit to prolong the useful life of the high efficiency filter. Where practicable, the discharge point for this extraction unit should be to the outside air, distant from other working areas, air-conditioning inlets or breathing air compressors. Where this is not possible, testing of the exhaust air is to be carried out.

Procedures should be established for changing these HEPA filters so that areas outside the enclosure are not contaminated. The most satisfactory method for assessing the integrity of the HEPA filter and seal fittings is regular inspection in conjunction with a static pressure alarm to indicate any failure in the system.

When installing the asbestos removal area containment, extra consideration should be given to the alteration of the fire rating of the building and to the provision of the fire-fighting facilities, emergency exits and emergency lighting.

#### 4.11.11 Signage

The asbestos removal site should be clearly defined to ensure that non-essential persons do not enter and to clearly delineate the removal site and warn persons that asbestos removal work is being carried out. Warning notices stating "ASBESTOS HAZARD AREA - KEEP OUT" must be placed at entrances to the removal area. These signs, with lettering of 100mm in height, are to be placed so they are clearly visible. Other more general signs may be used elsewhere in the buildings to indicate that construction work is in progress (Figure 1).<sup>3</sup>



<sup>3</sup> [https://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=standards&p\\_id=9995](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=9995) Section 1910.1001(j)(4) (Accessed 30 January 2014)



Figure 1: Examples of Signs to be placed in the vicinity of an Asbestos Removal Site<sup>4</sup>

All signs and barriers should remain in place until a clearance to re-occupy has been granted.

#### 4.11.12 Compliance Testing of Removal Area Prior to Commencement of Work

When the asbestos contractor is satisfied that the enclosure is complete, and before any asbestos removal begins in an enclosure, a competent person should carry out a visual inspection to check the integrity of the structure. Smoke testing may also be used to detect leaks. Negative air exhaust units should not be used while the smoke test is being conducted. Only smoke-generating devices incorporating non oil-based, non-toxic smoke fluid should be used. Flares should not be used.

Attention should be given to the billowing inward of the plastic sheeting. At the beginning of each working period the inspection should be repeated and any defects rectified immediately. If any leaks or other deficiencies in the enclosure are found during the testing, work should not proceed until these have been rectified.

<sup>4</sup> <http://www.keysignsuk.co.uk/safety-signs-uk.asp?ProductID=8508> (Accessed 31 July 2013)

If air monitoring or visual examinations of the enclosure and items of equipment indicate that asbestos dust might be escaping from the enclosure, asbestos removal work should be stopped until any defects have been rectified. Following any such incident and before work commences it is essential to:

- identify the source of the leak(s);
- prevent further release of fibres;
- re-test the enclosure;
- clean any contaminated areas;
- conduct a visual inspection; and
- conduct monitoring tests specific to the incident;
- where applicable and necessary, notify the Department.

A supply of expandable foam sealant, polyester insulation or equivalent should be maintained on the site to assist with sealing leaks.

#### **4.11.13 Decontamination Facilities**

The decontamination unit should be situated immediately adjacent to, and joined to, the enclosed asbestos removal area. Where it is not physically possible to locate the decontamination unit in this way, alternative procedures to minimize asbestos contamination should be implemented. See Section 7.14 (Remote Decontamination Units.)

The decontamination unit should be divided into three distinct areas:

1. a dirty decontamination area;
2. a clean decontamination area; and
3. a clean changing area.

These areas should be separated by suitable airlocks or buffer zones. Normally these airlocks have spring-loaded doors or two or more overlapping sheets of plastic sheeting positioned to define the boundary between each segment of the decontamination unit, while allowing personnel access and an air-flow towards the asbestos work area. To ensure there is sufficient airflow through the decontamination unit if doors are used, they should have large openings with a hinged flap operating as a one-way valve.

A typical layout is shown in Figure 2.

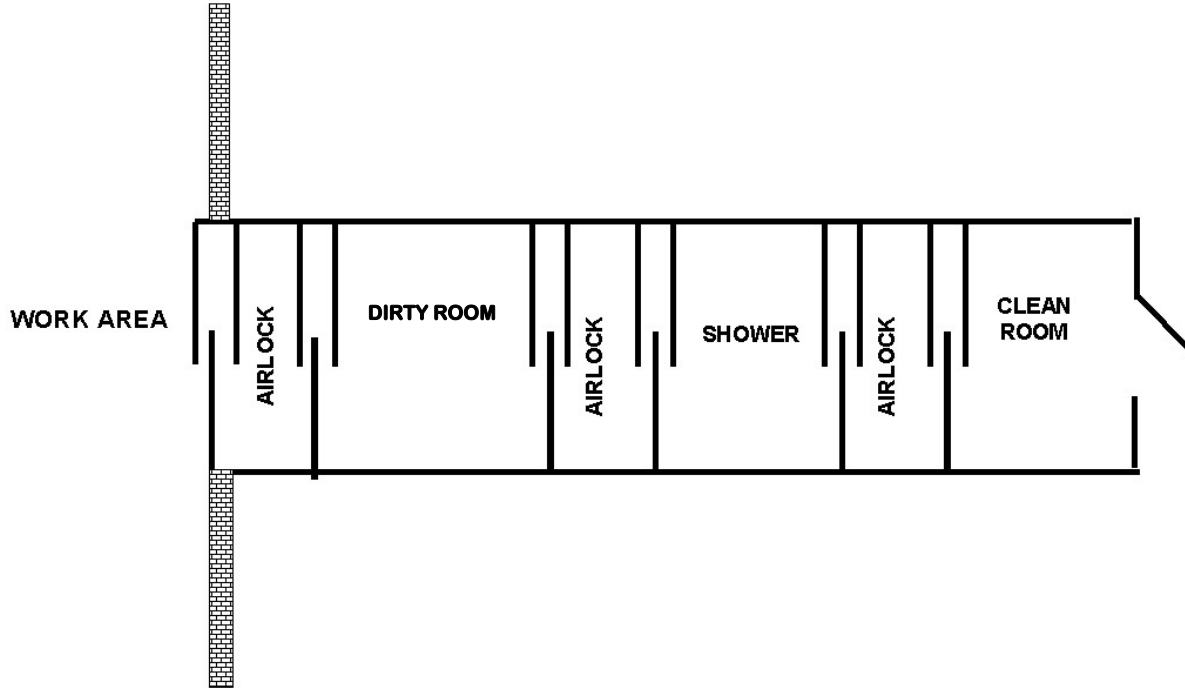


Figure 2: Typical Decontamination Facility<sup>5</sup>

The dirty decontamination area should provide for:

- vacuum cleaning or hosing down of contaminated clothing and footwear;
- the storage of contaminated clothing and footwear;
- labelled waste bags/bins for disposable protected clothing; and
- a shower area with an adequate supply of warm water.

The clean decontaminated area should provide for:

- the storage of individual respirators in containers or lockers;
- airflow towards the dirty decontamination area; and

<sup>5</sup> Modified from: Asbestos – Part 56 of Title of the Official Compilation of Codes, Rules and Regulations of the State of New York (Cited as 12 NYCRR Part 56). As amended, effective March 21, 2007. State of New York Department of Labour Safety and Health Subpart 56-9.



- a shower area with an adequate supply of warm water.

The clean changing area should provide for:

- the storage of clean clothing;
- separate storage of clean and dirty towels; and
- airflow towards the clean decontamination area.

All water from the decontamination facility should pass through a high efficiency particulate filter or other trap before it passes into sewer mains. The filter or trap must be capable of capturing particulates down to 5µm - refer to Section 7.22 (Waste Water Management) of these guidelines.

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

#### **4.11.14 Remote Decontamination Units**

Remote decontamination units are not located next to the asbestos work area. They should only be used if a decontamination unit cannot be located immediately adjacent to the asbestos work area. When a remote decontamination unit is to be used, the asbestos contractor may need to implement additional procedures to minimize asbestos contamination including, for example, methods for the connection and disconnection of airline respirators.

The route of access from the asbestos work area to the decontamination unit should be suitably signposted and barricaded to restrict public access. An isolated changing area should be attached to the asbestos work area. Before workers enter this changing area, all obvious signs of asbestos dust should be removed from their protective clothing using an asbestos vacuum cleaner.

The isolated changing area is used to discard outer garments including coveralls and overshoes and to dress in fresh outer/protective clothing for the journey to the decontamination unit. Control monitoring must be conducted in the immediate vicinity of the access route and at other suitable locations outside the asbestos area to ensure that no contamination is being spread outside of the isolated changing area and asbestos work area. Respiratory protection should continue to be worn until the appropriate phase of the decontamination procedure within the remote decontamination unit.<sup>6</sup>

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<sup>6</sup> Asbestos - New Zealand guidelines for the management and removal of asbestos (3rd Edition), 39

### **4.11.15 Procedure for Entering the Asbestos Work Area**

The procedure for persons entering the asbestos work area should be as follows:

#### ***4.11.15.1 Clean Change Area***

- Change into clean work clothes and put on clean protective clothing;
- Store any removed clothing in a dust-proof container;
- Pass through the airlock into the clean decontamination area;
- Adequate supplies of undergarments and socks (disposable or reusable) should be provided for all personnel entering the asbestos work area; and
- Adequate supplies of shorts and t-shirts should also be made available for all workers.

#### ***4.11.15.2 Clean Decontamination Area***

- Put on respirator. Check that it is working properly and that there is a good facial seal; and
- move to the dirty decontamination area.

#### ***4.11.15.3 Dirty Decontamination Area***

- Put on any additional protective equipment that has been stored in the dirty decontamination area, such as footwear; and
- if using air-supplied equipment, connect to the air supply;
- exit from the decontamination unit into the asbestos work area.

### **4.11.16 Procedure for Leaving the Asbestos Work Area**

The decontamination procedure for persons leaving the asbestos work area should be as follows:

#### ***4.11.16.1 Asbestos Work Area***

- Use an asbestos vacuum cleaner to remove any obvious signs of asbestos dust from protective clothing;
- remove footwear and leave inside the asbestos work area, adjacent to the decontamination unit (footwear should be stored upside down to minimize further contamination); and

- proceed into the dirty decontamination area.

#### ***4.11.16.2 Dirty Decontamination Area***

- If shoes/boots have not already been removed, remove them and store them (upside down) within the dirty decontamination area;
- if using air supplied equipment, disconnect airline respirator;
- keep other respiratory equipment in operation;
- shower while wearing protective clothing and respirator;
- leaving the respirator on, remove protective clothing and place it in labelled waste bags/bins;
- remove wet underclothing such as t-shirts or shorts, while showering and place it in the storage unit provided within the dirty decontamination unit; and
- pass through the airlock into the clean decontamination area.

#### ***4.11.16.3 Clean Decontamination Area***

- Commence shower and remove respirator;
- thoroughly wash hands, fingernails, face, head and respirator;
- store respirator in a suitable container within the clean decontamination area; and
- move to the clean change area.

#### ***4.11.16.4 Clean Change Area***

- Change into clean clothing; and
- exit decontamination unit.

### **4.11.17 Person Outside the Enclosure**

The asbestos contractor should ensure a worker is stationed outside the asbestos work area for the duration of the asbestos work to:

- liaise with outside management;
- communicate with personnel outside the enclosure; and
- instigate emergency/evacuation procedures if necessary.

Records of these activities should be kept on a daily basis.

#### **4.11.18 Sealing the Enclosure and Decontamination Unit upon the Completion of the Asbestos Removal Work**

After the removal work has been completed, all plant and equipment within the asbestos work area and the decontamination unit, including any remaining non-removable items, should be vacuumed and/or wet wiped to remove any residual dust. When decontamination is not possible, the items should be wrapped in plastic and sealed and only opened in another removal area. When emptying the asbestos vacuum cleaner, any asbestos contained should be disposed of as asbestos waste, including the containment bag and filters.

Once the asbestos supervisor is satisfied that the asbestos work area and decontamination unit are clean, all of the clean surfaces should be sprayed with PVA using airless spray equipment. Items of equipment that may be damaged by the application of the PVA can be screened with plastic sheeting. Any layer of plastic forming the inner surface of the enclosed work area or decontamination unit should also be sprayed with PVA.

The final layer of any plastic enclosing the asbestos work area and decontamination unit should not be taken down until a visual inspection has found no visible asbestos residue and clearance monitoring indicates airborne asbestos fibre levels are below 0.01/mL.<sup>7</sup> Settled dust sampling may also be considered as an indicator of cleanliness.

Plastic sheeting and any similar materials used for the enclosure must be treated as asbestos waste. This need not apply to scaffolding or other equipment used to add strength to the enclosure, but any such equipment should be vacuumed, damp-wiped and sprayed with PVA as part of the clean-up process. Ropes, warning signs and protective plastic isolating areas should not be removed until the asbestos work area and decontamination unit have had a satisfactory clearance inspection.

#### **4.11.19 Mini-Enclosures for Small-Scale Asbestos Removal Work**

Mini-enclosures are suitable for asbestos removal work in areas with restricted access, such as ceiling spaces, and for emergency asbestos removals. The mini-enclosure has to be large enough to allow movement inside the enclosure and contain all the equipment needed for the asbestos removal work. The frame of a mini-enclosure can be made from a variety of materials, but has to be strong enough to support the plastic sheeting that forms the enclosure.

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<sup>7</sup> [https://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=standards&p\\_id=9995](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=9995) Section 1910.1001(c)(1) (Accessed 30 January 2014)

Machinery that consumes oxygen or emits exhaust fumes must not be placed in a mini-enclosure. Heavy duty plastic sheeting, 200µm minimum thickness<sup>8</sup>, should be used to make the enclosure. Recycled plastic must not be used. The tape used to connect the plastic to the frame must be strong enough to securely hold the plastic to the frame. A smoke tube should be used to check the sealing of the plastic sheeting.

A slit will have to be made in the plastic sheeting to allow entry. The slit can then be taped from inside the enclosure. A typical layout is show in Figure 3.

