

# Guidelines for the Management and Removal of Asbestos

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# ■ INTRODUCTION

## 1. Asbestos — background information

Asbestos is the fibrous form of mineral silicates belonging to the serpentine and amphibole groups of minerals. Loose fibre broken down from the mined rock material is used in the manufacture of numerous products. Asbestos is invariably mixed with another material and is rarely encountered in its raw form making identification based on visual examination unreliable. Inhalation of asbestos fibres has been shown to pose a potentially fatal health risk.

Asbestos has been incorporated in a number of materials for the construction, cladding and thermal/acoustic insulation of offices, factories and houses and in a wide range of products, including heat-resistant textiles, decorative coatings, asbestos cement pipes, thermal insulation for pipes and boilers, brake and clutch friction linings, gaskets, floor tiles and packing materials. Its properties of heat resistance and mechanical strength have been exploited in these applications. Substitutes have been found for many of the above applications and while at present it is not considered practicable to remove asbestos from all products this is the long-term goal.

## 2. Health aspects

Exposure to asbestos fibre may occur when materials containing asbestos are sanded, sawn, drilled, or handled in maintenance or removal tasks. Most of the larger fibres are deposited in the nose and major airways, and are cleared by normal physiological processes. Smaller fibres may be deposited in the airspaces deep in the lung or migrate to other parts of the body. Three main disease states have been associated with the inhalation of asbestos fibre: asbestosis, lung cancer and mesothelioma.

Inhalation of high concentrations of all forms of asbestos may result in **asbestosis**, a progressive fibrosis of lung tissue. The development of scar tissue (fibrosis) may occur after exposure to asbestos ends or may continue after exposure has ceased.

The two forms of **cancer** associated with the inhalation of asbestos are lung cancer and mesothelioma. Generally, fibres below 3 micrometres in diameter and greater than 5 micrometres in length\* are potentially carcinogenic, and the risk of cancer increases as fibre diameter decreases. The risk of cancer also increases with the dose.

There is a long latency period which, in the majority of cases, ranges from fifteen to fifty years between exposure and the development of mesothelioma and lung cancer. There is some suggestion that children exposed to asbestos have a greater susceptibility to disease. Asbestos-related disease, therefore, has the potential to continue to occur long after the exposure to asbestos has been controlled. Recommendations made in these guidelines are aimed at eliminating the risks of asbestos-related disease. Every effort should be made to reduce exposure to the lowest practicable level.

\* This size of particle is not visible to the naked eye — the diameter of a human hair varies from 40 to 125 micrometers.

All forms of asbestos have been found to cause **lung cancer**.

Mesothelioma is a specific cancer of the lining of the chest cavity (the pleura) or, less commonly, the lining of the abdominal cavity (the peritoneum). Asbestos exposure is considered to account for at least 80% of mesotheliomas that develop with crocidolite (blue asbestos) and amosite (brown asbestos) providing the greatest hazard.

Pleural changes in the form of **pleural plaques** or **pleural thickening** may also be associated with inhalation of asbestos fibres.

The health risk to persons with exposure to asbestos is greatly increased if they smoke.

### 3. Relationship with the Health and Safety in Employment Act 1992

3.1 Sections in the Health and Safety in Employment Act 1992 that are particularly relevant to this guideline include:

- (a) **Section 6** which places general duties on the employer to take all practicable steps to ensure the safety of employees while at work;
- (b) **Section 7** which places responsibility on employers to ensure that there are in place effective methods for —
  - (i) Systematically identifying existing hazards to employees at work,
  - (ii) Systematically identifying (if possible before, and otherwise as, they arise) new hazards to employees at work, and
  - (iii) Regularly assessing each hazard identified, and determining whether or not it is a significant hazard.

Where there occurs any accident or harm in respect of which an employer is required by section 25 (1) of the Act to record particulars, the employer shall take all practicable steps to ensure that the occurrence is so investigated as to determine whether it was caused by or arose from a significant hazard.

- (c) **Section 8, 9 and 10** which require the employer to eliminate the hazard or where this is impracticable to isolate or minimise it;
- (d) **Section 19** which places duties on employees to take all practicable steps to ensure employees' safety while at work.

### 4. Definitions

**All practicable steps** in relation to achieving any result in any circumstances, means all steps to achieve the result that it is reasonably practicable to take in the circumstances, having regard to —

- (a) The nature and severity of the harm that may be suffered if the result is not achieved; and
- (b) The current state of knowledge about the likelihood that harm of that nature and severity will be suffered if the result is not achieved; and

- (c) The current state of knowledge about harm of that nature; and
- (d) The current state of knowledge about the means available to achieve the result, and about the likely efficacy of each; and
- (e) The availability and cost of each of those means.

*Asbestos Regulations definition of asbestos*

**Asbestos** means—

- (a) Amosite, chrysotile, crocidolite, fibrous actinolite, fibrous anthophyllite, or fibrous tremolite; or
- (b) A mixture containing a mineral specified in paragraph (a); or
- (c) A material that is composed wholly or partly of a mineral specified in paragraph (a); or
- (d) A material or article that is contaminated by a mineral specified in paragraph (a):

*Asbestos Regulations 1998, Regulation 2 (1)*

**Asbestos fibre** means a particle of asbestos that is not less than 5 micrometres in length, and is less than 3 micrometres in width, and has a length to width ratio of not less than 3:1.

**Certificates of competence for restricted work** — No person shall undertake restricted work unless he holds a certificate of competence issued under the provision of the Asbestos Regulations, or is acting under the direct supervision of a person who holds such a certificate.

*Asbestos Regulations (1998), Regulations 18 and 19*

**Dust control equipment** means 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 that would otherwise generate asbestos dust.

*Asbestos Regulations (1983), Regulation 2*

**Friable** means asbestos that under ordinary conditions can be easily crumbled.

**Hazard** means 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.

*Health and Safety in Employment Act 1992, s.2(1)*

**Health and safety inspector** — Inspector for the time being, appointed under section 29(1) of the Health and Safety in Employment Act 1992.

*Health and Safety in Employment Act 1992*

**Membrane filter method** means a membrane filter method using phase contrast microscopy for estimating airborne asbestos fibre concentrations.

**New Zealand accredited laboratory** means a laboratory that is currently accredited by International Accreditation New Zealand on behalf of the Testing Laboratory Registration Council.

**Owners** (property) includes, where appropriate, lessees and managers or their agents.

**Principal** means a person who engages any person (otherwise than as an employee) to do any work for gain or reward.

**Restricted work** means work in one or more of the following categories:

- (a) 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;
- (b) 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;
- (c) The demolition or maintenance of any thing, including a building or part of a building, containing friable asbestos;
- (d) The encapsulation of materials containing friable asbestos;
- (e) The use, on asbestos cement or other bonded product containing asbestos, of—
  - (i) A power tool with any kind of cutting blade or abrasive device, except when it is used with dust control equipment; or
  - (ii) Any other equipment whose use may result in the release of asbestos dust, except when it is used with dust control equipment.
- (f) Dry sanding of floor coverings containing asbestos.

*Asbestos Regulations (1998), Regulation 2*

**Structure** includes a plant, erection, edifice, wall, chimney, fence, bridge, dam, reservoir, wharf, jetty, earthworks, reclamation, floating structure and tunnelling.

**Vacuum cleaner:** Vacuum cleaning machines complying with AS 3544:1988 *Industrial vacuum cleaners for particulates hazardous to health or environment* (or equivalent standard) are acceptable for use with asbestos work.

## 5. Workplace Exposure Standards (WES)

Form of Asbestos	Concentration
Chrysotile	(a) An average concentration over any 4 hour period of 1 fibre per millilitre of air; and (b) An average concentration over any 10 minute period of 6 fibres per millilitre of air.
Amosite, crocidolite, fibrous actinolite, fibrous anthophyllite, and fibrous tremolite	(a) An average concentration over any 4 hour period of 0.1 fibres per millilitre of air; and (b) An average concentration over any 10 minute period of 0.6 fibres per millilitre of air.

The workplace exposure standards for asbestos are defined in Schedule 1 of the HSE (Asbestos) Regulations 1998.

# ■ Section 1: IDENTIFICATION, ASSESSMENT AND CONTROL OF ASBESTOS IN BUILDINGS

## 1.1 General responsibilities

Where asbestos products are present (or thought to be present) in a building or other structure, consultation and information sharing should occur between employers and employees through established consultative processes.

The need to identify and assess asbestos in buildings does not imply that the only option is removal. Where the assessment shows that the asbestos product is in a stable condition, no further action may be warranted. Encapsulation or enclosure may be viable alternatives to removal.

### 1.1.1 Property owners

Property owners, with the exception of owners of private homes should:

- Take all practicable steps to identify asbestos products within their properties and record the location and condition of such asbestos, once identified, in a record for the building in accordance with these guidelines;
- Inform tenants of the presence of asbestos and of any action on asbestos which may become necessary.
- Ensure that all contractors required to do work are informed of the presence of asbestos.

### 1.1.2 Employers

Employers shall:

- Provide and maintain, so far as is practicable, safe and healthy work environments and practices;
- Consult with employees, and adopt sound practices to control exposure to airborne asbestos;
- Comply with provisions of the Health and Safety in Employment Act 1992.

Employers should:

- Liaise, where appropriate, with property owners on a continuing basis, so that the existence and condition of asbestos in the working environment is known.

### 1.1.3 Employees

Employees shall:

- Comply with instructions given for their own safety and health and that of others generally and in work procedures related to asbestos;
- Take care for their own health and safety and for the health and safety of others;

- Co-operate with employers in their fulfilment of legislative obligations; and
- Report immediately to their supervisor any perceived safety or health risk.

## 1.2 Inspection and hazard identification

### 1.2.1 Inspection

The aim of the inspection is to assist in determining whether a hazard exists. It is recommended that employers or property owners initiate this action.

The location of asbestos-containing materials should be determined by persons familiar with construction practices. Identification of the materials shall be performed by a New Zealand accredited laboratory (or the Australian equivalent) for that procedure.

### 1.2.2 Types of asbestos-containing materials

In buildings many of the asbestos-containing products do not present a significant health risk unless they are abraded or machined so as to release dust containing asbestos fibre. Asbestos insulation may be disturbed by maintenance staff, telephone installers or air-conditioning personnel working in confined spaces. Degradation may also occur as a result of water damage or movement of construction materials, lagged pipes, etc. Birds and rodents are also capable of disturbing asbestos materials.

The type of asbestos-containing materials which may be encountered in a building or other structure which are of most concern from a health perspective include:

- (a) Sprayed-on fireproofing/soundproofing/thermal insulation.** These vary from hard, impervious and well-sealed materials to friable materials applied by spraying or trowelling. The colour will normally vary from white to brown/grey to blue, although in some instances products may have been painted or dyed.  
  
