Safety Matters @Work
Workers Compensation Board of PEI

Guide to Asbestos Management

This Guide is adopted from the Alberta Asbestos Abatement Manual as published by Human Services, Government of Alberta, in August 2011.

This guide provides guidance to help employers meet their obligations with respect to asbestos abatement based on provisions under the *OHS Act* and Asbestos Regulations. The guide is not intended as a form of legal advice, and should not be taken as a statement of the law; therefore the reader should always refer back to the Asbestos Regulations for specific requirements.

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CHAPTER 1

Asbestos and Asbestos-Containing Materials

INTRODUCTION

Asbestos is the common name given to a group of naturally occurring mineral silicates that can be separated into flexible fibres. It is found in the veins of rock and is usually mined from an open pit mine. The asbestos fibres are extracted from the ore after successive stages of crushing and aspiration. These fibres are then sealed in plastic bags for use in the manufacture of products containing asbestos.

The name asbestos comes from the Greek word meaning "unquenchable or indestructible." There are two main mineralogical classifications of asbestos — serpentines and amphiboles — based on the rock types which form the asbestos. Each classification is further sub-divided as follows:

Serpentine Asbestos:

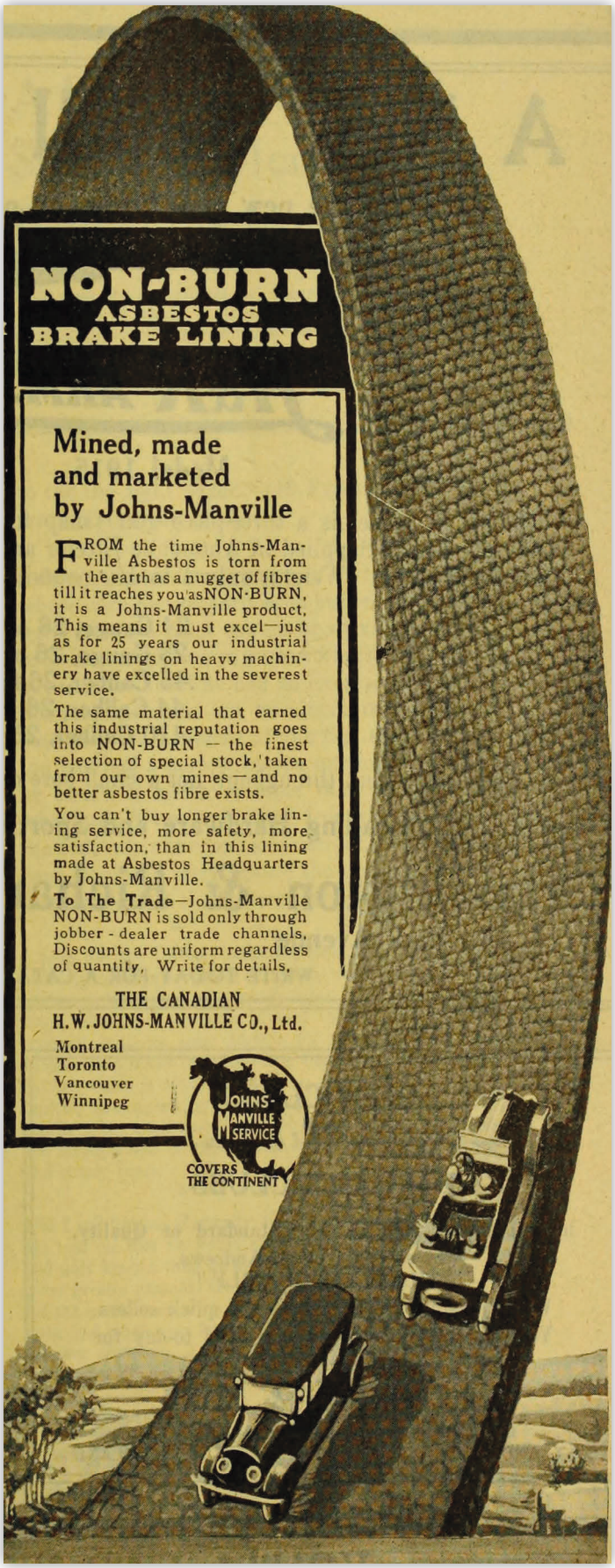
- Chrysotile

The serpentine family consists of only chrysotile or "white" asbestos. It is a hydrated magnesium silicate having long wavy fibres that are white or off-white. The chrysotile form accounts for approximately 90% of current world consumption.

Amphibole Asbestos:

- Amosite
- Crocidolite
- Fibrous Tremolite
- Fibrous Anthophyllite
- Fibrous Actinolite

Within the amphibole family, only amosite and crocidolite have had significant commercial use. Amosite is often called "brown" asbestos and has much straighter and shorter fibres than chrysotile. Crocidolite is referred to as "blue" asbestos and has long straight fibres much like amosite.



HISTORY OF ASBESTOS USE

Humans began using asbestos at least 10,000 years ago. Archaeological evidence supports that clay cooking pots in Scandinavia dated 8,000 B.C. contained asbestos fibres. These ancient potters realized adding asbestos to clay made their vessels heat-resistant. The Egyptians made asbestos burial shrouds. Romans weaved asbestos fibres into napkins and tablecloths. Later, Crusaders in the Middle Ages built asbestos bags to hold flaming tar, which they catapulted over fortress walls.

The Industrial Revolution drastically increased the demand for raw asbestos materials following the invention of steam-powered equipment and the need for products that were resistant to high heat. From the late 1800s, worldwide demand for asbestos-based products exploded. For the next century, millions of tons of asbestos ore was found to be present in more than 3,000 different manufactured products.

World War II saw the most significant asbestos consumption in North America. The war effort demanded building products be readily available, easy to work with, and cheap to buy. Consequently, asbestos-containing materials (ACM) were used in nearly all construction and shipbuilding endeavours at that time.

The post-war prosperity introduced hundreds of new asbestos products into homes, schools, offices, and factories. It also saw the rise of asbestos used in cars, airplanes, and even air conditioners. Asbestos was everywhere. It coated electric wires, lined furnaces, and insulated walls and pipe systems.

In 1973, the Canadian government began introducing legislation prohibiting the use of asbestos in some consumer products. By 1980, this legislation extended to some products used in the construction industry and by the end of this decade the use of most ACM became prohibited from being used in new buildings and renovations. By the end of 2018, all products containing asbestos (with a limited number of exclusions) are prohibited from being imported, sold or used in Canada.

Many products which, at one time, contained asbestos are either no longer in use or have been replaced.

