For Homeowners, Building Workers And Property Owners.

Asbestos, A Practical Guide

The Author's Website

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About the author.

I am a retired builder with a large amount of experience fixing fibrous asbestos cement products and then later removing them. My first job in Australia in 1964 was as a journeyman carpenter cladding timber frame houses in NSW. We called it cottage work in those days and we clad them inside and out, walls and ceilings with fibrous asbestos cement sheeting (FAC) that we called "Fibro" for short. My last job with asbestos was a removal in 2003 thirty nine years later.

As a subcontractor in NSW and QLD and as a main (general) contractor in the NT, I have fixed various asbestos products inside and outside of homes up until the period that it was phased out in the mid to late 1980's and early 1990's.

In 1995 I was issued an asbestos removal license (43133) by the Northern Territory Work Health Authority, and did many asbestos removal jobs, complying with Australian Work Health (OH&S) Regulations and the NOHSC National Code Of Practice For The Safe Removal Of Asbestos.

PrefaceThis book is intended as a guide for people who live in homes that may contain asbestos and as a guide for people who may be considering buying a home that may contain asbestos.

It is intended to help building contractors, tradesmen and the DIY involved in renovations and remodeling work on older houses and to give them a good basic knowledge of this subject.

Commercial property owners and organizations using older properties should be aware of their obligations when leasing buildings that may contain asbestos. There is much information of interest to them here, but the specifics are not gone into any great detail on this subject .

While my experience is based on Australian conditions and regulations I know that the same types of materials were used world wide and similar legislation regarding working with asbestos containing materials exists elsewhere. Rather than going into the specifics this book is intended to give a feel for the general intent of asbestos regulations and to provide practical hands on advice to homeowners and workers.

Disclaimer

This book is presented for information only. I make no guarantee that it is either complete or accurate in total or in part. The material here is presented as an overview and as advice only.

For information relating to legal or medical matters relating to asbestos use, contact the relevant specialists.

I do not accept any responsibility or liability for any expenses, losses, damages and costs you might incur as a result of the information here being inaccurate or incomplete in any way, and for any reason.

Regulations breed like rabbits and there is no way that I can give specific advice for any particular jurisdiction. It is up to you to check with your local authuries regarding for specific details before proceding with any work involving asbestos containing materials.

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1 Glossary of Asbestos Related Terms and Acronyms.

Adequately Wet	When using the wet method of ACM removal, to wet the material sufficiently to prevent the release of particulates.
AIB	UK term, asbestos insulation board.
Air Monitoring	The sampling of airborne asbestos fibres. A method of checking the effectiveness of asbestos control measures. There are three categories. 1. Exposure monitoring 2. Control monitoring 3. Clearance monitoring.
Air-line respirator	A respirator which is fed breathable air from a compressor at greater than normal atmospheric pressure via an air line.
Amphibole Asbestos	It has two sub-types of commercial significance. 1. Crocidolite, is blue in colour and is often referred to as Blue asbestos. The most hazardous of the amphibole asbestos family 2. Amosite, gray to gray-green in the rock, cloudy gray when processed. Sometimes brown and hence called Brown Asbestos. Second only to Crocidolite in toxicity.

Asbestos	The fibrous form of mineral silicates belonging to the serpentine and amphibole groups of rock-forming minerals. Comprising:- • Actinolite, Amosite (brown asbestos) • Anthophyllite • Chrysotile(white asbestos) • Crocidolite (blue asbestos) • Tremolite Or any mixture containing one or more of the mineral silicates belonging to the Serpentine and Amphibole groups.
Asbestos Abatement	A term for the removal of asbestos containing materials from structures.
AC Asbestos Cement	Cement and sand products reinforced with asbestos fibres.
ACM Asbestos Containing Material	Any material, object, product or debris that contains asbestos.
Asbestos Removal Control Plan	A documented list of the measures to be taken to control the risks to workers and others while asbestos removal work is being undertaken. It is specific to each individual work site.
Asbestos Removal Site	The asbestos work area and the surrounding adjacent area. The area around the work area that could possibly have a risk of asbestos exposure.
Asbestos Removalist	A person who performs asbestos removal work. Small amounts of bonded asbestos (in certain jurisdictions) may be removed by any person deemed competent. Larger amounts of bonded ACM and friable asbestos require that the person to be licensed as being competent to remove asbestos.
Asbestos Vacuum Cleaner	A vacuum cleaner that is used specifically and only for asbestos removal work. Fitted with a HEPA Filter

Asbestos Waste	All ACM and all items and materials that have come into contact with ACM during asbestos removal works. It includes but is not restricted to:- 1. Worker's disposable respirators and coveralls. 2. Plastic drop sheeting, screening and masking materials. 3. Disposable rags and wipes. 4. Disposable primary waste containers, ACM plastic bags. 5. Any removed timber or other material that the ACM was fixed to and has the potential to hold asbestos fibres.
Asbestos Work Area	The immediate area of removal work; with restricted access, well defined boundaries with barriers and clear signage. Determined by a risk assessment by a competent person.
Asbestosis	An asbestos related disease, a build up of scar tissue in the lungs.
Breathing Zone	The immediate space in front of a person's face from which air is inhaled. A 300 mm hemisphere extending forwards from an imaginary line passing through a person's ears
Class H Vacuum Cleaner	UK term for a cleaner that conforms to various standards for working with asbestos.
C Ceiling Limit	USA, OSHA terminology. An airborne concentration of a toxic substance in the work environment, which should never be exceeded.
Chrysotile Asbestos	The type of asbestos used in Fibrous Asbestos Cement materials. Occurs in the base rock serpentine. It is green in its natural state. When it is processed, (it's fibres separated), it becomes gray in colour.
Clearance Inspection	A visual inspection by a competent person when asbestos work has been completed to verify that the area is safe to be returned to normal use. This has to be done when the work area is dry, and it may also include clearance monitoring and dust sampling.
Clearance Monitoring	Monitoring of a work area after the work is completed to measure the levels of airborne asbestos fibres, using static or positional monitors set up at average head height. In the Australian Code an area is deemed to be "cleared" if the airborne fibres are found to be less than 0.01 fibres per ml.
Client	A "person in control" of a property who commissions Asbestos Removal Work.
Competent Person	A person who is deemed capable of supervising the safe performance of the specified work. The person's qualifications may be gained by training, knowledge and past experience. In most jurisdictions the person holds the relevant licenses.

Control Level	The airborne concentration of asbestos fibres which, if exceeded, indicates a need to implement a control, action or other requirement. The first Control Level for Asbestos is set at 0.01 fibres/ml of air.
Control Monitoring	Air monitoring measures the level of airborne asbestos fibres in an area during work on ACM. It is used to check that any control procedures in place are working correctly.
CA Regs Control of Asbestos Regulations	UK term. Control of Asbestos Regulations 2006. The latest consolidation of Asbestos Regulations in the UK.
Dust and Debris	Small pieces, scraps, dust etc. of ACM that are visible to the naked eye and are heavy enough to settle on surfaces.
Exposure Monitoring	Monitoring of a person's exposure to asbestos fibres by various methods to make sure that the levels comply with NES. Samples are taken inside a person's breathing zone, often by fitting a filter holder on a worker's jacket lapel.
f/cc Fibers per cubic centimeter	Units of measurement for asbestos in air.
FAC Fibro	An Australian term which is shortened form of Fibrous Asbestos Cement. Now replaced by AC. Used in some trade names, e.g.. Fibrolite.
Fibro Cutter	A hand held shear tool used for cutting Fibro, or Fibrous Asbestos Cement.
Friable Asbestos	ACM that contains more than 1% of asbestos, which in a dry state can be a powder, or it may become crumbled and powdered by hand pressure.
Hazard	Anything at all that can cause sickness, injury or death.
HSE Health and Safety Executive	UK term. The UK government agency responsible for the regulation of almost all the risks to health and safety arising from work activity in Britain.
Health Surveillance	Regular health checks to monitor changes in a worker's health as a result of exposure to asbestos.
Hornblende	Another name for Amphibole Asbestos
Inaccessible Areas	Areas which are hard to get at such as wall cavities and the interiors of plant and equipment.
Latency Period	The period from initial exposure to a substance to the onset of the disease.
MFM Membrane Filter Method	A method for estimating airborne asbestos fibres
Mesothelioma	An asbestos related disease, a cancer of the lungs.

Method Statement	UK Government. In the Control of Asbestos Regulations. A statement of the proposed methods and control measures for particular work with ACM. Similar to the Australian Control Plan.
Mil, mil	An imperial system unit of measurement equal to one thousandth (1/1000) of an inch. A unit of length equal to 0.0254 millimeter. i.e. Polyethylene sheeting may be described as 6mil.
um, um Micron, or Micrometer	A metric system unit of length equal to one millionth (1/1000,000) of a meter, approximately 1/25,000 of an inch. i.e. Polyethylene sheeting may be described as 200um or 0.2mm
NESHAP National Emission Standards for Hazardous Air Pollution	US government standards from the us EPA dealing in part with asbestos issues.
NES National Exposure Standard	An Australian exposure standard governing the concentration of airborne asbestos fibres that details safe (in the light of current knowledge) worker exposure levels.
NIOSH National Institute for Occupational Safety and Health	US federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. Part of the Centers for Disease Control and Prevention in the Department of Health and Human Services.
NOA Naturally Occurring Asbestos	Almost aways in previously mined areas so the danger would be known to locals in the area. It has been said "There is no health threat if NOA remains undisturbed and does not become airborne". (US EPA web site).
Notification Period	The time period between lodging the relevant forms and control plan etc. and receiving authority to commence work with ACM .
OSHA Occupational Safety and Health Administration	U.S. Department of Labor. Quote:" *US The Occupational Safety and Health Administration, since its inception in 1971, aims to ensure employee safety and health in the United States by working with employers and employees to create better working environments.*"
PEL Permissible exposure limit	USA, An exposure limit that is published and enforced by OSHA as a legal standard.

Person with Control	In relation to buildings or premises, a person who has control of premises used as a workplace. The person with control may be: 1. The owner of the premises; 2. A person who has, under any contract or lease, an obligation to maintain or repair the premises; 3. A person who is occupying the premises; 4. A person who is able to make decisions about work undertaken at the premises; 5. An employer at the premises.
PPE Personal Protective Equipment	Equipment and clothing that is used or worn by a worker to protect themselves against workplace risks or hazards. It includes, face masks, respirators, coveralls, goggles, helmets, gloves, ear protection and footwear.
Plan of Works	UK Government. In the Control of Asbestos Regulations. The plan by which the licensed removal contractor will set out the transit routes, location of skip, enclosure,etc. in conjunction with the Method of Work. It is similar to Australian Control plan.
PLM Polarized Light Microscopy	A method of asbestos fibre analysis.
PACM Presumed Asbestos Containing Material	Any material, object, product or debris that is presumed to contain asbestos. PACM are treated exactly as if they had been tested and found to contain asbestos.
RACM Regulated Asbestos Containing Material	A term used by the US EPA for different categories of ACM. Includes both friable and non-friable ACM
RPE Respiratory Protection Equipment	Disposable or reusable masks hoods and other protective equipment to stop the inhalation of harmful fumes or fibres.
Respirable Asbestos Fibre	Asbestos fibres able to reach the gas exchange regions of the lungs. In Australian codes they are defined as fibres that are less than 3 um wide, more than 5 um in length and have a length to width ratio of more than 3 to 1.

Risk	The likelihood of a hazard causing harm to a person. In terms of asbestos risk it relates to illness or disease arising from exposure to airborne asbestos fibres.
SEM Scanning Electron Microscope	A method of asbestos fibre analysis.
Settled Dust Sampling	This is done after ACM are damaged or disturbed in any way. The sampling and analysis are an indication of cleanliness but not necessarily an indication of health risks.
Shadow Vacuuming	The technique of fixing an asbestos vacuum cleaner inlet close the the cutting edge of a tool to collect dust. The technique of a second worker holding an asbestos vacuum cleaner inlet close the the cutting edge of a tool to collect dust.
Structure	Any man made construction, being either temporary or permanent. Includes buildings or building parts etc.
CAR2006 The Control of Asbestos Regulations	UK Government. Control of Asbestos Regulations enacted in 2006
TEM Transmission Electron Microscopy	A method of asbestos fibre analysis. A microscope technology and an analytical method to identify and count the number of asbestos fibers present in a sample. Capable of achieving a magnification of 20,000x.
UKAS United Kingdom Accreditation Service	The UK government body responsible for assessing and certifying asbestos removalists.
Vermiculite	A chemically inert, lightweight, fire resistant, and odorless magnesium silicate material that is generally used for its thermal and sound insulation in construction and for its absorbent properties in horticultural applications. A major source of vermiculite is the mine in Libby, Montana, which has been demonstrated to contain various amounts of amphibole minerals.
Work	Any activity, physical or mental, carried out in the course of a business, occupation or a profession.
Worker	A person who performs work. In terms of work health regulations this covers a broad range of people who do work under a person in control, whether paid or not. They can be contractors and their employees, apprentices, work experience students and volunteers.
Workplace	Any place where people work.

2 Background Facts.

The name Asbestos is given to a group of minerals of a fibrous nature that are found as seams in various rock formations. All the different types of asbestos have one thing in common. They are **non-inflammable**. This fact alone makes the material very attractive for various products, i.e. brake linings, boiler gaskets, pipe lagging and heat insulating products.

The fibrous nature along with the flexibility, length and tensile strength of the fibres make it able to be spun or woven for fire blankets and rope gaskets. These same qualities of the asbestos fibres make it and excellent choice for reinforcing various materials like cement to make products like building siding and roofing sheets or pipes for water mains. Also add the fact that some asbestos products show resistance to many chemical substances.

Asbestos when it is extracted from the ground, especially by open cut mining, is a very cost effective material. It is ready for use almost straight away. It does not need expensive industrial processes like refining or smelting to use it.

Considering these facts it is little wonder that asbestos in all it's forms was seen as a wonder material.

This naturally occurring silicate, asbestos, was mined in various areas of the world, with Russia and Canada being major suppliers. In Australia it was mined at many locations with the now infamous Wittenoon mine in WA being the best known.