These materials are found on structural steel members and decks (as fireproofing), ceilings, fire-plugging, fire doors and occasionally on walls (as fireproofing and/or soundproofing). They may be exposed, or concealed, by suspended ceilings or other decorative structures.
- (b) Acoustic plaster soundproofing.** This is a firm, open-pored, plaster-like material, applied by a trowel. The soundproofing material is usually exposed and not usually painted.
- (c) Insulation.** Asbestos-containing material used in the insulation of air-conditioning ducts, hot and cold water pipes, hot-water reservoirs, pressure tanks, and boilers is generally covered with a fabric or metal jacket. Fire doors often contain laminates of asbestos materials covered by wood or metal.
- (d) Decorative coatings e.g. textured ceilings.** This is a soft matrix of a variety of materials, including asbestos, usually sprayed onto surfaces to provide a decorative effect.

- (e) **Flooring.** Floor coverings, e.g. vinyls, may incorporate asbestos. This asbestos content may be in the product itself but it is more commonly found in the backing material.
- (f) **Lagging.** A number of methods of lagging have been used on boilers, condensate tanks and steam headers hot water, steam and condensate pipes including:
- Applying a raw asbestos/water mixture to the surface, laying chicken wire over it and applying a finishing cement of fine clay mixed with asbestos;
  - Fixing pre-made asbestos blocks to the metal of the device and cementing them together with an asbestos/fire clay mix. Chicken wire was laid over the material and a final layer of fine clay/asbestos cement applied;
  - Using preformed pipe lagging, usually in two pieces containing asbestos wrapped in calico. In many instances the pipe was painted, traditionally red or white although other colours can be found; or
  - Using asbestos paste to finish the lagging where valves are cut into pipes, or where right-angle bends are present. This may have occurred where sheet metal cladding was used on pipes in areas subject to damage, e.g. at floor level, near access to manholes or in ceiling areas.
- (g) **Asbestos-cement and other materials** These materials deteriorate with age or chemical damage. Very corroded materials may exhibit a breakdown of the matrix. The material becomes brittle and flaky.

Damage to buildings, roofing sheets or walls through breakage may occur creating the possibility of fibre release from the fragments.

Apart from pipes and cladding, asbestos cement products may have been used for a number of applications, for example, bench tops and lining of fume cupboards.

### 1.2.3 Material sampling

Sampling and analysis of suspect material is the only way to verify the presence of asbestos (air sampling to determine the presence of asbestos in air is not acceptable by itself). It is important to sample all suspect material and have it analysed as detailed in 1.2.4. Suspect material must be regarded as containing asbestos, and dealt with accordingly, until the results of the analysis are available.

Samples should be taken of all suspect materials. Whatever method is used, it is important that a representative sample be taken.

Any variations in the appearance, texture or colour of the material will necessitate additional samples being taken. For multistorey buildings, at least one sample should be taken per floor.

Samples taken should be adequately labelled, to enable follow-up action. For example, the name and location of the building, the exact location of the sampled material, date of sampling and a batch identification number

should all be recorded. Those taking samples should consider the need to wear suitable respiratory protection.

#### **1.2.4 Analysis of material samples**

Three methods for identifying asbestos are currently used: Polarised Light Microscopy (PLM) using Dispersion Staining if relevant, X-ray Diffractometry (XRD), and Scanning Electron Microscopy with Energy Dispersion X-ray Analysis (SEM-EDXA). The PLM method generally suffices, but use of one of the other methods for verification of difficult samples is recommended.

False results could lead to expensive abatement actions or allow an existing hazard to remain.

The following items should be specified for inclusion in the report received from the testing laboratory:

- The sample identification number.
- The analysis method used, that is PLM, XRD or SEM-EDXA.
- A description of the sample appearance.
- Proportion, if known, and type of asbestos present.
- Comment on other materials detected.

#### **1.2.5 Risk evaluation**

If analysis of material samples confirms the presence of asbestos, the potential exposure of persons entering places of work should be evaluated by people competent to do this. The composition and condition of all asbestos material in the buildings should be assessed for its potential to release fibres into the workplace air. The period between each assessment will be determined by the condition and location of the asbestos material.

In some cases a visual assessment will be required on at least an annual basis. Where the asbestos is in good condition, and is unlikely to be disturbed, visual assessment at three-yearly intervals may be adequate.

#### **1.2.6 Air sampling**

Air sampling may be used to estimate the current level of exposure to airborne asbestos fibre. Results obtained by air sampling are invariably low especially when samples are taken at times when the asbestos is not being disturbed.

Air sampling is not an alternative to risk evaluation by visual assessment.

Two methods for measuring asbestos in air levels are currently used: the Membrane Filter Method (that cannot be used to positively distinguish between asbestos and non-asbestos fibres) and a method using Scanning Electron Microscopy with Energy Dispersive X-ray Analysis (that is able to distinguish between asbestos and non-asbestos fibre).

Any air sampling should be designed to collect samples that are representative of particular working areas or provide information on the source of emission.

Where detailed air sampling is undertaken, as well as the numerical results of measurements and the calculated time-weighted averages, the monitoring data should include information such as:

- The date and exact time of sampling (start and finish times);
- The names of the persons conducting the sampling and analytical determinations;
- Sampling instrument used, its accessories and the method of analysis; and
- The location, nature, dimensions and other distinctive features of the workplace where measurements were made, and the work station or position filled by any person wearing a sampling device.

### **1.2.7 Records**

A record of all information gathered relating to the presence and condition of asbestos in the building should be made and maintained by the property owners and occupiers. The record should, where appropriate, contain details on the following:

- Identification.
- Location.
- Assessment of exposure risk.
- Monitoring results.
- Risk management plan (regularly updated).

Where possible, the presence of asbestos should be marked clearly on building plans. These plans should be made available to employees including tradespeople and to outside contractors.

### **1.2.8 Labelling**

Where it has been decided that asbestos materials are to be left intact, labelling that is clearly visible should indicate that asbestos is present. A reasonable interpretation must be placed on this requirement, e.g. labels would not be required to identify asbestos cement cladding.

Similarly, materials suspected of containing asbestos but found to be asbestos-free should be identified as such. This will avoid confusion and ensure that the correct measures are taken for protection against the hazards that these substances may exhibit.

## **1.3 Hazard control**

**1.3.1** An asbestos management programme should be seen as part of an organisation's overall approach to risk management. Where the evaluation process has revealed a likelihood of exposure to asbestos fibres, all practicable steps should be taken to ensure that employees and others are protected.

The control of asbestos hazards should use the most appropriate method for the particular circumstances. The methods of control include removal, encapsulation or sealing, and enclosure, and should be based upon the assessment of the condition of the asbestos, the possibility of further damage or deterioration, and the potential for exposure of personnel to airborne asbestos. Where the asbestos is in a *stable* condition, no immediate action may be necessary.

The Health and Safety in Employment Act requires employers to take all practicable steps to eliminate significant hazards. Removing asbestos from a building or structure is consistent with this requirement. However, it must also be considered that in the process of removal, airborne asbestos fibre levels may actually increase. Furthermore, it may not always be practicable to remove all of the asbestos.

A summary of the relative advantages and disadvantages of each control method, as well as situations in which each may be considered appropriate, is presented in Table 1.

### **1.3.2 Removal**

In general, asbestos insulation should be removed when:

- It is breaking away from the substrate base; or
- The insulation is likely to be abraded or otherwise damaged.

As there is a possibility that non-asbestos insulation may become contaminated from adjacent sprayed asbestos, consideration may need to be given to the treatment of adjoining non-asbestos insulation.

### **1.3.3 Enclosure**

Enclosure is the placing of a barrier between the asbestos material and the surrounding environment. Enclosure of asbestos material is particularly suitable where the material or its protective coating is liable to mechanical damage. An example of this would be building a box enclosure around exposed asbestos-lagged steam pipes.

A suspended ceiling **cannot** be considered as an enclosure if any type of work, routine or otherwise, is performed above the suspended ceiling or in the space between the suspended ceiling and the reinforced concrete slab or ceiling proper.

### **1.3.4 Encapsulation or sealing**

NOTE: Encapsulation of friable asbestos materials is restricted work and may only be carried out by a person holding a "certificate of competence for restricted work" or by a person under direct supervision of a person holding such a certificate.

Encapsulation involves coating the asbestos material with a product which usually penetrates to the substrate and hardens the material. Where there is no substantial penetration of the substrate, and the coating just provides a protective barrier impermeable to asbestos, the process is usually referred to as sealing. Both encapsulation and sealing are to be considered as restricted work under the Asbestos Regulations.

Encapsulation or sealing is not considered to be an acceptable alternative to repair or removal of severely damaged asbestos materials. Sealing would be inappropriate where the sealed asbestos is likely to suffer mechanical damage, for example, through impact, drilling or sanding.

For large areas the cost of encapsulation or sealing may approach the cost of removal. Any eventual removal may be more difficult and costly. Continuing assessment will also be required if the encapsulation or sealing option is taken.

Not all paints and other surface coatings on the market are suitable. In

particular, the sealant should not increase the fire hazard properties of the material being treated. If the insulation is poorly bonded to the substrate, the application of a coating may result in large sections of the insulation material breaking away from the substrate. The surface to be encapsulated or sealed should be cleaned with a vacuum cleaner to remove all debris and dust particles ensuring good adhesion of the coating to be applied.

### **1.3.5 Coatings for encapsulation or sealing**

Both water-based (emulsions) coatings and solvent-based coatings may be used. These may be pigmented or clear. Pigmented coatings, contrasting in colour to the asbestos insulation, will be useful in situations where the asbestos may be subjected to mechanical damage. Damaged areas will be shown by a colour difference, making location of these areas for subsequent repair work relatively simple. Pigmented coatings will also allow easier detection of areas where the coating may inadvertently be absent or is too thinly applied.

Application of coatings shall be by airless spray. Operating pressures should be kept as low as practicable to avoid creating high levels of asbestos dust when the coating material impacts with the surface of the asbestos insulation. Coatings should not be applied by roller because the suction effect arising from this method of application can cause the asbestos insulation to be removed.

To effectively seal asbestos insulation it is usually necessary to apply several coats of the particular sealing agent. The first, and possibly all of the coats applied, may need to be diluted so that good penetration of the insulation can be achieved.

Subsequent to sealing any asbestos materials, an efficient cleanup of the surrounding area with a vacuum cleaner should be undertaken to remove any liberated dust containing asbestos.

### **1.3.6 Removal and maintenance work**

Removal of friable asbestos (see definition of restricted work) shall be carried out only by a person holding a certificate of competence to perform restricted work. All work should be undertaken in accordance with section 2: Safe Removal of Friable Asbestos, and in accordance with the general procedures listed in these guidelines.

Where restricted work is being performed, an employer is required by regulation to notify the Occupational Safety and Health Service of the Department of Labour and should give reasonable notice to property owners, employers and employees that asbestos removal is to be carried out, and when it is to be carried out. The notification should also include an explanation of the general procedures and equipment involved and the precautions to be taken.