The construction industry was the main user of asbestos products. Former building materials which contained asbestos are typically found in the following locations and products:

Building Exteriors

- Asbestos cement siding panels – flat, corrugated, shingles, or accent panels
- Asbestos cement soffits – flat or perforated panels
- Asbestos cement roof panels – corrugated
- Roofing felts and mastics
- Building overhangs – thermal spray
- Stucco
- Brick and block mortar
- Loose fill insulation in exterior wall cavities (vermiculite)

Flooring

- Vinyl asbestos tiles (VAT)
- Sheet vinyl flooring (asbestos paper backing)
- Floor leveling compound

Ceilings

- T-bar ceiling tile
- Asbestos cement ceiling tile
- Acoustic and stippled finishes
- Plaster or drywall jointing materials

Walls

- Plaster or drywall jointing materials
- Stippled finishes
- Thermal spray
- Asbestos cement panels

Service Areas

- Insulation in boiler rooms — boilers, vessels, pipes, ducts, incinerators, floors, ceilings, walls
- Fan rooms — insulation on pipes, ducts, chillers, floors, ceilings, walls
- Machine rooms — insulation on pipes, ducts, floors, ceilings, walls
- Crawl spaces — insulation on pipes, ducts
- Wall cavities, insulation above ceiling spaces — pipe and duct chases, pipes, ducts

Structural

- Fireproofing spray on beams, decks, joists, columns and other structural members

Pipes (insulation on either exposed or concealed pipes)

- Steam and hot water heating supply and return lines
- Domestic water supply and drain lines
- Chilled water lines
- Rain water and sanitary lines — asbestos cement or bell and spigot cast iron, insulated or bare pipe
- Gaskets in flanged pipe joints

Miscellaneous

- Incandescent light fixture backing
- Wire insulation
- Fume hoods – internal linings and exhaust ducts
- Lab counters
- Elevator brake shoes
- Heating cabinet panels (asbestos cement)
- Fire dampers and fire stop flaps
- Diffuser backplaster
- Emergency generators – thermal insulation and exhaust manifolds
- Firestopping
- Theatre curtains
- Welding blankets and screens
- Incinerators – internal insulation
- Cooling towers – panels and fill
- Duct tape
- Duct expansion/vibration isolation joints

Building products containing asbestos in an unbound or loosely bound form include:

- Insulating cements
- Sprayed insulation — fire resistant, acoustic, thermal, condensation control
- Insulation block — magnesia or calcium silicate
- Textiles — not saturated, for lagging, curtains or clothing
- Vermiculite insulation (may contain tremolite asbestos as a contaminant) – produced from the Libby, Montana mine by W.R. Grace & Company and known by the brand name "Zonolite"

The list of products containing asbestos which were used in applications other than construction include:

- Bound-fibre products
- Brake linings, brake blocks, clutch facings
- Gaskets, packings
- Plastics
- Textiles and catalyst supports
- Non-bound fibre products such as millboards and papers
- Some electrical insulation and filters or filter aids

Non-friable products which may contain asbestos pose little danger of releasing airborne fibres unless they are cut, broken, sawn, ground, sanded or are in deteriorating condition.

Tyneside Shipyards, 1943.
Two young workers mixing asbestos insulation.

FRIABLE SPRAYED PRODUCTS USED IN BUILDINGS

One product that is usually friable and a major cause of concern in buildings is asbestos-containing, sprayed-on acoustic or thermal insulation. A good measure of a product's potential hazard is its friability. A very friable material easily crumbles with hand pressure; a less friable material cannot be crushed with hand pressure. The more friable the material, the more likely it is to release fibres into the air.

Asbestos was introduced into North America for acoustical and decorative use. In 1950, it was approved for use as a fibrous spray for fireproofing. It was widely used for the fireproofing of structural steel, components of high-rise office and public buildings, and in auditoriums, hallways and classrooms of school buildings. The use of asbestos-containing spray products was widespread until approximately 1972, although the use of several acoustic products containing asbestos continued after this date.

The concentration of asbestos can vary greatly within one installation due to the method of application.

The formulation of sprayed-on insulation depends, to some extent, on the method of application. There were two main methods of application — the wet method and the dry method. The extent of the problems associated with the insulation at a particular site is also related to the skill of the person applying the product.

These materials were used in applications ranging from fully exposed in factories, partially hidden for architectural effect, or fully enclosed behind suspended ceilings. The materials may be found on beams, beams and columns, or beams and decks. The material may be in good condition or may be flaking badly. It may have a hard or solid surface but be very soft beneath the skin. The materials may have become damaged by maintenance or renovation activities or water. The applications may range in thickness from almost no measurable thickness to 75 mm (3 in). The materials may be extremely well coated with a layer of dirt behind a suspended ceiling or be completely open in a room and susceptible to damage by direct contact.

Thermal insulation of a pipe. The insulation is made from asbestos fibres.
Source: https://commons.wikimedia.org/wiki/File:Asbestos_pipe_insulation.jpg

Thermal insulation of a pipe. The insulation is made from asbestos fibres.
Source: https://commons.wikimedia.org/wiki/File:Asbestos_cement_mortar.jpg

PIPE OR BOILER INSULATION

Asbestos-containing materials have been used extensively in thermal mechanical insulation because of their excellent insulating properties. It could also be formed in place and was frequently used to complete irregular sections around valves, elbows, and fittings or to provide additional strength over fiberglass insulation on pipes or ducts. This material is frequently called asbestos-cement, asbestos insulating cement, or blue mud. It may have been used with other asbestos-containing insulations or frequently found combined with fiberglass pipe insulation on straight runs of piping. This wide range of asbestos-containing products and the variety of their appearances means it is impossible to confirm by eye, or from building plans, if a product contains asbestos. The only way to be sure is to have the product properly analyzed in a laboratory.

ASSESSING HEALTH AND EXPOSURE RISK

If asbestos is inhaled, it could cause disease. Intact and undisturbed asbestos presents no direct health hazard but does present a potential exposure hazard should fibres be released and inhaled. As a result, there is some risk associated with all asbestos installations.

The health risk is considered minimal for asbestos materials in good condition in an inaccessible location and protected from damage. Where damage can be controlled or prevented, managing the exposure risk is often the most cost-effective control measure. Where damage or disturbance cannot be controlled or where deterioration is due to uncontrolled natural causes, management of the exposure risk is very difficult.

Air monitoring alone is insufficient to determine the potential health and exposure risk since asbestos fibres cannot usually be detected above background levels unless the material is disturbed in some way. Additional criteria is needed to determine the risk of exposure or the need for removal.

Examples of materials that cannot be effectively managed include:

a) materials in air handling systems where air movement can break down or erode the material;
b) materials that are damaged by water or vibration;
c) materials that are easily accessible to the general public and may be damaged by accident or through vandalism; and
d) friable materials in proximity to maintenance activities.

Once the assessment has been completed, the health risk to workers in this location will depend on the condition of the asbestos-containing materials and the accessibility of the materials. If the asbestos-containing materials are in poor condition, and workers are directly exposed because of the accessibility to the materials, then the area must be vacated immediately and the asbestos abatement must occur as soon as possible by an asbestos contractor. Where there is minimal damage to the asbestos-containing materials, and it is in a more secure location within the workplace, an asbestos management plan must be implemented.

ASSESSMENT AND DETERMINATION OF HEALTH RISK

There are 8 major factors which assist in evaluating the condition of a particular asbestos installation. Assessment and determination of health risk must be conducted by a competent person, trained in the evaluation of potential asbestos exposure risk.

(1) Condition of Material

The condition of the asbestos-containing materials may indicate how easily fibres can cause contamination by being released into the area. An assessment of the condition considers the quality of the installation, adhesion of the material to the underlying base, deterioration, vandalism, and/or damage.

(2) Water Damage

Water can dislodge, delaminate, and disturb friable asbestos-containing materials that are otherwise in good condition. Water can carry fibres as a slurry to other areas where evaporation leaves a collection of fibres that can be released into the air.

(3) Exposed Surface Area

The exposed surface area of friable material affects potential fibre fallout levels and the possibility for contact and damage. Visible friable material is considered to be exposed.

Maintenance personnel frequently access the space above suspended ceilings to service or maintain electrical or communications equipment, or adjust the ventilation system. In most cases, this space is considered an exposed surface. Areas with louvres, grids, or other open ceiling systems should be considered exposed.

(4) Accessibility

Accessibility is one of the most important indicators of exposure potential. If the asbestos-containing material can be reached, it is accessible and subject to accidental or intentional contact and damage. Friable material is considered accessible if it is close to heating, ventilation, lighting, and plumbing systems requiring maintenance or repair.