The ancient Greek word for inextinguishable gives us the modern word Asbestos. They used it for the wicks in continually burning lamps, and the Romans are said to have had a cloth made out of it.

2.1 Types of asbestos.

The two classes of asbestos found in buildings are:-

Chrysotile Asbestos. This is the type of asbestos used in Fibrous Asbestos Cement materials.

- Occurs in the base rock serpentine.
- It is green in its natural state.
- When it is processed, (it's fibres separated), it becomes gray in colour.
- Individual fibres are silky, flexible and relatively long in relation to their diameter.

Amphibole Asbestos(sometimes known as hornblende.) has two sub-types of commercial significance.

- **Crocidolite,**is blue in colour and is often referred to as Blue asbestos.
  - The most hazardous of the amphibole asbestos family
- **Amosite,**gray to gray-green in the rock, cloudy gray when processed. Sometimes brown and hence called Brown Asbestos.
  - Second only to Crocidolite in toxicity.

These two main types of asbestos are obviously different, but the properties of asbestos also differ between geographic regions and even different mines.

Under the law in Australia and I assume in other countries, asbestos containing materials (ACM) are divided into two types:

- **Bonded**Asbestos containing material(s)(ACM) or bonded asbestos.
  - That is the asbestos fibres are bonded into another material which encapsulates the asbestos fibers.
  - The actual asbestos is used to reinforce or to strengthen the base material in a similar way the steel rods may be used to reinforce concrete or glass fibres that are used with various resins to make fibreglass products.
  - The most common bonded ACM are cement sheets or sidings.
  - The percentage of asbestos fibres in the various materials varies considerably. In some cement based sheet products it can be as low as 2% while in other products it can be up to 17%
  - Stable bonded ACM can be removed by holders of a **"B" Class asbestos removal license.**

- **Friable**ACM is defined as a material that contains more than 1% of asbestos, which in a dry state can be a powder, or it may become crumbled and powdered by hand pressure.

  - Typically friable products include steam pipe lagging and rope gaskets for furnaces etc.

  - One of the greatest risks to building workers is the so called limpet asbestos. This was a product that was sprayed onto structural steel as a protection against fire. This material is extremely dangerous because it is very friable. Further, this material can drop fibres and contaminate ceiling materials that do not normally pose a threat.

It is quite possible that bonded ACM may deteriorate so much that it should be reclassified to FRIABLEso that only those with "A" Class asbestos removal licenses should be allowed to touch it. In my opinion the ACM in section **??** fall into this category.

2.2 The dangers of asbestos

You may ask after reading the previous section "If it is so good, why are we still not using asbestos containing materials then"?

Anyone who lives in a western country and who reads newspapers or watches the TV news will know of the law suits, the massive payouts, and the untold misery and suffering of thousands of workers and their families who were exposed to asbestos in their workplaces for many years.

What you may not know is the fact that many of those workplaces produced products that are found in many existing family homes, so while the trade unions and victim's rights organizations have won many battles for the earlier victims of this appalling substance the dangers still exists for many ordinary home owners.

"The first recorded use of asbestos was in Finland about 2500 B.C. where the material was used in the mud wattle for the wooden huts the people lived in as well as strengthening for pottery.

Adverse health aspects of the mineral were noted nearly 2000 years ago when Pliny the Younger wrote about the poor health of slaves in the asbestos mines.

Although known to be injurious for centuries, the first modern references to its toxicity were by the British Labour Inspectorate when it banned asbestos dust from the workplace in 1898. Asbestosis cases were described in the literature after the turn of the century. Cancer was first suspected in the mid 1930's and a causal link to mesothelioma was made in 1965."[5]

It was not until the late1980's that it it's use in building materials was phased out. Asbestos was totally banned from sale in Australia at the end of 2003. A total ban came into effect in the Eropean Union in 2005. There is still not a total ban of asbestos containing products in the US.

In the 1960's and 1970's there were vague warnings about using dust masks etc. and for the most part we used them, but again they were not as good as modern dust masks.

The manufacturers of these products knew well the toxicity of their products, even as early as the 50's and 60's but for their own reasons they chose to ignore or to play down the asbestos dangers contained in them.

The lack of immediate health effects has often meant that victims are unaware of the dangers they are exposed to which means that exposure to the hazard can continue over a long period causing serious health effects. It has been stated that the latency period can range from 20 to 30 years.

- Most sources seem to agree that all cases of illness caused by asbestos have been linked to the act of breathing in asbestos fibres or dust.
- In many cases, the first symptoms of an asbestos related disease only occur many years, sometimes decades after the initial exposure to airborne asbestos fibres.
- This lack of any immediate affect to a person's health has in the past lead to unsafe work practices continuing for a longer period than it should have, with claims and counter claims being aired on both sides.

- **It is now undisputed that breathing in asbestos fibres can and has caused severe health problems and death many times.**
- At the present time (2009) the main illnesses linked to asbestos are;-
  - Asbestosis. An asbestos related lung disease, pneumoconiosiscaused by inhaled fibres scarring the lung tissue, Fibrosis.The latency period of this disease is said to be between 15 to 25 years.
  - Malignant Mesothelioma. A cancer of the lungs that is caused by direct inhalation of asbestos fibres deep into the lungs. It is almost always fatal.
  - Pleural Plaque.
- It is also generally accepted by medical researchers that people who have been exposed to asbestos fibres have a greater risk of contracting other diseases of the lungs, (like cancer caused by cigarette smoke), than people who have not been exposed.
- People with very little exposure to asbestos like worker's families have also been known to suffer from asbestos related diseases.

Because of the proven health risks associated with asbestos, it's use is now totally banned in just about every country in the world. The problem is of course, managing the large amounts of the stuff still in use around the globe.

Exposure to airborne asbestos fibres has to be managed. To this end regulations and codes of safe practice have been drawn up and enacted into law in most countries worldwide. In all cases working with asbestos safely is not a matter of choice. Homeowners, building workers and building owners MUST comply with certain rules when managing asbestos containing materials. It is the law.

3 Public buildings and workplaces with ACM.

What is given here is a very brief summary of a complicated topic. It is for the benefit of people who may be ignorant of the legistlation and not know that they may be subject to it.

The owners or leasors or managers of public buildings and workplaces are required by law to identify and manage asbestos, and to adhere to the various asbestos management codes and standards.

Anyone wanting detailed information on the legal aspects owning, leasing or working in a building that contains ACM is advised to check their local jurisdiction. Considerable information is available from the sources listed in the bibliography. (Australian workplace regulations here)[2].

- Building owners or the person with control of a building must take steps to put in place an asbestos management plan.
- A primary requirement of a management plan is to have regular asbestos audits carried out.
- If an audit finds that the workplace has ACM then the person with control over the building must set in place an asbestos register for the building and to make a risk assessment for the safe management of ACM present in the building.
- Copies of the register must be kept and made available to any interested parties.
- ACM or suspected ACM must be clearly labeled as such and maintenance workers and others should be made aware of it
- As an example, walls and ceilings that are sheeted with ACM should be clearly labeled as such and no tradesman or similar person should be allowed to work on these materials without consultation and taking the required steps detailed in the management plan.
- If alterations to the building are proposed then correct measures should be taken for the removal of ACM. Note! The requirements for asbestos removal work in work places and public buildings are more stringent than what is found in the rest of this document.
- Provision should be made in the management plan for periodic monitoring of the status of the ACM in the building and the upgrading of the asbestos register.

4 ACM, Asbestos containing materials

Various leaflets put out by Government organizations state that any building built prior to 1990 may contain ACM. This of course takes in a whole range buildings which includes:

- Houses, private and rented. Apartments and public housing.
- Workplaces like factories, office buildings, schools and shops.

So what form do these ACM take?

There are many publications that contain lists of a frightening amount of products that ranges from curtains to lamp wicks, welding rods to jointing compounds. One authority lists over 3000 and admits that that wasn't the total. I guess that we will never know the true extent that industry used this noxious substance. So in these pages I will list only the main ones that are likely to be causes of concern to homeowners, building workers , property owners and building managers.

Be aware also that buildings built after 1990 could possibly contain asbestos. Even though the manufacture of the products had ceased, wholesalers and builders could still have got rid of old stock, or second hand items may have been built into new structures.

As stated before there two main categories of ACM that can be found in house construction.

- Bonded ACM, which is the main subject for this book and I will be going into some detail on managing and removing it.
- Friable ACM the removal of which should only be done under the supervision of a person holding an "A" class removal license. This type of asbestos removal is highly technical, dangerous and it is not the subject of this book apart from the next warning section.

4.1 Friable Asbestos.

Friable asbestos, (able to be crumbled in the hand) in a property, home or workplace must be removed by a company or person who holds an "A" class asbestos removal license.
It is not only illegal for an unlicensed person to handle friable asbestos material but it is downright unsafe, you could be placing yourself and other people at grave risk.
Friableasbestos products.

- **Pipe lagging.**
- **Jointing compounds that break down into a friable state with time.**
- **Pipe and duct gaskets.**
- **Door seals etc.**
- **Old electrical ceramic fuse boxes had friable asbestos cloth inserts.**
- **Bonded ACM that has deteriorated to a dangerous extent. ??**

I havr seen guys working with friable material removing the lagging from steam pipes at a power station. In addition to the normal safety gear they wore waders and worked in what was similar to an above ground swimming pool about 750 (2'6") deep. The lagging was separated from the pipes and bagged while completely under water.

- **If you have any loose pipe lagging in a boiler installation:- Do not disturb it in any way.**
- **If you are living in rented accommodation notify your landlord as soon as possible of your concerns.**
- **If you get no action, or you are not satisfied with your landlords response put your concerns in a letter and keep a copy yourself.**
- **At the same time contact your local authorities, again in writing explaining the situation and including a copy of your letter to your landlord.**
- **If it is your own home, contact your local authorities and they will give you a list of approved licensed asbestos removalists.**

Friable asbestos products very often contain the most dangerous types of asbestos fibres. Do not touch it, don't try to tape it up! leave it to the experts!

4.2 ACAsbestos cement

AC or Asbestos cement sheeting is a building product that has been around for a long time. In the post WW2 years, the 50's and 60's, it is estimated that a third of new houses built in Australia used AC somewhere.

In Australia use of ACM peaked in about 1975, at 70,000 tonnes per year. Much of this industry output remains in service today in the form of 'FIBRO' houses and water and sewerage piping. [1]

The name **Fibro**us Asbestos Cement Sheeting was shortened in Australia to the first five letters, namely FIBRO. There is a possibility that the name could have also derived from a James Hardy & Co product called FIBROLITE. If I happen to use the term "Fibro" in this book, then you can be sure that I am talking about **Fibro**US ASBESTOS CEMENT SHEETING. I mention this because of the the widespread common use of the term Fibro; many people now use the term in error when referring to any flat cement based building sheet. A bit like using the term "Biro" for any "ball point pen"

AC is by far the largest category of materials that contain asbestos in the home. They come in a few different forms with varying percentages of asbestos fibres reinforcing a cement base to give it strength. It is the main type of bonded ACM that has been used in building construction.

4.2.1 AC siding sheets.

- AC sheet products have been used on external and internal walls and ceilings, and they can also be found in the typical planked siding form.
- The manufacturing process produced a very slight ripple effect to the front surface of the sheets.
- The back of the sheets had a definite dimple effect.
- These sheets were produced in two thicknesses, 6mm and 4.5mm, two widths, 900 and 1200 and from 1800 to 2700 long. AC sheets have a face side that while basically smooth it has a slight ripple effect and the normally hidden side has a dimpled texture.
- They were fixed with 2.8 x 25 or 30 shear point, flat head galvanized nails, commonly known as Fibro nails. The reason for the shear points being that they punched their way through the brittle FIBROsheets without splitting them, as a conventional pointed nail would have done. The old AC sheets were far more brittle than today's sheets (reinforced with cellulose) that have replaced them.
- Cover battens and external corner moulds are accessory type asbestos containing products that originally always were used in conjunction with AC sheets. Internal corner joints were usually covered with two standard flat cover battens.
- Cover battens were used at sheet joints, both vertical and horizontal. At internal corners and around windows and doors these items are 40x8mm thick and came in

up to 3000 lengths. They were usually cut to length with a hack saw as FIBROcutters would not do this job. They also were fixed with shear point nails.

- On internal ceilings and walls the AC battens were used mainly in the 1930's to the 1960's.

- Early internal linings sometimes used rectangular timber cover battens, Timber "D" moulding and with timber quarter round (quad) moulding at internal corners.

- Later on the joints were made with aluminium "H" joint strips and sometimes aluminium internal and external corners.

4.2.2 Wet area pre-finished AC sheets. Trade name "Tilux" in Australia

- Used in the wet areas, Bathroom, WC, laundry and for kitchen splash backs. The low price, a decorated easy to clean surface finish and the quick fixing of the sheets, made it a cheaper alternative than ceramic tiles .

- TILUXis 6mm thick and was made in 900 and 1200 wide and usually 1800 and 2100 high sheets.

- This pre-finished product came in a range of colours and hatched and mottled patterns.

- TILUXis smoother than the standard unfinished 6mm sheets. The back surface though has the typical dimpled surface of standard AC sheets.

- Mostly the sheet joints were made with aluminium trims.

- Almost always in my experience TILUXwas fixed with chromed screws in loose caps. Towards the end of the use of Tilux, adhesives like liquid nails were used to fix it.

4.2.3 AC corrugated roof sheets.

- Called SUPER SIXor sometimes (later on) FIBROLITEthese ACM along with their accessories, were used for roof sheets mainly, but they were also used for industrial walls .
- They were made in approximately 900 wide by 1800 long sheets. The fixings were proprietary screws or hooked bolts (in the case of fixing to angle purlins) with a typical diamond shaped galvanized washer.
- Another very popular application of these corrugated sheets was for garden fencing. The SUPER SIXsheets were stood up vertically into say a 450 deep trench, bolted at the joins, a capping piece was added and the trench back filled. No posts or rails were needed.