Waste asbestos products shall be disposed of in accordance with section 5 of these guidelines.

### **1.3.7 Substitutes**

The special properties of asbestos cannot always be duplicated in other materials, so its continued use in some highly specialised applications may be unavoidable. Wherever possible, however, asbestos products

should be replaced by materials which are asbestos-free, and do not themselves constitute a health hazard. When considering substitute materials, account should be taken of all health risks associated with the manufacture, use, transport, storage and disposal of the substitutes proposed.

### **1.3.8 Demolition and structural alterations involving restricted work**

Demolition and structural alteration of buildings or other structures containing asbestos-based material should be in accordance with these guidelines.

All asbestos products, including asbestos cement sheeting, must be removed before demolition is commenced. In some circumstances, partial removal, followed by partial demolition to allow access to previously obstructed asbestos material, may be necessary. In such cases, the partial demolition operation should be conducted under conditions appropriate to the removal work.

The techniques for handling and removal of non-friable asbestos-cement products are detailed in section 2 of these guidelines.

Table 1 Determination of Appropriate Control Method

<p><b>Removal</b></p> <p><b>Appropriate when:</b> Surface friable or asbestos poorly bonded Asbestos is severely water damaged or liable to damage or deterioration Located in air conditioning duct Airborne asbestos exceeds exposure standard Other control techniques inappropriate</p> <p><b>Not appropriate when:</b> Located on complex and inaccessible surfaces Removal extremely difficult and other techniques offer satisfactory alternative</p> <p><b>Advantages:</b> Hazard removed No further action required</p> <p><b>Disadvantages:</b> Increases immediate risk of exposure especially to removal workers Creates major disturbance in building Often highest cost, most complex and time-consuming method Removal may increase fire risk within building - substitute required Possible contamination of whole building if removal done poorly</p>	<p><b>Encapsulate or seal</b></p> <p><b>Appropriate when:</b> Removal difficult or not feasible Firm bond to substrate Damage unlikely Short life of structure Readily visible for regular assessment</p> <p><b>Not appropriate when:</b> Asbestos deteriorating Application of sealant may cause damage to material Water damage likely Large areas of damaged asbestos</p> <p><b>Advantages:</b> Quick and economical for repairs to damaged areas May be adequate technique to control release of asbestos dust</p> <p><b>Disadvantages:</b> Hazard remains Cost for large areas may be near removal cost Asbestos management programme required Eventual removal may be more difficult and costly Tenting and clearances still required</p>
<p><b>Enclosure</b></p> <p><b>Appropriate when:</b> Removal extremely difficult Fibres can be completely contained within enclosure Most of surface already inaccessible Disturbance to, or entry into enclosure area not likely</p> <p><b>Not appropriate when:</b> Enclosure itself liable to damage Water damage likely Asbestos material cannot be fully enclosed</p> <p><b>Advantages:</b> May minimise disturbance to occupants Provides an adequate method of control for some situations</p> <p><b>Disadvantages:</b> Hazard remains Continuing maintenance of enclosure Asbestos management programme required Need to remove enclosure before eventual removal of asbestos Precautions needed for entry into enclosure</p>	<p><b>Defer</b></p> <p><b>Appropriate when:</b> Negligible risk of exposure AND Asbestos inaccessible and fully contained OR Asbestos stable and not liable to damage</p> <p><b>Not appropriate when:</b> Possibility of deterioration or damage Airborne asbestos dust exceeds recommended exposure standard</p> <p><b>Advantages:</b> No initial cost Cost of removal deferred</p> <p><b>Disadvantages:</b> Hazard remains Need for continuing assessment Asbestos management programme required</p>

## ■ Section 2: SAFE REMOVAL OF ASBESTOS

### 2.1 General

- 2.1.1** This section provides guidelines for undertaking the planned and safe removal of asbestos-based materials from buildings, equipment/plant, structures and ships, and outlines the equipment to be used, removal techniques and general safety and hygiene requirements.
- 2.1.2** This section applies to the removal or work on:
- Friable asbestos, including sprayed asbestos coatings used for thermal and acoustic insulation in buildings;
  - Decorative coatings in buildings;
  - Asbestos-based lagging on boilers and other industrial plant;
  - Asbestos cement products; and
  - Vinyl-asbestos floor and wall coverings.
- 2.1.3** Working with asbestos and asbestos-based products is hazardous. It is the employer's duty to provide a healthy and safe place of work. To achieve this it will be necessary to plan the work and adopt good work practices.
- 2.1.4** In any activity involving the removal of asbestos-containing materials the procedures adopted must allow for the containment of asbestos. All practicable steps must be taken to ensure that workers and others in the area are not exposed to asbestos fibres.

**NOTE: Removal of friable asbestos that has been used for thermal or acoustic insulation and other stated applications may only be carried out by a person holding a certificate of competence for restricted work or by a person under direct supervision of a person holding a certificate (see definition of restricted work in Introduction, 4).**

## Part I: SAFE REMOVAL OF FRIABLE ASBESTOS

This section applies to the removal or work on:

- Friable asbestos, including sprayed asbestos coatings used for thermal and acoustic insulation in buildings;
- Decorative coatings in buildings;
- Asbestos-based lagging on boilers and other industrial plant.

### 2.2 Planning and programming considerations

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

### 2.3 Information to be supplied by the property owner, occupier or agents

- 2.3.1** The owner or their agent should supply precise details of the scope of the work to the asbestos contractor prior to commencement of any work. It is recognised that in some cases the full extent of the asbestos material is not known until after the removal is under way.

In the preparation of job specifications the following considerations should be addressed:

(a) Location:

- Indoors;
- Outdoors but protected;
- Outdoors exposed to weather;
- Enclosed in ducts or trenches below ground level;
- Difficult or unusual site conditions which will influence the selection or application of removal methods, particularly in regard to transport, scaffolding or weather protection.

- (b) Technical description of the material to be removed with details of the type of asbestos present and any special or unusual materials or circumstances.

- 2.3.2** 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 pipework 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 pipework, boilers, turbines or refinery equipment.
- (e) Any unusual or specific hazards associated with the removal job.
- (f) Temperature considerations — normal working temperature for each portion of the plant concerned, ambient temperature at the removal area.
- (g) Conditions of substrate surfaces — special requirements, such as the removal or otherwise of protective paint or lacquer from pipework or for the application of paint or other protective coatings to the substrate from which the asbestos-based material has 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, for example, 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) 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 buildup and consequent fire risk.
- (l) Site occupancy restrictions and conditions.
- (m) Adjacent area cleaning (adjacent areas which are to be cleaned or are to be protected from airborne dust and are to be cleaned on completion).
- (n) Safety practices to be followed under relevant legislation.
- (o) Location of any relevant electrical cables.

## **2.4 Information to be supplied by the contractor**

**2.4.1** Restricted work involving asbestos must be notified to the Occupational Safety and Health Service of the Department of Labour.

**2.4.2** The asbestos contractor should provide specifications or drawings showing details as follows:

- (a) Type and extent of isolation required at the asbestos removal area and location of restricted access borders.
- (b) Particular methods to be adopted when removing material, including detail of the contamination control programme, for example, provision of negative air pressure and the location of the exhaust unit. This should include specifications of size, capacity and type of filter, location of decontamination unit and where it is to be discharged.
- (c) Waste disposal programme including:
  - on-site storage system;

- method of removal from the building;
- (d) Waste disposal site.

## 2.5 Guidelines for asbestos contractors for planning and programming

**2.5.1** Consideration should be given to the removal of all asbestos from a building at the one time. Piecemeal removal often leads to the contamination of other work areas thus placing other persons at risk.

As the removal of asbestos is dependent upon progress of other contractors at the site, details of planning schedules which will control the work and allow for effective removal without other personnel being present in the asbestos removal area should be agreed upon.

**2.5.2** Conversely, the work of other contractors should be scheduled to preclude them working near to, or accidentally breaking into the asbestos removal area.

**2.5.3** The following are the major points to which early consideration should be given:

- (a) Safety and health of personnel.
- (b) Most appropriate work methods for the work.
- (c) Identification of types of asbestos involved.
- (d) Programme of commencement and completion dates. However, it should be recognised that unforeseen problems with removal or the extent of the asbestos cannot always be ascertained prior to removal work commencing.
- (e) Responsibility for the supply and application of isolating-materials, e.g., ropes, barriers, plastic screens, waste containers and warning signs.
- (f) Preparation of surfaces (pre-removal) cleaning.
- (g) Precise information on extent of the work covered by the contract.
- (h) Limitations of access to the removal area.
- (i) Conditions of employment on the site, including the labour and supervision required and agreed working hours.
- (j) Transport facilities.
- (k) Protected storage area pending the removal of asbestos-based materials.
- (l) Availability of water, power, heat, light and drainage.
- (m) Accommodation, decontamination and canteen facilities.
- (n) Provision of access equipment, such as scaffolding or ladders.
- (o) Protection of adjacent areas, plant and machinery.
- (p) Waste disposal methods and responsibilities and cleanup requirements.
- (q) Temporary sealing of asbestos where necessary.

- (r) Notification to the Occupational Safety and Health Service of the Department of Labour is required.
- (s) Responsibility for air monitoring, including clearance monitoring.

## 2.6 Training

**2.6.1** All asbestos removal workers must be instructed in the relevant aspects of working with or on asbestos: the health hazards associated with asbestos, safe working procedures, and the wearing and maintenance of protective clothing and equipment.

The level of training may vary according to the requirements of a job but all workers should be given detailed information on the reasons for safety and health precautions (see section 7 of these guidelines).

## 2.7 Supervisory personnel

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

- To plan the total removal procedure.
- To select the most appropriate technique for removal of asbestos.
- The pre-removal setting up.
- 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 contaminate 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.

## 2.8 Site preparation for the removal of friable asbestos from buildings and other structures

In all cases the procedures adopted for the removal of friable asbestos must be designed to contain the asbestos and minimise 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 and 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;
- 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 at all stages during and after the asbestos removal 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 the 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:

- The removal of fireproofing, thermal or acoustic insulation applied to structural steel or ceilings, or other similar major asbestos removal jobs (section 2.9);
- The removal of decorative coating containing relatively low percentages of asbestos (section 2.12);
- Small scale jobs such as the removal of minor amounts of asbestos pipe lagging (section 2.13).

## 2.9 Preparation of a site for a major removal programme

- 2.9.1** Where total enclosure of the removal area is required, isolation of the area can be achieved by the installation of low density polyethylene sheeting (not less than 125 microns thick) on the floor and walls of the structure. It may be necessary to erect a temporary timber or metal frame to which the plastic barrier can be attached. All joints should be overlapped and double taped to ensure that the area is completely sealed off. In some circumstances the use of adhesives may supplement the use of tape.
- 2.9.2** 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.

