

Asbestos Management Guidelines

Executive Summary

Asbestos has a number of uses in building construction, mainly insulation. It can be found in lagging and fire retardant materials. All forms of asbestos are confirmed cancer causing materials, mostly affecting the respiratory system. Diseases caused by asbestos may not show for 10 to 50 years after exposure.

The most dominant usage of asbestos in the Pacific, is in asbestos cement sheeting used for building materials, and to a much lesser extent, insulation around boilers and associated pipes. Asbestos release occurs when the material has been damaged or when buildings are being demolished.

Asbestos disposal is mostly through uncontrolled dumping at illegal dumping sites across small Pacific Island Countries and also in controlled burial sites, generally without the proper measures in place. This is not suitable and proper management is needed when disposing of asbestos, to protect people from further exposure to asbestos fibres.

Special precautions need to be taken when removing asbestos from a building. Sampling is required (Refer Section - Asbestos Sampling) and depending on the type of asbestos, extensive removal measures may be required.

All forms of asbestos should be handled only by persons wearing the appropriate PPE (Personal Protective Equipment). Friable asbestos requires full disposable body protection suits and respirators with the correct filters, gloves, boots etc. (Refer section - Personal Protective Equipment.) A decontamination unit will need to be constructed to set up a negative air atmosphere (Refer section - Decontamination Unit) and wetting agents will be needed to ensure asbestos release is minimised (refer section - The Removal).

Asbestos should be wrapped in plastic, disposed to a secure landfill and covered with at least one metre of soil. (Refer section - Disposal).

Introduction

Asbestos is the generic name used for a group of naturally occurring mineral fibres. Common forms of asbestos include amosite (brown), anthophyllite (grey), chrysotile (white) (shown in Figure 1) and crocidolite (blue).



Figure 1:
Chrysotile fibre

Asbestos is commonly used for its insulation and chemical resistant properties and may be found in lagging and fire retardant materials including:

- Insulation (Pipe, boiler, and block insulation; sprayed-in insulation; electrical wiring insulation)
- Fireproofing and acoustical texture products such as decorative plaster, fire blankets and fire doors,
- Spackling, Patching & Taping Compounds (includes caulking, putties, joint compounds, adhesives, tapes, thermal taping compounds),
- Asbestos-cement pipe and sheet material,
- Tiles, wallboard, siding and roofing (includes roofing shingles, roofing felt, base flashing, cement wallboard, cement siding, ceiling tiles and lay-in panels, asphalt floor tile, vinyl floor tile, vinyl sheet flooring, flooring backing, vinyl wall coverings),
- Vermiculite (used in some horticultural potting mixes, brake pads),
- Asbestos may also be found in elevator brake shoes, elevator equipment panels, ductwork, electrical panel partitions, electrical cloth, cooling towers, and chalkboards,
- Asbestos has been used in home appliances (coffee pots, toasters, irons, popcorn poppers, and crock pots). Until 1980, handheld hair dryers commonly contained asbestos also.

These are but a small sampling of the thousands of products that contained asbestos.

Health and Environmental Impacts

The asbestos fibres are capable of remaining in animal tissue for months. All forms of asbestos are confirmed cancer causing materials, mostly affecting the respiratory system. Breathing in asbestos may cause damage to the lungs and chest cavity, and cause scarring. Scarring of the lungs is referred to as asbestosis, or mesothelioma, which is a severe form of lung cancer. Cancer of the lung and chest cavity and is inevitably fatal. These diseases may not form for a long period of time and may not show for 10 to 50 years after exposure.

Asbestos fibres are very stable in the environment and do not evaporate, dissolve in water or break down over time.

Present Situation

Cement-asbestos water pipes and materials have been a widely used building material in past years. Asbestos release occurs when the material has been damaged or when buildings are being demolished.

The most dominant usage of asbestos in the Pacific, is in asbestos cement sheeting and to a much lesser extent, insulation around boilers and associated pipes. Asbestos has previously been found as wrapped rope or sprayed on adhesive type substances around boilers. Fibrolite is the most common asbestos fibre used and can be found in constructions erected prior to 1980. Buildings constructed after this time may possibly still contain asbestos containing materials.