In schools, the behaviour of the student population should be considered in evaluating accessibility. Damage is the most obvious factor. For example, students involved in sport activities may accidentally damage material on the walls and ceiling of a gymnasium. Material that is easily accessible is also subject to damage by vandalism.

(5) Activity and Movement

This factor combines the effects of general causes that may result in contact with, or damage to, friable material. These causes include air movement, maintenance activities, vibration (from machinery or other sources), and activity levels of students or building workers. This factor is also an indication of the potential for future exposure.

(6) Air Distribution System

Action is required by building owners if asbestos-containing materials are found in supply or return air plenums where asbestos fibres could enter the air supply or return air systems.

(7) Friability

The easier the material can be crumbled, the more friable the material, and the greater the potential for asbestos fibre release and contamination. Sprayed asbestos material is generally more friable than most trowelled materials or mechanically installed insulation.

(8) Asbestos Content

To calculate total asbestos content, the percentage content for each type of asbestos present in a given sample should be added. While all asbestos-containing materials present an exposure potential, those with a high percentage of asbestos content can release more fibres.

CHAPTER 2

Health Effects Associated With Exposure to Asbestos

PHYSICAL CHARACTERISTICS OF ASBESTOS

Asbestos fibres, unlike man-made fibres such as fiberglass, can be split into thinner and thinner fibres parallel to their length. At their finest, the fibres can hardly be seen by the best optical microscope. The average diameter of an airborne asbestos fibre ranges from 0.11 to 0.24µm, depending on the type of asbestos. By comparison, a human hair is approximately 75µm in diameter (more than 300 times thicker), and a glass fibre ranges between 3 to 15µm in diameter. Seen under a microscope, chrysotile asbestos has a very curly nature, similar to a wavy string or thread. Amosite and crocidolite forms of asbestos are very straight and rod-like, reflecting their solid structure.

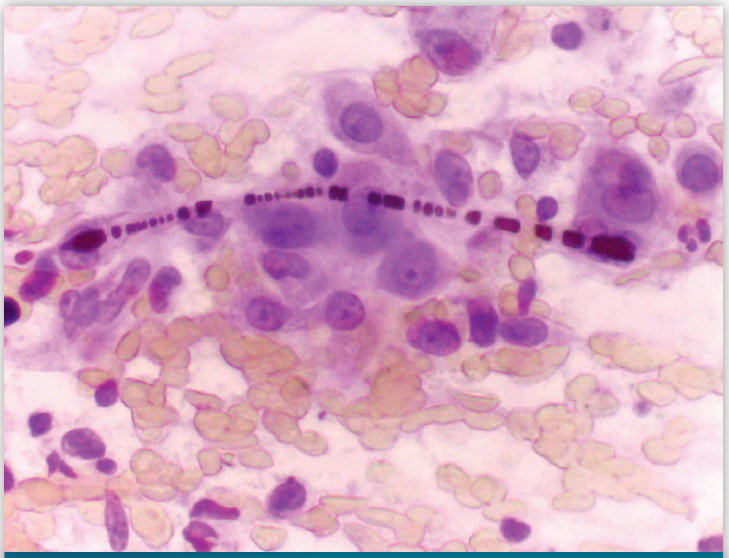
Chrysotile mineral, Brazil
Eurico Zimbres / CC BY-SA

These fine fibres tend to settle very slowly in air. The aerodynamics of settling are determined by the mass, form (particularly the diameter) and orientation of the fibre. If any air turbulence is present, the fibre may not settle out or can easily re-enter the air stream after it has settled.

ENTERING THE LUNGS

Asbestos-related diseases are caused by asbestos fibres that are inhaled and settle in the lungs. Once embedded in lung tissue, the fibres may remain within the body for extended periods. Amphiboles, because of their physical properties, remain embedded for a very long time.

How far asbestos fibres penetrate into lung tissue depends on their length, diameter and shape. Longer fibres are screened more effectively by the nasal hairs. Inside the upper respiratory tract, fibres are deposited either by simple gravity or through impact at points where the air stream changes direction. The size of the deposits depends on both fibre diameter and fibre length.



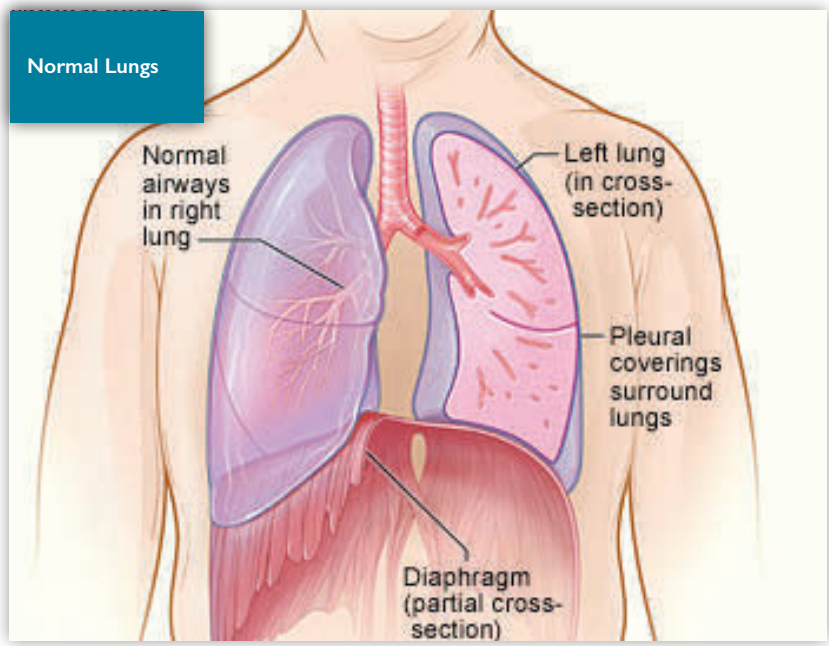
Asbestos body in a cytological slide (smear from a lung carcinoma)
Source: https://commons.wikimedia.org/wiki/File:Carcinoma_asbestos_body_lung.jpg

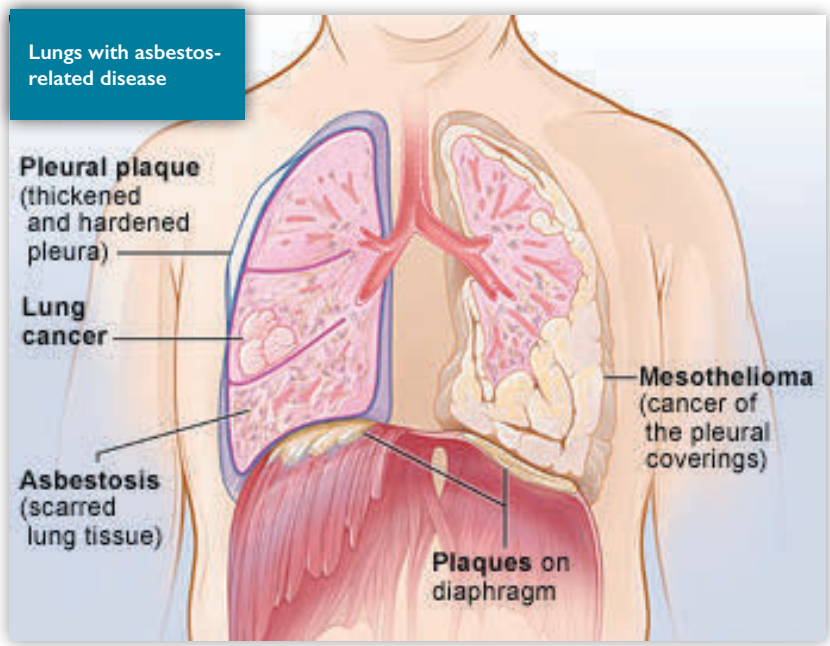
HEALTH EFFECTS FROM OCCUPATIONAL EXPOSURE

ASBESTOSIS

Asbestosis is a condition associated with exposure to high concentrations of airborne asbestos. It is an irreversible, fatal disease. The lungs build up scar tissue around the fibres in an attempt to remove them. This causes lung tissues to stiffen and leads to symptoms of coughing, difficulty in breathing, weight loss, and eventually death. The disease is similar to silicosis and "black lung", diseases associated with work in mines.