- 2.9.3** Vertical shafts should be properly sealed off to prevent the thermosyphon effect spreading asbestos fibre throughout the building.
- 2.9.4** Where asbestos is removed from an entire floor of a multistorey building, all passenger elevators 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 an elevator dedicated for this purpose. Where an elevator 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.
- 2.9.5** All movable furniture, plant and fittings shall 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 be necessary.
- 2.9.6** Where masking operations may liberate asbestos fibres, all persons in the removal area should wear respiratory protective devices approved for asbestos. This precaution is particularly applicable when removing existing barriers or partitions such as false ceiling tiles. Where asbestos materials may have fallen on to a false ceiling, the ceiling should only be removed under full removal conditions. Any utility or service line which penetrates into the ceiling space is to be sealed.
- 2.9.7** 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 recirculated air should be replaced.
- 2.9.8** 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.
- 2.9.9** To prevent the escape of airborne asbestos fibres from the removal area enclosure, an exhaust extraction fan should be installed in a position so as 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 a 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 using smoke testing.
- 2.9.10** The air extracted by this system should pass through an appropriate High Efficiency Particulate Air (HEPA) filter to remove any asbestos fibres. Ideally, air extraction units should be so situated 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.

- 2.9.11** The HEPA filter should comply with the minimum 99.97 percent efficiency requirement detailed in AS 1324: 1996 Part 1 *Air filters for use in general ventilation and air conditioning*. A coarse pre-filter should be installed prior to the HEPA filter 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.
- 2.9.12** Extraction equipment should be operated continuously whilst the removal enclosure is in place. Such equipment should be fitted with thermal cut out systems.
- 2.9.13** 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.
- 2.9.14** Warning notices stating “**Asbestos hazard area, keep out**” shall be placed at entrances to the removal area. These signs, with lettering of 100 mm 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.

## 2.10 Compliance testing of removal area containment prior to commencement of work

- 2.10.1** Before any asbestos removal begins in an enclosure, a visual inspection to check the integrity of the structure must be carried out. Smoke testing may also be used to detect leaks. Attention should be given to the bellowing inward of the plastic sheeting. At the beginning of each working period the inspection should be repeated and any defects remedied immediately.

## 2.11 Decontamination facilities

- 2.11.1** To prevent the escape of asbestos as workers enter and leave the removal area a specially constructed mobile or on-site decontamination unit will normally be required. In all cases where it is deemed necessary to totally enclose the removal area, a decontamination unit consisting of at least two compartments should be used. Where a friable asbestos removal programme is being undertaken, a decontamination unit should be provided that incorporates the following elements or achieves the same or better protection:
- (a) A **dirty area** having provision for:
- Removal of contamination from protective clothing, footwear and respirator with hand-held shower;
  - Washing footwear in foot bath;
  - Storage of contaminated clothing and footwear;

- Airflow towards the removal area;
- (b) A **clean area** having provision for:
- Storage of individual respirators in containers or lockers;
  - Showering with warm water;
  - Storage of clean clothing;
  - Separate storage of clean and dirty towels;
  - Airflow towards dirty area.

In all cases, asbestos contamination must be contained within the enclosure. An example of the layout of a typical decontamination unit is shown in diagram 1.

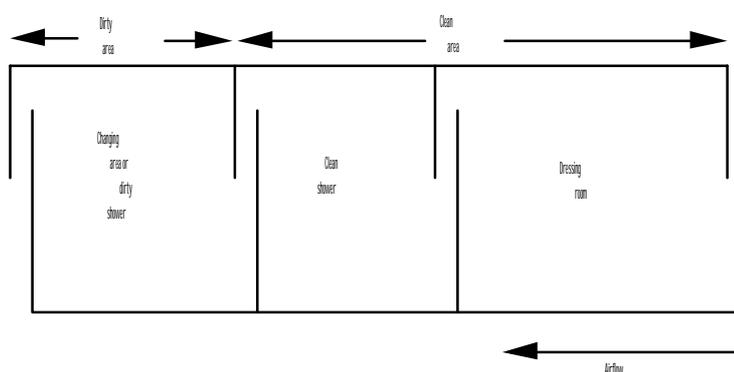


DIAGRAM 1. FLOOR PLAN OF TYPICAL DECONTAMINATION UNIT

- 2.11.2** Spring-loaded doors or two or more overlapping plastic sheets between the areas should be used to ensure that an airlock is maintained as the person passes through the unit.
- 2.11.3** The decontamination unit should be sited immediately adjacent to, and joined to, the enclosed asbestos removal area. Where it is not physically possible to locate the decontamination unit adjacent to, and joined to, the removal enclosure alternative procedures to minimise asbestos contamination should be implemented.
- 2.11.4** Decontamination procedures should be followed whenever the worker leaves the enclosure. While the protocol to be followed will vary with the design of the decontamination unit, it is recommended that:
- The respirator should be worn and operating until the person has removed all contamination from outer garments and equipment;
  - No more than six persons should use one decontamination facility;
  - Personnel should not smoke, eat or drink in any part of the decontamination facility; and
  - The decontamination unit should be regularly cleaned by persons wearing protective clothing.

## 2.12 Removal of decorative coatings

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 of the procedures set out in sections 2.8 to 2.11 for major removal programmes. This is especially so if complete saturation with water is possible thereby greatly reducing the release of asbestos fibres.

### 2.12.1 Procedures to be adopted

In all cases, 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 although the floor will need to be covered. All furniture, fittings and curtains must be removed. Negative air pressure should be maintained within the work area.

2.12.2 Procedures must be adopted to ensure that the asbestos-containing 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.

## 2.13 Small scale asbestos removal work

The procedures to be adopted for the removal of small quantities of asbestos should be designed around the risk of asbestos fibre release. Each situation should be assessed to enable a correct decision to be made about the measures necessary to control exposure to asbestos.

The small scale work where this may occur could include:

- Removal of small amounts of asbestos pipe lagging.
- Minor electrical or plumbing work.

As previously indicated, containment of the asbestos work area is important as are both the use of correct work methods to reduce release of airborne fibres, such as water saturation, and correct disposal of waste.

## 2.14 Equipment

2.14.1 All tools and electrical equipment, such as vacuum cleaners and power tools, should be left in the removal area until the completion of the removal job. When the equipment is removed it should be vacuumed thoroughly and all accessible surfaces wiped over with a damp cloth. When decontamination is not possible, the item should be wrapped in plastic and sealed and only opened in another removal area. Any asbestos contained in the cleaner should be disposed of as asbestos waste.

## 2.15 Removal techniques for buildings and structures

2.15.1 The removal of asbestos-based materials from buildings and other structures should be carried out by methods which will minimise the release of asbestos fibre into the atmosphere both during and after the

removal operation. The choice of method is determined by the nature of the asbestos material, the quantity of insulant and its location.

**2.15.2** Breaking through the finishing compound and cutting the reinforcing wire in the lagging are operations which can liberate considerable quantities of dust. Care should therefore 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.

**2.15.3** 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.

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

**2.15.5 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.

**2.15.6** The equipment consists of an injection harness of light flexible hose with a number of outlets, each terminating in an injection head with its own shutoff control. These heads have numerous holes through which water is fed into the insulation.

**2.15.7** The following steps are recommended for the soaking procedure:

- (a) Where the asbestos-based material is covered with cloth, mastic or other such materials, loose material dust should be removed by vacuum cleaning or by wiping with a damp cloth.
- (b) Where cladding has to be removed before access is obtained to the asbestos-based material, the cladding should be removed carefully and surfaces vacuum cleaned continually or, where practicable, sprayed with water.
- (c) Holes or cuts should be made in the outer covering to enable water injected in such a manner and quantity as to ensure that asbestos-based material 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.
- (d) The quantity of water and the time to soak will be dependent on factors such as thickness of insulation, access and location of holes.
- (e) The saturated asbestos-based material 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.

**2.15.8** The asbestos-based material should be properly soaked and small sections which may be dislodged should be properly disposed of.

**2.15.9 Spray method**

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

- (a) The asbestos-based material is not covered with other materials such as calico or metal cladding which require prior removal;
- (b) There is no reinforcing wire or similar restrictions to removal;
- (c) The asbestos-based material is not coated with paint or mastic;
- (d) Where rapid temperature drop due to excessive water could cause damage to heated metal components;
- (e) Where no live electrical conductors are present and where no damage to electrical equipment can arise from the entry of water.

**2.15.10** The spray should be applied in such a manner as to ensure that the entire surface of asbestos-based materials is wet but minimal runoff occurs.

**2.15.11** In many instances it will be helpful if a wetting agent is added to the water to facilitate more rapid wetting of the insulation material.

**2.15.12** It is desirable for the asbestos-based material 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.

**2.15.13** 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.

**2.15.14** The wetted asbestos-based material should be removed in sections and immediately placed in suitably labelled containers and properly sealed. Any small sections which may be dislodged should be collected and properly disposed of.

**2.15.15** Asbestos fibre release is significantly depressed although not entirely eliminated by this technique, therefore appropriate respiratory protection should be used.

**2.15.16 Dry removal**

**This method is considered the least desirable removal technique and shall only be used where the spray and soaking methods cannot be used.** Such may be the case where there are live electrical conductors or where major electrical equipment could be permanently damaged or made dangerous by contact with water.

**2.15.17** 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.

## **2.16 Protective clothing and equipment**

- 2.16.1** When the use of respiratory devices and protective clothing is required, adequate rest breaks should be provided for, taking into account the physical strain caused by the use of such equipment.
- 2.16.2** The degree of respiratory protection required is determined by the nature of the removal job, the type of asbestos and the potential for exposure to asbestos fibre.
- 2.16.3** A guide to the selection of appropriate respiratory protection for various operations involving asbestos is presented in section 4 of these guidelines.

## **2.17 Dismantling of asbestos removal area**

- 2.17.1** The asbestos removal job should only be considered to have been completed when the asbestos contractor has complied fully with the clearance criteria. (See section 3.4 — Clearance and Visual Inspection Procedure.)
- 2.17.2** 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. In taking these tools and equipment from the removal area, appropriate decontamination procedures should be observed.
- 2.17.3** 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 reused, but must be treated as asbestos waste. Safety barricades and warning signs should not be removed until the complete area has been thoroughly cleaned.

## Part II: HANDLING OF NON-FRIABLE ASBESTOS

### 2.18 General

**2.18.1** Non-friable asbestos products have been compounded from asbestos mixed with cement or other hard bonding materials.

This part recommends precautions to be observed when working with non-friable asbestos products.

**2.18.2** 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; or
- Asbestos bonded into bituminous products.

**2.18.3** So long as 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.

**2.18.4** New fibro-cement products manufactured in New Zealand no longer contain asbestos.

**2.18.5** The employer shall ensure that precautions are observed during structural alteration or demolition involving asbestos-cement materials and removal of floor and wall coverings containing asbestos.