4.2.4 AC sheets thicker than 6mm Fibro or siding materials.

- AC sheets were produced in thicknesses other than the 4.5mm and 6mm sheets intended purely for cladding walls and ceilings.
- The manufacturing process was different, and they are sometimes referred to as Compressed AC sheets.
- The surface finish on the thicker sheets is a lot smoother on both sides than on the standard 6mm and 4.5mm flat AC siding sheets.
- 10mm to 12mm thick sheets have been used as panels in various places, for example they have been used a lot to panel out verandah and deck handrails, stair handrails, door and window head feature panels etc.
- Thicknesses from 15mm to 22mm have been used for flooring, fixed on top of timber floor joists in wet areas and on patios. Many times with ceramic tile coverings.
- These thicknesses have also been used for bench tops, although this was rare in houses because of the cost. They were used in commercial kitchens, school laboratories etc.

4.2.5 Other less common AC products.

- A variation of of standard AC is a product that is intended to look like red clay brickwork. The sheets are standard AC sizes, 6mm thick and the imitation brickwork attempts to duplicate the appearance of 225x75 bricks with a 10 joints.
- AC gutters and rain water down pipes. They have a similar surface appearance to the corrugated roofing.
- There used to be a lot of moulded type planter boxes out of AC. These type of moulded products had a larger percentage of fibres, or just longer fibres in them than the plain flat sheeting.

- Similar to the last item are telephone cable pits.
- Water main pipes.
- Flue pipes for stoves and kitchens, residential and commercial.
- Underlay sheets for vinyl tiles and ceramic tiles.

I can remember A job in 1966 where as a subcontractor I fixed large FIBROfascias to a new hotel building. They were about 900 deep with a "J" shaped return on the bottom edge. They were jointed with a mastic compound. The reason that I bring this up is to make the point that the the factories making these products must have had departments that produced small runs of many and varied products.

4.3 Non cement based materials.

Vermiculite

The following is a quote from the US EPA website.

*"**Protect Your Family from Asbestos-Contaminated Vermiculite Insulation***

Vermiculite is a naturally occurring mineral composed of shiny flakes, resembling mica. When heated to a high temperature, flakes of vermiculite expand as much as 8-30 times their original size. The expanded vermiculite is a light-weight, fire-resistant, and odorless material and has been used in numerous products, including insulation for attics and walls. Sizes of vermiculite products range from very fine particles to large (coarse) pieces nearly an inch long. A mine near Libby, Montana, was the source of over 70 percent of all vermiculite sold in the U.S. from 1919 to 1990. There was also a deposit of asbestos at that mine, so the vermiculite from Libby was contaminated with asbestos. Vermiculite from Libby was used in the majority of vermiculite insulation in the U.S. and was often sold under the brand name Zonolite.

If you have vermiculite insulation in your home, you should assume this material may be contaminated with asbestos and be aware of steps you can take to protect yourself and your family from exposure to asbestos. This Web page provides important information on how to protect yourself and your family if you suspect that you might have vermiculite insulation from Libby, Montana."

I don't know any more about this than what I gained from the EPA website. If you live in the US you should look at this site. It has photographs of some of the different forms that it takes.

As far as I can tell vermiculite sold in other countries does not have this problem. It was and still is used for a wide range of insulation type applications. All new vermiculite products are tested and have to be asbestos free.

Miscellaneaous bonded ACM

- There are a few different types of composite roofing shingles that contain asbestos.

- Vinyl floor tiles that we never suspected contained asbestos, started appearing with asbestos warning labels on them in the phase out period (late 70's early 80's). There would still be many of those still about.

- Underlay for flooring products. While some vinyl flooring did not contain asbestos, the flooring underlay does.

- Plaster patching compounds.

- Caulking type compounds used for example in brickwork expansion joints.

- Some texture type paints and paints containing flock type bulking out for sound-proofing.

- Acoustic ceiling panels. (hi-fi buffs used to stick them on walls also).
- A type of mastic sealant used for sealing joints between building components. For example the joints between door / window frames and brickwork.
- Electrical switchboard backing panels. “Zelemite”

ACM not normally used in houses

Homeowners:- Never discount the possibility that previous owners of the home brought into the house or garden some asbestos containing product that was not really a part of the house or building material.

For example, before I started one construction job in 2004, as is normal I had to clean up the site. I had to safely dispose of 40 or 50 lengths of 150mm AC water pipe that had been used as garden bed edging. It was deteriorating badly and the owners hadn’t a clue as to what it was. It was a concern more so because there was a young child in the home.

I have also seen many instances of moulded ACM products intended for commercial use (junction boxes normally set into pavements by electrical and telephone companies) used as window boxes or garden planter boxes.

4.4 Hidden asbestos containing materials

Here; I am not talking about AC eaves lining to brick houses, but the deliberate covering up of ACM. Anyone buying a house that falls into the right age group that could possibly contain asbestos should do their utmost to ascertain the true facts of the matter.

- Prospective purchasers, intending renovators and DIY handymen should note that many AC clad houses have had their battens and corner moulds removed in order to disguise the fact that the cladding is an asbestos containing product.
- The sheeting that is then simply patched with some sort of bogging compound is easily spotted.
- Harder to see are the ones that have been covered up with various other types of modern sheeting.
- Covering old sheeting is a valid procedure and in itself should not be a problem as long as the purchaser knows the extent of the covered work.
- New owners must know; so that when they come to do any renovations like removing sections of walls for new doors and windows, they will be able take the necessary precautions and also be in a knowledgeable position to factor in the extra cost involved in safely working with and disposing the offending material.
- Not so common is the covering up of AC clad internal walls and ceilings with plasterboard. In my experience the old AC is has usually been disposed of before lining with plasterboard.
- Quite a lot of wet area sheeting has been covered with ceramic tiles. Again this is no real problem until renovation work is planned.

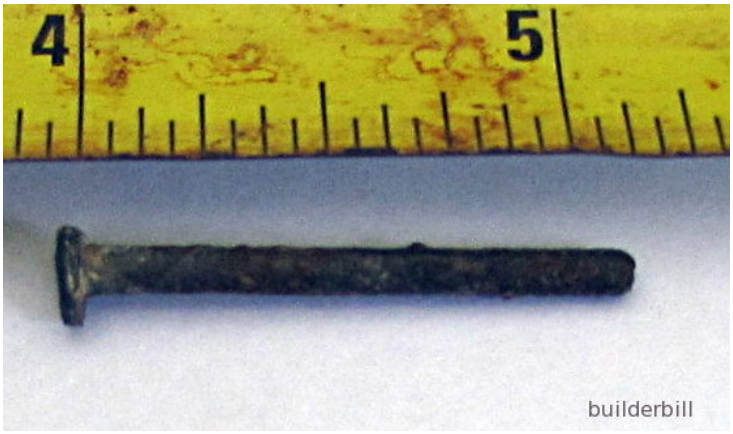
5 Photographs of ACM

5.0.1 External flat AC sheets

Img 5.1: An elevated timber frame house clad with AC flat sheets. The horizontal batten at the gable triangle hides a small "Z" type flashing that sits under the top sheets and under the bottom ones. The dark mildew type staining is typical of unpainted AC sheets.

Img 5.2: Flat sheet cover batten with typical broken end.

Img 5.3: A close up of the end of a broken batten showing clumps of loose fibres.

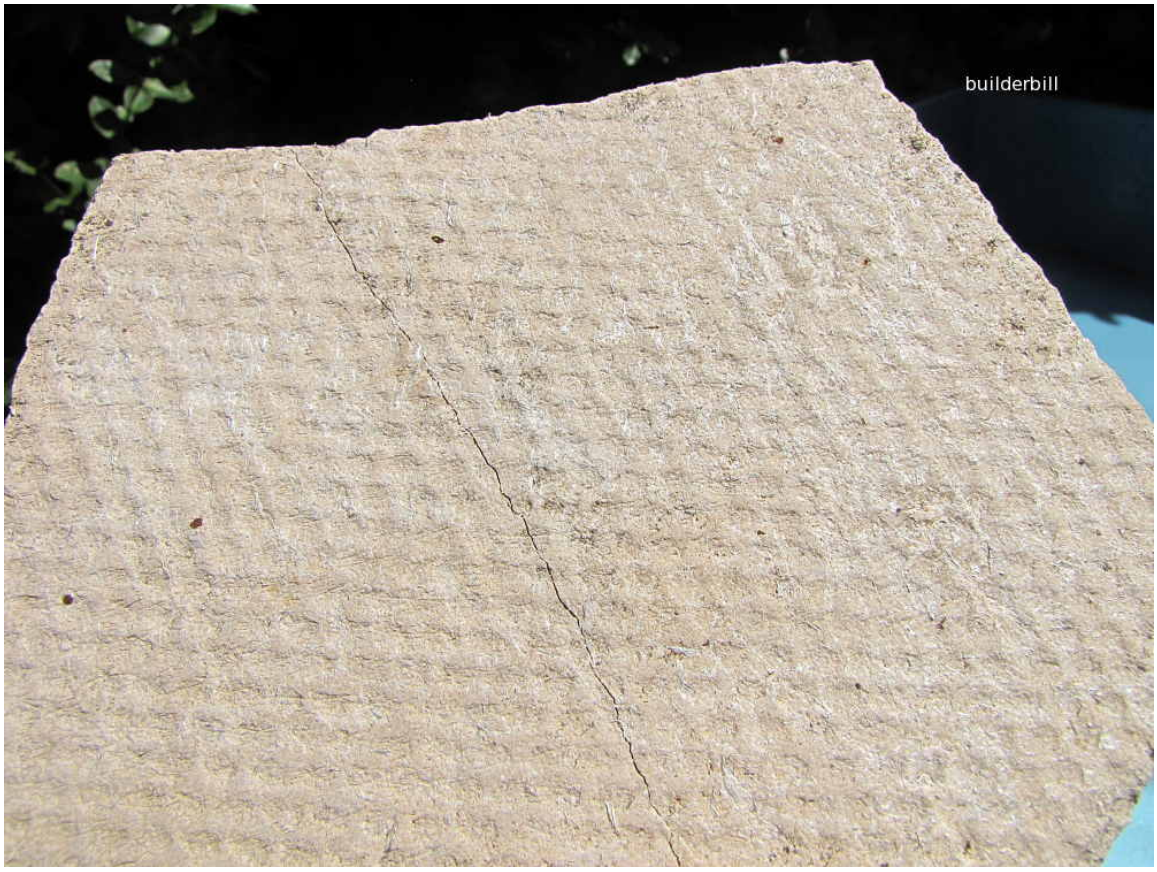


Img 5.4: A typical 30 x 2.8 shear point galvanized Fibro nail.

Img 5.5: Typical break in sheet where the nail was too close to the edge of the sheet. (The nail did not break the corner mould because these were generally thicker and had more asbestos fibre reinforcing than the flat sheets

Img 5.6: Another typical corner break in an AC sheet
Photos that illustrate the readiness of AC sheets to crack when they were nailed too close to the sheet edge.

Img 5.7: The back side of an AC batten is recessed by about 3mm. This shows typical breaking away of material on the inside edge at the nail point.



Img 5.8: The back surface of an FAC sheet showing the typical dimpled appearance.

5.0.2 Internal AC sheets

Img 5.9: A 1940's interior clad with AC walls and ceilings.

For the most part timber cover battens were used to cover the joints internally. Internal wall corners had "quarter round" or "Quad" beading, and often the wall to ceiling joint was done with a timber scotia or cornice mould.

Img 5.10: A fairly unusual AC moulded internal corner joint.
Normally a timber cornice or scotia was used in cases like this. It is also possible to deduce from this photo that all the other cover battens in this photo are timber (wood). The nail fixings in wood are easy to cover with filler and paint. But the heads of Fibro nails always stick out on AC sheets so they are a good indication of the material used. Large flat head nails, clout nails, were of course used for fixing other cladding so it not a definite indication of the presence of ACM.

5.0.3 Corrugated AC roofing.

Img 5.11: "Super Six" corrugated sheeting. Produced by James Hardy & Co. In Australia. This photograph shows a roof dating back to the 1950's. The left hip flashing uses cement mortar to seal the gaps, which is not unusual, particularly on lower pitched roofs. It is just possible to see the end of an AC ridge vent which were used a lot on these roofs.

Img 5.12: A version of this type of roofing used in the UK. Note the profile of the ridge capping.

5.0.4 Photographs of Loose Exposed Asbestos Fibres

Img 5.13: Part of a "Super Six" roof hip flashing that is severely weathered. ACM like this in my opinion falls into the classification of Friable asbestos. The asbestos fibres are no longer firmly bonded into the cement mix. Note that the surface cement paste has eroded away showing the individual grains of sand.

Img 5.14: Another hip flashing close up.
These roofs date back to the late 1930's early 1940's, and show severe weathering.

5.0.5 Wet area AC sheeting

Img 5.15: The trade name of this product manufactured by James Hardy and Company in Australia is “TILUX”.

6 Asbestos and homeowners

6.1 What are the risks of living in a home that contains asbestos cement type products.

Quite simply my view is that I would not be unduly worried for myself and my family living in a home that was clad externally or internally with any AC products. PROVIDED THAT:-

- The products are undamaged.
- They are in good condition and preferably painted or otherwise sealed.

AC sheeting is a very stable and durable product, any contamination from it must come from breathing in the dust and the fibres that the dust contains.

Asbestos cement materials are stable if it they are undisturbed and not subjected to extreme weathering.

To protect against weathering which eventually would release fibres into the atmosphere it is advisable to keep the external surfaces painted and well maintained.

From a personal point of view, if I lived in a house that contained asbestos products sooner or later I would take steps to renovate at least the inside of the house, by removing or covering up the offending sheet materials. Working on the principal that accidents can happen and dust can be released.

6.2 Identification of asbestos

The only positive way to detect the presence of asbestos in a product or substance is by the inspection of a sample by a trained technician using scientific equipment at a certified testing laboratory.
Note! *"When electron microscopy was applied to asbestos analysis, hundreds of fibers were discovered present too small to be visible in any light microscope. There are two different types of electron microscope used for asbestos analysis: Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM)."[5]*
Contact a licensed asbestos removalist in your area and have samples of the material tested at a registered testing laboratory.
For commercial properties have a full asbestos audit done on the property which includes laboratory tests of all PRESUMED ASBESTOS CONTAINING MATERIALS. (PACM).