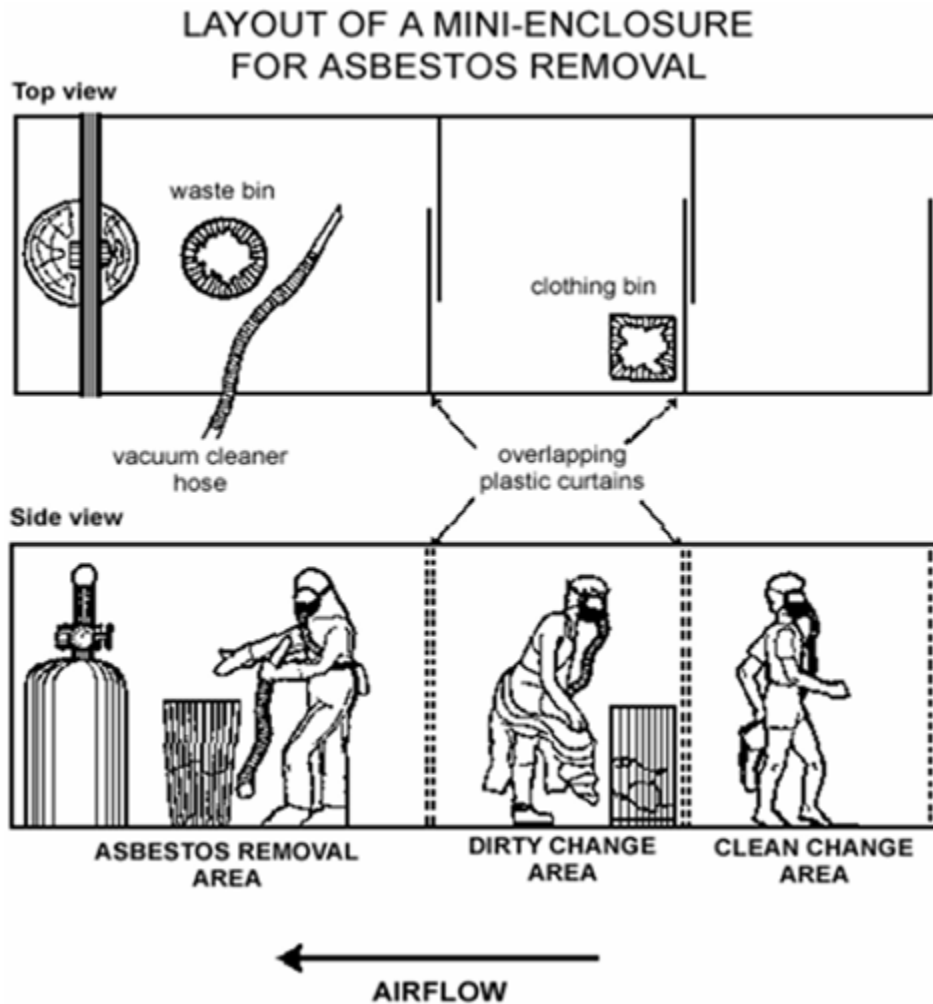


Figure 3: Layout of a mini-enclosure for small-scale asbestos removal

<sup>8</sup>[https://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=standards&p\\_id=9995](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=9995) Section 1910.1001(c)(1) (Accessed 30 January 2014)

The hazards and work procedures that need to be considered for large enclosures also need to be taken into account for all mini-enclosures. Workers leaving the mini-enclosure must follow the personal decontamination procedures.

#### **4.11.20 Dry Decontamination – Suitable for Small-Scale Non-Friable Asbestos Removal Work – Service and Maintenance**

Personal decontamination must be undertaken each time removal workers leave the asbestos work area and on completion of asbestos service and maintenance work. Personal decontamination should be done within the asbestos work area where recontamination cannot occur. Asbestos-contaminated PPE should not be transported outside the asbestos work area except for disposal purposes.

The procedure for dry decontamination is:

- all visible asbestos dust/residue is removed from protective clothing using an asbestos vacuum cleaner and/or wet-wiping;
- the protective clothing is taken off (while still wearing a respirator) and placed in an asbestos waste bag;
- disposable protective clothing is preferred. If non-disposable clothing is used, such as wet weather gear, it should be completely wetted before double bagging, labelled and sent to a laundering facility capable of laundering asbestos-contaminated clothing. The laundering of contaminated protective clothing in workers' homes is strictly prohibited;
- clothing and footwear worn during the removal should be vacuumed using an asbestos vacuum cleaner and the footwear should also be wet-wiped;
- disposable respirators should then be discarded as asbestos waste;
- non-disposable respirators should be removed and thoroughly cleaned and
- after removing the respirator, workers should wash their face and hands, paying particular attention to their fingernails.

This form of personal decontamination may also be appropriate after the service and maintenance or removal of:

- an asbestos gasket;
- an asbestos (Zelemite) electrical switchboard;
- **small** amounts of asbestos sheeting or vinyl floor covering (typically less than one day's work for one person);
- minor amounts of asbestos debris;
- asbestos cement conduits and in-ground surface pits; or
- asbestos friction materials.

However, some of these forms of asbestos-contaminated materials could be friable making more extensive decontamination procedures necessary. The measures adopted should always address the risks of each individual asbestos removal job.<sup>9</sup>

#### 4.11.21 Vehicular/Machinery Decontamination

Vehicular decontamination units are required when asbestos removal works require the use of heavy machinery and/or trucking in the asbestos removal area - for example, large-scale removal of contaminated soil or of internal building asbestos-contaminated materials.

A risk assessment should be undertaken by the asbestos contractor to determine the extent or necessity of vehicular decontamination procedures. The vehicular decontamination unit should be located away from the personal decontamination unit and should be adjacent to the asbestos removal work area.

The decontamination unit may be purpose-built with suitable heavy duty timbers and plywood. The decontamination unit must be lined internally and externally with heavy duty plastic sheeting of 200µm thickness<sup>10</sup>. The sheeting must be checked regularly for damage and leaks and, if any are identified, it must be removed and replaced before usage continues. The unit must be watertight to prevent excess water run-off during wash-down procedures. Spring-loaded doors on either side of the unit should be used to ensure that an airlock is maintained as the vehicle/machine is passing through the unit.

During entry and exit procedures, only one set of doors should be open at one time, to prevent airborne fibres from escaping the enclosure. All materials used in the construction of the decontamination unit must be disposed of as asbestos waste once the unit is dismantled upon completion of removal works. Extraction fans should be installed to force the air back into the

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<sup>9</sup> Asbestos - New Zealand guidelines for the management and removal of asbestos (3rd Edition), 41

<sup>10</sup> [https://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=standards&p\\_id=9995](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=9995) Section 1910 (Accessed 30 January 2014)

asbestos work area. After each vehicle/machine has been thoroughly washed, the unit must be liberally doused with water to arrest any fibres remaining in the decontamination unit.

#### ***4.11.21.1 Procedures for Decontamination of Machinery***

At all times when in the asbestos work area and the vehicular decontamination unit, the machine operator must:

- be fully kitted with appropriate PPE and RPE required for the asbestos removal work;
- ensure the machine is thoroughly washed down using water hose pressure when exiting the removal work area;
- take care to ensure the cab, tracks/tyres, undercarriage, boom and body are thoroughly doused with water to remove any residue of asbestos dust on the machine; and
- leave the machine in the decontamination unit.

Once the machine has been thoroughly washed and the decontamination unit has been washed down, another operator similarly kitted in clean PPE and RPE is to enter the decontamination unit from the clean side to extract the machine from the decontamination unit to the clean area.

**NOTE:** *No operator can exit from the asbestos working area through the vehicular decontamination unit<sup>11</sup>.*

#### ***4.11.21.2 Procedures for Decontamination of Vehicles***

At all times when in the asbestos work area and the vehicular decontamination unit, the vehicle operator must:

- ensure that the vehicle's windows are wound up completely and securely;
- ensure that all air-conditioning inside the vehicle is turned off;
- ensure that they do not exit the vehicle while in the asbestos removal area;
- ensure that the vehicle is washed down thoroughly using water hose pressure; and
- take care to ensure the sides, tray, undercarriage, tyres and cab body are thoroughly doused down with water to remove all visible residue of asbestos dust on the vehicle.
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<sup>11</sup> [https://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=standards&p\\_id=9995](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=9995) Section 1910 (Accessed 30 January 2014)



#### **4.11.22 Waste Water Management**

The vehicular decontamination unit must be suitably constructed so that no water escapes its confines, except to where it is to be collected for filtration or disposal. The water from the decontamination process is to be collected in a "sump" and regularly disposed of as contaminated waste. Alternatively, a trap should be constructed with a HEPA filtration unit to extract and collect asbestos fibres from the water before it is collected as normal contaminated water from the vehicles or machinery. No unfiltered water is to be dumped in any catchments.

#### **4.11.23 Decontamination of Waste Removed from Asbestos Work Area**

Waste bags and wrapped items need to be decontaminated before leaving the enclosure. Asbestos-labelled bags need to be wetted down and not overfilled, to reduce the risk of splitting and tearing.

#### **4.11.24 Glove Bag Removal Method<sup>12</sup>**

Glove bags are single-use bags constructed from transparent, heavy duty plastic with built-in arms and access ports. Generally these glove bags are approximately one metre wide and 1.5 metres deep. Glove bags are designed to isolate small removal jobs from the general working environment. They provide a flexible, easily installed and quickly dismantled temporary enclosure for small asbestos removal jobs. The glove bag removal method is especially suited for the removal of asbestos lagging from individual valves, joints, piping etc.

A major advantage of all glove bags is that they contain all waste and contamination within the bag, eliminating the need for extensive PPE and decontamination. The only significant limitation on the use of glove bags is the volume of waste material they are able to contain. Care needs to be exercised to prevent overfilling of the bag with water or waste. See Figure 4 below.

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<sup>12</sup> Asbestos - New Zealand guidelines for the management and removal of asbestos (3rd Edition), 45

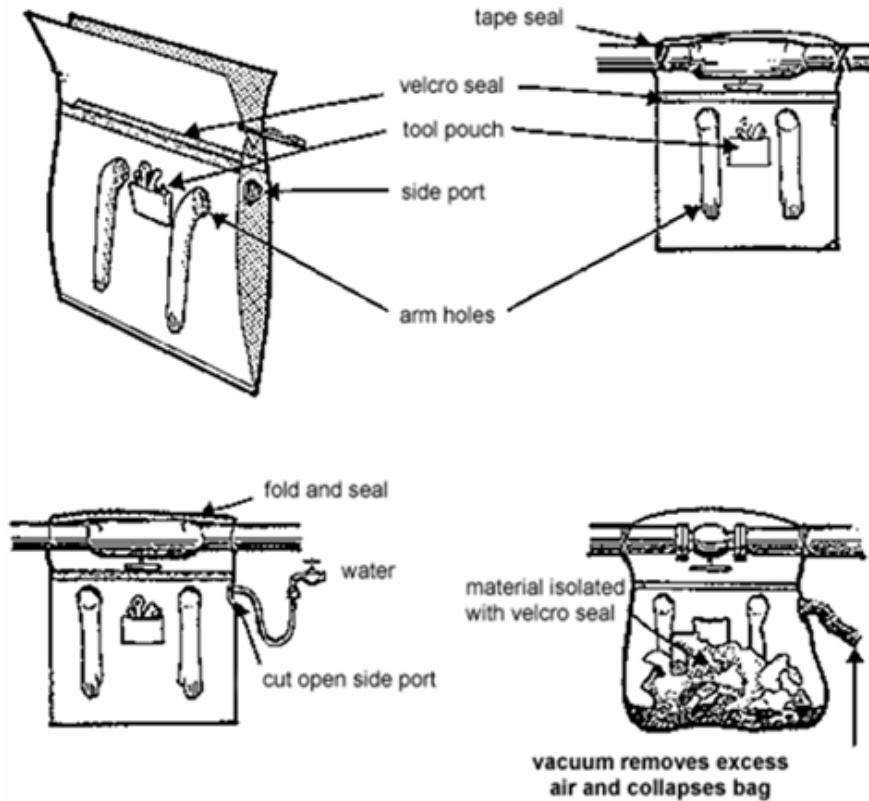


Figure 4: Use of glove bags<sup>13</sup>

1. Cutting and removal tools that will be used in the removal should be placed into the glove bag at the start of the job. When the removal is complete, tools should be either disposed of as asbestos waste or sealed for re-use in future removal jobs.
2. The glove bag should completely cover the pipe or object on which the asbestos removal work is to be performed. The lagging on either side of the bag must be sound enough to support the weight of the bag and its wet contents.
3. Cut the sides of the glove bag to fit the size of the object from which asbestos is to be removed. Attach the sides of the glove bag to the object by folding in the open edges together and securely sealing them with duct tape. Seal all openings in the glove bag with duct tape or an equivalent. The bottom and side seams of the glove bag should also be sealed with duct tape or an equivalent to prevent any leakage if there is a defect in a seam.

<sup>13</sup> Asbestos - New Zealand guidelines for the management and removal of asbestos (3rd Edition), 45

4. Thoroughly saturate the asbestos-contaminated materials 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-contaminated materials that have fallen into the bag should be thoroughly saturated. Any canvas should be cut and peeled away from the asbestos-contaminated materials. If the asbestos-contaminated materials are dry, it should be re-sprayed with the wetting agent before it is removed.
5. Thoroughly clean the pipe or surface from which the asbestos has been removed with a wire brush and wet wipe it until no traces of the asbestos-contaminated materials can be seen. Wash down the upper section of the bag to remove any adhering asbestos-contaminated materials.
6. Seal any edges of the asbestos-contaminated materials that have been exposed by the removal or by any maintenance activity to ensure these edges do not release any airborne asbestos fibres after the glove bag is removed.
7. Once the asbestos-contaminated materials have been removed and sealed, insert a vacuum hose from an asbestos vacuum cleaner into the glove bag through the access port to remove any air in the bag that might contain airborne asbestos fibres. Once the bag has been evacuated, squeeze it tightly as close to the top as possible, twist it and seal it with tape, keeping the asbestos-contaminated materials safely in the bottom of the bag.
8. Remove the vacuum line from the bag and then remove the glove bag from the work place for proper disposal as asbestos waste.

#### **4.11.25 Wrap and Cut Removal Method<sup>14</sup>**

This method of removal produces the lowest levels of airborne asbestos fibres and is most appropriate for redundant plant and equipment. The plant or equipment to be removed should be double wrapped with minimum 200µm thick plastic and taped so that the ACM is totally sealed within the plastic. The wrapped plant and equipment can then be cut from the rest of the plant and equipment using mechanical shear or oxy-cutting tools. Only exposed metal should be cut and care should be taken to ensure the plastic wrapping is not punctured and/or melted.