### 2.19 General precautions to be observed for non-friable asbestos products

**2.19.1** Work procedures must be designed to minimise the generation of dust. Action should be taken to avoid the spread of asbestos fibre. In particular, the following principles should be adopted:

- (a) Abrasive cutting or sanding power tools should not be used on asbestos-containing products. These may generate large amounts of dust containing asbestos.
- (b) Non-powered hand tools such as hand saws should be used.
- (c) Wetting down the material further reduces the release of asbestos fibre when cutting.
- (d) High pressure water jets/guns shall not be used because of the potential to spread asbestos waste over the surrounding environment.
- (e) Work with asbestos-containing products in well ventilated areas and, where possible, in the open air.
- (f) Good work hygiene principles shall be observed. This may entail the use of plastic drop sheets to collect off-cuts and coarse dust

or the use of appropriate vacuum cleaning equipment when necessary.

- (g) Suitable respiratory protection should be used when airborne asbestos fibre is likely to be present.
- (h) All off-cuts and collected dust should be disposed of as asbestos waste. (See section 5 of these guidelines.)

## 2.20 Removal of asbestos cement sheeting

2.20.1 The employer 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:

- (a) The asbestos-cement sheets should be sprayed with a sealing solution or wetted with water, but not with high pressure water jets. The sheets should not be wetted if this creates a risk of a worker slipping or falling from a roof.
- (b) Power tools should not be used in the removal with the exception of a drill to remove roofing screws.
- (c) Asbestos-cement sheets should be removed with minimal breakage and should be lowered to the ground, not dropped.
- (d) The removed sheets should be stacked on a plastic sheet and not allowed to lie about the site where they may be further broken or crushed by machinery or site traffic.
- (e) All asbestos-containing waste should be kept wet, wrapped in plastic or otherwise sealed and removed from the site as soon as possible, using covered bins or on a covered truck.
- (f) The asbestos-containing waste should be disposed of in a manner, and at a site approved by the appropriate disposal authority. (Refer to section 5: Storage, Labelling and Disposal of Asbestos Waste.)
- (g) Asbestos-cement sheets must not be reused or offered for sale.
- (h) Any asbestos-cement residues remaining in the roof space or around the removal area should be cleaned up, using a vacuum cleaner if necessary.
- (i) Staff should be relocated (where appropriate).
- (j) As far as practicable there should be no spread of contamination beyond the work area.
- (k) 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.
- (l) Workers should wear disposable overalls and either a disposable respirator or half-face mask fitted with dust filters appropriate for asbestos. (Refer to Part 4: Respiratory Protective Equipment and Protective Clothing.)

### **2.20.2 Working on brittle roofs**

Asbestos-cement sheeting is liable to shatter without warning under a person's weight and for this reason roofs that are sheathed in asbestos-cement sheeting are included in those roofs known as "brittle roofs".

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

The employer should consider what hazards are involved and how they can be overcome. In the planning and execution of the work, a system of work should be established, taking into consideration the work to be done, relevant statutory requirements, the type of equipment necessary, the training and experience of the employees involved and the instruction and supervision required. The system of work should allow for not only those directly involved in the work, but also other persons who could be affected.

## **2.21 Removal of vinyl floor and wall coverings containing asbestos**

NOTE: In the Health and Safety in Employment (Asbestos) Regulations 1998 dry sanding of vinyl asbestos floor coverings is classified as "restricted work".

- 2.21.1** Vinyl-asbestos 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.
- 2.21.2** The contractor working with 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.
- 2.21.3** Where the vinyl-asbestos coverings are found (or assumed) to contain asbestos the provisions set out in section 2.21.7 should be followed.
- 2.21.4** Significant release of asbestos fibre can result when vinyl-asbestos products are abraded by sanding. The work methods and control procedures used when working with vinyl-asbestos products must be designed to limit workers' exposure to asbestos and the spread of asbestos into the surrounding environment.
- 2.21.5** In deciding the approach that is to be taken in replacing asbestos-backed vinyl products, the following options may be considered:
- Leaving the covering in place and fixing a new covering over the top.
  - Removing the product with a spade or other flat instrument.
  - Sanding to surface the substrate. This should only be done after all reasonable steps have been taken to remove the asbestos by scraping.

Fixing the new covering over the asbestos-vinyl material creates the least risk at the time but, in reality, it just defers the problem. The best option

will usually involve removal with a method that minimises release of dust containing asbestos fibre.

#### **2.21.6 Sanding of floors in removing vinyl-asbestos products**

Power sanding of floors shall be kept to a minimum. In all cases the surface should be wetted to minimise 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 vinyl-asbestos 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.

#### **2.21.7** The following procedures should be used for the wet sanding of floors:

- 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 which must be treated as asbestos waste at the completion of the job. Overalls may be used for several jobs but they must be sealed in a plastic bag between jobs.
- All operators should wear a half facepiece respirator with a class P1 filter suitable for asbestos dust or a combination P1 and organic vapour filter if using kerosene.
- Cleanup 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.

## ■ Section 3: MONITORING ASBESTOS IN AIR LEVELS AND CLEARANCE PROCEDURES

### 3.1 General

- 3.1.1** The measurement of airborne asbestos fibre levels may 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 minimised.
- 3.1.2** 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, both are concerned with safeguarding the health of individuals but, in the case of quality control sampling, the immediate emphasis is placed on confirming that the task has been completed to a satisfactory standard.
- 3.1.3** The determination of airborne asbestos fibre concentrations in air must be carried out in accordance with a recognised procedure. This requirement is satisfied where the collection has been conducted by a person that has been trained by a New Zealand accredited laboratory (or an Australian equivalent). The analysis must be carried out in accordance with a method specified by a New Zealand accredited laboratory for atmospheric testing for airborne asbestos fibre concentrations.

### 3.2 Quality control in removing or encapsulating asbestos

#### 3.2.1 Air sampling

Air sampling may form part of the procedure used to monitor asbestos in buildings or other structures. **Clearance sampling** has received the greatest attention but it may also be useful to perform:

- **Background sampling** to establish the conditions that exist before work is commenced;
- **Leak testing** to check the integrity of the enclosure deployed in removal or encapsulation activities; and
- **Reassurance sampling** — sampling after the enclosure has been removed.

While the remainder of this section refers mainly to clearance sampling following asbestos removal, the procedures are generally applicable to all forms of quality control sampling.

- 3.2.2** The object is to obtain results that are representative of the asbestos fibre in air levels that are likely to exist in the area under investigation. It must be recognised that there may be considerable variation in the levels as a result of changing work practices and environmental conditions.
- 3.2.3** For this type of assessment only static samples are considered to be appropriate. In order to achieve a satisfactory detection limit, and to

obtain a reasonably representative sample, the sampling conditions have been precisely defined. (See section 3.6.)

### 3.3 Monitoring of removal work

- 3.3.1** 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 that is 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.

### 3.4 Clearance and visual inspection procedures

- 3.4.1** At the completion of the removal process, clearance should be gained prior to reoccupation. This procedure is the responsibility of the principal. The principal should engage the services of an independent person or agency to conduct a visual inspection and carry out final clearance monitoring.

While the 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.

The steps that will normally be taken in this process are set out in diagram 2.

#### **3.4.2 Visual inspections**

The visual inspection is 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 (i.e. that 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 (see diagram 2).

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, then it should be sealed and the location noted.

#### **3.4.3 Clearance monitoring**

Following a satisfactory visual inspection, clearance monitoring will be required. The area must be dry and the negative air switched off and the inlet capped before sampling is started. As far as is 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 at 1 to 2 metres from the floor and away from walls or other solid surfaces. Section 3.6 discusses the requirements for sampling equipment. If the area has been sprayed with PVA or other sealant, sampling should not commence for at least 2 hours to allow the sealant to dry properly.

#### 3.4.4 Sample numbers

The recommended number 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
	<10	1
50	150	2
200	600	4
500	1500	6
1000	3000	9
5000	15,000	16
10,000	30,000	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 3 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 determinant. 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.

#### 3.4.5 Sampling procedure

Sampling is to be conducted over a period of 4 hours at a rate of 2 litres/min to give a sample volume of 480 litres.

At the start of the sampling period activity to disturb any settled asbestos fibres should be undertaken. 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 flowmeter. The sampling period should be as close as possible to 4 hours and recorded to the nearest minute.

#### 3.4.6 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.

### 3.4.7 Interpretation of results

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

- (a) 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 Electron Microscopy with Energy Dispersive X-ray Analysis).

NOTE: This method requires special filters and arrangements will need to be made with the testing laboratory; or

- (b) Contamination from surrounding areas negates the feasibility of achieving lower levels.

## 3.5 Occupational sampling

**3.5.1** The employer is responsible for ensuring that employees working with asbestos and all others that may come into contact with asbestos fibre generated from the process are protected. For persons working with asbestos Workplace Exposure Standards are specified (see exposure standards in introduction). These standards are only applicable where the work is directly connected with asbestos or an asbestos product.

**3.5.2** Personal monitoring will generally be required using equipment that samples air from the workers' breathing zone. To obtain a sample that can be compared with the Workplace Exposure Standard a sample over any continuous 4-hour period is to be taken.

**3.5.3** The sampling strategy should be designed to gain 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 will have to be gained. In particular, information on the following should be sought:

- (a) The plant and equipment used for transporting and processing materials containing asbestos;
- (b) The exhaust ventilation and other dust control equipment;
- (c) The composition of the materials (i.e. the percent and type of asbestos present in the material handled);
- (d) Process details; and
- (e) The tasks performed by individual employees.

### 3.5.4 Sampling duration and flow rate

The Workplace Exposure Standards for asbestos refer to 4-hour periods. A 4-hour sample at a sampling rate of 1 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 4 hours and preferably cover the full work period with two 4-hour samples.

## 3.6 Sampling equipment and analysis

- 3.6.1** The Workplace Exposure Standards and the asbestos clearance level refer to levels that have been estimated by the **membrane filter method**.

Briefly the method involves:

- (a) Drawing air through a 0.8 µm pore size membrane filter with sampling pump;
- (b) Clearing the filter and mounting it on a microscope slide;
- (c) Counting the fibres on randomly selected fields using phase contrast microscopy; and
- (d) Calculating the concentration of fibres in air from the number of fibres counted and the volume of air sampled.

### 3.6.2 Sampling pump

A portable air sampling pump capable of sampling 2 litres per minute is suitable for both occupational and quality control sampling. The pump must be capable of maintaining the flow-rate through the filter within +10% of the set flow over the entire sampling duration. Pumps with automatic flow control are preferred.