There are many easily recognised manufactured materials that can be identified visually as being ACM. These materials, usually asbestos cement (AC) products can simply be classified as Presumed ACM and they must be treated in the same manner as material that has been tested for positive for asbestos.

6.2.1 A visual inspection, sometimes may identify asbestos if you know what to look for.

Assuming that the property is in the right age group, 1920's to 1990's then a visual inspection alone may help a prospective purchaser, an intending renovator or anyone working in a building to decide if the property has an asbestos problem.

Please read this section and refer back to the photograph chapter.

As stated above there is only one sure way, by lab tests, to truly determine the presence of ACM. However below are a few pointers that may help you to identify some of the more obvious asbestos containing products in a building and so save the cost of testing.

- AC sheets are hard, brittle and sound hollow, not solid when rapped with a hard object like the handle of a screwdriver. They do sound solid over the studs though, so rap in a few places.
  - A wall that sounds uniformly solid all over is probably plastered masonry.
  - A wall that generally sounds dull and hollow could be plasterboard or hardboard (Masonite).
  - If it is possible to dig a fine pointed screwdriver into the wall surface the in all probability the wall is not clad with AC sheeting.
- Any smooth sort of sheeting, inside and out, on the walls, ceilings and as lining under the eaves **that has the the 8mm thick batten covering the joints** is immediately suspicious. See photos.
- Add to these the use of the **moulded "L" shaped external corner moulding**and you can be fairly sure that you have identified asbestos cement sheeting.

- The presence of shear point nails will also confirm suspicions.
- Because AC siding is brittle compared to other more modern sheets it is common to see pieces chipped off near the edges of sheets. The cover battens are often split or broken off near the bottom or top right at the last nail.
- As mentioned before, AC sheeting in the thinner sizes has a slight ripple effect on the face. You may have to get your eye close and look along the surface to see it.
- If there are any broken, non painted edges then sometimes it is possible to see small fibres exposed.
- The fibres of course are microscopic, what you would be looking at are the bundles of many asbestos fibres that were used to reinforce cement sheets.
- Brick houses are usually free of problems, but check any eaves lining which is where you are most likely to identify asbestos in these houses.
- If you rap on what appears to be painted brickwork on a brick veneer home and it sounds hollow **then look further**, it could be the asbestos containing fake brickwork.
- If a previous owner has taken off the old AC cover battens and corner moulds, and bogged the joints up, and say put aluminium angles on the external corners it should be fairly easy to see that this has been done.
  - Given that we had 40mm wide cover battens to play with and that we used that fairly imprecise tool the FibroCutter to cut the sheets then the joints between the sheets were less than perfect.
  - Also, given the quality of the timber frames in those days then some of the sheets were often not level with their neighbors, making it almost impossible to mask the joints.
  - Attempts to cover it all up with texture paint also fails to cover the joints between sheets.
- Harder to find, and sometimes impossible to see are the jobs where new cladding or new siding has been fixed on top of existing Fibro. On high level houses it is sometimes possible to see the old material from underneath.

6.2.2 Other methods that may identify ACM

Once again, a word of caution, suitable precautions should be taken when removing even the smallest pieces

- For a few years before it was banned totally it was possible to identify asbestos products by the fact that they sometimes had a warning label or stamp on the back of the sheets saying that "this product contains asbestos"
- Conversely you may see "this product does not contain asbestos" stamp on them.
- So by gently prising off a suspect sheet you may be able to see one of these labels.
- It has been said, though I have never tried it that if a cigarette lighter is applied to a broken edge of AC sheet with fibres exposed then these fibres will not burn, whereas the fibres in other similar looking material will burn. Hardly scientific, as whatever fibres are there are usually encased in cement paste so whether they are asbestos or cellulose they are unlikely to burn.

There are now on the market Asbestos Testing Kits of various types. Basically what happens is that the company sends you a kit with instructions of how to safely take a couple of samples. These samples are then sent back to the company and their approved testing laboratory tests them and you get your result back in a couple of weeks.

If there is any doubt at all, play it safe and just assume that the material contains asbestos.

Or, alternatively get tests done.

Friable Asbestos is a totally different matter.

If you have any suspicions that you have Friable asbestos, do not touch it, call in an A class licensed removalist to assess the suspect materials. What follows is for Bonded ACM only.

6.3 Management of ACM In Your Home.

If you know or suspect that you have asbestos in your home DON'T PANIC. Just about all of these bonded asbestos products are very stable. By far the best asbestos management strategy is to LEAVE IT ALONE. DO NOT DISTURB IT! The danger from AC is through inhaling the fibres but in it's undamaged state it does not give off any fibres.

- On a fairly regular basis check the material to see that it is in good, undamaged condition.
- Don't to anything that will abrade the surface, don't scour it, don't let tree branches abrade it.

If you have siding or sheeting is in good condition, then it may be OK to paint it using a good quality acrylic paint. Remember though that the preferred option, the best thing to do is to have the ACM removed. See the section below.

6.3.1 Management of corrugated AC roofing

This is one product that in my opinion the only thing to do with it is to have it removed professionally. The basic removal method for bonded AC materials is the wet method which on a roof increases the danger of slipping. The alternative dry method is not applicable here. The proffessionals will asses the risk and quite possibly seal the roof before removal.

- The material itself contains a very high percentage of asbestos fibres. Far more than the ordinary flat FIBROsheets. See the photographs in the previous chapter.
- Any material on a roof gets far more weathering than wall or eaves lining.
- The corrugated AC roofing gets porous and weak with age, any of this stuff still on a building is well past it's use by date.
- Even if there was no asbestos in it, there is a good case to be made for its removal on safety grounds alone.
- I did a job many years ago where no less than three experienced tradesmen fell through a corrugated AC roof . Not all the way through luckily. This was a graphic example to me of how this material deteriorates and becomes dangerous .
- It is doubly dangerous to walk on when it is damp or wet. It attract mould and mildew and even when only moist with dew it is very slippery.
- Be extremely careful if you have to walk on one of these roofs. Use planks and or cat ladders. Do not put your full weight onto the roof sheeting.

If you are living in a house that still has a corrugated AC sheet roof then call in professional help and get it replaced. Don't wait until some young guy like a TV antenna fixer gets seriously hurt!

6.3.2 Encapsulating AC sheeting by painting

Cleaning and preparation for painting AC siding.

Most importantly, you will will be working with water, identify and take steps to prevent water entering any electrical points of entry and power points.

- Restrict access to the work area.
- So tape plastic protection round any electrical sources.
- Do not use scourers, wire brushes or sandpaper. Nothing that will create dust.
- If you have any areas of mildew or mould then wash them down with a weak solution of chlorine - household bleach.
- Be particular in washing off the chlorine afterward, especially around metal frames.
- For bad stains you can use sugar soap or plain soapy water.
- If the sheets have been painted but the paint is flaking off, then use a spray bottle of soapy water and keeping the work area moist lightly peel off the paint with a paint scraper.
- Wear the correct PPE[1] while doing this.
- Dispose of cleaning rags and paint scraps etc. according to the same procedure used for disposing of any asbestos products.

Don't obsess about the cleaning, don't try for perfection. Anything that is stubborn, leave it. Remember you are not wanting to abrade into the surface of the cement.

Modern paints are excellent for sticking to surfaces like old cement sheets.

[1] – Personal Protection Equipment

Filling and painting AC sheeting

You need to fill up any cracks, damaged areas and slightly open joints. The reason is twofold, first the whole idea of painting is to provide protection from water ingress, to stop further deterioration and second and less import is to make it look good.

- Buy a good caulking gun and at least one box of white acrylic sealer filler compound. also you will need a good cloth, a bucket of water and a good flexible painter's scraper - putty knife.
- Whatever type of siding that you have, it is 100% sure that there will be joints in it that would benefit from a touch of filler.
- In the case AC cover battens I would run a bead of filler down each side, irrespective of whether the joints were tight or not.
- The filler is a good flexible medium that not only fills, but once it is dry it grips almost as a glue. This stops those small cracked pieces at the ends of battens eventually falling off.
- If there are any loose or raised nail heads tap them in with a hammer or if they are still not solid smear a touch of filler over them to again hold them in place.
- With a small broken pieces like the one in figure 5.5 seal the broken piece as described in this section 10.5
- Use the PVA glue sealer technique to spray the broken edges with the weakened glue and let it dry.
- Using either gap filler or better still a blob of acrylic stud glue (not the PVA, that's too thin and runny) get a blob behind the loose piece to be fixed.
- Press or tap the piece back into position. Wiping off the excess with a paint scraper. The piece should stay in position, but if it doesn't, don't try to nail it. Hold it in position with tape or a wedge etc. until the filler/glue has gripped.
- Any other exposed broken AC edges, spray with the weak PVA glue to encapsulate any loose fibres before starting to paint.

You will find that time spent doing filling work will not only give you a better job by holding potentially loose pieces, but the finished job will look better. As a bonus you will save time when painting by not having to continually go back and dab in more paint into open joints.

A couple of paint manufacturers here in Australia produce top class premier acrylic exterior grade paint products that are advertised as "no primer required". That is, the paint can be applied directly to most building surfaces. Wood, cement based products and most metals without using a primer. This type of paint usually has mould inhibitors and it is excellent for painting these asbestos containing flat sheets.

- Get 20 litre drums and use a good mixer in a slow speed electric drill if possible, or take your time and do a thorough job with a hand mixer.
- The first coat on previously unpainted surfaces may need to have a touch of water added, but don't overdo it. Definitely no more than 10%.
- If possible use the paint directly as it comes out of the tin, with no water added.
- Some authorities advocate the use of a low pressure airless spray gun. but I tend disagree with their use for small one off projects.
- By sticking to the recommedations and using a contractor with spay a lot of jobs just might not get done on costs grounds alone.
- It is far better for a home owner to be able to do the job himself by brush and roller than it not get done at all.
- I use a good quality 75mm cutting in brush and 20mm x 270mm lambs wool roller.
- Why use an expensive roller cover ?
  - Just because the surface is smooth and a 10mm or 15mm foam cover will do the job OK, that does not mean it is the best tool for the job.
  - A good roller that can hold a large amount of paint and roll it out. You spend more time painting the surface and less time up and down and charging the roller with paint.
- Use the paint and spread it out, but don't try to save paint by trying to get maximum coverage. Just lay it on easily and move on. NO unnesscessary rubbing and scrubbing.
- Do at least two coats of paint and possibly three.
- Dispose of the roller cover and paint brush when the work is finished.

6.3.3 Small jobs on AC sheeting.

From time to time a homeowner may need to drill one or two holes in AC sheeting to fix odd items like clotheslines. As before the best method is not to do it at all if another method can be found.

For cutting larger openings in AC sheeting, like for the rectangular wall air conditioning units then the best way is to **replace the full sheet with modern material**and cut the hole in the new sheet. That way you can cut the new sheet safely with power tools.

However if you do have unavoidable small jobs with AC sheeting then read the relevant section in the removal section and adapt it to your needs.

For the most part the motto "If it's not broken don't fix it" is good advice, however if your sheeting gets damaged or if it shows signs of wear, do fix it as soon as possible.

- This may be as simple as just screwing or gluing a piece of replacement (non ACM) material over a hole, or it may mean a larger project that requires outside help.
- In either case, make sure that the person doing the work follows correct removal and disposal procedures.

6.3.4 Covering old AC with new cladding

A more permanent way of encapsulating AC sheeting and siding is to cover it with new sheeting, for example Sheetrock or plasterboard internally and new metal or vinyl cladding externally.

- In general, without a license, a home owner is allowed to remove and dispose a certain square area of Bonded AC material.
- Where I live that amount (at the time of writing) is ten square metres.
- The person doing the work must follow correct asbestos removal procedures. The details of this are in a later section.
- Check with your local authority for the amount and approved methods in your area.
- This usually means that a homeowner or a non licensed contractor can remove AC battens etc from the surface of the old cladding and dispose of them. (Less than 10 M^2)
- Removing of the whole of the AC sheeting (more than 10 M^2) however means that the work has to be done by a "B" class licensed asbestos removalist.
- So as a result the old cladding is more often than not left in place and the new cladding is fixed over the top of it. This is to save the extra cost of a contractor to remove and dispose of the AC sheeting.
- Sheeting an AC clad house, once the battens and trims have been removed is relatively simple.

  - Care has to be given to the selection or design of the flashing and trims around doors and windows to make sure that the new cladding will be watertight.
  - Another consideration that we have where I live, is that many of the homes that we do these "cover up" jobs on is that the houses are high set, with stairs and verandah handrails that will need cutting shorter by the thickness of the new cladding.

- Horizontally fixed corrugated metal wall cladding material like "Custom Orb" or any of the horizontal fixed vinyl siding boards is a cost effective way of giving an old house a new lease of life, and at the same time it is an effective way to encapsulate the AC sheeting to prevent damage and deterioration.

  - When the cladding is horizontal the wall studs at 450 or 600 centers are ample for the cladding fixings.
  - When the cladding or siding is fixed in vertical direction the spacing of the noggins in the wall framing is usually too wide for the code requirements for the cladding fixing centres.
  - Take the case of a wall that is 2700 high with noggins at 900 centres then the spacing is too wide so counter battens[2]will have to be used. A far better idea is to have the cladding running horizontally.

[2]Counter battens are a layer of battens at right angles to (in this case the wall stud) other battens to either alter the orientation of the sheeting or to alter the batten centres.

6.3.5 Management of wet area sheets

- It is possible to leave these old sheets in place, they are pre finished.
- If they are showing sign of wear then they can be painted, preferably with two pack epoxy.
- A better way is to simply cover them with ceramic tiles.

The more usual thing to do with these sheets is to remove them entirely because bathrooms and the like get a significant amount of other work done in them during alterations in a remodeling project.

For most of the time that Tilux was in use the sheets were fixed with screws only and so they are easy to remove in full sheets. It was only very late in the piece that adhesives like “Liquid Nails were used.