If lagging has to be removed to allow pipe to be cut, the glove bag removal method should be used to expose the metal at the point to be cut and for a sufficient length on either side. The insulation should be thoroughly wetted, bagged and disposed of as asbestos waste. The pipe should then be cut at the centre of the exposed section.

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<sup>14</sup> Asbestos - New Zealand guidelines for the management and removal of asbestos (3rd Edition), 46

#### ***4.11.25.1 Removal of Decorative Coatings (Textured Ceilings)<sup>15</sup>***

Because of the relatively low asbestos content (range of 3-10%) and the nature of the product, it may not be necessary to adopt all the procedures set out in Sections 7.12 to 7.20 for major removal programmes. This is especially so if complete saturation with water is possible as this greatly reduces the release of asbestos fibres.

However, where contamination of the asbestos-contaminated materials covers a large area (typically greater than a standard three-bedroom residential dwelling) and where work exposure exceeds a maximum of 8 hours total work duration, then procedures as described in Sections 7.3 to 7.12 of these guidelines must be followed.

#### ***4.11.25.2 Procedures for Small-Scale Removal Work - Domestic Dwellings<sup>16</sup>***

The minimum procedures that must be followed in instances of domestic dwellings are that the room(s) must be isolated from adjoining areas. This can be done by sealing doors and other openings with tape. It may not be necessary to totally enclose the removal area with polythene sheeting, provided the surfaces can be vacuumed with an asbestos vacuum cleaner and wet-wiped clean. The floor must be covered. All furniture, fittings and curtains must be removed. Negative air pressure should be maintained within the work area.

Procedures must be adopted to ensure that the asbestos-contaminated materials do not contaminate other areas. Work methods must be methodical and orderly, thereby reducing the release of airborne fibres and the spread of asbestos. Protective clothing should remain in the removal area and be disposed of as asbestos waste at the completion of the job.

### **4.11.26 Decontamination of Soil**

#### ***4.11.26.1 General***

Asbestos fibres or dust can be released from materials present on the site, including materials buried at insufficient depth, by weathering, erosion or disturbance by, for instance, vehicles or during construction activities. The tendency for asbestos fibres to be released is increased if the contaminated material consists of friable asbestos, such as pipe lagging, asbestos blankets, rope

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<sup>15</sup> Asbestos - New Zealand guidelines for the management and removal of asbestos (3rd Edition), 46

<sup>16</sup> Asbestos - New Zealand guidelines for the management and removal of asbestos (3rd Edition), 46

or millboard. If the site is well drained and dry then the tendency for asbestos fibres to release is also increased.<sup>17</sup>

#### ***4.11.26.2 Excavation and Removal Offsite***

This process is suitable for all types of asbestos contamination. The site should be appropriately secured or boarded off to prevent the unintentional entry by members of the public or other non-essential personnel. Appropriate warning signage should be erected at all entry points and are not to be removed until the work is completed.

The methods used for this decontamination should be based on a risk assessment. The use of professional site remediation advice and/or services should be considered as they can develop a RAP (Remediation Action Plan) for the asbestos contractor to work to.

The minimum suitable respiratory protection is a P2 half face-piece respirator with particulate filter. The type of decontamination facilities should be determined by a risk assessment by the asbestos contractor. During soil decontamination the topsoil should be dampened down to minimize the generation of dust and all visible pieces of asbestos-contaminated materials should be picked up individually so that the risk of asbestos fibre inhalation is effectively eliminated. The method of dampening should be such so as not to cause pooling or run-off of contaminated water.

If this is not practicable, the contaminated topsoil should be removed to a depth that has no visible contamination or asbestos debris. The contaminated soil must be disposed of as asbestos waste at a registered tip-site. The trailer used for removing the asbestos-contaminated materials from site to the registered tip-site must be lined in accordance with Section 9 of these guidelines.

All documentation should be maintained by the asbestos contractor and provided to the client. In addition, there should be:

- provision for PPE to prevent the spread of contamination to the wearer and others;
- provision for personnel decontamination;
- provision for vehicular and equipment decontamination;
- provision for personnel amenities outside the contaminated area;
- provisions for monitoring of the removal area to ensure no cross contamination. This may include air monitoring; and

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<sup>17</sup> Asbestos - New Zealand guidelines for the management and removal of asbestos (3rd Edition), 46

- other requirements as outlined in these guidelines including an asbestos removal plan, safety plan and other documentation.

#### **4.11.27 Site Remediation for Fire-Damaged Asbestos-Contaminated Materials**

The remediation and clean up of fire-damaged asbestos containing products, including cement bonded products such as cladding material, is a restricted activity that requires the direct supervision and management by a person holding a *Certificate of Competence for restricted work*.

The asbestos contractor must complete a site investigation to assess:

- the types of asbestos-contaminated materials damaged and the extent of damage and contamination (this may include an inspection of surrounding properties);
- the potential for contamination into drainage systems and the protection of these; and
- other risks/hazards that the asbestos removal personnel will be exposed as well.

Generally, fire damaged asbestos-contaminated materials attracts a lot of attention due to the high public health concern. The asbestos contractor may be required to deal with a variety of agencies including fire investigation, police, the Ministry of Health and the NEPA. Fire damaged asbestos-contaminated materials need to be kept wetted down, but not to the point of causing pooling. Any water used for the wetting down of fire damaged asbestos-contaminated materials will be contaminated and must be captured and treated as such.

The site should be appropriately secured or boarded off to prevent the unintentional entry by members of the public or other non-essential personnel. Appropriate warning signage should be erected at all entry points and are not to be removed until the work is completed.

The removal method adopted by the asbestos contractor should be one that minimizes the risk of further contamination. In addition, there should be:

- provision for PPE to prevent the spread of contamination to the wearer and others;
- provision for personnel decontamination;
- provision for vehicular and equipment decontamination;
- provision for personnel amenities outside the contaminated area;

- provision for monitoring of the removal area to ensure no cross contamination. This may include air monitoring; and
- other requirements as outlined in these guidelines, including an asbestos removal plan, safety plan and other documentation.

#### **4.11.28 Removal Techniques for Buildings and Structures**

The removal of asbestos-contaminated materials from buildings and other structures should be carried out by methods that will minimize the release of asbestos fibre into the atmosphere during and after the removal operation. The choice of method is determined by the nature of the asbestos materials, the quantity of insulant and its location.

Breaking through the finishing compound and cutting the reinforcing wire in lagging can liberate considerable quantities of dust. Care should be taken in the selection of tools and in keeping the insulation wet. Tools should allow cutting of the insulation into small sections while keeping asbestos fibre levels in the removal area to a minimum.

**NOTE:** *Power, telephone and fire alarms may lie beneath asbestos insulation. These cables must be clearly identified prior to the commencement of any cutting as severe damage and / or hazard to the worker could result.*

As the techniques used for the removal of sprayed thermal insulation from buildings are not dissimilar from those used for removal from steam pipes and boilers, the following removal methods may be adapted to the removal of asbestos from industrial plant and machinery.

##### **4.11.28.1 Removal by Soaking or Total Saturation**

The quantity of asbestos-containing insulation to be removed from pipes or ducts is often so extreme, or the material so thick, that the spray method (see following technique) will not suppress fibre release sufficiently. An alternative is to soak the insulation by the introduction of water through appropriate applicators.

The following steps are recommended for the soaking procedure<sup>18</sup>:

- Where the asbestos-contaminated materials are covered with cloth, mastic or other such materials, loose material dust should be removed by vacuum cleaning or by wiping with a damp cloth. Where cladding has to be removed before access is obtained to the asbestos-contaminated materials, the cladding should be removed

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<sup>18</sup>Asbestos - New Zealand guidelines for the management and removal of asbestos (3rd Edition), 49

carefully and surfaces vacuum-cleaned continually or, where practicable, sprayed with water.

- Holes or cuts should be made in the outer covering to enable water to be injected in such a manner and quantity to ensure that ACM is wetted but not washed out by the passage of water. It has been found that slow saturation from the metal interface outwards is quite successful. The addition of a wetting agent to the water will assist the saturation process.
- The quantity of water and the time to soak will be dependent on factors such as thickness of insulation, access and location of holes.
- The saturated asbestos-contaminated materials should be removed in sections and immediately placed in properly labelled containers and suitably sealed. During this process it may be necessary to carefully cut reinforcing wire or similar restraints.

The asbestos-contaminated materials should be properly soaked and small sections that dislodge should be properly disposed of.

#### ***4.11.28.2 Spray Method***

Water is very effective in preventing release of asbestos fibre. This method should be used only where small quantities of asbestos-contaminated materials are to be removed and where the following conditions apply to the material:

- the asbestos-contaminated materials are not covered with other materials such as calico or metal cladding which require prior removal;
- there is no reinforcing wire or similar restrictions to removal;
- the asbestos-contaminated materials are not coated with paint or mastic;
- where rapid temperature drop due to excessive water could cause damage to heated metal components; and
- where live electrical conductors are present and where no damage to electrical equipment can arise from the entry of water.

The spray should be applied in such a manner as to ensure that the entire surface of ACM is wet but minimal run-off occurs. In many instances adding a wetting agent to the water will facilitate more rapid wetting of the insulation material. It is desirable for the asbestos-contaminated materials to be wetted through its full depth and maintained in a wet condition. A manually controlled, consistent low-pressure coarse spray, such as from an adjustable pistol grip garden hose, should be used for this purpose.



The design of the spraying equipment will be dependent on availability of water supply and access to the area to be sprayed. It is important that the spray should be copious, but not such that the water droplets generate dust from impact with the surface of the insulation. When using cutting equipment to remove asbestos, the water spray should be directed at the site of the cut and the wetted material removed as the cut progresses.

The wetted asbestos-contaminated materials should be removed in sections and immediately placed in suitably labelled containers and properly sealed. Any small sections that is dislodged should be collected and properly disposed of. Asbestos fibre release is significantly depressed although not entirely eliminated by this technique, so appropriate respiratory protection should be used.

#### ***4.11.28.3 Dry Removal***

This method is considered the least desirable removal technique and must only be used where spray and soaking methods cannot be used - for example where there are live electrical conductors or where major electrical equipment could be permanently damaged or made dangerous by contact with water<sup>19</sup>.

Notwithstanding the general guidance given earlier in these guidelines, the greater potential for the generation of the airborne asbestos dust in dry removal techniques demands that particular attention be given to work methods.

### **4.11.29 Protective Clothing and Equipment**

When the use of respiratory devices and protective clothing is required, adequate rest breaks should be provided to take into account the physical strain caused by the use of such equipment.

Care should be taken in the selection of all tools and equipment for asbestos removal tasks. In addition to suitability for these tasks, all tools should prevent or minimize the generation and dispersion of airborne asbestos fibres as much as possible. The use of power tools in asbestos removal work should be avoided because of the possibility of internal contamination which commonly occurs with such devices. In general, manually operated hand tools are preferred<sup>20</sup>.

At the end of removal work, all tools should be:

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<sup>19</sup> Asbestos - New Zealand guidelines for the management and removal of asbestos (3rd Edition), 50

<sup>20</sup> Asbestos - New Zealand guidelines for the management and removal of asbestos (3rd Edition), 51

- decontaminated by fully dismantling and cleaning under controlled conditions; or
- placed in sealed containers (and used only for asbestos removal work); or
- disposed of as asbestos waste.

## CAUTION

**In general circumstances high speed abrasive power tools or pneumatic tools such as angle grinders, sanders, saws and high speed drills should not be used for asbestos removal - for example, when removing asbestos fibrolite sheeting.**

### *4.11.29.1 Spray Equipment*

A constant low pressure water supply is required for wetting down asbestos. 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 such as a pump up garden sprayer may be used.

### *4.11.29.2 Asbestos Vacuum Cleaners*

Asbestos vacuum cleaners should only be used for collecting small pieces of asbestos dust and debris. Larger pieces should never be broken into smaller sizes so they can be vacuumed. Vacuum cleaners used on asbestos work should not be used for any other purpose and must be labelled "*For Asbestos Use Only*". Asbestos vacuum cleaners should not be used for vacuuming wet materials because this can damage the HEPA filter. Use the correct attachment to the asbestos vacuum cleaner for the type of surface you are cleaning.

Procedures should be established for the general maintenance of asbestos vacuum cleaners in a controlled environment. They should be cleaned externally with a wet cloth after each task, the hose and attachments stored in a labelled container or impervious bag and a cap should be placed over the opening to the asbestos vacuum cleaner when the attachments are removed<sup>21</sup>.

PPE should be worn whenever an asbestos vacuum cleaner is opened to change the bag or filter or to perform other maintenance or decontamination. Emptying asbestos vacuum cleaners can be hazardous if the correct procedures are not followed. Asbestos vacuum cleaners should only be emptied by a competent person with the correct PPE in a controlled environment and in compliance with the manufacturer's instructions.

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<sup>21</sup> Occupational Safety & Health Administration Regulations (Standards - 29 CFR) Standards Section 1910

Whenever possible, asbestos vacuum cleaners should not be hired as they can be difficult to fully decontaminate. If hiring is necessary, they should only be hired from organisations that provide vacuum cleaners specifically for work with asbestos.

When the work is complete the asbestos vacuum cleaner should be decontaminated with the bag and filter being removed in accordance with the manufacturer's instructions and disposed of as asbestos waste. The inside and outside of the vacuum should be wet-wiped and the asbestos vacuum cleaner should be re-sealed in the storage container provided.

#### ***4.11.29.2 Inspection of Equipment***

All equipment used for the removal of asbestos-contaminated materials should be inspected before the commencement of the removal work, after any repairs and at least once every seven days when it is being used continually. A register should be maintained with details of these inspections, the state of the equipment and any repairs.<sup>22</sup>

### **4.11.30 Dismantling of Asbestos Removal Area**

The asbestos removal job should only be considered to have been completed when the asbestos contractor has complied fully with the clearance criteria.

#### ***4.11.30.1 Clearance and Visual Inspection Procedures***

On completion of the asbestos removal job, all tools and equipment not used for cleaning should be removed from the removal area so that efficient vacuuming of the inside of the removal area enclosure can be undertaken. When taking these tools and equipment from the removal area, appropriate decontamination procedures should be observed.

After clearance has been given, any sealing plastic used should then be dismantled, folded inwards and placed in appropriate disposal bags and sealed. The sealing plastic should not be re-used, but must be treated as asbestos waste. Safety barricades and warning signs must not be removed until the complete removal area has been thoroughly cleaned<sup>23</sup>.