### 3.6.3 Limitations of method

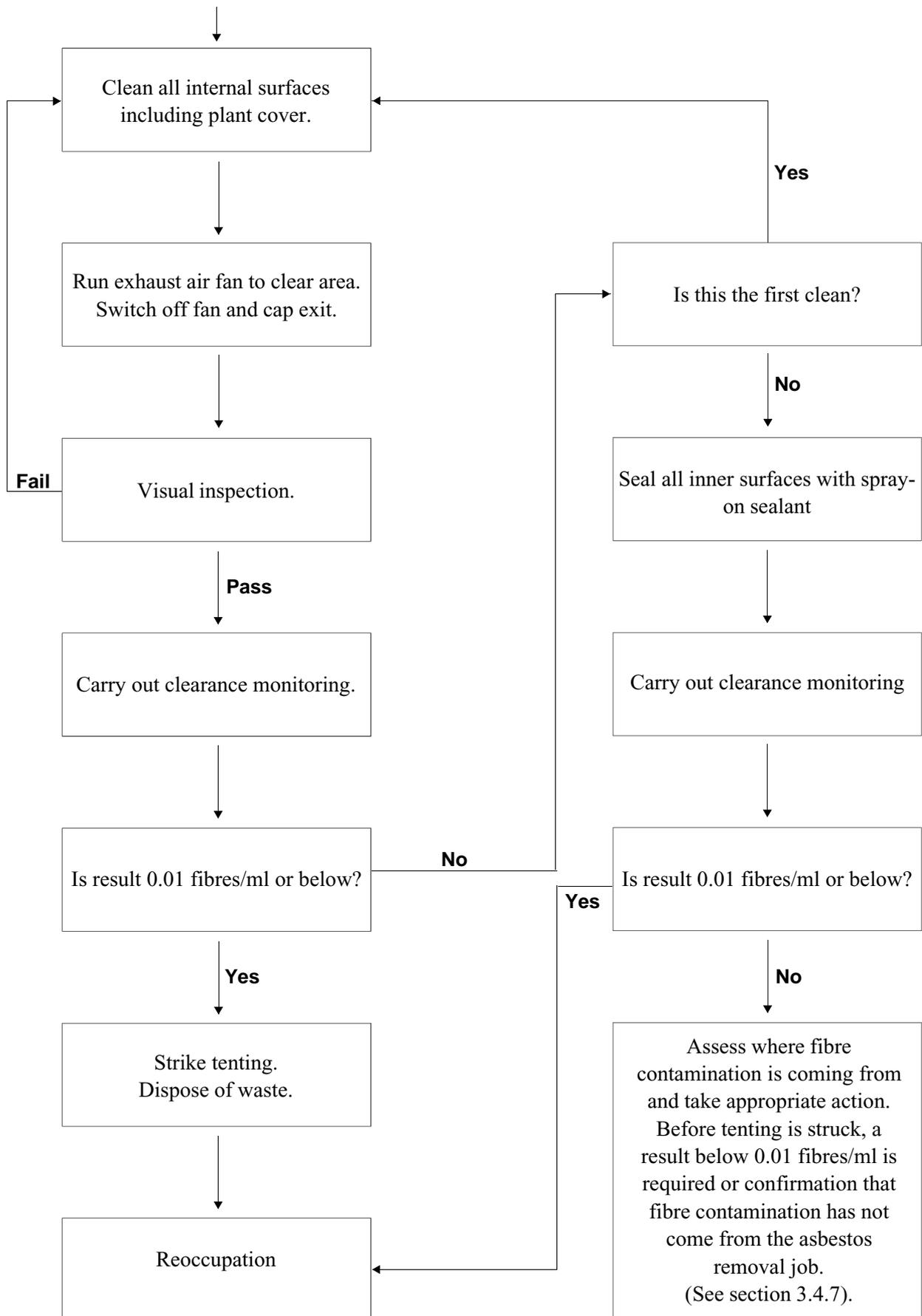
If consistent results are to be obtained, it is essential the method be followed in detail. The method does not detect all asbestos fibres that may have been present in the air sampled. Particles that are: >5 µm in length, <3 µm wide and have a length to width ration >3 :1 are counted as fibres but those less than approximately 0.2 µm in diameter may not be visible. Using the membrane filter method, it is not possible to identify the exact nature of the fibre with certainty. All particles meeting the fibre definition are counted. In some circumstances, this may lead to a gross over estimation of the asbestos fibre levels. This is more likely to be a problem when sampling in commercial buildings where the predominant fibres may not be asbestos and lower levels of asbestos are being estimated. The use of the Scanning Electron Microscopy method with Energy Dispersive X-ray Analysis is recommended where high fibre levels are encountered and gross amounts of non-asbestos fibre is suspected.

### 3.6.4 Selection of laboratories

All aspects of the membrane filter method and the SEM method, from sample collection to fibre counting, may be subject to systematic and random errors. The analytical errors are more readily addressed and adherence to method details and participation in quality assurance schemes will see these errors minimised. To ensure that the laboratory used for the assay of samples have the necessary facilities, expertise and quality control procedures, only laboratories accredited by International Accreditation New Zealand (or the Australian equivalent) for the counting of fibres by the membrane filter method are to be considered.

# Guideline for the Removal of Tented Area Sheeting

Diagram 2



## ■ Section 4: RESPIRATORY AND PERSONAL PROTECTION FOR ASBESTOS WORK

### 4.1 General

- 4.1.1** Employers and others involved in work involving asbestos or abatement procedures must be fully conversant with the appropriate control measures necessary to protect against exposure to asbestos fibres. There is a legal requirement placed on employers to ensure that their employees and others in the vicinity are adequately protected from the effects of asbestos.
- 4.1.2** Good occupational hygiene practice requires that all practicable efforts be made to prevent asbestos fibre from entering the air of the workplace. In circumstances where it is impracticable to prevent asbestos from entering the atmosphere, suitable respiratory protective should be worn.
- 4.1.3** An information sheet on approved types of respiratory protection devices (see appendix 1) is available from your local office of the Occupational Safety and Health Service of the Department of Labour. This sets out in detail the types of respirators permitted for different work situations, the selection process, and the standards to which they must comply.

For more detailed information on respirators you should refer to the appropriate standard AS 1715:1994 *Selection, use and maintenance of respiratory protection devices* which has now been adopted as a New Zealand Standard. *A Guide to Respirators and Breathing Apparatus* has been published by the Occupational Safety and Health Service and is available from branch offices.

Particulate filters for respirators are designed to achieve filtering efficiency according to three classes:

- P1** Intended for use against mechanically-generated dusts.
- P2** Intended for use against both mechanically- and thermally-generated particulates.
- P3** Intended for use against all particulates including highly toxic materials.

For non-powered respirators, class P3 filters offer the highest protection when used in conjunction with a full facepiece.

### 4.2 Respirator programme

- 4.2.1** It is essential for all organisations required to use respirators in their work to develop and run a comprehensive respiratory protection programme. There are seven elements to a successful programme which include:
- 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.

### 4.3 Administrative system

- 4.3.1** Written standard operating instructions must be available. These should provide information on the company policy in respect of the issue and use of RPDs. One person should be responsible for the co-ordination and direction of this policy. Each RPD programme will vary according to the peculiarities of the work being carried out.

### 4.4 Knowledge and assessment of risks involved

- 4.4.1** 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.

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 and 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 period exposed.

### 4.5 Correct selection of respiratory protection devices (RPDs)

- 4.5.1** The information sheet in appendix 1 provides the required information on the correct selection of the most appropriate RPD for asbestos work. In addition, the following issues must be addressed:

- **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 of spectacles, or facial characteristics may effect the face seal adversely. Positive pressure powered equipment with full facepiece copes better with these problems than non-powered devices.

- **Freedom of movement**

The need for a worker to move freely about a job will influence the type of RPD. While airline respirators offer higher protection the restrictions imposed by the airline 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**

Other factors which may affect the selection of RPDs could include:

- The need to communicate;
- Ease of cleaning; and
- Availability of replacement parts.

## 4.6 Staff training

- 4.6.1** The correct and proper use of RPDs must be taught to all users. No person should be required to use respirators without first being given training in correct use, operation, care and maintenance, emergency procedures, and cleaning and storage requirements.

## 4.7 Medical assessment

- 4.7.1** Any type of respirator may impose undue stress on some users. Persons required to routinely wear respirators should be given the opportunity of a medical assessment to determine if they are able to safely wear them.

## 4.8 Inspection, maintenance and storage of RPDs

- 4.8.1** Proper inspection, maintenance and repair of RPDs is an essential part of the respirator protection programme. Facepieces should be cleaned, dried and stored properly after each use. Regular checks of the diaphragms, valves and facepiece parts will reveal any defect which should be repaired. The batteries for powered air RPDs will require recharging.

## 4.9 Protective clothing

**4.9.1 General**

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 (see section on laundering).

#### 4.9.2 Types of protective clothing

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

- (a) Is made of material that resists penetration by asbestos fibres, such as nylon or treated synthetic material;
- (b) Covers the body and fits snugly at the neck, wrists and ankles. It should also cover the head by having an attached hood; and
- (c) Is maintained in good condition and if torn or damaged, 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 on the signs and symptoms of heat disorders and the means to prevent illness caused by heat.

There are three types of overalls in general use for asbestos work. Each type of overall 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 need to be considered.

- (a) **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.
- (b) **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 ongoing jobs because they can be washed under a shower when leaving the contaminated area. Laundering is necessary primarily for hygiene. The PVC type overalls can be used in a similar way, however, they are heavy, cumbersome and too hot for longer jobs.
- (c) **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.

#### 4.9.3 Laundering of asbestos-contaminated clothing

The laundering of contaminated overalls presents some difficulties:

- (a) 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.
- (b) While the washing process removes asbestos fibres, the spin drying cycle deposits the fibres on to the garment again.
- (c) During the mechanical drying process asbestos fibres are released into the air.

Regulation 1 of the Health and Safety in Employment (Asbestos) Regulations 1998 requires that clothing which has been used in asbestos work be “ ... laundered in accordance with the following requirements:

- (i) The clothing is, wherever practicable, laundered at the place at which the work involving asbestos has been carried out; and
- (ii) If it is not practicable to launder the clothing at that place, the clothing is, before being taken to the place where it is to be laundered, dampened and placed in a closed container impermeable to asbestos dust and conspicuously marked with the words “ASBESTOS CONTAMINATED CLOTHING”; and
- (iii) Wherever the clothing is laundered, it is laundered in such a manner as to clean the clothing and to suppress the release of asbestos dust into the air; and
- (iv) Every employee to whom the clothing is given for laundering receives, before being given the clothing, instructions on the precautions to be taken to ensure that the clothing is laundered and handled in such a manner as to protect the safety of every employee coming into contact with it during the laundering process; and
- (v) The clothing is not laundered by an employee at an employee’s home.”

#### **4.9.4 Footwear**

Footwear should be adequate for the type of work being undertaken.

#### **4.9.5 Gloves**

If gloves are provided they should be made of impervious material for ease of cleaning. To assist with manual dexterity disposable type 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 asbestos corns or “warts”.