In this case of course the correct asbestos removal procedures should be carried out. This is fairly easy to do in a small contained area like a bathroom. See the later removal sections.

6.3.6 Management of loose items.

For items like planter boxes, garden ornaments, stove top pads, oven gloves ironing board covers etc it is best just to dispose of them if you have the slightest suspicion that the may contain asbestos.

Use the disposal procedures detailed later in this book bearing in mind codes that apply to your area.

6.4 Should you test or not test?

After reading the previous chapters you may wonder why I even consider this question, surely everyone who suspects that they have ACM in their home should get it tested. Not so!

Some reasons not to test:-

- Consider carefully before removing pieces of suspect material to send to a testing lab.
- There are asbestos testing kits available that allow you to do it yourself, but just **the actual fact of disturbing the material for a test piece can release fibres into your home.**
- In many cases it may be better not to do any testing at all, but to just assume that the suspect material does contain asbestos and treat it accordingly .
- Depending on where you live there may be a legal issue to consider before getting any testing or an asbestos audit done on your property.
- If you get tests done that prove the existence of asbestos containing materials you may then be duty bound to disclose that fact to prospective purchasers of the property or others with an interest in it.

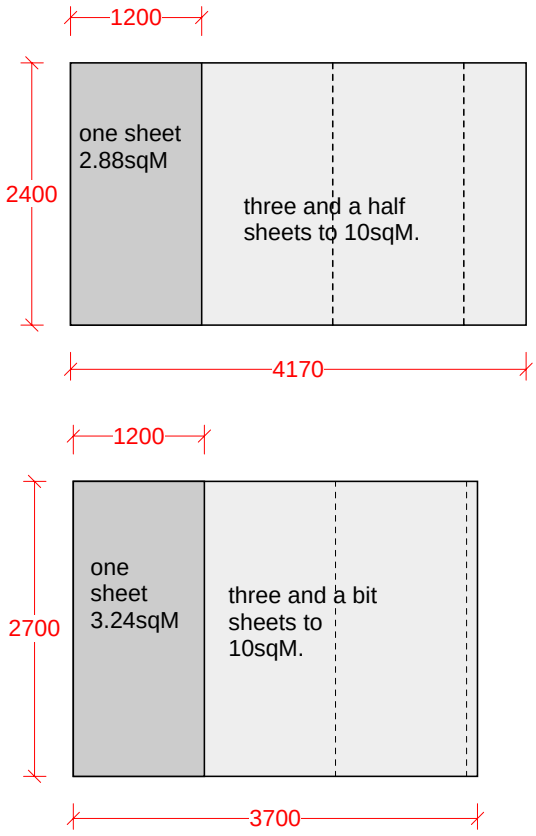
Reasons to test.

- For your own peace of mind it may be better to know the facts.
- Asbestos removal can be expensive, so if test results are negative then you may save a lot of money.
- Depending on the type of building, for instance **if it is a rental property you may be legally bound to have an asbestos audit done on the property.**

6.5 Home owner AC removal

In many jurisdictions a homeowner or his representative, can get a permit to remove a small amount of Bonded Asbestos material.
[3]

- In the various Australian states that I am aware of the limit is 10 M² but each state has slightly different rules regarding this.
- In the sketch Fig 4.1 I have shown a couple of examples of what 10 M² actually is in sheets, so that the unwary will not make the mistake of taking 10 M² to mean 10M x 10M, which is of course 100 M².
- Thinking about our example earlier of removing the battens from a AC clad house. Lets say that the battens are 2600 long by 40 wide. 10 / (2.6 x 0.04) =96 battens, which should come close to doing a normal sized house.



Img 6.1: An illustration of what 10M² looks like in terms of standard sized flat sheets.

In a case like the batten example above, I think that when a person goes through the right channels and has shown that they are willing to do the right thing, then the local safety inspectors are very helpful and in my experience they would not be overly strict if a few extra battens have to be removed over the 10sq.M. limit. The occupational health and safety guys are always more than helpful, let's face it we are all interested in getting rid of this noxious material safely.

If you have a home renovation job that requires more than 10 M² of bonded material to be removed then you have a few options.

1. Hire a contractor that has **a removal license and a builder's license.**
   - Because this book is aimed at work on old homes, which are either occupied or have been vacated just for the duration of the job then it is in everyone's interest to get the work finished quickly.
   - When I used to do renovation jobs that included elements of ACM removal, it was very convenient for me as a builder not to have to worry about employing a removalist myself. I didn't actually go looking for removal work, but it gave me a good edge when tendering for work because I saved the owner the extra hassle of getting the ACM removed beforehand.

[3] The legal owner of the property has to sign the application forms, a person who is only renting a property can not do anything of this nature.

- I could strip one section of a roof or say one wall of a house and have it re sheeted or clad in the day. Doing it like this the property is never left unsecured or open to the elements.

2. Hire an asbestos removalist to remove the offending material, then engage a contractor to do the actual work of the renovation.

    - This has the benefit of maybe being able to get more competitive quotes from the ordinary building contractors.
    - Doing it this way requires good organisation. Lets face it you don't want your roof cladding or wall sheeting open to the elements if your plans go awry.

3. Do the work yourself, or alternatively get your contractor to get a license to remove asbestos.

    - If you are reasonably medically fit, of good character and have a normal amount of common sense then you may be able apply for a removal license yourself as a homeowner.
    - You will have to do some studying, pay a few dollars and attend a training course of some sort, run by an accredited training authority.
    - You may then get a one off permit do do the one project that you have planned.

6.6 Home owners, don't lose sight of other issues!

Correct asbestos procedures are vitally important, and they demand a lot of consideration, but don't concentrate so much on the asbestos that you lose sight of other issues!

Your local building authority or council may require you to get approval for even very small jobs, For instance where I live if a homeowner wants to take out a window frame and turn it into a doorway. He has to get plans drawn up, obtain an engineering certificate and get building approval.

Only after this process will he notify the work health section that he will be removing some ACM.

In respect of alterations and additions to your home, do it properly. Get the paperwork right. You may not think that you will ever want to sell your home, but if you do put your house on the market a tidy collection of all the relevant documents will make the sale a dream, it reassures prospective buyers and it facilitates the sale.

Compare that to what happens when permits and certificates are missing. You could have to drop your price by many thousands of dollars, or you may have to spend much time and money to rectify these omissions before you put the house on the market.

Please, do yourself a favour, do it right the first time.

7 Asbestos considerations for building contractors and trade subcontractors.

What follows in this chapter is just a personal opinion. The fact is that we still have plenty of homes that contain ACM and they will be around for a while yet. Another fact is that someone sooner or later will have to remove it.

When I first obtained a class "B" removal license in early 1995, it came about in a round about fashion. I had a contract to supervise the construction of a number of strata titled[1]units or apartments for a local land owner - developer.

We hit problems from the very beginning. The old 1970's buildings on the site contained AC sheeting.

- The asbestos had to be removed before the buildings could be demolished and any new work could started.
- We got a couple of quotations from two licensed "A" class Asbestos removal companies.
- They were surprisingly expensive and so we looked around for alternatives.
- To cut a long story short I obtained a class "B" license, hired a few men and we did the job on a cost plus basis.[2]
- Even though we found and disposed of a lot more ACM than was originally indicated, and we all made good money for the two weeks that it took us to do the job we saved developer $17.000.00. (1995 value)

[1]Units able to be sold to individual owners, but with only one main land (Strata)Title.
[2]Material etc. costs and hourly rates for labour, plus a percentage to cover running costs.

It was fairly obvious that the quotes we had received were inflated to say the least. The reason for this was that the llicensed people were seen as specialists. I took the attitude that they only had three things that I did not have.

1. The license.

    a) In my case it was easy, I have never wanted to remove friable asbestos products so straight away I had a lot less to learn. I decided to apply for a license for bonded AC products only and the whole process took about four weeks.

2. That specialist knowledge.

    a) These people are not professionals in the respect that they have got university degrees. They are not professors or rocket scientists. It is not a hard subject to learn. They certainly didn't know any more about building construction and demolition than I did.

3. Specialist Equipment.

    a) Once again, with no friable asbestos removal, the equipment is very simple. With bonded ACM there is no need to use expensive re-usable respirators and suits. Anything that is taken away from a completed job is simple and easily cleaned.

7.0.1 Who can obtain a license?

I think just about anyone who is of good character and in reasonable physical condition. Prior building and construction knowledge is an obvious advantage.

When I sat for my license the procedure was fairly simple, I was given or had to buy a set of the relevant regulations. I had to study them and after a period of time I had an interview and had to satisfy the work health inspector that I had a good knowledge of the procedures involved. In addition I had to provide a couple of sample methods of work, similar to what is listed below.

The Australian Codes of Practice are available for free.[1, 2] I am sure that there are many other similar documents on the web free for anyone to download. After all, the authorities are keen to spread this information. Asbestos is a public health and safety issue.

We were subjected to many unscheduled site inspection during the first few jobs that I did and I guess that at any time the license could have been revoked.

Things have changed noe of course, you will have to attend and pay for certified training courses.

7.0.2 Is it worth getting a "B" class license to remove bonded ACM?

This has got to be dependent on so many variables that it can only be decided by the individual.

- If you only come across ACM very rarely then don't bother.
- If somehow you have a gut feeling that it is dangerous then leave it to someone else.

I have never regretted doing the removal work that I did. We followed the guidelines and as such it was safe. It was safe for us as workers and it was safe for the clients.

- In a few cases of alterations an additions we came across ACM unexpectedly, with very little delay and not a lot of extra cost to the job we were able to handle it.
- In many cases of alterations we were able to do the removal and re cladding work in sections, whereas a separate removalist would have not wanted the stop and start inconvenience.

The word convenience is the key. I did not go out of my way to do this sort of work, I did not see it as a career, but more as a knowledge that I had that I could use from time to time when it was needed.

8 Bonded Asbestos Removal

Asbestos fibres are extremly small, they are not detectable by the naked eye. The photograhs in this book do not show single asbestos fibres, they show huge clumps of fibres.
Single asbestos fibres are said to be bouyant.They can remain airborne for long periods.
The whole purpose of any safe removal procedure and the main thrust of all asbestos removal codes is to protect workers and the public from breathing in loose aerborne asbestos fibres.

When asbestos fibres are used as a reinforcing agent for various products, and when those fibres are fully encased in a matrix of innocuous material, then the ACM is said to be **Bonded Asbestos.**

All that follows refers to the removal of these asbestos cement products, like the material in photograph section. Those materials are sand and cement based, but certain other products like roof shingles and vinyl floor tiles also come under this category. They can also be said to be "firmly bonded".

For the most part the Australian Asbestos Code is being used for reference in this document because of the author's practical experience as a "B" class removalist for a number of years.

If you happen to live somewhere that does not have any specific legal requirements regarding asbestos removal and handling methods then the recommendations here are a good starting point. Do it correctly and play it safe, even if you are not required to do so.

8.1 Who can remove bonded asbestos?

Homeowners and non licensed individuals may be allowed to remove a certain maximum amount of bonded asbestos sheeting.

- To do this they must contact their relevant authority and detail the extent of the work.
- This could be just a page of text, with a small sketch showing the area to be worked on. It depends on the job.
- They will be given various booklets and guides which are based on the current code requirements for the safe removal of asbestos, explaining how to do the work and the safety procedures required.
- They will be told the correct procedure and the place to dispose of the waste.
- They will then be given a starting date, which could be immediately or it could be some future time.

For any other amounts of bonded asbestos removal, the work has to be supervised by a "B" class licensed asbestos removalist.

This does not mean that everyone working on the job has to be licensed, but that the workers have to be under the supervision of a person who is licensed by the local authority where the work is being done.

In Australia we have slightly different rules in each state, they are not listed here because they may change before you read this book. If a country as small as Australia (population wise) can't agree on a unified simple set of rules then you should be able to see why this text keeps stating the obvious: CHECK THE REGULATIONS IN YOUR OWN AREA!

8.2 Notification period.

This is the published amount of time that a government authority usually needs to receive an application to remove or work with ACM. It differs from place to place. For instance in the UK the HSE requires a two week notification period is given. Given that there are various forms to be filled out and a METHOD STATEMENT (similar to the control plan below) to be supplied and considered it is little wonder that they recommend a notification period of at least three weeks. From this you will be able to gather that working with ACM is not a spur of the moment decision.

8.3 Asbestos removal control plan (method statement).

Any person who is undertaking the removal and disposal of asbestos must do some planning beforehand. For very small amounts of bonded asbestos it may not be required by law that a plan has to be submitted, but they still will have to make themselves familiar with the techniques and disposal methods available and to plan which methods will best suit the work to be done.

Before a licensed person or company can start a removal job the relevant authorities must be informed beforehand that asbestos disposal work in a particular location is proposed. All relevant information must be included in the removal plan. It should be detailed information. It is not sufficient to use a catch all expression like *"All work will comply with the requirements of the ... Asbestos Removal Code of Practice"*.

- Even though this text is concerned only with the removal of bonded AC products here, there is still a huge variety of materials, the condition of the materials, the type and location of the ACM.
- The work could be a straight out demolition or it could be a renovation where all or only some of the ACM is being removed.
- An asbestos removal plan must be well thought out and it must be detailed.
- More often than not a copy of the relevant architectural drawings are marked up to reflect the position and details of the ACM to be removed.

A removal plan goes on the record at at a local authority and it can be part of a permanent record of the work done on a particular building.

Further than that though a copy of the plan should be used and referred to on the job so that all workers are familiar with the extent of the work and the measures being taken. It is essential to avoid any misunderstandings and confusion that may result in unsafe methods.

Information to be included in a AC removal control plan/method statement.

1. Program of work and proposed start and finish dates
2. Details of the ACM to be removed.
    a) The type of the ACM and it's location.
        i. This is usually done on copies of architectural plans.
    b) It's condition and the amount to be removed.
3. Details of the asbestos removal boundaries. (9.1)
4. Electrical Safety. See (9.3)
5. PPE. Personal protective equipment. See 9.4
6. Preparation for removal work. See (9.5)
7. Details of air monitoring program if any.
8. Methods for removing the ACM. Only two options, either wet or dry.See section 9.6
9. Removal Tools And Equipment. See section 9.7
10. Decontamination. See section 9.8
11. Waste disposal. 9.9

Note! This list of information to be included in a removal plan is a fairly basic one for straightforward bonded asbestos removal work.