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<sup>22</sup> Occupational Safety & Health Administration Regulations (Standards - 29 CFR) Standards Section 1910

<sup>23</sup> Occupational Safety & Health Administration Regulations (Standards - 29 CFR) Standards Section 1910

## 5.0 Handling of Non-Friable Asbestos

Non-friable asbestos products have been compounded using asbestos mixed with cement or other hard bonding materials. This section of the guidelines recommends precautions to be taken when working with non-friable asbestos products.

These products include, but are not limited to:

- flat or corrugated compressed asbestos cement sheeting;
- asbestos cement pipes for water, drainage and flue gases;
- roofing shingles;
- floor or wall coverings;
- asbestos gaskets;
- pump and valve packings;
- asbestos bonded into bituminous products; and
- flexible building boards such as villa board, hardiflex, flexiboard.

While new fibre cement products no longer contain asbestos (it was replaced by non-asbestos fibres such as cellulose in the 1980s), crocidolite (blue) and amosite (brown) asbestos were extensively used in many asbestos cement building products until the 1970s. Chrysotile (white) asbestos was used almost exclusively in fibre cement products during the 1970s and 1980s.

If these products are maintained in good order and are not worked on with abrasive cutting or grinding tools they are not likely to present a health risk. The employer must ensure that precautions are taken during structural alteration or demolition involving asbestos cement materials and the removal of all floor and wall coverings containing asbestos.

Work procedures must be designed to minimize the generation of dust. Action should be taken to avoid the spread of asbestos fibre. In particular, the following procedures should be adopted<sup>24</sup>:

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<sup>24</sup> Asbestos - New Zealand guidelines for the management and removal of asbestos (3rd Edition) Section 8

- abrasive cutting or sanding power tools should not be used on asbestos-contaminated materials as they may generate large amounts of dust containing asbestos;
- non-powered hand tools such as hand saws should be used;
- wet the material to further reduce the release of asbestos fibre when cutting;
- high pressure water jets/guns must not be used because of the potential to spread asbestos waste in the surrounding environment;
- work with asbestos-contaminated materials in well-ventilated areas and, where possible, in the open air;
- observe good work hygiene principles. These may involve using plastic drop sheets to collect off-cuts and coarse dust, or using appropriate vacuum cleaning equipment when necessary;
- suitable respiratory protection should be used when airborne asbestos fibre is likely to be present; and
- all off-cuts and collected dust should be disposed of as asbestos waste.

## **5.1 Removal of Asbestos Cement Pipes**

### **5.1.1 General**

In most cases, asbestos cement pipes are considered non-friable. However fibres can be released into the air and surrounding environment when the pipes are crushed, damaged, mishandled or in a badly weathered condition. To prevent the release of asbestos fibres, the contractor must not allow the pipe to be damaged, crushed or shattered in any way during removal. The contractor must not sand, chip, grind or use any power tools on the piping during its removal.

The asbestos cement (asbestos cement) piping can generally be removed in sections, split at the collar (or sleeve) and removed carefully by lifting out of the excavated shaft. The piping must be kept wet at all times and must not be blown with compressed air or a vacuum cleaner not rated to HEPA requirements.

**NOTE:** *When asbestos cement piping is damaged, the removal and remediation work is now defined as "Restricted" and will require the removal and decontamination of the surrounding soil in most cases.*

### 5.1.2 Enclosure

The need for an enclosure and a decontamination facility should be determined by a risk assessment. The decontamination facilities should be located inside the asbestos work area. Decontamination facilities, appropriate for the removal job, should be available throughout the entire removal process.

### 5.1.3 Personal Decontamination

PPE should be vacuumed and wet-wiped in conjunction with any other decontamination methods. Decontamination should be carried out in a designated area. Contaminated PPE should not be worn outside the asbestos work area under any circumstances.

## 5.2 Removal of Asbestos Cement Sheeting

### 5.2.1 General Conditions

ASBESTOS CEMENT products would normally be assessed as non-friable even though they can suffer significant weathering in outdoor environments. Provided these products are maintained in good order, they present a low health risk. However, if such a product is damaged (broken or damaged by water, fire etc) or has deteriorated to expose fibrous material, it will present a health risk and will require removal.

In some cases the product can be damaged to the point of becoming easily crumbled. Once it is at this stage it becomes friable asbestos and removal must be completed by a NEPA approved asbestos abatement contractor. Precautions should be observed during structural alterations or demolition involving these products. Hail, storm and fire-damaged asbestos cement products can pose a high risk of asbestos exposure and should be assessed to determine if they are friable. Under normal removal conditions the removal of asbestos cement products does not attract a recommendation for extraction ventilation.

The **minimum** suitable respiratory protection is a P2 half face-piece respirator with a particulate filter.

### 5.2.2 Enclosure

The need for an enclosure and a decontamination facility should be determined by a risk assessment. The decontamination facilities should be located inside the asbestos work area.

Decontamination facilities appropriate for the removal job should be available throughout the entire removal process.

### 5.2.3 Removal<sup>25</sup>

The asbestos contractor should ensure that the following precautions are observed when removing asbestos cement roofing, wall sheeting or other asbestos cement products from buildings or other structures:

- The work area should be kept clean, tidy and free from asbestos cement debris and cleaned up at least daily. All debris should be collected and disposed of as asbestos waste.
- Prior to the removal process, asbestos cement sheets should be finely sprayed with PVA using low-pressure spray equipment. The PVA must be dry before sheet removal begins, to eliminate a risk of a worker slipping or falling from a roof.
- Anchoring bolts/screws should be removed from the roofing sheets using an oxy-torch or other suitable device that will not significantly damage the sheet. All nails and bolts removed should be disposed of as asbestos waste.
- asbestos cement sheets should be removed with minimal breakage and should be lowered to the ground, **not dropped**. Unnecessary breaking of asbestos cement sheets must not be permitted.
- Cranes or elevated work platforms (EWPs) can be used to safely access and lower the asbestos cement sheets to the ground. Use of this equipment must comply with all relevant regulations, guidelines and codes of practice.
- The removed sheets should be stacked on two layers of plastic sheeting 200µm thick and not allowed to lie about where they may be further broken or crushed by machinery or site traffic.
- All asbestos-containing waste should be kept wet, wrapped in plastic sheeting 200µm thick or otherwise sealed and removed from the site as soon as possible using bins pre-lined with a minimum of two layers of 200µm sheeting.
- The asbestos-containing waste should be disposed of in a manner, and at a site, approved by the appropriate disposal authority - refer to Section 9 of these guidelines.
- Asbestos cement sheets must not be re-used or offered for sale.

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<sup>25</sup> Asbestos - New Zealand guidelines for the management and removal of asbestos (3rd Edition) Page 87

- Any asbestos cement residues remaining in the roof space, framework, exposed wall cavities or around the removal area should be cleaned up using an asbestos vacuum cleaner if necessary.
- Rough sawn timber cannot be effectively wet-wiped or vacuum-cleaned. If the timber is to remain in situ or be recycled, it should be sealed with PVA using low-pressure spray equipment.
- Staff should be relocated (where appropriate).
- As far as practicable there should be no spread of contamination beyond the work area.
- All windows and doors in the building should be closed or, in buildings where there is no ceiling, the area below or adjacent to the work should be roped off.
- Workers should wear disposable overalls.

### **5.2.4 Personal Decontamination**

PPE should be vacuumed and wet-wiped, in conjunction with any other decontamination methods. Decontamination should be carried out in a designated area. Contaminated PPE should not be worn outside the asbestos work area under any circumstances.

### **5.3 Working on Brittle or Unstable Roofs<sup>26</sup>**

Asbestos cement sheeting is liable to shatter without warning under a person's weight. For this reason, roofs that are sheathed in asbestos cement sheeting are known as "brittle roofs". In some cases the roof structure itself is unstable due to damaged timber framing.

The removal of asbestos cement sheeting from a roof should only be undertaken by persons with the knowledge, experience and resources necessary to allow them to work safely at heights.

The asbestos contractor should conduct a risk assessment to determine appropriate requirements for the safe removal of asbestos sheeting from brittle or unstable roofs.

Consideration should be given to:

- the necessity to have asbestos removal workers on the roof, exposed to the risk of a fall. Alternative methods that should be considered by the asbestos removalist include the use of crane/man cages or mobile scaffolding, or elevated work platforms where the removal work is done from the confines of the protective working platform;

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<sup>26</sup> Asbestos - New Zealand guidelines for the management and removal of asbestos (3rd Edition)



- the structural integrity of the building, if asbestos removal workers must work from the roof. Propping may be required and, if so, must be certified by a registered engineer;
- suitable gangways being installed if asbestos workers must work from the roof to prevent workers from walking directly on the asbestos sheeting. (All asbestos removal workers must wear suitable fall arrest harnessing if working above 6 metres); and
- identification and protection of all open voids, including clear sheeting, to prevent asbestos workers falling through.

**NOTE:** *Chicken wire installed under asbestos sheeting is not to be considered by the asbestos contractor as an appropriate means to prevent the asbestos worker from falling through the asbestos sheeting.*

### 5.3.1 Fall-Arrest Systems

The use of fall-arrest systems, the asbestos contractor must ensure that:

- they are not used when working below 6 metres;
- supervisory personnel are trained and certified to competently supervise such systems.
- asbestos removal workers are appropriately trained to use the fall-arrest system correctly and safely;
- anchoring points for harnesses/static line set up are capable of holding 15kN for a single person and 22kN for two persons;
- emergency procedures are defined in case of a fall-arrest; and
- appropriate checklists for equipment and training/induction of persons and equipment are readily available throughout the removal operations.

The system used for working on brittle or unstable roofs should allow for not only those directly involved in the work, but also other persons who could be affected.

### 5.3.2 Preparation and Enclosure

If the asbestos cement sheeting removal includes grinding and abrading, the wet-spray method should be used and the removal should be undertaken within an enclosure - refer to Section 5 of these guidelines for information on the use of enclosures.

The minimum respiratory protection for this operation is a P2 filter with a half face-piece respirator. If grinding or abrading is involved, the minimum recommended respiratory protection is a P3 full face-piece particulate respirator. Section 15 of these guidelines provides further information on the selection, use and maintenance of the appropriate RPE and PPE.

Decontamination facilities should be available throughout the entire removal process. A decontamination unit should be available when grinding or abrading is undertaken and otherwise as determined by a risk assessment by the asbestos contractor.

#### **5.4 Removal of Vinyl Floor and Wall Coverings Containing Asbestos**

In the 1960s and 1970s vinyl floor tiles and vinyl floors sheets were commonly reinforced with asbestos in a bonded matrix. A visual inspection cannot determine whether vinyl floor tiles contain asbestos. The material must be sample-tested. All fittings and fixtures on top of the vinyl floor should be removed before the vinyl is taken up. Vinyl-asbestos (VA) coverings (usually asbestos-backed floor coverings) may still be encountered. They do not usually present a risk in situ but sanding to prepare the surface for replacement or removal operations may create a hazard.

The contractor working with vinyl products that may contain asbestos should ensure that all practicable steps are taken to confirm whether or not asbestos is present. If there is any doubt about the product being asbestos-free, laboratory tests should be carried out. The product is more likely to contain asbestos if it was installed between 1968 and 1985. Where the VA coverings are found (or assumed) to contain asbestos, the provisions set out in these guidelines should be followed. Significant release of asbestos fibre can result when VA products are abraded by sanding. The work methods and control procedures used when working with VA products must be designed to limit workers' exposure to asbestos and the spread of asbestos into the surrounding environment.

In deciding the approach to be taken in replacing asbestos-backed vinyl products, the following options may be considered:

- leaving the product in place and fixing a new product over the top; or
- removing the product with a spade or other flat instrument; or
- sanding the surface to expose the substrate. This should only be done after all reasonable steps have been taken to remove the asbestos by scraping.

Fixing the new product over the VA covering creates the least risk at the time but, in reality, just defers the problem. The best option will usually involve removal of the covering with a method that minimizes release of dust containing asbestos fibre<sup>27</sup>.

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<sup>27</sup> Asbestos - New Zealand guidelines for the management and removal of asbestos (3rd Edition), Sec8

## **5.5 Sanding of Floors in Removing Vinyl Asbestos Products**

Power sanding of floors must be kept to a minimum. In all cases the surface must be wetted to minimize the release of asbestos fibre. If floors are sanded dry, it is highly likely that asbestos fibre levels above the workplace exposure standard will be generated. Sanding equipment used to sand VA floors should not be used for other jobs.

While water is the safest liquid to use for wetting floors when sanding, some contractors prefer to use kerosene, on the basis that it does not clog the abrasive or stain the flooring. If a flammable liquid is used, extreme care must be taken to avoid ignition. The flammable liquid should have a flashpoint above 61°C - the product's SDS (Safety Data Sheet) will advise of this.

The following procedures should be used for the wet sanding of floors<sup>28</sup>:

- The work area should be sealed or isolated from other parts of the building. This would normally involve the use of plastic sheeting or other suitable material for sealing off all doors and entrance ways.
- Cupboards and drawers should either be sealed or emptied prior to the commencement of work.
- The floor should be wetted by "mopping" with kerosene or water to assist in suppressing dust.
- All operators should wear single use overalls that must be treated as asbestos waste on completion of the job. Overalls may be used for several jobs but must be sealed in a plastic bag between jobs.
- All operators should use a half-face piece respirator with a class P2 filter suitable for asbestos dust or a combination P2 and organic vapour filter if using kerosene.
- Clean-up procedures should be carried out thoroughly by first vacuuming residues and dust from all surfaces followed by wet mopping. The vacuum cleaner should be fitted with a HEPA filter and the cleanings disposed of as asbestos waste.
- Where sanding has been carried out in service rooms such as kitchens, cupboards and drawers not previously sealed should be vacuumed and wiped down with wetted rags.
- All asbestos-contaminated waste (including rags that have been used for wet-wiping) must be disposed of in properly labelled and sealed bags.
- Equipment used to sand floors should be cleaned by vacuuming and wet-wiping before being removed from the job.

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<sup>28</sup> Asbestos - New Zealand guidelines for the management and removal of asbestos (3rd Edition), Sec8

## ***5.6 Removal of Asbestos-Backed and Millboard from beneath a Vinyl Floor***<sup>29</sup>

### **5.6.1 Preparation and Enclosure**

All fittings and fixtures on top of the vinyl floor should be removed before the vinyl is taken up.