Some products which have used asbestos in the manufacturing process include:

Asbestos cement products:

Fibrolite (1972 – 1982)

Durock (up to 1974)

Coverline or Highline profiled sheets (1972 – 1982)

Hardiflex or Hardiplank (1982); New Hardiflex (1982 - present)
does not contain asbestos

Harditherm (1972 - 1982)

Duratherm (up to 1974)

Decorative coatings :

Glamortex

Whispar

Asbestos disposal is mostly through uncontrolled dumping at illegal dumping sites across small Pacific Island Countries and also in controlled burial sites, generally without the proper measures in place. This is not suitable and proper management is needed when disposing to protect people from further exposure to asbestos fibres.

Safe Handling

The only type of asbestos material that may not require the use of PPE is non-friable asbestos, and only if this material is not being cut in some form. PPE should be worn, however, for the removal of non-friable building materials.

All forms of friable asbestos should only be handled by persons wearing the appropriate PPE (Personal Protective Equipment) ie. full disposable body protection suits and respirators with the correct filters, gloves, boots etc. This equipment should be purchased by specialist safety gear suppliers (refer to contacts list for suggested suppliers).

Undesirable Practices

- ✘ Resale of asbestos construction materials after removal,
- ✘ Exposure of asbestos to persons that are not wearing appropriate PPE.

Desirable Practices

- ✘ removal of asbestos that is a health risk to building occupants, in a safe manner that does not liberate significant quantities of asbestos fibre,
- ✘ wrapping of wet asbestos in plastic sheeting,
- ✘ immediate disposal and coverage of wrapped asbestos to a secure landfill.

Management Options

Asbestos in most situations should be removed from buildings, as it is likely to have been damaged in sections since it was installed, probably decades ago. Asbestos can remain in buildings and not be detrimental to the health of occupants, in some circumstances. A risk assessment should be conducted to ensure that no harm is likely to building occupants if the material is left to remain. If there is no-one capable of doing a risk assessment, specialist advice should be sought through the national Health and Labour Department, SPREP, OSH New Zealand, NOHSC Australia, specialist consultants or the laboratories referenced later may be of some assistance.

Asbestos Sampling

The presence of asbestos-containing material (ACM) cannot be determined by visual inspection alone. This is why testing is necessary.

Testing of asbestos can be undertaken in two ways, by direct measurement of materials or by air sampling. The latter method is an effective method of determining the concentration of asbestos that building occupants are exposed to, but requires the use of calibrated air sampling pumps which are not readily accessible by most Pacific Island countries.

Before obtaining a sample of asbestos, the purpose and approach to sampling should be discussed with the laboratory where the samples will be sent. A list of laboratories that are accredited to conduct asbestos material sampling is detailed in the contacts section of this guideline.

- The advice of the laboratory should be followed,
- Asbestos in some materials may not be uniformly distributed and composite samples may be needed. Laboratory advice should always be obtained prior to sampling,
- Friable asbestos may release significant numbers of fibres during sampling so at least a half-face respirator should be worn whilst conducting sampling,
- Wet the material to be sampled with water,

- Take a representative quantity of about 10 grams, disturbing the sample as little as possible. (A core sample may be required for sprayed or trowelled insulation. Preferably use a single-use sampler that also acts as a container – such as an acrylic tube, about 12 mm width and 100mm long, beveled to a cutting edge at one end with fitted caps.) It is common practice for the laboratory undertaking the analysis to supply the correct sampling containers, so prior contact is recommended.
- Label with a unique number and place in a clean plastic bag; seal and protect from physical damage by packing,
- Keep a record of the number and corresponding accurate location of where the sample was taken from (also known as a sample record),
- Clean debris with wet cloth and discard in a plastic bag; seal material with paint or core hole with a sealant,
- Send to the laboratory.

Information that should be sought from the laboratory includes:

- presence of asbestos,
- types of asbestos,
- the methods used in examination.

The laboratory may be able to offer an opinion on the approximate portions of asbestos in the sample if requested. If asbestos is 1% or greater by mass, the material is considered to contain asbestos, although this level is dependant on the type of asbestos and is usually much lower than 1%.

Particular care needs to be taken when removing asbestos from around air conditioning systems, as an open air duct can quickly spread asbestos fibres throughout the building.

Once it is established that ACM exists in the building materials and poses a health risk to occupants, the asbestos should be safely removed.

Non-Friable Asbestos

Non-friable asbestos has been mixed with cement or other hard bonding material and includes materials such as flat and corrugated asbestos cement sheeting, asbestos cement pipes and pump and valve packings. Removal work on non-friable asbestos will generally be outside as it is an exterior wall cladding and has more applications with use outdoors.