Notes on air monitoring.

1. The use of air monitoring devices tests whether the asbestos control procedures are working.
2. Air monitoring is not yet mandatory for all asbestos removal jobs.
    a) Bonded asbestos removal to private houses may be excluded. Certainly working in the open on the outside is excluded.
    b) Bonded asbestos removal on buildings that are to be demolished.
3. It is certainly mandatory to conduct air monitoring to any Friable asbestos removal and to any asbestos removal to workplaces, public building, schools and similar.
4. Smaller "B" class licensed contractors use the services of specialist companies for air monitoring when it is required.

When Friable asbestos has to be removed, or bonded asbestos is to be removed from the inside of workplaces and public buildings then a whole set of other provisions are also needed. Air monitoring has been mentioned, but things like smoke testing enclosures, negative pressure exhaust units, portable decontamination units etc. come into the control plan. These more specialized asbestos control methods do not need to be gone into here. They are better left in the hand of the specialist "A" class removal companies.

9 The removal control plan in detail

9.1 Asbestos removal boundaries

There should always be two boundaries to an asbestos removal site. These boundaries are to be determined by a competent person based on a risk assessment.

1. **The boundary of the actual work area.**

    a) Taking an example of work in a private home, it could be the whole of the house itself or a clearly defined part of it, and the area to and around a waste disposal skip or dumpster.

    b) A good policy is define this area with a temporary 1800 high fence and sheeted it with 200 um black poly to stop wind blowing into the area. This is easily removable when the skip has to be taken to the disposal site.

    c) If only part of a house is being worked on then any internal doors or corridors between the work are and the rest of the house must be sealed. Each area to have it's own entry.

2. **The boundary of the work site**.

    a) Taking the example a private house again, the boundary of the work site is almost always[1]the boundary of the property.

    b) A section of our asbestos removal code says "*All interested parties must agree on the asbestos removal boundaries before any asbestos removal work may commence*".[2]What this means is that before you go around and place signs and warning tape on the property boundaries you must get the approval of the adjacent property owners first.

    c) This is usually done by delivering a couple of letters to them a week or so before the job starts.

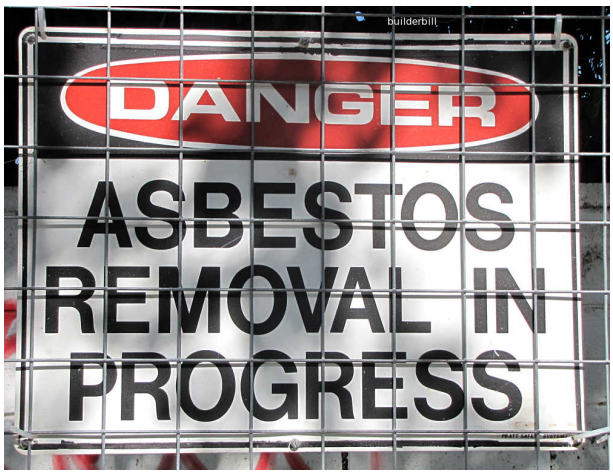
        i. One letter is a general one for a few houses either side and opposite to the work property explaining that asbestos removal work is being carried out, giving details of the contractor, license number and a contact phone number for any questions. This letter is to reassure the neighbours that the work has been approved and it will be work will be executed in compliance with the relevent codes of practice.

[1]In a case where the owner of an adjacent property refuses permission then a temporary fence is set up just inside the boundary line.

[2]Aust. Gov. nohsc. code of practice for the management and control of asbestos in workplaces [nohsc: 2018 (2005)]

ii. The letter for the immediate property owners is virtually the same thing with a copy that has place for them to sign giving their permission for the common fence line to act as the work site boundary.

9.2 Site Boundary Signage



Img 9.1: A typical boundary sign.

The site boundary should be laid out to clearly define a no-go area for the general public and casual visitors. It should warn them of the potential danger and keep them out of the area.

- The asbestos removal site should be **clearly defined**.
  - This is usually done with black and yellow striped plastic warning tape, with the words "ASBESTOS HAZARD" or similar at intervals of about 1 metre.
  - The tape is about 75mm wide and it comes in rolls of 50 metres long, but this can vary with the manufacturer.
  - It should be fixed continuously to the full perimeter of the boundary to be visible from the outside.
  - In addition to the tape, at every opening or gate in the boundary solid warning signs should be attached. There are certain standards set for warning signs but if you purchase them from a reputable local outlet they will be applicable to your local codes.
  - Signs and tape should be weatherproof.
- The warning tape and signs should be kept in good order for the full duration of the work.
- The site boundary **should be secured**to ensure that non-essential people do not enter.
  - A good idea is to put a padlock and chain on any gates from the inside to deter the complete idiots. A note with a mobile phone number can get worker's attention if necessary.
- All barriers and warning signs should remain in place until the removal work has been completed and the waste has been transported off site.

9.3 Electrical safety during asbestos removal work

Some time before any demolition work, alterations and addition to any building structure is started a good basic building practice is for the person in charge of the work to go around with a licensed electrician to inspect the work area and to plan the steps to be taken to make the area electrically safe. This is a basic requirement on all alteration jobs and it is extremely important.

It is doubly important in the case of asbestos removal work. There are extra factors that make the risk of electric shock possible, over and above the dangers of normal work.

- The greatest risk factor is the fact that the wet method of removal is by far the safest and preferred way to control asbestos dust and airborne fibres.
- Wherever possible the the wiring circuits leading into the removal area should be de-energised and if possible any electrical equipment should be removed from the work area.
- Any equipment that cannot be removed should be de-engerised and protected from damage and water.
- The affected circuits should be locked out in some manner. It is not sufficient for example to turn off circuit breakers and tape them up with with tape or tag them with warning signs.
- Any smoke detectors, thermal fire alarms etc. should be removed after the circuits have been isolated and de-energised.

On typical AC removal jobs it is common to just leave one power circuit active well away from the work area and to use power cords protected by ELD (earth leakage detector) safety boxes to bring power into the work area **for lighting only.** The lights themselves should be sealed safety fittings.

Almost always there is no other reason to use electrical power inside an asbestos removal area.

- Make sure that the power has be turned off inside the work area and that it can't be turned back on again.
- Do not take any power cords and electrical lights into the work area that are not fully protected.

9.4 PPE. Personal protective equipment.

Everyoneentering the asbestos removal work area should wear appropriate PPE.

9.4.1 RPE or Respiratory Protective Equipment. (Respirators)

This is the single most important item of protective equipment because of the airborne nature of the damaging asbestos fibres. Note, the recommendations here are for AC removal ONLY and using the WET METHOD.

If a dry method or partial wet method is used, for example, the stripping of vinyl asbestos floor tiles or removing anything dry in confined areas **then P3 respirators MUST be used and this work should be done by specialist contractors.**

- Everyone inside the asbestos **removal**work area should wear respiratory protective equipment (RPE) conforming with the requirements of the regulations applying to their area.
- There are two main categories of respirators.
  - Fully disposable ones that are worn once and then disposed of. This the simplest and the best type to use for the removal of AC type ACM. In some areas both P1 and P2 masks are deemed acceptable. The author has always used P2 ones.
  - Reusable masks with throw away cartridge filters. To use these types of mask decontamination must be carried out at the end of each job, and the mask should be kept in a sealed container until it is needed for the next asbestos removal job. **Do not contemplate using a mask that has been used on an asbestos removal site for anything else thereafter**.
- There are many further requirements that apply to the use of reusable respirators that make the simplicity of using disposable respirators the best choice by far for AC removal.
- In Australia for working with AC material the recommended disposable respirators are designated P1 and P2.
- The extra cost of using P2 rather than P1 is minor compared to the cost of the whole of the work. P2 respirators are more robust and provide for a better fit than P1 ones.
- In other countries the respirator type may be the same but they may be designated differently so check your own regulations and make sure that you have the right ones..

Using respirators.

- There is a certain amount of extra effort required to breath through standard disposable respirators, so workers must be medically fit to wear RPE.

- The RPE has to be worn all the time in the asbestos removal area.
- Obey the manufacturers instructions regarding positioning of the straps and getting a good fit . Usually you have to pinch the nose clip to make a neat fit.
- Spectacles should be removed before fitting the RPE. They must not be allowed to make a gap between the mask and face.
- Put the overall hood over the straps.
- At the end of the work period, take off RPE last and bag it in the waste container.
- If for any reason (i.e.beards) a worker is not able to acheive a good fit to the respirator he should not be used in ACM removal work.
- Don't dangle a respirator around the neck or leave it lying around.
- Keep the cartons of new respirators outside of the work area.

9.4.2 Protective clothing and footwear

Img 9.2: A worker wearing a reusable respirator and a disposable coverall Note! The hood goes over the respirator straps so that the last item of PPE removed is the mask after the suit and gloves etc. have been bagged. Photo credit - Wikepedia

- Protective clothing should be provided and worn by workes at all times in the asbestos work area prior to the final clearance inspection.
- It should be made from materials which provide adequate protection against fibre penetration.
- Wear coveralls that would be considered one size to big for normal wear, to reduce the risk of them splitting.
- There are provisions in the various codes for using reusable coveralls, but as with reusable respirators they are quite restrictive and they are only suitable for specialist applications that are not covered here.
- Disposable coveralls that are approved under the relevant codes should be used for AC removal work.
  - Like the masks they should only be used once and bagged and placed in the asbestos waste container after use.

  - The disposable coveralls should have elasticated cuffs at the wrists and ankles and they should have a hood with a draw string to make a neat fit around the face.

- Disposable gloves may be worn. It really depends on the worker's preferences. If gloves are worn they should treated as asbestos waste.
- Ordinary leather safety boots with laces or Velcro fasteners should not be used in the removal area.
- Appropriate safety footwear should be worn by workers in the area and it usually consists of rubber gum boots or rubberized work boots.
- Safety helmets should be worn if the work would require it anyway.
- The rubber gum boots that we used were cut down to just above the ankles and the legs of the disposable coverall were run over the boots, not tucked into them.
- At the end of each day's work the boots should be washed inside and out with the hose and left upside down in the work area.

Very important! The respirator goes on first. One reason for this is that by going on first it makes a good fit, but just as important is the fact that it allows the wearers to take off their suits and place them in the disposal bag still with the mask protection, and then remove the mask .

One worker should stay suited up to assist and to place the other worker's suits and masks into the bags. To then wipe it clean and then to put in his own sit into the bag and lastly his own mask and then seal the bag.

Keep in mind that wearing PPE is only part of the process of the SAFE removal of ACM. It does not make the wearer "bullet-proof".

9.5 Preparation for removal work.

Follow good building and trade practices by creating a clean work site. Removing non essential items and rubbish is basic good practice for any job. A clean rubbish free work area is also a safe work area.

Once again, **this is of far greater importance in the case of asbestos removal work.**Asbestos removal work is hard at the best of times and anything that makes it easier is to be encouraged.

Take away any movable appliances and furniture and remove any fixtures if possible. Outdoors plants and shrubs can interfere with the smooth run of the job. If at all possible remove them first.

Remove any doors in the asbestos removal area for ease of laying the drop-sheeting and for the convenience of the workers. An exception to this are external doors that will be closed or locked when the workers leave the removal area.

- The site and boundary fences should be in position with the warning signs and tape fixed.
- All materials, tools, barricades, trestles and planks etc. should be one site.
  - In particular PPE should be available in ample quantities. Do not skimp on this. Disposable masks and suits are just that! Disposable. They should not be reused because there are no fresh ones on hand.

The preferred method of storing ACM on the site and then removing it for disposal is a large truck delivered skip-bin (dumpster).

- The skip-bin should be placed on site before any removal work begins.
- The skip ideally should be close to the work area and with walking space all around it.

9.5.1 Polyethylene Sheeting, Drop-Sheets.

Commonly Called 200 um Poly or in North America 6 mil Poly and in the UK 500 gauge.

Note! um: Or micrometer. A metric measurement which is one millionth of a metre. um is also the unit of choice for measuring the length and diameter of asbestos fibres. In Australian asbestos codes[1] polythene sheet and bag thickness are laid down as **200 um minimum thickness.**It can also be labeled 0.2mm thickness.

mil: An imperial system measurement, one thousandth of an inch. Being equal to 0.0254 millimeter. Many US government publications, e.g.[6] call for the use of 6 mil minimum thickness polyethylene. (If you have a calculator handy and have worked out that 200 um is in fact almost 8 mil then it just goes to show the difference in standards around the world and one reason for my repeated warnings for you to check your own regulations).

- In most cases, both indoors and outdoors two layers of 200 um poly sheeting will have to be laid on the floor or the ground.
- This poly sheeting can be easily damaged if it is laid on top of rubbish.
- Typically the poly is black and it comes in a roll 1800mm (6ft.) wide, that when it is unrolled it is seen to be folded and when unfolded it is 3600mm wide.
- It is similar in strength and thickness to the poly used as vapour barriers under concrete slabs, but it is cheaper as it is not designed for a long life.

Plastic Sheeting, Bottom Layer.

- One complete layer of poly should be laid over the floor of the work area. It should be laid in any area used for stacking and walkways used by workers to carry the ACM to the skip-bin and around it.
  - It should have all the joints taped fully with duct tape. (Duct tape while quite expensive to buy in single rolls, gets to be remarkably cheap when bought by the carton).
  - The plastic should be turned up the bottom of none AC walls, say at least 200mm. (8 inches) and be taped to the walls. The idea is to form a tray to collect all the small pieces of ACM and dust.
  - If the wall is to be part of the removal work then the poly is fixed to the floor as close as possible to the wall.
  - It should extend from the work area to the skip and around the skip, turning up the sides of the waste bin. There should be nowhere that workers walk with ACM that is not protected by plastic. There should be no open edges that ACM can get under or places for it to get hidden.
- This bottom layer remains in place for the duration of the work, being repaired during the course of the job if it gets damaged.