The minimum respiratory protection for this operation is a P3 full face-piece powered air purifying particulate respirator. Since asbestos millboard is typically 100% asbestos and very friable, a full enclosure with negative air extraction units must be used for this type of removal. A decontamination unit must be available at all times - refer to Section 4 of these guidelines.

### **5.6.2 Removal**

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 securely wrapped with 250µm thick plastic sheeting, 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 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 the vinyl tiles, care should be taken not to scorch or burn the tiles. Burning or scorching 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 hazards.

## ***5.7 Removal of Asbestos Gaskets and Rope from Plant and Equipment***<sup>30</sup>

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.

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<sup>29</sup> [http://www.asbestosremovalaustralia.com.au/asbestos\\_friable\\_vinyl\\_sheet\\_floor\\_covering.htm](http://www.asbestosremovalaustralia.com.au/asbestos_friable_vinyl_sheet_floor_covering.htm) (Accessed 30 January 2014)

<sup>30</sup> <http://www.hse.gov.uk/pubns/guidance/a25.pdf> (Accessed 30 January 2014)

Asbestos rope was often used for lagging pipes and valves and for sealing hatches. It is likely that the asbestos-contaminated materials in gaskets and rope from plant and equipment will be friable.

### **5.7.1 Preparation**

Ensure the plant or equipment is shut down and isolated. The minimum respiratory protection suitable for this operation is a P2 filter with a half face-piece respirator.

### **5.7.2 Removal**

Dismantle the equipment carefully. Protect any other components with plastic sheeting. Thoroughly dampen the gasket or rope with water. Use a hand-scraper to slowly remove the gasket or rope. Continue to dampen as drier material is exposed. Collect the removed asbestos-contaminated materials in a container directly beneath the scraper.

All the asbestos gasket or rope should be removed.

## **5.8 Removal of Asbestos Switchboards and Meter Boards<sup>31</sup>**

Historically, ACM was used in and around switchboards and meter boards to provide electrical insulation and to prevent fire spreading from the boards. Asbestos-contaminated materials were used in the front panels and also in materials that covered the inside and back of the switchboard boxes. Small electrical load centres (with a main switch and a few fuses) have also been known to have ACM backings.

A registered electrician must isolate the relevant switchboard or meter board before any work begins. When removing an asbestos switchboard or meter board any other asbestos-contaminated materials, such as fire-proofing on the switchboard box sides and base, should also be removed.

### **5.8.1 Preparation**

Electricity must be disconnected from the switchboard or meter panel by a registered electrician. Once disconnection has been tested and confirmed the removal process can begin. All wiring on the back of the switchboard or meter board should be disconnected or isolated by a registered electrician. If this is not practical, the wiring should be suitably terminated and labelled to indicate that it is live and the wiring should be protected against

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<sup>31</sup> <http://www.deir.qld.gov.au/workplace/subjects/asbestos/electrical-installations/index.htm#.Uuq3cvuFY40> (Accessed 30 January 2014)

mechanical damage or otherwise rendered safe. The switchboard or meter panel and surrounding area should be cleaned before removal work begins.

The minimum suitable respiratory protection is a P2 half face-piece respirator with particulate filter - refer Section 8 of these guidelines for information on the selection, use and maintenance of appropriate RPE and PPE.

### **5.8.2 Removal**

Lay out a 200µm thick plastic sheet to catch any debris that may fall. Remove the mounting screws from the board without damaging the board. Vacuum the front surface of the board using an asbestos vacuum cleaner. Tilt the board forward and disconnect the cabling from the board. Wrap the board in a double layer of heavy duty 250µm plastic sheeting - refer to Section 9 of these guidelines for waste disposal procedures.

### **5.8.3 Decontamination**

- Vacuum the area where the board was located and the surrounding area.
- Wet-wipe the area with a rag to remove minor amounts of debris that may be attached to the wall or cabling. Dispose of this rag as asbestos waste.
- Vacuum the sheet of plastic laid out to catch any debris and dispose of it as asbestos waste.
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## **5.9 Removal of Asbestos Mastics and Bitumen<sup>32</sup>**

Mastics and bitumen are usually soft, so they were often reinforced with asbestos to give them strength while retaining their flexibility.

### **5.9.1 Preparation**

The minimum respiratory protection suitable for this operation is a P2 filter with a half face-piece respirator. Section 15 of these guidelines provides further information on the selection, use and maintenance of appropriate RPE and PPE.

### **5.9.2 Removal**

Because these asbestos-contaminated materials are flexible they need to be removed using scraping and chipping tools. The pieces removed should be kept as intact as possible.

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<sup>32</sup> <http://www.hse.gov.uk/asbestos/essentials/> (Accessed 30 January 2014)

If heating is used to soften the material to enable it to be peeled, it is important not to burn the material as this can release airborne asbestos fibres. Excessive heating is also likely to generate toxic fumes and gases and generate a fire hazard.

### **5.10 Removal and Cleaning of Ceiling Tiles<sup>33</sup>**

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

#### **5.10.1 Preparation**

The minimum respiratory protection suitable for this operation is a P2 filter with a half face-piece respirator. If considerable amounts of asbestos dust or debris are likely to be involved, full face-piece air purifying positive pressure respirators should be worn. Section 8 of these guidelines provides information on the selection, use and maintenance of appropriate RPE and PPE.

#### **5.10.2 Method**

Any surface below the tiles that might be contaminated should be covered with 200µm plastic sheeting. The first tile should be lifted carefully to minimize the disturbance of any asbestos fibres. The top of each tile should be thoroughly vacuumed with an asbestos vacuum cleaner and wet-wiped, where possible prior to removing other tiles.

Where non-asbestos ceiling tiles are to be re-used, they should be covered with plastic as they are removed from the ceiling to prevent further dust settling on them. Asbestos ceiling tiles must not be re-used. Wrap the asbestos ceiling tiles in a double layer of heavy duty 200µm thick plastic sheeting - refer to Section 9 of these guidelines for waste disposal procedures. Ceiling tiles should not be placed in the ceiling until the areas of the ceiling space affected by the maintenance work have been cleaned.

## **6.0 Monitoring Asbestos in Air Levels and Clearance Procedures**

The measurement of airborne fibre levels will be required to verify that asbestos exposure standards have not been exceeded and to check that practices set out in these guidelines have been met. The main objective of sampling should be to ensure that the potential for personal exposure has been minimized.

The type of monitoring that is applicable will depend on the exposure circumstances. A clear distinction should be made between sampling conducted as part of the quality control procedures on asbestos removal or encapsulation jobs and occupational sampling. Overall,

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<sup>33</sup> <http://www.hse.gov.uk/asbestos/essentials/> (Accessed 30 January 2014)

both are concerned with safeguarding the health of individuals but, in the case of quality control samplings, the immediate emphasis is placed on confirming that the task has been completed to a satisfactory standard.

## **7.0 After Abatement: Monitoring Asbestos in Air Levels and Clearance Procedures**

### **7.1 Monitoring of Removal Work**

The requirements for air sampling should be established before the removal process begins. It may be appropriate to conduct background monitoring to establish existing asbestos fibre levels. This is most likely to be useful where the contract is for the removal of only part of the asbestos present in the building or structure.

The ability of the enclosure to contain the asbestos generated in the removal process is perhaps best monitored by regular checks on the negative air pressure. A pragmatic method is to observe the inward bulge in the plastic sheeting. Air sampling may, especially in the initial stages of the removal work, provide more direct evidence that satisfactory containment is being achieved.

### **7.2 Control Levels for Monitored Airborne Asbestos Fibres**

Control levels are airborne asbestos fibre concentrations which, if exceeded, indicate there is a need to review current control measures or take other action. These control levels are occupational hygiene best practice and are not health-based standards - i.e. they are below the concentrations set for asbestos.

The control levels shown in the following table should be used for determining the effectiveness of control measures:

**Table 2: Control levels for monitored airborne asbestos fibres<sup>34</sup>**

Control Level (airborne asbestos fibres/mL)	Control/Action
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<sup>34</sup> Occupational Health & Safety Administration Regulations (Standards - 29 CFR)



**Table 2: Control levels for monitored airborne asbestos fibres<sup>34</sup>**

Control Level (airborne asbestos fibres/mL)	Control/Action
≥0.01	Continue with control measures
<0.01	Review control measures
≥0.02	Stop work and find the cause

### ***7.3 Clearance and Visual Inspection Procedures***

At the completion of the removal process, clearance must be gained prior to reoccupation.

This procedure is the responsibility of the principal. The principal should engage the services of an independent person or entity to conduct a visual inspection and carry out final clearance monitoring.

While the asbestos contractor undertaking the removal work may engage an agent to carry out monitoring while the work is progressing, final clearance for reoccupation must be conducted by an independent agent.

#### **7.3.1 Visual Inspections**

The visual inspections are conducted after the removal area has been meticulously cleaned. Normally inspections prior to clearance monitoring will be the responsibility of the principal, but this function may be delegated to an independent operator who has no financial or other interest in the job. If attention is given to the cleaning aspect of the removal process, it is unlikely that airborne asbestos contamination will be a problem.

Any asbestos remaining (including that which is not visible to the naked eye) will be removed rapidly in the normal cleaning process. In some circumstances sealant may be applied to work surfaces and plastic sheeting after the visual inspection and initial monitoring. Any dust present in the removal area must be treated as if it contains asbestos. If asbestos is not completely

stripped from an area because of access difficulties the area should be sealed and the location noted.

### 7.3.2 Clearance Monitoring

Following a satisfactory visual inspection, clearance monitoring will be required for all friable asbestos work and interior asbestos sheeting removal. The area must be dry, the negative air switched off and the inlet capped before sampling is started. As far as practicable, the decontamination unit must be isolated from the area being cleared.

Sampling pumps are to be suitably placed to collect representative samples. The sampling head should be positioned one to two metres from the floor and away from walls or other solid surfaces. Section 7 of these guidelines discusses the requirements for sampling equipment. If the area has been sprayed with PVA or other sealant, sampling should not commence for at least two hours to allow the sealant to dry properly.

### 7.3.3 Recommended Number of Samples

The recommended numbers of samples to be taken should be determined as follows:

Enclosure area (m <sup>2</sup> )	Enclosure volume (m <sup>3</sup> )	Number of samples
<50	<10	1
50	150	2
200	600	4
500	1500	6
1000	3000	9

<sup>35</sup> Asbestos - New Zealand guidelines for the management and removal of asbestos (3rd Edition), Sec8

**Table 3: Recommended Number of Samples<sup>35</sup>**

Enclosure area (m <sup>2</sup> )	Enclosure volume (m <sup>3</sup> )	Number of samples
5000	15000	16
10000	30000	20

If the volume of the area to be cleared is less than 10 cubic metres, one sample is sufficient; otherwise at least two samples should be taken. Where the enclosure is less than three metres high, or where exposure is only likely to be at ground level, use the area for calculating the number of samples. In other cases the volume should be used as the basis for determining the number of samples. If there are large items in the enclosure, their volume may be subtracted from the total before estimating the number of samples to be taken.

The above criteria are to be used as a guide only in estimating the number of samples to be taken. For example, it may be necessary to take more samples where the area is subdivided.

### 7.3.4 Sampling Procedure

Sampling should be conducted over a period of 4 hours at a rate of 2 litres/minute to give a sample volume of 480 litres. At the start of the sampling period, activity should be undertaken to disturb any settled asbestos fibres. This can be achieved by fanning the air beside accessible surfaces where it is suspected asbestos may be present.

The flow rate should be recorded at the beginning and end of the sampling period using a calibrated flow meter. The sampling period should be as close as possible to 4 hours and recorded to the nearest minute.

### 7.3.5 Storage and Transport of Filters

Filters should not be treated with a fixative - this has been shown to be unnecessary and may damage the sample. Care should be taken to follow exactly the instructions specified by the analysing laboratory for the handling and transport of the exposed filters.

### 7.3.6 Interpretation of Results

For a clearance to be given, all results must be less than or equal to 0.01 fibres/ml unless:

- It can be established that the fibre present is unlikely to be asbestos (this will normally require confirmation by an alternative method such as Scanning Electronic Microscopy with Energy Dispersive X-ray Analysis).

### **7.3.7 Standardized Method of Determining the Concentration of Asbestos Fibres in Air Samples**

The acceptable method of analysis for determining the concentration of asbestos fibres in air samples is the NIOSH Method which is described in detail in the NIOSH Manual of Analytical Methods. The NIOSH Method utilizes the phase contrast microscopy analysis (PCM) test method. For definitive analysis, it is crucial that the air samples are analyzed by a nationally and/or internationally accredited asbestos testing laboratory.

## **7.5 Occupational Sampling**

The employer is responsible for ensuring that employees working with asbestos and all others who may come into contact with asbestos fibre generated from the removal process are protected. For persons working with asbestos WES are specified in Table 3 in these guidelines. These standards are only applicable where the work is directly connected with asbestos or an asbestos product.

Personal monitoring will generally be required using equipment that samples air from the worker's breathing zone. To obtain a sample that can be compared with the WES a sample over any continuous 4-hour period is to be taken.

The sampling strategy should be designed to achieve results that are indicative of typical exposures. The person conducting the sampling should be conversant with occupational hygiene monitoring procedures. In developing the sampling strategy relevant information on the processes in the workplace must be gained. In particular, information on the following should be sought:

1. the plant and equipment used for transporting and processing materials containing asbestos;
2. the exhaust ventilation and other dust control equipment;
3. the composition of the materials (the percentage and type of asbestos present in the material handled, for example);
4. process details; and
5. the tasks performed by individual employees.

### **7.5.1 Sampling Duration and Flow Rate**

The WES for asbestos refers to 4-hour periods. A 4-hour sample at a sampling rate of one litre per minute is recommended but, depending on the level of dust present in the air, the sampling rate

may have to be reduced to avoid overloading the filter. The total sampling period should never be less than four hours and preferably cover the full work period with two 4-hour samples.

## **8.0 Respiratory and Personal Protection for Asbestos Workers**

### **8.1 General**

Employers and others involved in asbestos removal or abatement procedures must take all necessary control measures to protect against exposure to asbestos fibres. There are a legal requirements placed on employers to ensure that their employees and others in the vicinity are adequately protected from the effects of asbestos.