# ■ Section 5: STORAGE, LABELLING AND DISPOSAL OF ASBESTOS

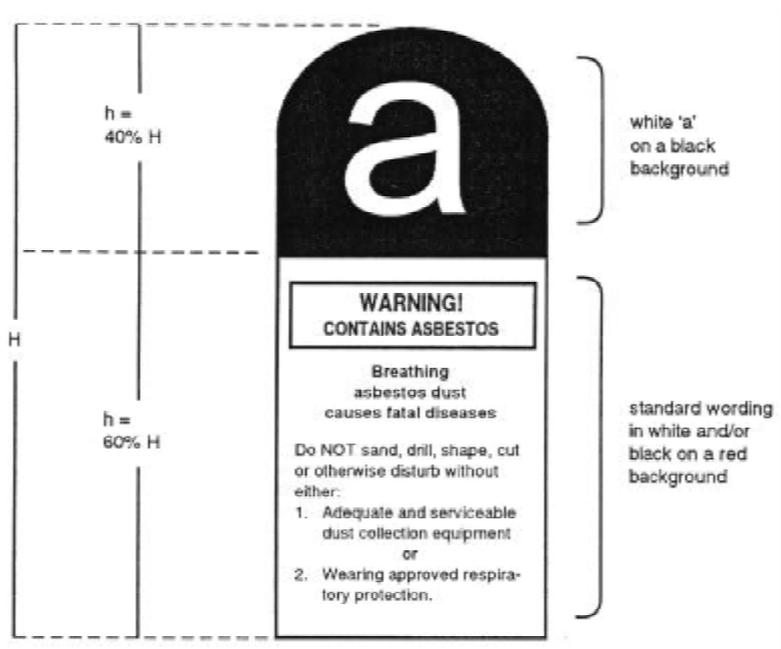
## 5.1 General

- 5.1.1 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; to ensure that asbestos-containing materials are stored, labelled and disposed of correctly.

## 5.2 Labelling of asbestos materials (not asbestos waste)

- 5.2.1 Articles containing asbestos and the packaging of such articles shall be labelled in the manner set out below. Minimum dimensions and colours are indicated in the diagram.

### INTERNATIONAL ASBESTOS LABEL



Regulation 35 of the Health and Safety in Employment (Asbestos) Regulations 1998 states:

**35. Labelling of products containing asbestos**—Every manufacturer and supplier of products containing asbestos must take all practicable steps to ensure that products manufactured or supplied on and after 1 April 1999 bear a label that is—

- (a) In the form specified in Schedule 3; and
- (b) Affixed in a conspicuous place; and
- (c) Affixed firmly.

## 5.3 Storage and disposal of asbestos

- 5.3.1 The employer should take all practicable steps to ensure that asbestos waste products are not received into, stored, distributed or despatched

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 any of the contents escaping when subjected to the stresses and strains of normal handling.

- 5.3.2** All asbestos waste shall be sealed in plastic bags (200 µm thick) and labelled **“Asbestos hazard — Wear respirator and protective clothing while handling contents”**.

## 5.4 Handling

- 5.4.1** The employer should ensure that asbestos waste received into or despatched from any workplace is packed in sealed plastic bags and the following practices applied:

- (a) Pallet loads should be securely fastened by banding (in order to not cut the bags) and covered.
- (b) Pallet loads should be securely mounted on suitable pallets which 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.
- (c) 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 which can be effectively sealed.

- 5.4.2** 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.

- 5.4.3** The skip or other container should be cleaned thoroughly after use.

- 5.4.4** Manufactured goods containing asbestos, such as brake linings and clutch facings, should be sealed or suitably packaged (e.g. by shrink wrapping) to prevent asbestos fibre arising from abrasion during transport.

## 5.5 Disposal at designated refuse site

All asbestos waste is to be buried in a designated area within a managed refuse disposal site under the control of a territorial local authority under the Resource Management Act, and covered with at least 1 metre of earth in accordance with the provisions of regulation 13 of the Health and Safety in Employment (Asbestos) Regulations 1998.

There will be a need for some discretion on what constitutes “earth” used to cover waste asbestos in a refuse disposal site. The intention of Regulation 13 is that the waste asbestos be covered with material to prevent the spread of asbestos fibres. Smallish quantities of asbestos waste, such as sanding from flooring, asbestos waste from brake workshops, asbestos cement from repair jobs, etc. 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 which are covered as necessary with clean fill or other material.

## **5.6 Reuse of asbestos**

Every employer must take all practicable steps to ensure that no previously used product that contains asbestos is reused or offered for sale.

## ■ Section 6: ASSEMBLY AND REPAIR OF FRICTION MATERIALS

### 6.1 General

- 6.1.1** This section of these guidelines 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:
- (a) Manufacture or relining of brake and clutch assemblies for automotive and industrial applications.
  - (b) Operating vehicle maintenance depots (fleet operators).
  - (c) Operating commercial garages and service stations.
- 6.1.2** This section does not apply to the manufacture of products incorporating raw asbestos fibre.
- 6.1.3** Wherever possible, friction materials that do not contain asbestos fibre should be used.
- 6.1.4** Where products containing asbestos are being handled, the number of people in the area should be kept to the lowest possible figure. Workshops should be isolated from other occupied parts of the building or areas that the public have access to.

### 6.2 Servicing of brakes and clutches in garages or workshops

- 6.2.1** Airborne asbestos fibre is most likely to be produced when the friction materials are worked by cutting or machining. The dust that accumulates during usage also contains asbestos and handling or cleaning brake or clutch parts will produce airborne asbestos fibre.
- 6.2.2** The tasks that may result in exposures to asbestos fibre in the brake and clutch industries can be broken into two groups:
- (a) Vehicle maintenance — the replacement of brake and clutch assemblies on vehicles by garages and brake and clutch specialists; and
  - (b) Relining of brake and clutch assemblies.

While both of these tasks may be carried out in the same place of work, the risks are different and it is convenient to consider them under separate headings.

### 6.3 Vehicle maintenance

Asbestos fibres in both moulded and woven friction materials are locked into the product with resin and binders, thus limiting the release of asbestos fibre during handling and installation. Heat and abrasion during usage will generate fine dust consisting of degraded resins, 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 fibre of

respirable size will be present. Any accumulated dust should be removed before parts are handled.

Specialised local extraction systems are available which 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 5 of these guidelines. **In 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.

## 6.4 Relining of brake and clutch assemblies

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.

### 6.4.1 Handling

Manufacturers and suppliers of friction materials are, in many cases, able to provide predrilled and preground products in final assembly form and, where possible, these should be used, thus eliminating the necessity for machining that will release asbestos fibre. Truck brake blocks and segments are also available in various thicknesses, thus minimising 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 wherever possible.

### 6.4.2 Local exhaust ventilation

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:

- (a) Of a type which can be disposed of in a manner which does not place at risk the safety and health of people; and
- (b) Replaced immediately if damaged.

All joints in the ventilation system should be leak proof to prevent the escape of asbestos fibre. 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, then 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.

#### **6.4.2 General ventilation**

The most effective means to collect dust and asbestos fibre is to remove it as close as possible to the source with a high velocity local exhaust system. Some material, however, 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, then forced ventilation should be provided to achieve at least 10 air changes per hour.

#### **6.4.3 Cleanliness of premises and plant**

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

- (a) By means of a vacuum cleaner;
- (b) By wet cleaning; or
- (c) By some other method which collects the dust without exposing people to it. In no circumstances should dry sweeping or compressed air be used.

#### **6.4.4 Care and housekeeping**

The asbestos fibres which 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 cleanup and disposal of dust and waste.

All asbestos which is in a friable form, and any loose asbestos must be kept in a closed receptacle when stored or not in use. All receptacles which contain asbestos should be clearly labelled in accordance with section 5 of these guidelines.

#### **6.4.5 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. (See section 4: Respiratory Protective Devices and Protective Clothing.)

The employer should provide separate storage for clothing not worn during working hours. Protective clothing contaminated with asbestos dust must be placed in an appropriately-labelled plastic bag for laundering in accordance with section 4.9 of these guidelines.

#### **6.4.6 Respiratory protective equipment**

Asbestos fibre 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 fibre, 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 4.

## ■ Section 7: INSTRUCTION AND TRAINING

### 7.1 General

- 7.1.1** This part applies to all employers of employees including asbestos removal workers who are exposed to and required to work with asbestos including supervisory and maintenance personnel.

### 7.2 Type and scope of instruction and training required

- 7.2.1** The employer must provide the instruction and training to familiarise employees (including those with supervisory functions) with the following:
- (a) The health hazards and risks of working with asbestos.
  - (b) Explanation about the necessity for both general and specific control measures designed to protect the employee and any other person (including the families of workers who may be exposed to asbestos).
  - (c) How the control measures, etc. should be used if they are to be effective, e.g. the correct way of using respiratory protective equipment.
  - (d) The purposes and operation of air monitoring.
  - (e) The purpose and operation of medical surveillance.
  - (f) Their duties under the HSE Act and Regulations with particular emphasis on:
    - (i) The correct use of the control measure provided including respiratory protective equipment and protective clothing;
    - (ii) The need for cleanliness;
    - (iii) The need to attend medical examinations; and
    - (iv) The need to report any defects or inadequacies in the control measures (including exhaust ventilation, respiratory protective equipment and protective clothing).

### 7.3 Smoking

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

### 7.4 Training in maintenance of control equipment

- 7.4.1** The employer shall 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.

## **7.5 Training in the use of respiratory protective equipment**

- 7.6.1** All employees shall be provided with training on the correct use and maintenance of respiratory protective equipment.

## ■ Section 8: MEDICAL MONITORING

Section 10 of the Health and Safety in Employment Act 1992, among other things, requires employers to monitor the health of employees in relation to significant hazards.

Section 36 of the Act provides for Departmental Medical Practitioners (DMP) to require medical examination of employees exposed to significant hazards.

This section of the guidelines sets out the practicable steps which can be taken to comply with the Act.

### 8.1 Initial medical

- 8.1.1** Any employer directing employees to undertake restricted work with asbestos should ensure that the employee has:
- (a) A full work history;
  - (b) 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
  - (c) The employer should ensure that the employee has this asbestos medical thereafter according to the schedule (appendix 2).
  - (d) The cost of the medical examinations shall be the responsibility of the employer.
- 8.1.2** Notwithstanding the above provision, the departmental medical practitioner may direct any person undertaking work involving asbestos to have a medical examination.
- 8.1.3** While the employee remains in the employment of the employer:
- (a) The employer shall ensure that the employee has a medical examination in accordance with the schedule in appendix 2; and
  - (b) The cost of the medical examination shall be met by the employer.