Once established, asbestosis is an incurable condition. While elimination of further exposure to asbestos will not stop or reverse the disease, it will help to slow down the rate at which the disease progresses. Early symptoms of the disease — shortness of breath, often accompanied by a dry cough — usually develop 10 to 20 years after initial exposure.





CANCER

Lung Cancer

Lung cancer takes approximately 15 to 25 years to develop, depending on the frequency and duration of exposure. Exposure to asbestos fibres for four to six months may be sufficient to cause lung cancer.

The combination of smoking and occupational asbestos exposure is extremely hazardous. Dr. Irving J. Selikoff, a medical leader in the study of asbestos-related disease, produced the figures shown in Figure 1.

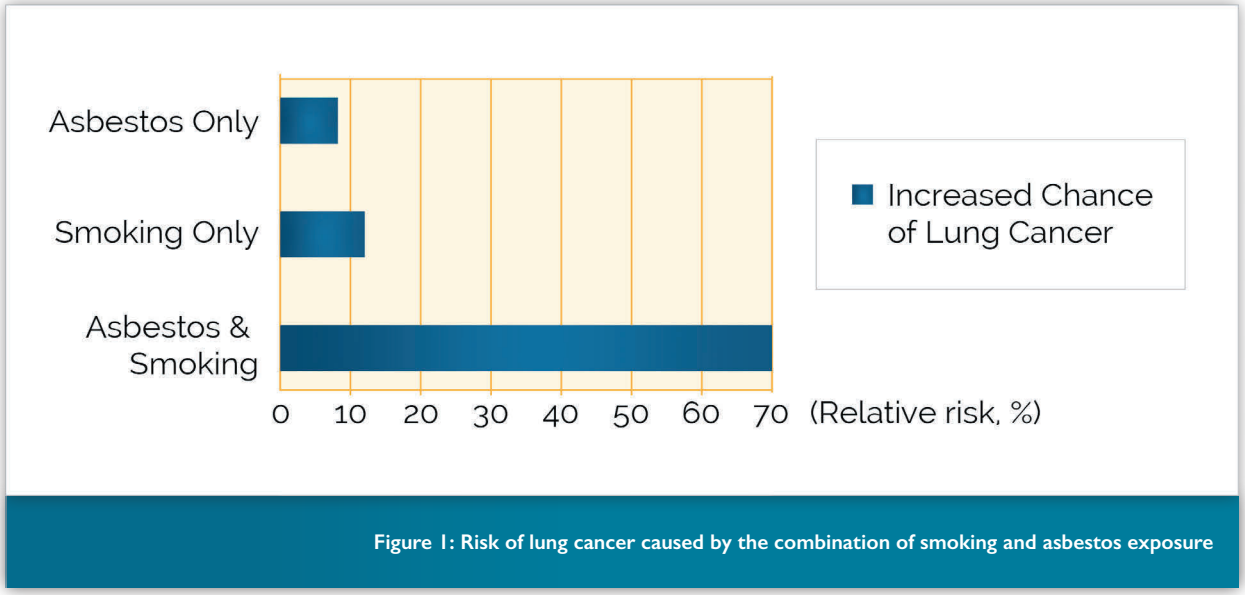


Figure 1: Risk of lung cancer caused by the combination of smoking and asbestos exposure

Pleural and Peritoneal Mesothelioma

Malignant mesothelioma is a rare type of cancer affecting 7 to 8 persons per million population. Research has shown that exposure to asbestos increases the risk of mesothelioma of the pleura, the membranes that line the lungs, and of the peritoneum, a membrane which lines the abdomen.

Malignant mesothelioma has no effective treatment and is always fatal. One half of all patients die during the first year following diagnosis; few patients survive longer than two years.

Development of the disease does not appear to be related to the amount of asbestos inhaled. Some susceptible individuals develop the disease following exposure in non-occupational settings. Development of the disease has been found to occur in individuals exposed to asbestos for as little as two months, and for as long as 50 years. The latency period between exposure to asbestos and the onset of terminal illness ranges from 15 to 55 years, with a mean of 40 years for both long- and short-term exposures.

Other Cancers Related to Asbestos Exposure

Other cancers related to asbestos exposure include cancer of the larynx, trachea, stomach, colon, and rectum. While these types of cancer are much rarer than asbestos-induced lung cancer, their true incidence is unknown. However, autopsies do show the presence of asbestos in the cancerous tissues.

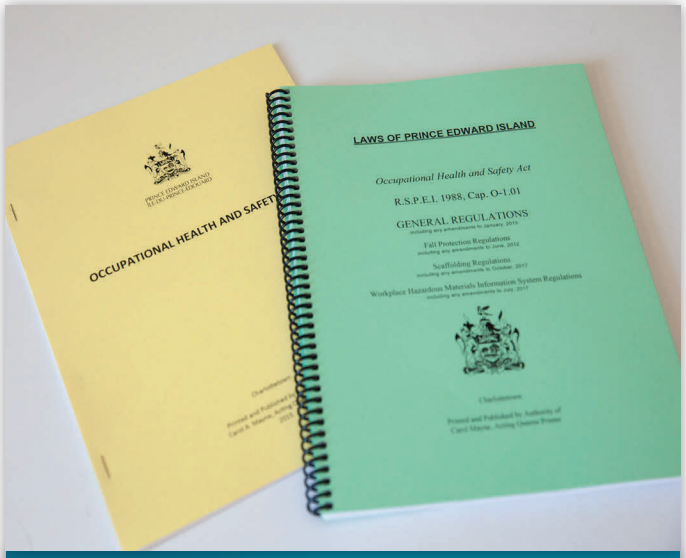
CHAPTER 3

Legislation

OCCUPATIONAL HEALTH AND SAFETY ACT

The Prince Edward Island Occupational Health and Safety (OHS) Act is law intended to protect the health and safety of workers on the job within provincially-regulated workplaces in Prince Edward Island (PEI). Federal workplaces in PEI, as well as the rest of Canada, are regulated by the Canada Labour Code. The Workers Compensation Board of PEI (WCB) is the agency responsible for administering the *OHS Act*. The WCB does this by:

- consulting with employers and workers on the development of safe and healthy work practices and programs;
- conducting workplace inspections;
- investigating serious work-related incidents and injuries; and
- responding to concerns about health and safety



Prince Edward Island *Occupational Health and Safety Act* and General Regulations

RESPONSIBILITIES

According to the *OHS Act*, everyone in the workplace has health and safety responsibilities, including employers, constructors, contractors, workers, owners, suppliers, self-employed persons, and service providers.

Employer Responsibilities

Section 12 of the *OHS Act* states that employers must take all reasonable precautions to make sure workers are kept safe at the workplace. This includes:

- Providing and maintaining equipment, machines, and materials in a safe manner.
- Providing the training and supervision necessary to keep the workers safe.
- Ensuring the workers, particularly supervisors, are familiar with workplace hazards and the procedures to minimize risks.
- Operating the business in a way that does not expose workers to health or safety hazards.
- Cooperating with the Joint Occupational Safety & Health (JOSH) Committee or Health and Safety Representative, if any.