Good occupational hygiene practice requires that all practicable efforts are taken to prevent asbestos fibres from entering the air of the workplace. In circumstances where it is impracticable to prevent asbestos from entering the atmosphere, suitable respiratory protection should be worn.

Respirators should be issued to individuals for their exclusive use. A system of regular cleaning, inspection and maintenance should be provided for respirators on extended personal use and records of all respirator issues and uses should be established and maintained.

### **8.2 Respirator Programme**

It is essential that all organisations required to use respirators in their work develop and run a comprehensive respiratory protection programme. There are seven elements to a successful programme:

- the administrative system;
- knowledge and assessment of the risks involved;
- control processes;
- correct selection of respiratory protection devices (RPDs);
- staff training;
- medical assessment; and
- inspection, maintenance and storage of RPDs.

#### **8.2.1 Administrative System**

Written standard operating instructions must be available. These should provide information on the company policy relating to the issue and use of RPDs. One person should be responsible for

the coordination and direction of this policy. Each RPD programme will vary according to the peculiarities of the work being carried out.

### 8.2.2 Knowledge and Assessment of Risks Involved

The degree of respiratory protection required for asbestos work is determined by:

- the nature of the work;
- the type of asbestos;
- the work methods; and
- potential for exposure to asbestos fibres.

It is essential that a full appraisal of the work using the above criteria is carried out to assess the likely risk factors and to identify the appropriate safety measures. It may be necessary to undertake environmental monitoring to assist with the assessment. This is a responsibility of the employer.

Air contaminated with asbestos fibres will be the major hazard to workers and the most appropriate control methods will need to be considered in the assessment process. Because the greatest risk is from the inhalation of asbestos fibres, stringent protection measures must be used. Therefore, all people likely to be exposed to asbestos must wear approved RPDs for the whole exposure period.

### 8.2.3 Correct Selection of Respiratory Protective Devices (RPDs)

The following issues must be addressed<sup>36</sup>:

#### *Fit to the wearer*

- If a proper fit cannot be achieved with one type, model or size of respirator, another which does fit must be provided.

#### *Face seal*

- The presence of facial hair (beard, stubble growth, or sideburns,) wearing spectacles, or facial characteristics may affect the face seal adversely. Positive pressure powered equipment with full-face-piece copes better with these matters than non-powered devices.

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<sup>36</sup> Occupational Health & Safety Administration Regulations (Standards - 29 CFR) Sec1910

- Persons requiring the use of prescription spectacles may not be able to use full-face-piece respirators because of the loss of seal around the spectacle arms. If their spectacles cannot be modified so that they do not need the support of the ears, these people should not use full-face-piece respirators and should wear air supply hoods instead. It is important to be sure these hoods will provide a sufficient level of protection.

#### *Freedom of movement*

- The need for a worker to move freely about a job will influence the type of RPD. While air-line respirators offer higher protection the restrictions imposed by the air-line may be prohibitive.

#### *Physical and thermal stress*

- The wearing of RPDs can cause severe problems during asbestos removal because of the physical activity required. In addition, this type of work is often carried out in hot environments. The cooling effect of air-supplied respirators will make them more acceptable and condensation on the visor will not be a problem.

#### *Other factors*

- factors that may affect the selection of RPDs could include:
- the need to communicate;
- ease of cleaning; and
- availability of replacement parts.

#### *Air supply hoods*

Where airlines are used, the airline should incorporate a belt-mounted back-up filter. Where a failure of the air supply system occurs, workers should leave the work area using normal decontamination procedures. The use of a backup belt-mounted filter device allows for adequate respiratory protection during this process.

#### *Battery powered full-face-piece air filtration respiratory protection devices*

Battery powered full-face-piece respiratory protection devices are particularly suitable for friable asbestos work requiring freedom of movement around enclosed plant and equipment.

When battery powered units are used, particular care must be taken to ensure that back-up battery power packs are readily available in case of failure. These batteries must be changed regularly to maintain a consistent quality of airflow through the filters to the mask.

Systems of work should be established for the cleaning, maintenance and storage of respirators. Respirators should be maintained in clean and good working condition by the person designated by the supervisor of the removal job as responsible for the safe working condition of respiratory equipment. Examples of the different types of respirators are shown in Figure 5.

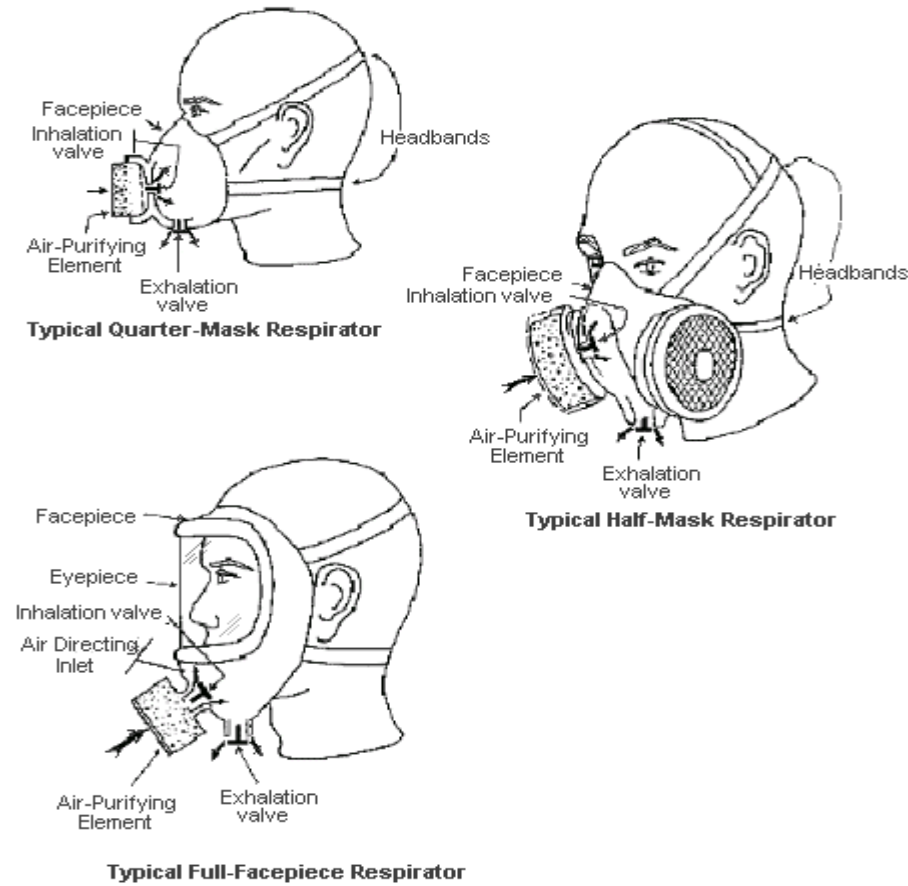


Figure 5: Types of respirators<sup>37</sup>

<sup>37</sup> <http://www.business.govt.nz/worksafe/information-guidance/all-guidance-items/new-zealand-guidelines-for-the-management-and-removal-of-asbestos-3rd-edition/respiratory-and-personal-protection-for-asbestos-work> (Accessed 30 January 2014)



### **8.2.4 Staff Training**

The correct and proper use of RPDs must be taught to all users. No person is to use a respirator without first being given training in its correct use, operation, care and maintenance, emergency procedures, and cleaning and storage requirements.

### **8.2.5 Medical Assessment**

Any type of respirator may place undue stress on some users. It is important that anyone required to routinely wear a respirator is given the opportunity to have a medical assessment to determine that they are able to wear it safely.

### **8.2.6 Inspection, Maintenance and Storage of RPDs<sup>38</sup>**

Proper inspection, maintenance and repair of RPDs are essential parts of the respirator protection programme. Facepieces should be cleaned, dried and stored properly after each use. Regular checks of the diaphragms, valves and face-piece parts will reveal any defect that should be repaired. The batteries for powered air RPDs will require recharging.

## **8.3 Protective Clothing**

Appropriate protective clothing will afford protection to asbestos workers and prevent spreading contamination or health risk to others. All protective clothing used to carry out restricted work must be disposed of as asbestos waste. During other work involving asbestos, protective clothing may be reused but appropriate measures must be taken to ensure cleanliness (refer to Section 8.3.2 of these guidelines for information on laundering).

### **8.3.1 Types of Protective Clothing<sup>39</sup>**

Persons involved in working with asbestos should always wear protective clothing that:

- is made of material that resists penetration by asbestos fibres, such as nylon or treated synthetic material of a type "P" Particulate Body Protection;
- covers the body and fits snugly at the neck, wrists and ankles. It should also cover the head by having an attached hood; and

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<sup>38</sup> <http://www.business.govt.nz/worksafe/information-guidance/all-guidance-items/new-zealand-guidelines-for-the-management-and-removal-of-asbestos-3rd-edition/respiratory-and-personal-protection-for-asbestos-work> (Accessed 30 January 2014)

<sup>39</sup> <http://www.hse.gov.uk/pubns/guidance/em6.pdf> (Accessed 30 January 2014)

- is maintained in good condition and if torn or damaged, is immediately repaired or replaced.

**NOTE:** *Because of the impervious nature of this type of clothing the wearer may become affected by heat stress. The employer should ensure that workers are knowledgeable about the signs and symptoms of heat disorders and the means to prevent illness caused by heat.*

There are four types of overalls in general use for asbestos work. Each type has its advantages and disadvantages. The use of disposable or single-use overalls for all asbestos work is advisable because laundering is not required. Where the use of alternative types is necessary, the full implications of how they will be cleaned or laundered should be considered.

1. Disposable or single-use protective clothing which is generally used for one job and discarded as asbestos waste. These are particularly suitable for all types of asbestos work.
2. Overalls made from lightweight synthetic material such as nylon, which is also waterproof, or PVC waterproof clothing. The light nylon overall is particularly suitable for large on-going jobs because they can be washed under a shower when leaving the contaminated area. Laundering is necessary primarily for hygiene.
3. PVC-type overalls can be used in a similar way, but are heavy, cumbersome and too hot for longer jobs.
4. Cotton or poly-cotton overalls which are commonly used in industry and come in varying colours and styles. These are used in the manufacturing or service industry such as brake workshops, but are hot and heavy for longer tasks and involve special laundering considerations.

### **8.3.2 Laundering of Asbestos-Contaminated Clothing<sup>40</sup>**

The laundering of contaminated overalls presents some difficulties:

- The transfer and handling of contaminated overalls may put other people at risk from asbestos. For this reason contaminated overalls should never be washed in a home laundry and workers in a laundry handling asbestos-contaminated clothing must take special precautions.
- While the washing process removes asbestos fibres, the spin-drying cycle deposits the fibres onto the garment again.
- During the mechanical drying process asbestos fibres are released into the air.

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<sup>40</sup> <http://www.hse.gov.uk/pubns/guidance/em6.pdf> (Accessed 30 January 2014)

The NEPA recommends that clothing that has been used in asbestos work is laundered in accordance with the following requirements:

- The clothing is, wherever possible, laundered at the place where the work involving asbestos has been carried out.
- If it is not possible to launder the clothing at that place, before being taken for laundering the clothing is, dampened and placed in a closed container impermeable to asbestos dust and conspicuously marked with the words "Asbestos-Contaminated Clothing".
- Wherever the clothing is laundered, it is laundered in such a way as to clean the clothing and to suppress the release of asbestos dust into the air.
- Before being given the clothing, every employee to whom the clothing is given for laundering must receive instructions on the necessary handling precautions. These precautions must ensure that the clothing is laundered and handled in such a way as to protect the safety of every employee coming into contact with it during the laundering process.'
- The clothing is not laundered by an employee at an employee's home.

### **8.3.3 Footwear<sup>41</sup>**

Footwear should be adequate for the type of work being undertaken. Generally, steel-capped work boots or gumboots are advisable.

### **8.3.4 Gloves<sup>42</sup>**

If gloves are provided they should be made of impervious material for ease of cleaning. To assist with manual dexterity, disposable gloves may be more acceptable. On health grounds there are few reasons to require people handling asbestos casually to wear gloves. However extended contact with asbestos can lead to asbestosis.

## **9.0 Storage, Labelling and Disposal of Asbestos**

All abated ACM must be clearly labelled before storage. NEPA representatives will not approve the storage of ACM which is not properly labelled.

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<sup>41</sup> <http://www.hse.gov.uk/pubns/guidance/em6.pdf> (Accessed 30 January 2014)

<sup>42</sup> <http://www.hse.gov.uk/pubns/guidance/em6.pdf> (Accessed 30 January 2014)

## ***9.1 General***

This section outlines the steps necessary for the employer to ensure, as far as is practicable, the prevention of contamination by asbestos from any workplace and to ensure that asbestos-contaminated materials are stored, labelled and disposed of correctly.

## ***9.2 Storage and Disposal of Asbestos***

The asbestos contractor should take all practicable steps to ensure that asbestos waste products are not received into, stored, distributed or dispatched from any place of work unless in suitably sealed and labelled receptacles. The receptacles should be designed, constructed, maintained and closed so as to prevent escape of any of the contents when subjected to the stresses and strains of normal handling.

All asbestos waste must be sealed in plastic bags (200µm thick) and labelled "Asbestos hazard - wear respirator and protective clothing while handling contents".

## ***9.3 Disposal Programme***

A waste-disposal programme and record keeping should be developed taking account of:

- waste containment;
- the location for waste storage onsite;
- the transport of waste within the site and offsite;
- the location of the designated refuse site;
- approvals needed from the relevant local disposal authority;
- any local disposal authority requirements that may apply to the amount and dimensions of the asbestos waste; and
- verification of the volume of waste disposed of at the designated refuse site.

Loose asbestos should not be allowed to accumulate within the asbestos work area. Asbestos waste may be collected and disposed of in an asbestos waste bag, drum, bin, or waste skip bin.

If asbestos waste cannot be disposed of immediately (because of volume requirements for disposal, for example), it should be stored in a solid-waste drum or skip bin and sealed and secured upon completion of each day's work so that unauthorized access is prevented.

## 9.4 Waste Bags

Asbestos cement sheets and pipes or insulating board must not be broken or cut for disposal in plastic bags. The employer must ensure that these materials are suitably sealed in plastic and transferred to a truck or skip for transport to a disposal site. The skip or truck is either to be labelled as containing asbestos or the driver is to carry a copy of the disposal authorization permit from the registered landfill.