### 8.2 Personal medical information

- 8.2.1** 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 Occupational Safety and Health Service of the Department of Labour encourages employees to share their medical information, where appropriate, with the employer.
- 8.2.2** Where an employee leaves the employer should ensure that the employee is aware of the need to continue with the schedule of medical examinations set out in appendix 2.
- 8.2.3** All medical records relating to asbestos should be retained by the employee for a period of 40 years.

## **8.3 Medical examinations**

- 8.3.1** The asbestos medical examinations shall be performed by qualified medical practitioners with specialist qualifications in occupational or respiratory medicine and experienced in asbestos-related diseases and conditions.

## **8.4 Further medical investigations**

- 8.4.1** The employer bears the responsibility and the cost of further investigations where, in the opinion of the medical practitioner specified above, such further investigations are warranted because of the presence of markers of asbestos exposure or disease.

## **8.5 Asbestos Exposure Register**

- 8.5.1** Employees who may have been exposed to asbestos should ensure that their names and appropriate details are entered in the Asbestos Exposure Register administered by the Occupational Safety and Health Service of the Department of Labour.

# ■ RECOMMENDATIONS FOR WORK WITH ASBESTOS RESPIRATORY PROTECTION EQUIPMENT

## Introduction

Good occupational hygiene practice requires that all practical efforts be made to prevent asbestos dust from entering the air of the place of work. In circumstances where it is impracticable to prevent asbestos from entering the atmosphere, suitable respiratory protective equipment must be worn.

This appendix provides guidance on the suitable respiratory equipment available for this purpose. Suppliers of this equipment will be able to provide evidence that the device being purchased or used has been approved to an acceptable standard as set out in this appendix.

## General

Respirators to protect against asbestos can be grouped into three main types:

1. Half facepiece air purifying.
2. Full facepiece air purifying, including powered air purifying.
3. Air line respirator, including self-contained breathing apparatus.

There are two ways of providing personal respiratory protection against contaminants such as asbestos:

1. Purifying the air taken from the working environment; or
2. Supplying the person with good-quality air from outside the working environment.

The three main factors that influence the degree of protection afforded by a respirator are:

1. The filter type,
2. The respirator face fit, and
3. The pressure within the respirator.

A respirator described as “positive-pressure” is one in which the air pressure inside the facepiece is positive (or greater) than the air pressure outside during exhalation and inhalation, because air is supplied.

A “negative-pressure” respirator is one where the air pressure inside the facepiece during inhalation is negative (or less) than the air pressure outside.

## Respirator Protection Factors

Respirator Protection Factors (RPFs) are used to assist in the correct selection of respirators according to the characteristics of the hazards involved, the capabilities and limitation of the respirator, and the fit of the respirator on the person.

The RPF is a measure of the degree of protection provided by a respirator to a wearer. This is defined as the ratio of the concentration of air contaminant outside the respirator to that inside the respirator. To assist with the decision, this appendix contains a list of asbestos levels likely to be encountered in different work activities.

Respirators are arranged in three classes representing three different respiration protection factors (RPFs). The choice of factors depends on the circumstances for which it is being used. The RPF is that assigned to the respirator by the Standard or approving authority, as the case may be. The RPF depends upon the device being properly fitted and the wearer being instructed in performing facial fit checks in accordance with AS/NZS 1715:1994 *Selection, use and maintenance of respiratory protective equipment*.

## Selection of appropriate respiratory protective equipment

The degree of respirator protection required for asbestos work is determined by the nature of the work, the type of asbestos, the work method, and the potential for exposure to dust.

Because of the variability of contaminant and the unpredictability of asbestos levels, people requiring respirator protection for asbestos work are encouraged to use the highest level of protection while taking into account economic and practicability factors (AS/NZS 1715:1994 provides further advice).

In selecting the correct equipment, the following factors need to be considered:

1. The maximum levels of asbestos dust likely to be encountered.
2. The RPFs of the chosen respiratory equipment.
3. The nature of the work the wearer is to undertake.
4. Personal requirements of the wearer, e.g. facial hair, glasses.

NOTE: The degree of protection is governed by the type of filter and facepiece type, and the effectiveness of the individual facial seal each time the device is put on. Significant leakage will occur if facial hair passes under the seal.

## Standards for respirators

All respirators which fall into the three classes by general description must comply fully with one of the following standards:

- NIOSH/MSHA (National Institute for Occupational Safety and Health/Mine Safety and Health Administration, USA)
- CEN (European Committee for Standardisation)
- AS/NZS 1716:1994 (Joint Australian/New Zealand Standard).

To maintain consistent quality, each of these standards refers to ongoing quality assurance programmes which facilitate compliance with performance standards. In addition, the relevant statutory authority in the country of origin will generally approve devices on the understanding that this process is adopted.

Each standard states that, to comply with the standard, assembled respirators shall consist of components which have been tested as a system. The use of components other than those tested as a system is to be discouraged because performance and efficiency may be compromised.

## Classes of respirator

### CLASS I

#### Type of respirator

Half facepiece respirators, negative pressure, disposable, or replaceable particulate filter devices (these devices will have a minimum of Class P1 or Dust/Mist filters).

Devices must comply with NIOSH/MSHA, CEN or AS/NZS 1716:1994 *Respiratory protective devices*.

#### Job

Simple short-term bulk sampling. **Hand work** only on materials such as asbestos cement or gaskets containing asbestos.

#### Assigned respirator protection factor

Up to 10 x Workplace Exposure Standard

### CLASS II

#### Type of respirator

A. Full facepiece negative-pressure particulate respirators with Class P3 or HEPA (High Efficiency Particulate Air) filters.

B. Full facepiece powered air purifying particulate respirator with Class P3 or HEPA filters.

Devices must comply with NIOSH/MSHA, CEN or AS/NZS 1716:1994.

#### Job

Effective wet stripping of asbestos. Power tool use on asbestos cement and similar products; clearance monitoring or entry into asbestos removal work area. Moderately dusty work.

#### Assigned respirator protection factor

100 x Workplace Exposure Standard.

### CLASS III

#### Type of breathing apparatus

Full facepiece airline positive-pressure respirator with a tightfitting facepiece operated in continuous, or pressure demand, mode with filtered air. This class also includes positive-pressure self-contained breathing apparatus.

The purity, quality and quantity of the air supply shall comply with Appendix A of AS 1715:1991. The air intake to the compressor must be sited in an uncontaminated atmosphere.

Devices must comply with NIOSH/MSHA, CEN or AS 1716:1991.

**Job**

Dry removal of asbestos, ineffective wet stripping. Asbestos work in confined spaces.

**Assigned respirator protection factor**

1000 x Workplace Exposure Standard.

## **Asbestos levels associated with typical materials and activities**

Respirable dust testing carried out in New Zealand during the past 10 years allows some generalised comments to be made on dust levels normally found in common industrial situations. The figures in the following table are for **guidance only**. It is important to realise that abnormal conditions may lead to higher (or lower) levels than those indicated. In the table > means “more than”, < means “less than”. All figures are expressed as respirable fibre per millilitre of air (f/ml).

NOTE: Because the level of fibre in air cannot be accurately assessed in each case, and differences in operation may lead to higher levels than quoted, the level of respiratory protection should always be assessed on the high side or worst case scenario.

	<i>Typical value</i>	<i>Extremes likely to be encountered</i>
<b>Insulation</b>		
Removal of moulded laggings	< 2	0 - 10
Chrysotile millboard, cutting, etc.	1 - 2	0 - 20
Handling asbestos cloth	< 1	0 - 2
Handling asbestos string	< 2	0 - 2
Removal of woven laggings	< 2	0 - 10
Sprayed amosite, removal wet	5 - 20	up to 100**
Sprayed amosite, removal dry	-	up to 300
Sprayed crocidolite, removal dry	5 - 20	up to 100**
Sprayed chrysotile, removal wet	5 - 20	up to 100**
Sprayed chrysotile, removal dry	-	probably 100
Stripping asbestos-covered wire	< 2	-
Cutting/sawing amosite-bearing insulation (Marinite, etc.)	0 - 2*	100
<b>Asbestos cement products</b>		
Cutting etc. dry (power tools)	0 - 2*	up to 20
Cutting etc. wet (power tools)	< 1	up to 10
Construction work (outside)	< 1	up to 10
Cutting A/C with hands tools	< 1	1
<b>Ambient air below sprayed insulation</b>		
Chrysotile, amosite	usually 0.1	0.1
Crocidolite	usually 0.1	occasionally 0.2 - 1
<b>Friction products</b>		
Cutting, finishing, radius grinding, etc.	normally 1	0 - 10
Changing filter bags	10	100
Handling friction materials (pads etc.)	< 0.5	2
Dry sweeping	0 - 2	-
<b>Handling raw asbestos</b>		
Chrysotile, amosite	2 with care*	
<b>General</b>		
Handling talc (may contain minor tremolite)	< 2	-
Cutting gaskets	< 2	-
Cutting greenstone (associated with tremolite)	< 2	-
Handling/quarrying serpentine (with minor chrysotile)	< 2	possibly up to 100 if conditions very dusty
*Assumes some form of extraction equipment.		
**To achieve low levels, extraction equipment in the room and good work practices will be required.		

## ■ MEDICAL MONITORING (SCHEDULE)

Any employer directing employees to undertake restricted work shall ensure that:

- (1) The employee has full occupational history, medical examination, chest X-ray (AP and lateral) and lung function tests (FEV<sub>1</sub> and FVC) (hereafter referred to as a "full asbestos medical") within one month of starting employment in the restricted activity.
- (2) The employee shall have this asbestos medical thereafter according to the following schedule.

Year after commencing employment	Medical required
1	The employer shall ensure that the employee has an adequate knowledge of the hazards faced and precautions required. This knowledge can be judged by an occupational health nurse. A sample of the knowledge required is included in the Appendix 1.
5	Full asbestos medical examination
10	Full asbestos medical examination
15	Full asbestos medical examination
18	Full asbestos medical examination
20	Full asbestos medical examination
thereafter every two years	Full asbestos medical examination

- (3) The cost of the examination shall be the responsibility of the employer.
- (4) The personal medical information 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.
- (5) Where an employee leaves restricted work, the employer should ensure that the employee continues with the above schedule of medical examinations.
- (6) These asbestos medical examinations shall be performed by qualified medical practitioners with specialist qualifications in occupational or respiratory medicine and experienced in asbestos-related diseases or conditions.
- (7) Those employees handling asbestos materials, but not involved in restricted work, should undergo the same regime of asbestos medical examinations by the same suitably qualified people.
- (8) The personal medical information of the employee undertaking non-restricted asbestos work 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 Occupational Safety and Health Service of the Department of Labour encourages employees to share their medical information, where appropriate, with the employer.

- (9) In both restricted and non-restricted asbestos work the employer bears the responsibility and the cost of further investigations where, in the opinion of the medical practitioner specified above, such further investigations are warranted because of the presence of markers of asbestos exposure or disease.