Preparing for Removal

The area should be contained ie. roped off to restrict access, and appropriate measures taken to minimise spread of asbestos during removal ie. covering vegetable gardens.

So long as non-friable asbestos sheets are maintained in good order and are not damaged with grinding tools, they are unlikely to present a health risk.

If the material needs to be cut, respiratory equipment should be worn: either a disposable respirator or a half mask fitted with dust filters appropriate for respirators. When working with non-friable asbestos non-powered hand tools should be used such as saws and screwdrivers to reduce the liberation of asbestos dust and fibres. The material should still be wetted down whilst being cut open and high powered water jets should not be used to avoid spreading asbestos waste. Cement-asbestos sheeting for roofs should not be wetted if this creates a risk of a worker slipping.

The sheeting should be lowered to the ground and not dropped. All asbestos sheeting should be kept wrapped in plastic and removed from the site by a covered vehicle. Any remaining asbestos materials and dusts should be removed by vacuum if necessary. It is important to be aware that asbestos roofing can be brittle so can shatter very easily and without warning under a person's weight. For this reason it is important that workers be careful and take the appropriate precautions when removing roof sheeting. Numerous deaths have been recorded from workers falling through brittle asbestos roofs.

Work on asbestos should be conducted in a well ventilated area or outdoors. The use of a plastic drop sheet should be used underneath materials that are being cut to pick up fallen pieces of asbestos materials or the use of a vacuum cleaner afterwards. The material should then be disposed of as asbestos waste.

Friable Asbestos

Asbestos-containing material (ACM) must first be treated with a solution of water and a wetting agent (50% polyoxyethylene ester and 50% polyoxyethylene ether) to reduce fiber release. Some types of amosite-containing materials will not absorb either water or water combined with the wetting agent. In this case other wetting agents should be tested on the material for absorption. If the material will not absorb the wetting agent, undertake a dry removal using Class 3 respiratory protection (refer Table 1). Wetting agents can be sourced from suppliers of industrial chemicals rather than laboratories (the latter will possibly provide a more expensive option).

Preparing for Removal

All movable items (eg. furniture) should be removed from the area. Any immovable items should be covered with suitable plastic and tape so that they are separated from the area. Other contractors and people should not be allowed in the vicinity of the asbestos removal work while it is being done.

Where operations may liberate asbestos fibres, all persons in the removal area should wear respiratory protective devices approved for asbestos. Warning signage detailing "Asbestos Hazard Area, Keep Out" should be

placed at entrances of the removal area. These signs should be clearly visible.

In order to prevent the escape of airborne asbestos fibres, the area to be remediated must be completely sealed with plastic sheeting and an exhaust extraction fan must be located so as to create a negative pressure of 12 pascals. Sometimes it is difficult to measure this level, so a good measurement is when there is visible inwards billowing of the plastic sheeting. The air passing through this filter needs to go through a High Efficiency Particulate Air (HEPA) filter to remove asbestos fibres, and the exhaust fan should discharge to the outside of the building. Consideration needs to be given to emergency lighting, exits and fire fighting in case of emergencies during the operation so that the area is not unnecessarily restricted. Any fire alarms and electrical wires should be clearly located and marked to prevent injury to workers undertaking the operations.

At the beginning of each working period, an inspection should be carried out to ensure there is no holes in the plastic containment barriers. Any defects should be fixed before work commences.

The requirement to set up a completely enclosed area subjected to negative air pressure should only be waived in the case of removal of very small amounts of friable asbestos, and considerable care should then be taken to ensure complete containment of the asbestos being removed. The room will need to be enclosed by taping up doors and openings, furniture and objects should be removed.

Protective clothing should remain within the contaminated environment and should be disposed as asbestos contaminated waste to prevent release.

Decontamination Unit

In all cases, where it has been deemed necessary to totally enclose the removal area, a decontamination unit of at least two compartments should be used. One compartment should be a dirty storage area where:

- a) contaminants are removed from clothing, footwear and respirator with a hand held shower and
- b) storage of contaminated clothes and footwear.

The clean area should be where:

- a) clean respirators are kept,
- b) a shower is available,
- c) clean clothes can be stored, and
- d) clean and dirty towels are stored separately.

Airflow should be directed from clean area to dirty area to the asbestos removal area.