Constructor Responsibilities

A constructor is a person who contracts work to be done on a project for an owner or who undertakes work on a project as an owner. Section 13 of the *OHS Act* states that a constructor must ensure that every reasonable precaution is taken to protect the occupational health and safety of everyone at the project. This includes:

- Coordinating the activities of the contractors and sub-contractors at the project.
- Ensuring all necessary health and safety information (such as hazard information and control procedures) for the project is communicated between all parties at the site including the JOSH Committee or Health and Safety Representative(s).
- Ensuring all workers, self-employed persons, and employers performing work for the project are in compliance with the *OHS Act* and Regulations.

Contractor Responsibilities

A contractor is a person or company that performs work on a contract basis. A contractor is often referred to as a sub-contractor. Section 14 of the *OHS Act* states that a contractor must ensure that every reasonable precaution is taken to protect the occupational health and safety of persons at or near the workplace. This includes:

- Coordinating the activities of the contractors and sub-contractors at the workplace where the work is being performed.
- Ensuring all necessary health and safety information (such as hazard information and control procedures) for the workplace is communicated between all parties at the site as well as the JOSH Committee or Health and Safety Representative(s).
- Ensuring all workers, self-employed persons, and employers at the workplace are in compliance with the *OHS Act* and Regulations.

The constructor and contractor responsibilities are very similar, except that the constructor's responsibilities reach across the entire project site, and the contractor's responsibilities are more limited to the work that is within their control.

For example, the constructor is responsible for ensuring hazard information is communicated to all workers/employers on site (such as asbestos removal is happening on a certain date, and only qualified workers can be present). However, the asbestos-removal contractor is responsible for controlling the asbestos-related hazards for his own workers and for communicating with the constructor.

Worker Responsibilities

All workers have responsibilities under the *OHS Act*. Workers must:

- Comply with company rules and procedures
- Wear personal protective equipment as required
- Use machinery, equipment, and materials only as authorized
- Follow job procedures
- Report hazards, unsafe conditions, or actions to the supervisor
- Report incidents
- Report all injuries for first-aid, no matter how minor
- Cooperate with the JOSH committee or representative.

Workers also have the following rights:

- To know about existing and potential hazards.
- To participate in making the workplace safe and healthy by being a Health and Safety Representative, a member of the JOSH Committee, or consulting with the employer, supervisor, JOSH Committee or Health and Safety Representative.
- To refuse unsafe work.

Owner Responsibilities

Under the *OHS Act*, an owner includes a trustee, receiver, mortgagee in possession, tenant, lessee or occupier of lands or premises used or to be used as a workplace. A person acting on behalf of an owner is also considered to have the same responsibilities. Section 18 of the *OHS Act* states that an owner shall take every reasonable precaution to provide and maintain the owner's land or premises used as a workplace in a manner that ensures the occupational health and safety of persons at or near the workplace. They must also ensure that the land and premises are used in a manner in compliance with the *OHS Act* and General Regulations. The owner is also required to give to the employer at the workplace any known information respecting hazards at the premises. This means that an owner has the responsibility to ensure that asbestos management, including inventory, abatement, and communications regarding the management plan, are being maintained and completed.

Supplier Responsibilities

A supplier is a person who manufactures, supplies, sells, leases, distributes, or installs any item, device, material, equipment or machinery, or biological, physical or chemical agent to be used by a worker. Section 15 of the *OHS Act* states that a supplier must ensure:

- that any item, device, material, equipment or machinery supplied by the supplier to a workplace is, when it is supplied, properly equipped with the safety features or devices required by the Regulations;
- that the item, device, material, equipment or machinery is maintained in safe working condition and in compliance with the *OHS Act* and Regulations, where it is the supplier's responsibility under an agreement to maintain it.

Service Provider Responsibilities

A person who, for gain, is a provider of an occupational health or safety service shall take every reasonable precaution to ensure that no person at or near a workplace is endangered as a result of the provider's activity. In addition, where the service involves providing information, the information provided at that time, is accurate and sufficiently complete to ensure an understanding of the information by the persons using it at a workplace.

OCCUPATIONAL HEALTH AND SAFETY ACT GENERAL REGULATIONS

REGULATORY REQUIREMENTS RELATED TO WORK WITH ASBESTOS

The PEI *OHS Act* General Regulations Part 49 contains provisions requiring owners, employers, and asbestos abatement contractors to take specific actions when a potential health risk of asbestos exposure is present in the workplace. The summary below is not intended to be a comprehensive list of requirements. For more detailed information, the *OHS Act* General Regulations should be referred to directly.

- The first section of Part 49 contains definitions. This includes the definition of "asbestos containing material" as containing 1% or more asbestos by dry weight. It also defines Type I, Type II, and Type III Removal Operations, which are now more aligned with other province's removal operations.
- There are provisions outlined for sampling of asbestos-containing materials to determine if there is asbestos in the workplace and the requirements for preparing a comprehensive inventory and management plan.
- Monitoring exposure levels is an important requirement for the protection of all workers. Air testing methods and acceptable exposure limits are outlined in these regulations.
- No asbestos work shall be done by anyone unless they hold a valid asbestos contractor's certificate issued by the OHS Division of the WCB. There are strict requirements that are outlined to obtain the certificate which must be renewed every 5 years. The certificate will also expire if the asbestos contractor does not submit a notification request for the removal of asbestos over a period of 3 years.
- The written notification must be submitted to the OHS Division of the WCB at least 3 days prior to any asbestos work starting. Significant time and effort is made to ensure the safety of the people in the workplace. The notification request is reviewed to confirm that all workers involved with the asbestos abatement have the necessary training to perform the tasks safely and that the procedures align with the risk of the asbestos exposure.
- Personal protective equipment is outlined in these regulations and they reflect the requirements in Part 45 of the *OHS Act* General Regulations. This includes provisions for following the CSA Standard Z94.4-18 "Selection, Use, and Care of Respirators".
- Once the boundaries of the asbestos work area are identified, the requirements for encapsulation or enclosures for the purpose of abatement must be followed to prevent the release of asbestos containing material into the ambient air.
- Provisions for ventilation to ensure that the enclosure is under adequate negative pressure is also regulated. All exhaust ventilation equipment must be certified at least once a year by a competent person.
- All asbestos waste must be handled according to the regulations and is required to be disposed of according to the Waste Resource Management Regulations under the *PEI Environmental Protection Act*.
- A Medical Surveillance Program for all workers is required. Workers must complete a pre-placement medical exam before they begin work as an asbestos abatement worker and are then subject to periodic medical exams throughout their career to ensure that they have been adequately protected from asbestos exposure.
- All asbestos contractors must keep accurate records of their workers' medical reports and their occupational exposure. These records must be maintained for at least 40 years.

Before any work involving asbestos takes place, the employer must ensure that procedures for the safe removal of asbestos dust and debris from the work area are set out in writing by a qualified person.

OTHER ACTS AND REGULATIONS

PROVINCIAL LEGISLATION

The Prince Edward Island Environmental Protection Act

The Island Waste Management Corporation (www.iwmc.pe.ca), has strict guidelines that must be followed for asbestos disposal in Prince Edward Island. The *Prince Edward Island Environmental Protection Act* Waste Resource Management Regulations provide direction for special waste disposal. Under these regulations, asbestos waste is considered special waste. All asbestos waste must therefore be delivered to the East Prince Waste Management Facility (EPWMF), and **a disposal permit must be obtained prior to disposal**.

EPWMF requires 24 hours' notice before accepting asbestos for disposal. Faxing the permit is not considered giving notice. It is always required to phone the facility (902-854-3636) 24 hours prior to the requested delivery time to make an appointment to deliver asbestos. The hauler and/or generator are responsible to confirm that the facility received notification of asbestos delivery.