Poly Sheeting, Second Layer.

- The first layer of poly sheeting is duplicated with a second layer.
  - This second layer is carefully rolled up at the end of each working day keeping small pieces of ACM contained.
  - It is placed in the waste-skip and covered.
  - A new second layer is placed in position before the start of removal work the next day.
  - Louvre windows and the tracks of sliding windows etc. in fact anything that would be hard to de-contaminate 9.8 later should also be covered with poly or taped over .

Poly sheeting, the waste-bin or skip-bin.

- The skip-bin is neatly sheeted with two layers of poly to it's inside faces, leaving enough extra poly draped over the outside of the bin to be used to cover the top of the bin at the end of each days work and at the end of the job.

Reduce the risk of a worker slipping.

The combination of plastic and wet removal methods make for a slippery surface underfoot. Do everything possible to minimise this.

For instance if there are changes in level or steps, place timber boards on the treads to define them easily .

9.6 Methods For Removing the ACM

There are two basic methods of removing bonded ACM.

- **The wet method**. This is the recommended method.
- Don't forget electrical safety. (9.3)
- While this method reduces the amount of airborne fibres, **it is still absolutely necessary to use ALL recommended PPE.**
  - As far as possible the ACM is kept adequately wet all the time it is being removed and placed in disposal bins or bags.
  - To do this an ordinary garden hose is used with a pistol grip (trigger) spray head. Nothing too sophisticated and certainly nothing high pressure.
  - Usually one worker works alongside the others that are removing the material.
  - He uses the spray to deliver a good wide soaking spray that wets and soaks into the material.
  - As soon as cracks appear he soaks them and when the backs of sheets are seen he soaks them also.
  - Small and broken pieces are wet down before being placed in disposal bags.
  - There is a balance between keeping everything damp and moist to keep dust and floating fibres down and using too much water.
  - The US EPA defines "*adequately wet*" to mean "*sufficiently mix or penetrate with liquid to prevent the release of particulates. If visible emissions are observed coming from asbestos-containing material (ACM), then that material has not been adequately wetted. However, the absence of visible emission is not sufficient evidence of being adequately wet*".[6]
- **The dry method.**
- An expensive and technical method that should only be used by specialist contractors.
  - The dry method should only be used in circumstances where it is impossible to use the wet method. For example if there is electrical equipment that could be damaged by water or even live electrical equipment in the removal area. Another exception to the rule of always using the wet method is when the temperature drops below freezing.
  - The extra work involved can mean building negative pressure enclosures around the ACM so that any air movement would be from the outside of the work area to the inside, and workers using full face supplied air respirators. These should work at a positive pressure. That is: there should always be air traveling out of the respirator, not being sucked in.

9.7 Removal Tools And Equipment.

This warning section should be understood by all workers, but it would not be necessary to mention it in the Asbestos Removal Plan

High speed power tools should never be used. Definitely no grinders, impact or high speed drills. No air tools, sanders or power saws.
Apart from the action of the tools creating dust at the cutting edge, there also is the fact that all electric tools have built in fans. These are designed to suck in cooling air and then to emit it, usually near the operators face. That is one danger. Less obvious is the fact that the inner workings of the power tool will become contaminated with asbestos fibres!
Even in hot conditions electric fans should not be brought into the area. Take frequent rest breaks in uncomfortabel conditions.
Do not use an ordinary vacuum cleaner. The filters are far too course, they do not catch asbestos fibres.
High pressure spray equipment (water blasters) should not be used, and compressed-air sprays should also not be used.
Do not use any tools that are hard to clean unless you are prepared to put them in with the waste at the end of the job. For example leather of cloth nail bags and tool pouches.

- Normally for "B" class removal and less than 10 M^2 it is sufficient for the asbestos removal plan to just state something like *"Only carpentry hand tools will be used".*
- It is not usually necessary to list any trestles or planks, but if higher removal work is being done then whatever special equipment to be used should be listed.
- To provide a constant low pressure water spray for wet removal, an ordinary garden hose is used with a pistol grip (trigger) spray head.
- If mains water is not available or if it is a small removal job then a portable pump up pressurized spray similar to gardener's back pack sprays can be used.
- Normally all tools are left inside the work area at the end of each day's work, and at the end of the work the tools and planks etc are de-contaminated before they are used elsewhere.
- Clear polyethylene ACM plastic bags, 200 um minimum, signed "danger asbestos materials. Wet waste containers similarly signed (if required). Cleaning rags or kitchen wipes. Buckets for water.

There is an exception that allows the use of power tools in our Australian Code [3]

This is that low speed battery powered tools may be used if a LEV hood is used on the tool. That is a Local Exhaust Ventilator. For the work under discussion here they are not applicable.

[3] Aust. Gov. NOHSC. code of practice for the management and control of asbestos in workplaces [nohsc: 2018 (2005)]

The guys with “A” class licenses doing friable and specialist work will have to list in their Asbestos Removal Plan whatever special equipment that they will use. This may include air monitoring equipment, HEPA vacuum cleaners, special PPE, even transportable decontamination buildings etc. Once again these details are outside the scope of this book.

9.8 Decontamination.

There are different aspects of asbestos decontamination and they do vary from job to job and the type of ACM being removed. Once again the emphasis here is on bonded ACM. So this text will not go into specialist decontamination procedures. Disposable masks and suits should be used and they should be bagged and disposed of every time they are taken off.

When reference is made to bagging the waste it is referring to the **double bag procedure**described in the next section 9.10 on primary containers.

9.8.1 Decontamination of workers.

- This should happen **every time**that workers leave the area. That means rest breaks, lunch breaks and end of work.
- A separate area inside asbestos work area is set up for this purpose. If it has a sink or wash trough so much the better but often the hose and sprinkler is used.
  - All obvious dust is wiped off the protective suits then the wipes and the suits are bagged **after being fully wetted.**
  - The rubber boots are wiped down and the wipes bagged.
  - Usually one worker assists the others with the bagging etc. and then does himself when the others have left the area.
  - Before leaving the area everyone should wash hands and face and in particular under fingernails. If it is possible a temporary shower should be used by all workers before leaving the site.
- Personal work clothing should not be allowed to get contaminated as it is not allowed to wash contaminated clothing at home in a domestic washing machine. Using the correct disposal suits with elastic cuffs stops this happening.

9.8.2 Decontamination of the workplace

When the all ACM has been removed and placed the the waste bin, then the last job is the de-contamination process. The favoured method is the wet method. The dry removal method will not be described here as once again it is in the sphere of the specialist "A" class contractors.

Wet Wipe Method.

- Decontamination takes place when all the ACM has been removed and placed in the main waste holder. (That is the truck delivered bin, skip or dumpster).
- The floor poly is removed along with the dust and small scraps that it contains and placed in the main waste holder.

- All small pieces of ACM are picked up and placed in the clear poly bags.
- Any protective poly or tape over windows, walls or appliances should be wiped down before removal. The plastic and tape should the be bagged.
- The whole area; walls, ceilings and floor is wiped down with moist rags or kitchen wipes and the rags are placed in the clear poly bags, double bagged and then into the main waste holder.
  - The technique with the wipes is to dampen the wipe in a bucket of clean water, wipe a surface with a flat clean section of the wipe and then place it in the poly bag.
  - **Do not rinse the rags or wipes in the bucket of water, that will contaminate the water!**
  - Even so get fresh water from time to time.
  - It is OK to fold and refold the rags or wipes to expose fresh clean surfaces but keep them flat and not bunched up.

Tinted PVA Method.

The wet wipe method of decontamination should be applied to all surfaces, but in some cases this is just too hard. For instance rough sawn timber in old stud walls or beams is hard to wipe clean. Even though these materials may be eventually covered, to protect workers like tilers or plasterboard fixers in the interim then the rough sawn timber should be sealed.

- The rough surfaces should be hand spayed to seal in the AC fibres with a tinted PVA glue sealer. 10.5
- The PVA can be tinted with ordinary paint tinters from any paint shop. Do not allow anyone to start working in the area until the PVA is dry.
- The reason for tinting is so that the PVA sealer which otherwise dries clear, can be seen and so checked to see that all areas are covered.

9.8.3 Decontamination of tools.

Using simple hand tools this consists of wiping the tools down with moist wipes a couple of times a the end of the job with the wipes being bagged. Overnight during the course of job the tools are left inside the work area.

Any hired equipment , say vacuum cleaners, is placed in sealed containers that are then wet wiped before taking out of the work area.

9.8.4 Soil Decontamination.

For the most part this is a fairy simple process. It is usually called for in cases of storm or other accidental damage to the outside AC cladding.

- PPE is worn and the area is dampened down.
- All visible pieces of ACM are placed in bagged.
- Bigger pieces are individually wrapped with double layers of 200 um poly.
- The waste is then disposed of as detailed in the waste disposal section.9.9

In the case exposed former landfill dumps where the soil is contaminated to a depth, then the area is wetted down continuously while the material is machine excavated and placed in skip bins. All workers wearing PPE and the machinery hosed down with the runoff water going into the excavation. The hole is then backfilled with clean material.

The whole of the material removed, ACM and soil, is treated as asbestos waste and disposed of as detailed in the Waste disposal section.

9.9 Waste Disposal.

Disposal of ACM waste is a highly regulated field and it is rightly so. In the past It was common to just dump the stuff in uncontrolled landfill areas where it may or may not later get buried.

There may be excuses for bad practices in the past as the dangers of this noxious substance were not fully known, but unfortunately fly tipping, (illegal dumping) is still a problem in this day and age. The main cause of this is may simply be the exta cost of doing the right thing. In this age of user pays surely there is a very good case to be made for local councils to subsidise or even even waive fees entirely for ACM disposal.

It is no longer acceptable for anyone to just throw ACM away with normal building rubbish.

An integral part of the overall Asbestos Removal Plan should be a waste disposal plan. The person making the plan should carefully study the needs of waste containment, the location of site storage of collected ACM and the type of containers to be used. He should work out unobstructed clear pathways from the work area to the storage and he should consider the security of the container and the method of removal and disposal of the waste. The person in charge should organise timely transport of the waste to the disposal site. **It is not recommended to store waste on the work site any longer than is necessary.**

9.10 Waste Disposal Containers

A typical bonded AC removal job uses a few different type of containers for control of and finally disposal of ACM waste.

Primary containers

These are usually quite small and are the immediate containers of the ACM.

- They are purchased specifically for asbestos waste and always have printed warning signs on them.
- Only new unused bags and containers should be used.
- Typically a warning sign will say "*Caution , Contains Asbestos, Avoid Opening or Breaking Container, Breathing Asbestos is Hazardous to Your Health*"
- Clear polyethylene ACM plastic bags, a minimum of 200 um thick are examples of primary containers.
  - The size of the bag is designed for easy lifting and carrying by one man without it bursting and so it should be no larger than 1200 long by 900 wide.
  - The recommendations for using these bags state that the bag should be only half filled, and the excess air slowly squeezed out before sealing the bag.

  - Sealing is done by twisting and folding over the top and then fixing it with duct tape or similar.
  - Pieces with sharp jagged edges should preferably be wrapped with offcuts of the black floor poly and taped before placing in the bags to stop them puncturing the bags.
  - The outside surface of the bag should be damp wiped before it is moved to a non removal area (but still a controlled) cleaner area where it is placed in a similar bag and sealed also. **This is the process know as double bagging.**

- Other primary containers can be various sizes of sealable metal drums or hard plastic sealable drums.

Secondary containers.

These are usually the steel skips in which the waste is transported to the waste disposal site in. They are carried to the site by a special truck and offloaded by the truck. They range from 3 to 5 cubic metre "Mini Skips" to Skip Bins from 5 to 30 cubic metre capacity.

The truck picks up the loaded skip with hydraulic arms and loads the skip onto the truck bed. A the other end the truck can offload in a similar way and then with different controls tip out the contents.

Mini skip type steel garbage containers that are emptied straight into a garbage compactor truck are not suitable for asbestos waste.

- The skip has to be lined with double layers of 200 um sheet poly and the ACM fully covered and sealed with the poly plastic sheeting.
- In addition it is usually covered with a tarp or netting as is normal for the transport of loose building waste.
- The skip has to be clearly marked as containing asbestos waste.
- A normal way of doing this cheaply is the wrap the perimeter of the loaded skip with asbestos warning tape, same as the boundary fence tape. The warning tape is not salvaged, but buried with the ACM.

Larger Metal Drums

If a few of these are stored for later disposal, when the drums have been wiped down on the outside and lids have been fixed, then they should be moved to storage by a forklift or crane. At any later time if the drums need to be moved they should be not be moved by hand or manhandled in any way. A forklift or similar should be used.

9.11 Reporting and Record Keeping Requirements for Waste Disposal

Wherever codes and regulations are in place there are requirements on the people involved in asbestos disposal process. These are need to make sure that the ACM is recognized for what it is and that it is disposed of according to the laws and bye laws of any particular location.

There are three parts to the process.

1. The ACM waste generator.
    a) This could be a home owner who is removing less than 10 M^2 of bonded asbestos or a licensed removalist removing larger amounts.
2. The ACM waste transporter.
    a) The truck or skip hire company through their employee, the truck driver.
3. The ACM waste disposal site operator.
    a) The person who prepares to receive the waste and then buries it.

The procedures vary from place to place, so what follows is a typical method only which would vary in the details but would be common for most areas.

- About a week before starting any work on site the removalist should contact the dump operator by phone or e-mail to let him know in general terms what his program is. This should be followed by the specific details of the work, site address, type and approximate quantity of materials to be disposed of.
- A similar phone call or e-mail should be made to the skip hire company, making sure that a skip or skips would be available at the correct time.
- 24 hours before the actual disposal the dump manager should be told that the removalist is ready to send some ACM waste.
- The dump manager should give a time for the disposal to take place and he would then arrange get a hole dug to bury the waste.
- The truck driver should be given a letter by the removalist to give to the dump manager once again describing the ACM and where it came from. The driver should sign a similar letter for the removalists records stating that the material was well wrapped and had the required warning signs when he received it.
- At the dump the ACM is placed in the prepared hole and the skip hosed down over the hole (decontaminated) before the waste in the hole is backfilled. (buried.)