The Removal

Spray Method

This method is used in instances where only small amounts of asbestos to be removed and the following conditions apply:

- the asbestos based material is not covered with calico or metal surfacing which requires prior removal,
- there is no reinforcing or wire or similar restrictions,
- the asbestos is not coated with paint or other substance,
- where rapid temperature drop could cause damage to heated metal components,
- where no electrical conductors or electrical equipment is present which could be damaged by water.

The spray should be applied so that there is sufficient water to wet the asbestos material but enough to create minimal runoff. A manually controlled low pressure spray such as an adjustable pistol grip garden hose is well suited for this purpose. The amount of water should be enough to soak the material through but not enough to produce dust from the water droplets hitting the material.

When using cutting equipment the spray should be directed to where the material is being cut and the wetted material be removed as the cut progresses. The removed material should be placed in containers and labeled, typically 6mm polyethylene bags.

Soaking Method

The quantity or thickness of asbestos might be so extreme that the spray method may not be sufficient to adequately suppress asbestos fibres. In this case, water should be introduced through applicators such as a hose with many holes along its length. Water should be fed into the insulation by the holes in the hose.

The following steps should be followed.

1. Where the asbestos is covered with cloth, mastic or other similar materials, loose dust should be removed with either a vacuum cleaner or damp cloth.
2. Where cladding has to be removed, this should be done so carefully, with constant vacuum cleaner usage. If practical, water should be used.
3. Holes or cuts should be made in the outer covering of the asbestos so that water can be fed into the insulation. Slow saturation from the metal interface outwards is an effective way of wetting the material.
4. The wetted material should be removed in sections and placed in containers and labeled, typically 6mm polyethylene bags.

Dry Method

This method is the least desirable out of the spray and soaking method and should only be used if the other methods cannot. An example when the dry

method should be used is when electrical appliances or equipment could be permanently damaged or make working with water dangerous.

This method involves the removal of asbestos without using any wetting agents.

Other Removal Issues

Cutting through the finishing compound and the reinforcing wire in the lagging can generate large amounts of asbestos dust. Care needs to be taken in the selection of tools used in this operation and should enable the asbestos to be cut in small sections.

All tools and electrical equipment used in the removal works, should remain in the contaminated area and be cleaned using a damp rag. Any equipment that needs to be opened should be opened inside the contaminated area. If decontamination is not possible it should be removed and discarded as asbestos waste.

After the equipment has been removed, the area should be vacuumed carefully. Once the work is completed the vacuum cleaner must go through appropriate decontamination procedure. The plastic used for sealing needs to be removed and not reused again. Ensure that the plastic is folded inwards and discarded as asbestos waste. After the sealing plastic has been removed the safety signs are then able to be taken down.

If friable asbestos has been removed, the plastic should be removed and the work regarded as completed only when clearance monitoring has demonstrated that the work is complete. There are specific limits which must be achieved to gain clearance. Refer to the Australian and New Zealand Asbestos Guidelines for clearance limits.

Personal Protective Equipment

Respiratory Protection Devices (RPDs)

The type of respirator required is dependent on how the asbestos will be removed. Refer to Table 1 to determine the type of breathing apparatus that is needed for the work being undertaken. There is an Australian Standard available called "AS 1715 Selection, use and maintenance of respiratory protection devices" which can be obtained for more information on the selection of appropriate respirators.

Table 1: Outline of breathing apparatus types and where they should be used.

Class 1	Half face piece respirator, negative pressure, disposable or replaceable filter particulate devices (must have a class P1 dust filter)
	Appropriate for handwork on materials such as asbestos cement or gaskets containing asbestos

Class 2	Full face piece negative pressure particulate respirators with Class P3 or HEPA (High Efficiency Particulate Air) filters Full face piece powered air purifying particulate respirator with Class P3 or HEPA filters
	Effective wet stripping. Power tool use on asbestos cement. Moderately dusty work.
Class 3	Full face piece positive air pressure respirator with a tight-fitting facepiece. Also includes positive pressure self-contained breathing apparatus.
	Dry removal of asbestos. Ineffective wet stripping. Asbestos work in confined spaces.

When conducting asbestos removal work, the risk needs to be identified to the workers and appropriate respirators need to be chosen. The workers need to be aware of the correct usage and importance of the devices as well.