All asbestos must be double-wrapped or double-bagged and taped so that the asbestos will not tear the bag as it is being off-loaded.

Examples of double-wrapped or double-bagged materials are:

- Asbestos placed inside a plastic bag and sealed and then placed in another plastic bag which is sealed and taped so the asbestos will not escape when being off-loaded. This is best done in small amounts as heavier bags tend to break open when being off-loaded.
- Asbestos placed in a bag and sealed and then placed in a cardboard box or plastic drum that is then taped shut.
- Asbestos placed in cardboard box and then in a plastic bag that is sealed shut.
- Asbestos double-wrapped inside tear-resistant plastic sheets and taped shut so the package will not open when off-loading, remembering that too large a bundle will break apart when off-loading.

FEDERAL LEGISLATION

Historically, the federal *Hazardous Products Act* (HPA) regulated the sale and use of some asbestos products in Canada. When health hazards related to asbestos became apparent, the HPA began to list a number of asbestos products that were "prohibited products" that could not be sold or imported for sale into Canada. This legislation initiated the control of asbestos containing materials in our living environments, including our workplaces. The first legislation regarding the restricted use of asbestos was introduced in 1973. On April 24, 1980 the use of asbestos in drywall joint cements, patching compounds and spackling was prohibited and the use of asbestos containing materials in construction projects, renovations and repairs came to a stop.

In 2007, the requirements that applied to asbestos products were revised and moved under the *Canadian Consumer Product Safety Act*. The Asbestos Products Regulations were amended again in 2011. On December 30, 2018, those regulations were repealed and the more stringent Prohibition of Asbestos and Asbestos Products Regulations under the *Canadian Environmental Protection Act* came into force. These regulations prohibit the import, sale, and use of asbestos and the manufacture, import, sale, and use of products containing asbestos in Canada, with a limited number of exclusions.

CHAPTER 4

Asbestos Management

ASBESTOS MANAGEMENT

Asbestos management is required at all sites (workplaces, workplace locations, buildings or structures) where asbestos-containing materials (ACM) are present, or suspected to be present, including:

- Sites where ACM are to remain in place. A carefully developed asbestos control plan will create an asbestos inventory and assist in controlling the condition of the ACM.
- Sites where workers are required to work with ACM (after an accidental fibre release, when performing a large repair, demolishing a structure or removing ACM); this will be accomplished by following the procedures for working with asbestos.

Effective asbestos management requires commitment from all levels of management:

- Building owners and employers are responsible to determine if ACM are present, or suspected to be present, at sites where work is to be carried out.
- Contractors engaged to conduct work activities at sites where ACM are suspected are responsible to assume that a site contains ACM in the absence of any information.
- Owners, employers, and contractors are responsible to communicate findings respecting ACM to anyone who could be affected by work activities at their site.

An Asbestos Management Plan may be difficult and costly to implement and enforce. It should be considered a temporary measure until all ACM are eventually removed.

ASBESTOS INVENTORY

The first step to managing asbestos is to conduct an inventory of all ACM at the workplace where ACM are known to be, or suspected to be, present. Buildings constructed prior to 1980 should be suspected of containing ACM and therefore have an inventory completed prior to any renovation or demolition work. However, asbestos has been found in buildings constructed into the early 1990's.

Section 49.4(3) states that if an employer or competent person suspects that a material contains asbestos, the material shall be treated as asbestos-containing material unless the competent person determines that it is not asbestos-containing material.

For many materials, the presence of asbestos cannot be ruled out on sight because the end product often appears the same whether it contains asbestos or not. The only way to be sure is to have the product properly analyzed in a laboratory.

As per Section 49.1(b) of the *Occupational Health and Safety Act* General Regulations, the definition of "asbestos-containing material" means material that contains 1% or more asbestos by dry weight and all vermiculite insulation.

An inventory must be prepared by a competent person and updated each time ACM is repaired or removed from the workplace and kept at the workplace for easy referral. It must contain the following components:

- The location of the ACM in the workplace;
- Specifically identify where ACM may release asbestos fibres into the atmosphere due to damage or poor repair;
- The date the inventory was prepared and the subsequent dates of review;
- The name of the competent person completing the inventory; and
- A general description of the ACM, including the type of asbestos and the percentage of the sample that is comprised of asbestos.

In accordance with recognized occupational hygiene practice, the preparation of an asbestos inventory includes, but is not limited to:

- A review of the site's history, construction, and renovations
- A complete walkthrough inspection of the building's interior; floor by floor, room by room, including facilities servicing each area and overall structure (electrical, plumbing, ventilation equipment), architectural and finishing details (ceilings, walls, floors, sealers, or caulking)
- A complete examination of the building's exterior and architectural finishing (stucco, parging, cementitious materials, siding, caulking), roofing
- Comments regarding hidden or concealed materials that are not practical to access or sample but are suspected to exist and contain asbestos
- Studying architectural plans for the building when available
- Submitting samples of all materials, including suspect materials for analysis at an accredited laboratory
- Preparing a report of findings, including nil findings
- Photographs

Note: The asbestos inventory must be updated, at a minimum, on a yearly basis and modified when items contained within are repaired and/or removed. Documentation with regards to the repairs or removal should also be retained with the inventory document to indicate the work was done properly.

The American Society for Testing and Materials (ASTM) – Standard Practice for Comprehensive Building Asbestos Surveys (E 2356) is one example of a recognized resource for preparing asbestos inventories.

Tracing insulation containing amosite
Source: https://commons.wikimedia.org/wiki/File:Trace_insulation_(2).jpg

SOURCES OF ASBESTOS

Sources of asbestos include, but are not limited to, the following materials:

- Asbestos cement pipes, wallboard, shingles, siding, roofing
- Floor tiles, vinyl, and asphalt flooring, including backing and mastics
- Acoustic or decorative wall and ceiling plaster (for example, popcorn & stipple ceilings), paints, spackles, coatings
- Ceiling tiles, lay-in panels
- Spray-applied, blown-in, boiler, breeching, pipe, tank, vessel, and other thermal insulation
- Fireproofing material including blankets, curtains, countertops, gloves, electrical wiring insulation, cloth, and structural insulation
- Flexible fabric duct connections and insulation
- Packing materials, gaskets, felts, caulking, putties, mastics, and adhesives
- Brake shoes
- Interior surfaces of ductwork in buildings contaminated with asbestos
- Mechanical insulation (parging cement, air cell, mag block)
- Drywall joint compound
- Vermiculite (not asbestos, however, assumed to be contaminated with asbestos fibres)

BULK SAMPLE COLLECTION

Sampling is required in order to confirm the presence of asbestos and must be carried out by a competent person. A competent person must have the demonstrated knowledge, experience, and training for recognizing suspect ACM, sample collection techniques, laboratory data interpretation, inventory preparation, and reporting. If sampling is not conducted, suspect materials must be handled as though they contain asbestos throughout maintenance, repair, renovation, removal, and demolition activities. Outlined below are some of the recognized occupational hygiene practices for sampling suspect materials for the presence of ACM.