Asbestos waste must be collected in heavy duty 200µm polythene bags. The bags should be labelled with an appropriate warning, clearly stating that they contain asbestos and that dust creation and inhalation should be avoided.

See Figure 7 below for an example of a warning statement that may be used.



Figure 7: Example of warning statement that may be found on an asbestos waste bag<sup>43</sup>

Controlled wetting of the waste should be employed to reduce asbestos dust emissions during bag sealing or any subsequent rupture of the bag. Only new, unused bags should be used and bags marked for asbestos must not be used for any other purpose. Hard and sharp asbestos waste requires preliminary sealing or a protective covering before it is placed in the waste bags, to minimize the risk of damage to the bags.

In order to further minimize 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 and excess air should be gently evacuated from the waste bag in a manner that does not cause the release of dust. The bags should then be twisted tightly, folded over (goose-necked) and the neck secured in the folded position with adhesive tape or any other effective method. The external surface of each bag should be cleaned to remove any adhering dust before the bag is removed from the asbestos work area. The asbestos waste should be double-bagged outside the work area immediately following the decontamination process.

The routes used for removing waste from the asbestos work area should be designated in the asbestos removal control plan before the commencement of each removal. The methods used

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<sup>43</sup> <http://www.screwfix.com/p/warning-asbestos-adhesive-labels-50-x-50mm-roll-of-250/55929> (Assessed 30 January 2014)

to transport wastes through the building should be determined by the asbestos contractor. In occupied buildings, all movements of waste bags should be outside normal working hours.

Once the waste bags have been removed from the asbestos work area, they should be placed in a solid waste drum, bin or skip. This container should then be inspected by the NEPA, who upon approval of the inspected hazardous waste will recommend that the National Solid Waste Management Authority (NSWMA) accept it for burial. Waste bags should not be stored at the asbestos removal site if they are not placed in an asbestos waste drum, bin or skip bin.

If a decontamination unit is being used for the asbestos removal then asbestos waste bags should be removed from the asbestos work area through the decontamination unit using the following "production line" operation:

- One worker is located in each section of the decontamination unit.
- The waste bags are passed from cubicle to cubicle and "showered out" to remove any asbestos residue.
- Once they have been removed from the decontamination unit, the waste bags are double-bagged prior to disposal.

## **9.5 Asbestos Waste Drums/Bins/Containers**

All drums, bins or containers used for the storage and disposal of asbestos waste should be in a good condition with lids and rims in good working order and free of hazardous residues.

They should be lined with plastic (minimum 200µm 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. If the container is to be reused the asbestos waste must be packed so that when the bin or drum is emptied there is no residue asbestos contamination.

Controlled wetting of the waste should be used to reduce asbestos dust emissions. Where possible, the container should be placed in the asbestos work area before work on asbestos-contaminated materials begins. The container should have their rims sealed and their outer surfaces wet-wiped and inspected before they are removed from the asbestos work area.

Where it is not possible to locate the containers inside the asbestos work area they should be located as close to the work area as possible. Routes for moving the waste from the asbestos work area to the waste containers should be designated prior to the commencement of each task. The asbestos contractor should decide the best means of moving the waste through the

building. In occupied buildings all movement of bags from the work area to the waste containers should be performed outside normal working hours.

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

Vacuum suction (Super Suckers) may be used to collect removed asbestos-contaminated materials. The asbestos contractor should assess the process to prevent asbestos contamination. Air from the vacuum system must be passed through a HEPA filter before it is released outside the asbestos work area.

### ***9.6 Asbestos Waste Skip Bins, etc***

If it is not feasible to use asbestos waste bags, drums or bins because of the volume or size of asbestos wastes, a waste skip bin, vehicle tray or similar container may be used.

Skip bins should be in good condition with no holes or rust or sharp edges that may damage or snag wrapping material. The asbestos-contaminated materials should be sealed in a double-lined, heavy-duty plastic sheeting 250µm (or similar impermeable material such as Geotech material) or double-bagged before they placed in the skip bin. However, non-friable asbestos waste may be placed directly into a skip bin or vehicle tray that has been double-lined with heavy-duty plastic sheeting (200µm thickness) provided it is kept damp to minimize the generation of airborne asbestos fibres.

Should the asbestos load be of a large quantity and weight, the material may be required to be split loaded into skip bins, vehicle trays and trailers to allow for safer transfer to the registered tip-site for disposal.

This requires the asbestos material to be wetted, wrapped and sealed in more than one package for disposal. The asbestos contractor should consult with their appointed registered landfill for advice and assistance.

Once the skip bin is full its contents should be completely sealed with the plastic sheeting. If the skip bin is to be used for storing the asbestos waste it must be able to be secured (by using a lockable lid, for example).

### ***9.7 Recycling of Construction Materials***

Before any building materials are recycled, procedures need to be established to ensure asbestos-contaminated materials are not reused unless they have been successfully decontaminated.

These procedures should include the quarantining of incoming building materials that are intended for recycling to:

- allow screening these materials for asbestos-contamination before they are distributed within the recycling yard; and
- enable the removal of contaminated building products to prevent their redistribution.

## **9.8 Handling**

The following practices should be applied:

- The employer should ensure that asbestos waste received into or dispatched from any workplace is double-packed in sealed six millimetre (6 mm) thick plastic bags. The bags must be sealed with goose-neck ties where possible. If goose-neck ties are not possible (for example when hindered by the shape of the ACM), the double bags must be sealed in an air-tight manner.
- Each double-bag containing ACM must be affixed with OSHA standardized asbestos warning labels (Figure 8).
- If the bags containing ACM are placed in a container, the container must be lined with 6mm thick plastic, and the external walls of the container are to be affixed with OSHA standardized asbestos warning labels.
- Pallet loads should be securely fastened by banding (in order to not cut or puncture the bags) and covered.
- Pallet loads should be securely mounted on suitable pallets that can be moved by hoist, forklift truck or other mechanical handling means without damage. Hooks or other sharp equipment should not be used for handling the bags.
- A supply of suitable adhesive tape should be made available by the employer to repair any damaged bags. Where the damage cannot be repaired to prevent the release of asbestos during handling, the damaged bag should be placed inside another receptacle that can be sealed effectively.
- Asbestos cement sheets and pipes or insulating board should not be broken or cut for disposal in plastic bags. The employer should ensure that these materials are suitably sealed in plastic and transferred to a truck or skip for transport to a disposal site. The skip or truck should be labelled as containing asbestos.
- The skip or other container should be cleaned thoroughly after use.



- Manufactured goods containing asbestos such as brake linings and clutch facings should be sealed or suitably packaged (by shrink-wrapping, for example) to prevent asbestos fibre arising from abrasion during transport.
- All abated ACM must be inspected by NEPA representatives to ensure compliance with the above-listed handling and storage criteria.



Figure 8a<sup>44</sup>: Examples of OSHA standardized asbestos warning labels



Fig. 8b<sup>45</sup>: OSHA standardized asbestos warning label

<sup>44</sup> <https://www.osha.gov/Publications/osh3095.pdf> (Accessed 30 January 2014)

<sup>45</sup> <https://www.osha.gov/Publications/osh3095.pdf> (Accessed 30 January 2014)

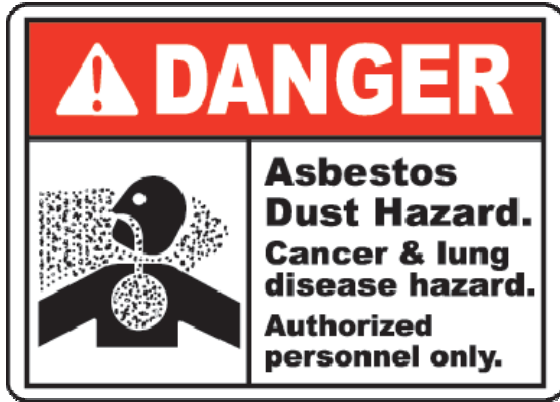


Fig. 8c<sup>46</sup>: OSHA standardized asbestos warning label



Figure 8d<sup>47</sup>: Example of airtight, labelled double bags packed with ACM

<sup>46</sup> <https://www.osha.gov/Publications/osha3095.pdf> (Accessed 30 January 2014)

<sup>47</sup> <https://www.osha.gov/Publications/osha3095.pdf> (Accessed 30 January 2014)



Figure 8e<sup>48</sup>: Gooseneck Tie

### ***9.9 Disposal at Designated Refuse Site***

Asbestos waste should to be buried in a designated area within a managed refuse disposal site under the control of the NSWMA and NRCA, and covered with at least 1 metre of earth.

There will be a need for some discretion on what constitutes "earth" used to cover waste asbestos in a refuse disposal site. The intention is that the waste asbestos be covered with material to prevent the spread of asbestos fibres. Relatively small quantities of asbestos waste, such as sanding from flooring, asbestos waste from brake workshops, asbestos cement from repair jobs, should be able to be safely disposed of by covering with compacted refuse. Operators of refuse disposal sites usually set aside an area for the disposal of large amounts of asbestos that are covered as necessary with clean fill or other material.

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<sup>48</sup> <http://www.biosch.hku.hk/clinicalwaste/clinicalwaste.html> (Accessed 30 January 2014)

## **9.10 Reuse of Asbestos Products**

The reuse or resale of products containing asbestos is strictly prohibited

# **10.0 Asbestos Friction Products**

## **10.1 Removal of Asbestos Friction Products**

### **10.1.1 Preparation and Enclosure**

Asbestos friction products can be removed outside an enclosure using a low pressure wet-spray method. Asbestos vacuum cleaners should be used for the dry-removal method.

The removal of asbestos friction products should be performed in an area that is not affected by wind. The minimum respiratory protection suitable for this operation is a P2 respirator. Section 8 provides further information on the selection, use and maintenance of appropriate RPE and PPE.

### **10.1.2 Removal**

The preferred method for removal is using a combination of vacuuming and the wet method. Either method can be used in isolation providing all precautions are taken. Compressed air must not be used to remove dust or debris from wheels or other parts of a vehicle. Power tools should not be used. Hand tools should be used to reduce the risk of airborne fibres.<sup>49</sup>

### **10.1.3 Wet Method**

Use a suitable collection device (a tray or container, for example) below the location where the work will be carried out to collect any dust or run-off. Wet the wheel and brake area with a fine water spray. Wipe down the wheel or automobile part using the wet method before removal. A misting-spray bottle should be used to wet down any dust. If the use of spray equipment to wet the asbestos is likely to disturb asbestos fibres, alternative wetting agents such as a water-miscible degreaser or a water and detergent mixture should be used.

Partially open the housing and softly spray the inside with water using the misting-spray bottle. Any spillage of dust, debris or water must be controlled - for example, through the use of containers to capture run-off - and either filtered or disposed of as asbestos waste. Fully open the housing and remove the component.<sup>50</sup>

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<sup>49</sup> [http://www.safework.sa.gov.au/uploaded\\_files/hzs2.pdf](http://www.safework.sa.gov.au/uploaded_files/hzs2.pdf) (Accessed 30 January 2014)

<sup>50</sup> [http://www.safework.sa.gov.au/uploaded\\_files/hzs2.pdf](http://www.safework.sa.gov.au/uploaded_files/hzs2.pdf) (Accessed 30 January 2014)

### 10.1.4 Dry Method

A collection tray should be placed under the components to capture any dust spilling from the brake assembly during removal. Use an asbestos vacuum cleaner to remove asbestos fibres from the brakes and rims or other asbestos-contaminated materials.<sup>51</sup>

## 10.2 General Guidelines for Working with Friction Materials Containing Asbestos

This section applies to all friction materials containing asbestos that are used in a way that may lead to an occupational exposure. It particularly applies to the following processes:

- manufacture or relining of brake and clutch assemblies for automotive and industrial applications;
- operating vehicle maintenance depots (fleet operators); and
- operating commercial garages and service stations.

This section does not apply to the manufacture of products incorporating raw asbestos fibre.

Wherever possible, friction materials that do not contain asbestos should be used. Where products containing asbestos are being handled, the number of people in the area should be kept as low as possible. Workshops should be isolated from other occupied parts of the building or areas that the public has access to.

This section applies to specialist relining workshops and other services that cut, grind, finish, drill, mill, saw, turn, bond or otherwise work the friction materials in a way that is likely to release asbestos fibre. Some of these processes - for example radius grinding - have the potential to release considerable amounts of asbestos fibre into the air.

## 10.3 Servicing of Brakes and Clutches in Garages or Workshops<sup>52</sup>

Airborne asbestos is most likely to be produced when friction materials are worked by cutting or machining. The dust that accumulates during normal usage also contains asbestos and handling or cleaning brake or clutch parts will produce airborne asbestos fibre. The tasks that may result in exposures to asbestos in the brake and clutch industries can be broken into two groups:

- vehicle maintenance - the replacement of brake and clutch assemblies on vehicles by garages and brake and clutch specialists; and
- relining of brake and clutch assemblies.

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<sup>51</sup> [http://www.safework.sa.gov.au/uploaded\\_files/hzs2.pdf](http://www.safework.sa.gov.au/uploaded_files/hzs2.pdf) (Accessed 30 January 2014)

<sup>52</sup> [http://www.safework.sa.gov.au/uploaded\\_files/hzs2.pdf](http://www.safework.sa.gov.au/uploaded_files/hzs2.pdf) (Accessed 30 January 2014)

While both of these tasks may be carried out in the same place of work, the risks are different and they should be considered under separate headings.

### **10.4 Vehicle Maintenance**

Asbestos in moulded and woven materials is locked into the product with resin and binders thus limiting the release of asbestos during handling and installation. Heat and abrasion during usage produce a fine dust containing degraded resin, fillers and products of wear from the metal brake drums and discs.

The major portion of the particulate produced in the operation of the friction materials is relatively harmless but some asbestos of respirable size will be present. Any accumulated dust should be removed before parts are handled. Specialised local extraction systems are available that will collect dust from brake drums. The use of such devices is recommended. They should be constructed to prevent the release of respirable fibres into the atmosphere.

Alternatively, the dust may be removed with a vacuum cleaner or by using a wet process. A cloth moistened with water or other solvent may be used provided it is disposed of in accordance with Section 7 of these guidelines. Under no circumstances should compressed air or dry-brushing be used for cleaning purposes. If the brake or clutch parts are to be sent out for specialist servicing, they should be sealed in a bag to prevent the release of asbestos fibre.<sup>53</sup>

### **10.5 Relining of Brake and Clutch Assemblies**

Manufacturers and suppliers of friction materials are, in many cases, able to provide pre-drilled and pre-ground products in final assembly form. Where possible, these should be used to eliminate the necessity for machining that will release asbestos fibre. Truck brake blocks and segments are also available in various thicknesses to minimize machining.