- a) Good Fit: A respirator needs to be chosen which has a good close fit to the face of the worker.
- b) Good Seal: Some respirators may not be suitable for all workers as it will not form a good seal around the face. The presence of facial hair or spectacles can inhibit the achievement of a good seal around the face.
- c) Freedom of Movement: Workers need to be able to freely move whilst wearing the respirator.
- d) Thermal Stress: Asbestos removal work is usually conducted in hot environments. Workers need to be prepared that discomfort is likely. Air supplied respirators are generally cooler but are more costly. If necessary, ice packs can be worn, and frequent rests are necessary.

RPDs need to be maintained regularly and cleaned and dried after every use. The condition of the valve, diaphragm and facepiece needs to be checked to ensure no maintenance is required.

Protective Clothing

While working with asbestos, protective clothing:

- must be composed of material that does not allow penetration of asbestos fibres ie. nylon or treated synthetic material,
- covers the body, including the head, and fits snugly at the neck, wrists and ankles, and,
- must be maintained in good condition and any defects remedied immediately.

Disposable overalls are recommended for use in asbestos work, although overalls made from light, synthetic material and cotton overalls can be used. Special cleaning is required for the latter two types of overalls and more information on this should be researched in *Guidelines for the Management and Removal of Asbestos*.

There are no particular health reasons that workers should wear gloves, although those who work a lot with asbestos should wear gloves to prevent asbestos corns or warts.

The team responsible for asbestos removal needs to be aware of the strict requirements regarding safe management and removal. This includes the areas of ACM, worker protection, work area containment and post-abatement cleanup.

Disposal

Asbestos waste is sometimes spilled both in and outside the work area. Containers full of wet material are very heavy and hard to transport. These containers must be sealed and handled carefully. Workers should continue to wear protective equipment during these operations. The best way to seal asbestos waste is by wrapping in large amounts of relatively thick plastic. There should be no openings in the plastic to enable the release of asbestos fibres. The wrapped asbestos should then be transported to the country's landfill disposal facility for immediate dumping.

At the dump, a special area away from municipal solid waste should be designated for this waste. This is particularly important where scavengers are present, which is the case for many waste sites in Pacific Island Countries. A hole should be prepared before the waste enters the site and the waste should be placed in the hole upon arrival. Placement of the wrapped asbestos inside the hole, minimizes the movement of the waste and hence the risk of tearing the plastic open and exposing the asbestos. The asbestos should then be covered with at least a one metre layer of earthen material (or clean fill) to further seal the asbestos.

Care should be taken when excavating in the vicinity of this area to prevent exposing the asbestos again (and tearing the plastic seal open). The burial area should be clearly marked with warning signs to ensure this does not happen.

Safe Storage Facility

Storage of asbestos is not recommended and the waste asbestos should be taken immediately to a dumpsite for disposal. Storage is not recommended as double handling of the material will only increase the risk of incidents and health hazards. If temporary storage (up to a few days) cannot be avoided, the asbestos must be left wrapped in plastic in a secure area and clearly labeled so as to indicate the hazardous nature of the contents.

Economics

Expect to pay around AU\$50 to \$150 or NZ\$70 for a single sample for asbestos analysis for building materials, plus shipping and handling costs.

Indicative PPE costs for working with asbestos are provided in Table 2.

Table 2: Indicative prices for asbestos removal equipment.

Equipment	Description	Cost
Coveralls	Disposable coveralls with hood	NZD\$9
	Disposable overalls (tyvek) are complete overalls with hood, down to ankle	AUD\$7.30 – NZD\$12
Masks	P1 rated disposable masks (Box of 12)	NZD\$32.50
Respirator	1/2 Face respirator (non-disposable) - 3M including 2 HEPA filters	NZD\$52.80

Further Information

Useful websites for more information containing a number of publications on safe asbestos management and removal include:

?? www.osh.dol.govt.nz

?? www.nohsc.gov.au

Laboratories

Australia

These laboratories are NATA certified (National Association of Testing Authorities) which means they have accreditation to be doing tests for Asbestos including Polarised Light Microscopy with dispersion staining techniques which is required for core samples of asbestos materials.

- ?? ESP Environmental and Safety Professionals,
- ?? Australian Safer Environment & Technology Pty Ltd,
- ?? Noel Arnold & Associates Pty Ltd
- ?? Pickford Consulting Pty Ltd
- ?? HLA-Envirosciences Pty Limited
- ?? WorkCover Authority of NSW

New Zealand

- ?? Dowdell and Associates Ltd
- ?? Capital Environmental Services Ltd