Bulk Sampling Precautions

In order to prevent potential exposure to asbestos while collecting samples:

- Avoid collecting samples when occupants are present.
- Competent persons taking samples must wear a National Institute of Occupational Safety and Health (NIOSH) approved respirator appropriate to the risk and also wear disposable gloves. Gloves must be changed each time a sample is collected and disposed of as asbestos waste.
- Suspect materials must be sprayed with a light mist of water to prevent fibre release during sampling.
- Suspect material must not be disturbed more than necessary; if possible, sample from a location with existing damage.
- If more than one layer of material is present (for example, a boiler covering) the sample must include material from each layer.
- If more than one layer of material is present (for example, boiler insulation, flooring, and roofing materials), ensure that sampling penetrates the full depth to capture all layers of the material.
- Each sample collected must be placed in a separate, sealable container, and labelled according to Workplace Hazardous Material Information System (WHMIS) Regulations for laboratory samples.
- Number and record the collection locations of each sample container.
- Where material is damaged during sampling, clean the contaminated area with a vacuum cleaner equipped with a High Efficiency Particulate Air (HEPA) filter or by wet wiping. Where necessary, polyethylene drop cloths should be placed under the sample area to catch and contain loose waste generated during sampling.
- Sampling tools and other equipment used during sampling must be decontaminated by cleaning with soap and water, followed by a water rinse or wet wiping.
- Waste materials must be placed into labelled bags, appropriate for asbestos waste.

Number of Samples

As outlined by the American Society for Testing and Materials (ASTM), a practical number of samples are to be obtained for each kind of material or area of the building. A sample collection practice is presented below:

Item	Type of Material	Size of area of homogenous material	Minimum number of bulk material samples to be collected
1	Surfacing material, including without limitation to material that is applied to surfaces by spraying, by troweling or otherwise, such as acoustical plaster on ceilings and fireproofing materials on structural members	Less than $90m^2$ $90m^2$ or more, but less than $450m^2$ $450m^2$ or more square metres	3 5 7
2	Thermal insulation, except as described in item 3	Any size	3
3	Thermal insulation patch	Less than 2 linear metres or $0.5m^2$	1
4	Less than 2 linear metres or $0.5m^2$	Any size	3

In accordance with recognized hygiene practice:

- Manufactured products that are homogeneous (such as floor tiles, linoleum, identical ceiling tiles, cement board) may only require one sample to show that a specific material is asbestos free (example of "specific" – a green patterned tile will be considered different from a yellow patterned tile).
- Batch-mixed materials (such as drywall joint compound, stucco, textured coating), may not have been uniformly mixed when they were applied and sections may vary in concentrations (i.e. they may not be homogeneous).
- A single positive finding confirms the presence of asbestos. Further sampling cannot deny its presence at the location of the positive finding.
- Best practice is to sample, at a minimum, in accordance with the table above.

Laboratory Analysis

The laboratory selected to perform the analysis of bulk samples, must be accredited for asbestos analysis. For example, laboratory accreditation by the AIHA (American Industrial Hygiene Association), NVLAP (National Voluntary Laboratory Accreditation Program), CALA (Canadian Association for Laboratory Accreditation), or any other ILAC MRA (International Laboratory Accreditation Cooperation Mutual Recognition Arrangement) signatory would be acceptable.

Measurement Method for Bulk Samples

There are several methods of determining asbestos content in a bulk sample because of the diversity of the materials being tested. The method used depends on various factors, such as the quantity of asbestos content required to be analyzed and the type of equipment required to view the fibres.

The NIOSH Manual of Analytical Methods identifies two methods to analyze bulk samples:

- NIOSH Method 9002, Asbestos (bulk) by Polarized Light Microscopy (PLM) which involves the viewing of the sample under a polarized light microscope. Identification is based on appearance and colour. The percentage of asbestos in the sample is expressed as an estimate of the area per cent of all material present; and
- Method 9000, Asbestos Chrysotile by X-Ray Diffraction (XRD) (if the material is chrysotile) which involves preparing the sample and doing an x-ray diffraction scan using an x-ray powder diffractometer with a copper target x-ray tube and scintillation detector. Chrysotile is identified by specific diffraction peaks and the size of the peaks determines the content.

The United States Environmental Protection Association (U.S. EPA) has additional methods commonly used, such as:

- U.S. EPA method 600/R-93/116, which is a comprehensive method outlining various techniques for determining the asbestos concentration in bulk building materials; and
- U.S. EPA method 600/R-04/004 which is used for vermiculite.

If more precise results are needed, or the content of asbestos may be low, the bulk samples may also be analyzed by transmission electron microscopy.

The accredited lab will cite the method used and should provide explanatory notes for each analytical result.

A single positive finding confirms the presence of asbestos. Further sampling **cannot** deny its presence.

ASBESTOS MANAGEMENT PLAN

After the Asbestos Inventory has been completed at a workplace, an Asbestos Management Plan must be developed.

The objectives of the Asbestos Management Plan are to:

- Prevent ACM, identified in the inventory, to become airborne in the workplace; and
- Protect the health and safety of workers if there is a release of asbestos fibres into the workplace.

It is necessary, once the Asbestos Management Plan has been implemented, to communicate the plan to the workers so that they are made aware of the contents.

Section 49.6(c) of the *OHS Act* General Regulations also requires that the Asbestos Management Plan be reviewed at least annually, or more frequently if conditions change, in consultation with the Health and Safety Committee or the Health and Safety Representative, if any.

RESPONSIBILITIES

Building owners and employers are responsible to develop and follow all components of the Asbestos Management Plan developed for the workplace. Contractors engaged in activities at a site are responsible to find out if a site has an Asbestos Management Plan prior to carrying out work and to follow it. The plan gives direction to maintenance and custodial staff, contractors, and people of all trades performing work activities at that site.

If the site has multiple tenants (workplaces with workers), the owner must ensure that each tenant engaging contractors or having workers who are likely to carry out maintenance, custodial duties, or repairs are informed of the presence of asbestos, the inventory, and the Asbestos Management Plan. Each employer is responsible to ensure that workers receive training for the plan as may be required.

It is recommended that a site owner or employer appoint an Asbestos Management Plan manager. The manager may be a health and safety coordinator, risk manager, physical plant administrator, maintenance manager, maintenance lead hand or supervisor, building and grounds manager or superintendent, facility manager, or an external consultant involved in ongoing building project management for that site. Maintenance and custodial staff are also key participants in the Asbestos Management Plan.

All workers at a workplace subject to an Asbestos Management Plan must be informed about the presence of ACM, how to avoid their potential health hazards and the limitations of their duties when working with ACM.

CONTENT OF AN ASBESTOS MANAGEMENT PLAN

An Asbestos Management Plan must be implemented, updated and revised as necessary until all ACM are removed from the building. In accordance with recognized occupational hygiene practice, an effective Asbestos Management Plan clearly identifies persons responsible, procedures and timelines for each element or action required by the plan. An Asbestos Management Plan should include, but not be limited to, the following elements:

An effective plan must be in writing and include the following components:

- Inventory of ACM in the building, including the location and the type (i.e. Ceiling tiles, floor tiles, pipe-wrap insulation, joint compound, etc.)
- Where the asbestos inventories will be kept
- Inspection frequency and procedures, which identify any physical damage, water damage, and/or evidence of deterioration
- Training requirements for maintenance staff and others who may come into contact with the materials or work in proximity to the materials
- Details of how external contractors and others will be informed of the presence of ACM
- Procedures to follow in the event of a fibre release or other emergency situations, including emergency numbers and the contact information of certified asbestos contractors
- Procedures to follow should the condition of the materials change
- Notification procedures for occupants and others in the building
- Labelling of ACM
- Details for ultimate removal of asbestos
- Record-keeping requirements

*See **"Appendix B - Asbestos Management Plan Template" on page 99** for a sample form for recording the results of periodic inspections.*

LABELLING AND SIGNAGE

Labels and signs provide a final line of defence to warn occupants (workplaces occupying space in the building) and others, and to prevent unprotected or unauthorized people from the risk of exposure to asbestos. Where practicable, ACM should be clearly identified with signs, labels, or other effective means. Information on warning labels and signs must be understandable to the workers and may include:

- The risks associated with exposure to asbestos fibres.
- A cautionary statement to not disturb materials containing asbestos.
- A cautionary statement respecting entering an area where repair or renovation activities involving these materials are underway.