The foregoing may seem complicated but it is simply a case of being organized. A skip containing ACM should not leave the removal site unless the disposal is organized at the other end.

9.12 Don't Use Your own Vehicles For Waste Disposal

Basic common sense says that anyone who has gone through the whole system correctly will not use a private vehicle to dispose of asbestos waste. If the vehicle is a metal tray back utility vehicle then maybe a few hand loaded and unloaded double bags may be acceptable if the vehicle is hosed down at the dump.

However for any larger quantities even for quite small amounts Mini skips are extremely convenient and safe.

10 Practical removal techniques, hints and tips.

10.1 Equipment For AC Sheet Removal

Garden hose and trigger spray head. The most important tool on the job.

2 gallon plastic buckets For keeping the smaller tools in. For clean water when decontaminating.

Kitchen wipes or clean rags For wiping down the poly bags, suits and boots and general decontamination.

Waterproof safety lights Run leads from a RCD safety box situated well away from the wet work area.

Roll(s) of 200um black poly. For drop sheeting and masking and screening.

Rolls of duct tape Sealing the joints in the drop sheeting and sealing the poly bags

10.2 Tools Used For AC Sheet Removal

Just a quick reminder, no power tools, no leather or cloth nail bags unless you want to dump them after. Hand tools only.

Claw hammers, Lump hammers.

Pincers or End cutter nips Pulling out loosened nails.

Nail punches - Drift punches. Drift punches are quite large compared to a carpenter's nail punch, so you may be able to buy one off the shelf. They are ideal for working with gloved hands and lump hammers as small nail punches are a bit fiddly when wearing gloves.

Modify nail punches by grinding the tip to the size of the FIBROnails. Depending on the timber, soft or hard this may be all that is needed. A few quick belts on the nail heads with a punch and lump hammer and the nails get punched in enough to loosen the sheet.

Engineer's Wadding punches With the centre hole just larger than a nail head. Wadding punches come in a variety of sizes. They are mainly used for cutting holes in gasket material. Get one that just fits over a FIBROnail head. A swift whack on the punch, again with a lump hammer will punch a circle around a nail head and the sheet can be wriggled off it.

Long (900mm) pry bar Lifting off nailed timber cleats and pulling 75mm nails.

A small precision pry bar(Stanley make a little beauty) With a wide flat prying surface. Most of the time these pry bars are used in conjunction with a hammer to tap it under a sheet edge close to a nail. The sheet and nail are lifted 10mm, the bar is removed and the nail is withdrawn with a claw hammer. (Faster than you can read this:-)

Hand saws Cutting timber studs etc. If they are being removed of course.

Brickies bolsters. The same use as the pry bar and as a cold chisel.

Cold chiselsthat have been ground with a flat side and a single bevel, that are similar to wood chisels but a lot cheaper to buy and no problem if they get ruined.

10.3 Notes on loading skip bins

Often right at the start of the job a lot of low level waste material is created that has to go into the poly plastic lined skip bin. This usually take the form of removed timber trims, architraves, skirting or baseboards etc. Later there may be timber studs and plates, or ceiling battens.

- These trims and timber always have FIBROnails with small scraps of the ACM attached or under the nail heads. These scraps should be give a quick squirt with the PVA sealer before moving them of the immediate work area.
- Do not be a rush to pile all this timber scrap into the skip, but place it somewhere near the skip on poly plastic drop sheeting, but keep out of the way of workers loading the skip.
- The main material is loaded into the skip first, that is the full flat AC sheets and part sheets.
- Quite often a worker or two climb into the skip bin and receives the material and stacks it.
  - This would be impossible to do if the skip bin was already part full with a jumble of lengths of timber with nails sticking out everywhere.
- When the main pieces of ACM have been placed in the skip then the clear ACM plastic bags of smaller material are are placed inside the ship bin. Again the emphasis is on placing the material without damaging the bags.
- The scrap timber and trims go in last and again they are placed into the bin. Not thrown.
- The main point of safe asbestos removal cannot be stated enough times. It is to reduce dust. Throwing ACM into skip bins is not only unsafe but it is wasteful of the use of the bin. Quite simply a tidy bin can hold more material and so save on hire, transport and disposal costs.

Do not overfill the skip bin.

10.4 Review Notes for removing AC sheeting from private houses.

CAUTION! Do not dust, sweep, or vacuum particles suspected of containing asbestos. This will disturb tiny asbestos fibres and may make them airborne. The fibres are so small that they cannot be seen. If you attempt to use a conventional home or shop vacuum cleaner, you are likely to do far more harm than good. The fibres are so small that they can pass through normal vacuum cleaner filters and be propelled back into the air.

The dust should be removed by a wet- mopping procedure or by specially-designed "HEPA" vacuum cleaners used by trained asbestos contractors.

The whole thrust of the regulations is to SAFELY remove ALL of the material.

Even the simplest tool can be used in a destructive way such that it's use may create far more dust than necessary. The be all and end all of using tools in asbestos removal is to take it easy, don't rush. The idea is to remove the ACM in as big pieces as possible. It is fairly common and easy to remove full sheets if it is done correctly.

My policy with respirators is to use disposable P2 masks that are comfortabele and fit well. New ones are used every time a worker enters the removal area and they are bagged as waste when leaving the area. The same applies to the disposable suits. These things are disposabe so renew them.

Check that the preliminaries are set up:-

1. Permission from authorities. Re-confirm and inform the authorities at least a week before commencing work, giving the starting date.

2. Neighbours to be informed beforehand in writing giving them details of the work and the safety measures being taken. Include phone numbers for them to get in touch, in case they have questions.

3. Asbestos Removal Plan has been approved. 6.5 Make sure that all workers on the job understand the main elements of the plan as it applies to the work that they are doing.

4. Asbestos removal boundaries set up. Fix temporary fencing if required, fix signs and barrier warning tape around the asbestos work area. 9.1

5. Electrical Safety .9.3

6. Make sure that there is PLENTY disposabel PPE on hand before commencing removal work.(9.4) All workers should use fresh disposable PPE every time they enter the work area; and it should be bagged as ACM waste every time that they leave the area.

7. Other PPE may include hard hats, safety glasses, gloves and rubber boots which should always be left on the job. They should not be taken out of the work area during breaks. This happens only at the end of the job.

8. The only tools to be used are hand tools, pry bars, hammers etc. These are usually left in the removal area for the duration of the job. If individual workers take their tools away after each day's work they should be decontaminated each time they leave the work area.

9. Take a considerable amount of time cleaning, leveling, removing obstacles, trimming shrubs and trees around the work area, before starting to lay protective plastic drop-sheets.

10. Preparation work and poly plastic drop-sheeting. 9.5

11. All equipment and tools needed available - 9.7 Including PVA glue and squeeze bottles.10.5

12. Primary and secondary waste disposal containers available. 9.9 The the skip to be lined with two layers of 200 um thick black poly plastic sheeting with plenty overhanging the sides to use for covering the top up.

13. Upon start of the actual ACM removal NO NON ESSENTIAL PERSONS SHOULD BE ALLOWED INTO THE REMOVAL AREA.

14. Don't smoke or eat and drink in the work area.

15. When working indoors shut all external doors and windows to mininimise the spread of wind blown fibres.

- Keep one person all the time with a hose delivering a fine mist spray to
- One guy works with the water spray and keeps a fine mist spray on all the surfaces of the AC. He should be well aware of the aims of the **"wet removal"**method and the meaning of the term **"adequately wet".**(9.6) He should spray the workers, the work, the walk areato the skip, and the area in general to keep down the dust.
- Remove all timber trims if any using pry bars and hammers. Stack them aside.
  - If they are to be salvaged, then the best time to clean them up is now, before the real removal starts. De-nail them and wipe them down to decontaminate. Stack them aside out of the way. All the nails and scraps should be bagged as ACM.
- Remove all the AC battens and corner moulds .
  - Use a small pry bar with a wide end to lift them away from the surface and the claw of a hammer.
  - These are almost never removed on one one piece. The nature of the things are that they will break almost every time at the nail.
  - Just keep things wet and place the pieces in the clear ACM poly bags.

Remove the first of the flat sheets. A two man team can do this best using a combination of punching, wriggling and prying. Other workers carry the sheets and carefully place them into the skip.

- If there is an external corner start from the exposed edge and use the pry bar at each nail to lift the nail enough to get a claw hammer under it.
- Always try to work from the open edge.
- If there is no open edge make one by removing the narrowest sheet first.
- To do this punch the nails through the sheet with drift punches or cut around the nails with wadding punches to hopefully lift out the sheet in one piece.
- Nail heads that that are left behind in the timber, to be sealed along with the fibres under them, with watered down PVA glue in a hand spray bottle.
- Usually small "Vee" chunks break off around the nails at the sheet joint. This is unavoidable and they are water sprayed and bagged.
- If the nails are hard to punch or if the underlying studs etc. are to be left in position, then punch around all the nails with the wadding punch.
- If the timber is to be re-used, for example if the wall is to be re-clad, don't remove the nails straight away give the PVA time to dry.
- If the timber is not to be reused in the same position don't attempt to recycle it, spray the nails etc. with PVA treat it as asbestos waste and put it in the skip-bin.
- Smaller pieces to be gathered up and placed in approved clear ACM plastic bags with asbestos warning signs on them. These are to be placed in the skip-bin..
- No shoveling or emptying wheelbarrows of loose material directly into the skip-bin.

Carry on removing the sheets in this way. It is better to get all the large sheets off and stacked in the skip bin first, and then load gradually smaller pieces and then the poly ACM bags.

1. At the end of each day's work the top layer of drop-sheet plastic is to be carefully rolled up with whatever dust it contains and put into the skip, along with disposables masks and overalls.
2. The skip to be sealed with plastic at the end of each day or when the work is halted.

When all ACM are removed fold up the top drop-sheet poly in such a way as to contain all small pieces and dust and place in the skip bin. Remove the cover sheet plastic to doors, windows and other protected surfaces and place in the skip-bin.

1. Continue with the decontamination procedure.(9.8)
2. Carry out the correct waste disposal procedure.(9.9)

10.5 PVA Glue Sealing, Dust Minimisation.

Ordinary white PVA glue (Polyvinyl Acetate) is a water based glue great for gluing many porous and semi porous materials together. It is often called carpenter's glue. Trade names here in Australia are "Aquadhere" and "Titebond". It is cheap to buy and in spite of many manufacturer's claims, they are all very similar in performance so there is little gained by spending more money.

The use of the glue in asbestos removal is to spray it onto exposed broken edges of AC sheeting to bind the asbestos fibres to prevent as much as possible the release of dust and fibres during the bagging or placing of materials in receptacles for disposal.

- Use a kitchen type of hand trigger spray bottle, the type that is commonly used for spraying deodorant or window cleaner.
- Specialist cleaning stores that cater to cleaning companies sell stronger bottles with better pump actions than the throw away supermarket ones pre-filled with cleaners. These are a lot better than the throw away ones in that they can handle the thicker liquid of the PVA mixture.
- Fill the squeeze bottle with a mixture of PVA glue and water.
- Mix the PVA glue by trial and error until it has as much glue as possible and yet still sprays well.

This is not by any means a permanent asbestos sealer, it is an aid in reducing the amount of dust during asbestos removal.

- A typical example would be in the removal of flat AC sheets.
- When each sheet is lifted off a worker gives each FIBROnail head and the AC trapped under it a liberal spray with PVA glue mixture.
- By the time that the nails (or the studs holding them) have to be removed, the ACM around and under the nail heads is a mass that holds together well.

10.6 Thickened Substances, Dust Minimisation.

On many occasions a useful technique is to use thickened substances. When they are spread on surfaces or used in containers they can act like flypaper trapping particles of dust and fibres as they are released.

- Very handy and easy for small jobs is a spray can of shaving foam.
- Similar to this is hair gel, which comes in larger tubs.
- Packets of commercial wallpaper paste can make up large quantities of a good paste.
- A good brand is Henkel, and a packet of 400 gram (or so) makes up a 2 gallon bucket.
  - The trick with making up the paste is to mix it according to the instructions, (maybe a bit thicker as it is easier to thin down) and then leave it overnight to stabilize and to really thicken.
  - If you have to keep it for an extended period of time then keep it in a fridge.

You may have noticed that the thickeners above are all water soluble. This is because just about all AC removal is done by the wet method. Making clean up and decontamination easy.

The paste is wiped off the surfaces with rags and placed straight away into Asbestos containers.

10.6.1 Drilling holes in AC sheeting

1. Set up warning signs, restrict access to imediate area and the rear of the wall. If drilling through roof sheeting tack measure to protect the inside and to restrict access underneath.
2. Place masking tape over the position of the hole. If the rear of the sheet is accessable do it there also.
3. Mark the hole position(s) with vertical and horizontal lines.
4. Place drop-sheets around the area taping with duct tape.
5. Don PPE.
6. Use an empty plastic butter container or any similar throw away carton and fill it with thickener. If the rear is open tape a similar container at the rear.
7. Line it up with the centre-lnes and using a hand drill or a low speed power drill, drill the hole(s).
8. Seal the edges of the hole with PVA or water based paint.
9. Bag all waste and PPE and clean up as detailed previously.

10.7 The Use of Pry Bars

It is so easy to do more harm than good with these tools. They are simple levers and and they can crack or shatter AC sheets like egg shells if used wrongly.

- Use the pry bars in a similar way that you would use them on a good finished wall surface that you don't want to damage.
- Always place the heel or fulcrum of the bar in a solid position, on top of a stud or noggin in the framing underneath. You can tell the position of studs, plates and noggins by the nail positions. Also by tapping the sheeting with a hammer. The sound will be hollow until the tapping is over a support, when it will sound solid.
- Otherwise use pieces of timber under the heel of the bar to spread the load, say across two studs or across a stud and a noggin.
- When the bar is used to pry under AC sheets to remove nails, use it as close to the nail as possible to minimise sheet cracking or breaking.
- Most times it is sufficient to pry the sheet and the nail up say 5mm to 10mm.
- Then the bar is removed, the nail head is proud of the sheet and pulled with a claw hammer.

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