When products must be machined, the employer should ensure that the release of dust into the work environment is reduced to the lowest practicable level. Before applying adhesive to bond segments to brake shoes surface dust should be removed with a damp cloth. Dust should not be removed by hitting the linings against a solid surface or by the use of compressed air. The employer should require the supplier of friction materials to provide them shrink-wrapped<sup>54</sup> wherever possible.

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<sup>53</sup> [http://www.safework.sa.gov.au/uploaded\\_files/hzs2.pdf](http://www.safework.sa.gov.au/uploaded_files/hzs2.pdf) (Accessed 30 January 2014)

<sup>54</sup> [http://www.safework.sa.gov.au/uploaded\\_files/hzs2.pdf](http://www.safework.sa.gov.au/uploaded_files/hzs2.pdf) (Accessed 30 January 2014)

## **10.6 Local Exhaust Ventilation (LEV)<sup>55</sup>**

An effective dust-extraction system must be fitted to all equipment that is used to cut, grind or otherwise machine the friction materials. High velocity/low volume systems are the most appropriate for these applications. For occasional or intermittent use in various locations, a portable dust-extraction unit may be suitable. The collection hoods for the dust-extraction systems should be designed to enclose the source of dust where practicable. Some machines, such as drill presses, may require more than one collection hood to efficiently capture material released.

The employer should ensure that filter bags in dust-extracting systems used to remove asbestos from exhaust air are enclosed to prevent the escape of asbestos fibres. The filter bags should be:

- of a type that can be disposed of in a manner that does not place at risk the safety and health of people; and
- replaced immediately if damaged.

All joints in the ventilation system should be leak-proof to prevent the escape of asbestos fibres. After filtration, the exhaust air from the system should be discharged outside of the building. If this is not practicable, for example, with a portable system, the air should be passed through a HEPA filter before it is discharged. Exhaust ventilation equipment should be inspected regularly and tested for any possible malfunction.

## **10.7 General Ventilation**

The most effective means of collecting dust and asbestos fibre is to remove it as close as possible to the source with a high velocity local exhaust system. Some material will inevitably escape into the workplace air and general ventilation should also be provided to limit the accumulation of airborne asbestos fibre. If natural ventilation does not provide a free flow of air through the area, forced ventilation should be provided to achieve at least 10 air changes per hour.

## **10.8 Cleanliness of Premises and Plant**

The employer should ensure that cleaning of plant and machinery and other surfaces where asbestos-containing dust may accumulate is carried out regularly:

- by means of an asbestos vacuum cleaner;
- by wet cleaning; or
- by some other method which collects the dust without exposing people to it. Under no circumstances should dry sweeping or compressed air be used.

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<sup>55</sup> [http://www.safework.sa.gov.au/uploaded\\_files/hzs2.pdf](http://www.safework.sa.gov.au/uploaded_files/hzs2.pdf) (Accessed 30 January 2014)

## **10.9 Care and Housekeeping**

The asbestos fibres that are hazardous to health are very small and invisible to the naked eye. The employer should ensure that employees are not placed at risk of inhaling asbestos fibres during any work processes and during clean-up and disposal of dust and waste.

All asbestos that is in a friable form and any loose asbestos must be kept in a closed receptacle when not in use. All receptacles that contain asbestos should be clearly labelled in accordance with Section 7 of these guidelines.

## **10.10 Protective Clothing**

The employer should ensure that employees wear protective clothing such as overalls when working on any operation using materials containing asbestos. The style of garment is, to a large extent, determined by the operations undertaken.

The employer should provide separate storage for clothing not worn during work hours. Protective clothing contaminated with asbestos dust must be placed in an appropriately labelled plastic bag for laundering in accordance with Section 10 of these guidelines.

## **10.11 Respiratory Protective Equipment**

Asbestos fibres in air levels should be controlled by the application of good work practices and effective ventilation. In some instances it may be necessary to use respiratory protective equipment for short periods when it is not practicable to maintain suitably low levels of asbestos fibres - for example, when the dust collection filters are cleaned. The employer should ensure that where respiratory protective equipment is used it complies with the requirements of Section 8 of these guidelines.

# **11.0 Instruction and Training**

## **11.1 General**

Persons carrying out asbestos removal work should be trained so they can carry out this work safely and without risk to their own health and others. This training must reflect the specific type of asbestos work to be undertaken.

All applicants for *a certificate of competence for restricted work* must have satisfactorily completed the following training:



- a minimum of two years' practical training under the supervision of an asbestos contractor;
- the health aspects and hazards associated with restricted asbestos work;
- the work practices to be followed in undertaking restricted asbestos work;
- the use, care and maintenance of respirators, vacuum cleaning and air extraction equipment;
- identification of products likely to contain asbestos;
- storage, labelling, transportation and disposal of asbestos; and
- dust concentrations, monitoring and clearance procedures.

This training must include information in the site-specific Asbestos Abatement Work Plan (refer to **Appendix A**), and specifically:

- safe work procedures;
- correct decontamination procedures;
- emergency procedures; and
- correct wearing and general maintenance of all PPE and RPE.

The asbestos contractor must also provide the following information to all their asbestos removal workers and to all applicants for employment as an asbestos removal worker:

- the health risks associated with exposure to asbestos;
- the need for, and details of, health surveillance, including medical and these guidelines.

The asbestos contractor should keep a written record of all training provided to each of their asbestos removal workers and ensure that these records are readily accessible.

## **11.2 Supervisory Personnel**

The asbestos contractor must ensure that persons supervising the removal of asbestos-contaminated materials defined as restricted must carry a Certificate of Competency in such work from The Department.

The asbestos contractor must ensure that supervisory personnel have a detailed knowledge of the precautions and procedures outlined in these guidelines. With this knowledge and personal experience, the supervisory personnel should assume the following responsibilities:

- to effectively implement the total planned removal procedure;
- to perform the pre-removal setting up;
- to perform the actual removal and final cleaning operation;
- to ensure that all necessary measures are taken to reduce the airborne concentration of asbestos dust to the lowest practicable level;
- to ensure that asbestos fibres and asbestos-containing material do not contaminated adjacent areas;
- to arrange for, and assess results of, air monitoring where appropriate;
- to ensure that all workers under their supervision are adequately trained in the safe working practices outlined in these guidelines;
- to ensure that the removal is continually supervised and that the operation is carried out in a safe and proper manner in accordance with the precautions listed in these guidelines;
- to ensure that personal protective equipment is used and maintained in good condition;
- to ensure that the removal site is maintained in a clean condition, that waste is quickly and properly disposed of;
- to ensure personal hygiene procedures are continually observed;
- to maintain copies of all records;
- to establish decontamination procedures; and
- to arrange for the disposal or laundering of PPE and clothing.

### **11.3 Removal Personnel**

The asbestos contractor must ensure that all removal personnel are properly trained in:

- safe removal procedures for the asbestos-contaminated materials they are working with (per the asbestos removal plan);
- hazards of exposure to asbestos and the controls intended to minimize their risk;
- the correct use, maintenance and storage of their personal protective equipment;
- the safe use of all plant and equipment they are required to use;
- monitoring procedures for the workplace;
- decontamination procedures; and
- emergency procedures.

The asbestos contractor may need to develop a Training Needs Analysis to identify specific areas that require behavioural improvement through training to improve performance.

Generally, most training (other than specialist training) can be given in-house so long as there are sufficient knowledge, expertise and resources available. Asbestos removal personnel should be sufficiently trained before they commence any removal activities. Removal personnel are required to undergo medical monitoring as outlined in Section 12 of these guidelines

### ***11.4 Sampling/Testing Personnel***

All persons undertaking asbestos sampling and/or testing must be competent to be able to undertake these tasks without any risk to their own safety and health.

Verification of competency to work in asbestos-hazard conditions would include experience and/or knowledge of:

- the varied types and applications of asbestos-contaminated materials (for sampling);
- hazards of exposure to asbestos and the controls intended to minimize their risk;
- the correct use, maintenance and storage of their personal protective equipment; and
- the safe use of all plant and equipment they are required to use.

This training would be over and above specific work training provided in relation to their task(s).

Further site-specific information must be provided to sampling/testing personnel by the asbestos contractor. Information on the type of instruction that should be given is provided in Sections 4.2 and 4.3 of these guidelines.

### ***11.5 Refresher Training of Personnel***

Retraining and/or refresher training should be given to all personnel who work with asbestos-contaminated materials to ensure that their knowledge remains consistent with current practices.

This is particularly important for those persons whose work with ACM is intermittent. Refresher training needs need to be assessed regularly.

In addition, refresher training can be used to:

- Impart new information such as legislative changes, improvements in work methods and technologies;
- Remind personnel of the risks of asbestos;
- Reinforce safe work practices such as removal techniques, decontamination etc. as identified in any Training Needs Analysis; and
- Provide examples of good practice in order to eliminate bad practices.

Refresher training (other than specialist training) can be provided in-house, provided sufficient knowledge, expertise and resources are available.

### ***11.6 Waste Disposal Transporters***

The asbestos contractor must ensure that the operators of transportation vehicles are properly trained in the correct:

- decontamination procedures for vehicular access to and from the asbestos removal area;
- operating procedures while in the asbestos work area to collect waste for disposal;
- requirements for the transportation of asbestos waste to the designated refuse site; and
- selection, use and maintenance of respiratory protective equipment.

### ***11.8 Smoking***

Employers should advise all people who work with asbestos to refrain from smoking in order to prevent the increased risk of lung disease.

### ***11.9 Training in Maintenance of Control Equipment***

The employer must ensure that any person carrying out any maintenance or servicing of exhaust ventilation equipment or other control equipment is trained to carry out the task.

### ***11.10 Training in the Use of Respiratory Protective Equipment***

All employees must be provided with training on the correct use and maintenance of RPE.

## 12.0 Medical Monitoring

### 12.1 Introduction

Employers are required to monitor the health of employees in relation to significant hazards. This section of the guidelines sets out some practicable steps to assist the asbestos contractor in complying with this requirement.

### 12.2 Initial Medical

Any employer directing employees to undertake restricted work with asbestos should ensure that the employee has:

- a full work history;
- a medical examination, chest X-ray (PA and lateral) and lung function tests (FEV1 and FVC) or such other tests that may be appropriate within one month of starting employment in restricted work; and
- further asbestos medical checks as required in the schedule while the employee remains in the employment of the employer. The cost of the medical examinations must be the responsibility of the employer.

Notwithstanding these provisions, the NRCA may direct any person undertaking work involving asbestos to have a medical examination.

### 12.3 Personal Medical Information

The personal medical information, including X-rays, of the employee remains the property of that employee. The employer will receive certification from the medical practitioner stating whether the employee is fit or otherwise for the restricted asbestos work. The recommendation is that employees should share their medical information with their employer where appropriate. If an employee leaves, the employer should ensure that the employee is aware of the need to continue with the schedule of medical examinations. All medical records relating to asbestos should be retained by the employee for 40 years.

### 12.4 Medical Examinations<sup>56</sup>

Asbestos medical examinations must be performed by qualified medical practitioners with specialist qualifications in occupational or respiratory medicine and experience in asbestos-related diseases and conditions.

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<sup>56</sup> Occupational Safety & Health Administration [Regulations \(Standards - 29 CFR\)](#) Medical surveillance guidelines for asbestos

### ***12.5 Further Medical Investigations***

The employer bears the responsibility and the cost of further investigations where, in the opinion of the NRCA, further investigations are warranted because of the presence of markers of asbestos exposure or disease.

## **APPENDIX I**

### **Preparation of the Asbestos Abatement Plan**

## The Asbestos Abatement Workplan

All Asbestos Abatement Contractors are required to submit an Asbestos Abatement Work Plan to be approved by the National Environment and Planning Agency (NEPA) and the Ministry of Health, prior to the commencement of any abatement activity. The Plan should be prepared according to the Guidelines for the preparation of an Asbestos Abatement Work Plan:

The Work Plan should contain, but not be limited to the following:

1. Identification:
  - a. Details of asbestos to be removed (e.g. the locations, whether asbestos is friable/non-friable, its type, condition and quantity being removed)
2. Preparation:
  - a. Consult with relevant parties e.g. workers; person who commissioned the removal work
  - b. Assigned responsibilities for the removal
  - c. Program commencement and completion dates
  - d. Emergency plans
  - e. Asbestos removal boundaries, including the type and extent of isolation required and the location of any signs and barriers
  - f. Control of other hazards including electrical and lighting installations
  - g. PPE to be used
3. Removal:
  - a. Details of air-monitoring program; Control and clearance
  - b. Waste storage and transportation program
  - c. Details of Method for removing the asbestos (wet and dry methods)
  - d. Asbestos removal equipment (e.g. spray equipment, asbestos vacuum cleaners, cutting tools)
  - e. Details of required enclosures, including their size, shape, structure etc, smoke testing enclosures and the location of negative pressure exhaust units
  - f. Details on temporary buildings required by the asbestos removal workers (e.g. decontamination units) including details on water, lighting and power requirements, negative pressure exhaust units and the locations of decontamination units
  - g. Other risk control measures to prevent the release of airborne asbestos fibres from the area where asbestos removal is undertaken
4. Decontamination:
  - a. Detailed procedures for workplace decontamination, the decontamination of tools and equipment, personal decontamination and the decontamination of non-disposable PPE and RPE
  - b. Method of disposing of asbestos wastes, including details on:
  - c. The disposal of protective clothing
  - d. The structures used to enclose the removal area
5. Relevant Consultation:



- Consult with any people who may be affected by the removal work, including neighbours

## **APPENDIX II**

### **Asbestos Abatement Post-removal Report**

## Asbestos Abatement Post-Removal Report

The asbestos contractor is required to submit to NEPA an Asbestos Abatement Post-removal Report within five (5) days of the completion of the abatement exercise unless otherwise stipulated by the NRCA.

The Post-removal Report should include, but not be limited to, the following information:

- Results of analyses of air samples and an interpretation of the results
- Final clearance of abatement work area
- Details of ACM storage (inclusive of location of disposal site and any approvals of same)
- Any anomalies that may have occurred during the abatement exercise