An appropriate label for material containing asbestos could be as follows:

DANGER
CONTAINS ASBESTOS FIBRES
CANCER AND LUNG DISEASE HAZARD
DO NOT DISTURB
Report damage

CHAPTER 5

Asbestos Contractors and Training Requirements

ASBESTOS CONTRACTORS

In Prince Edward Island, any time asbestos-containing material (ACM) is disturbed (including repairs, renovations, removal, or demolition) the work must be completed by an asbestos contractor.

> The *Occupational Health and Safety Act* General Regulations Section 49.10 states that no person shall undertake asbestos work unless the person is the holder of a valid asbestos contractor's certificate.

ASBESTOS CONTRACTOR'S CERTIFICATE

The Director of Occupational Health and Safety (OHS) approves all applications for a contractor to be certified. There are strict criteria in place that is required to be submitted and reviewed before the certificate is granted.

The certificate is valid for a period of 5 years from the day it is approved. The Asbestos Contractor may choose to renew it by resubmitting the required documentation. The Asbestos Contractor certificate will also expire if the Asbestos Contractor sells the business. In other words, the certificate cannot be transferred to a new business owner. If there are no notifications for asbestos work submitted to the Director over a period of 3 years, the certificate is considered dormant and will expire after those 3 years.

How to Apply for an Asbestos Contractor's Certificate

When an employer or contractor believes that it is in the best interest of his or her business to be able to handle and dispose of ACM, a written application must be submitted to the Director of OHS to become an Asbestos Contractor: The following documentation must be submitted with the application:

1. A copy of the applicant's current asbestos work procedures manual detailing the equipment to be used, processes to be followed, and confirmation that the *OHS Act* and Regulations will be complied with.
2. A copy of the applicant's Respiratory Protection Program and associated documents that follow the requirements of the CSA Standard Z94.4-18, "Selection, Use, and Care of Respirators"
3. Proof that the workers who will be performing the asbestos work have successfully completed a course in asbestos abatement.
4. Proof of the competency of the supervisor who will be on site overseeing the safe abatement of the asbestos.
5. Confirmation that the workers completing the asbestos abatement have participated in a medical surveillance program including:
    a. Completing a pre-placement medical exam; and
    b. Procedures for receiving periodic follow-up exams.
6. Procedures confirming that the applicant will establish and maintain all worker records for a period of not less than 40 years for:
    a. All required medical reports;
    b. All detailed work history containing dates and length of jobs performed, including the types of jobs and the material handled; and
    c. All worker training records.

Once the application has been submitted, all components will be reviewed to ensure that they meet the requirements of the OHS legislation. When the Director is satisfied that the application is thorough and complete, an Asbestos Contractor's Certificate will be issued to the applicant. This Certificate will allow this Asbestos Contractor to submit notifications for asbestos work to be completed. Notifications for asbestos work will not be approved if the Asbestos Contractor's Certificate is not valid. Any asbestos work completed without an approved notification is in direct violation of the *OHS Act* General Regulations and the person performing the work may be found guilty of an offence and subject to a significant fine.

The Director of OHS also has the right to terminate or suspend an Asbestos Contractor's Certificate at any time and may do so if there is evidence of non-compliance with the legislation.

TRAINING REQUIREMENTS

No worker shall handle ACM without training. Asbestos workers who handle, disturb, or remove ACM require an asbestos abatement course. Workers who transport or handle sealed containers for disposal also require an asbestos awareness course.

Prior to receiving a permit to conduct asbestos work, the asbestos contractor must provide worker names on the notification document. The permit approval process ensures that the names of the workers submitted on the notification correspond to the training certificates submitted by the asbestos contractor.

ASBESTOS ABATEMENT TRAINING COURSE

An asbestos contractor must submit proof of training to the Director of OHS before that worker is able to enter a work area where asbestos abatement is taking place. The asbestos abatement training course is generally a three-day course, with a comprehensive curriculum, but is not limited to:

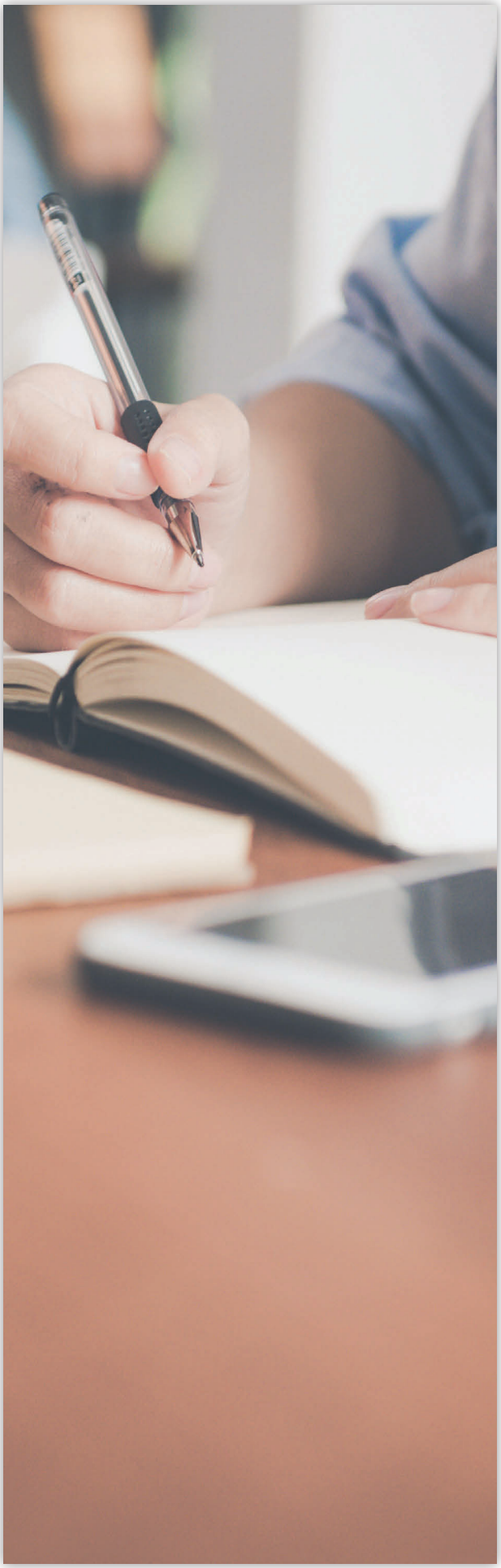
- Origins and History of Asbestos
- Health Effects Associated with Asbestos Exposure
- Principles of Inspection and Identification of Asbestos-Containing Materials
- Methods of Dealing with Asbestos
    - Removal
    - Encapsulation
    - Enclosures
- Testing for Asbestos
    - Bulk Sampling
    - Air Sampling
    - Sample Collection
- Personal Protective Equipment
    - Protective Clothing
    - Respirator Protection Program
    - Selection of Respirators
    - Fit-Testing
- Regulations regarding asbestos specific to Prince Edward Island
    - Type I Removal Requirements
    - Type II Removal Requirements, including Glove Bag Removal
    - Type III Removal Requirements
    - Asbestos Disposal Requirements
    - Permit Requirements

> It is important to note that online training is not an acceptable format of training because of the required hands-on training aspect and the review of regulations specific to Prince Edward Island.

ASBESTOS AWARENESS TRAINING COURSE

It is the responsibility of all employers who have workers that may become exposed to asbestos to train those workers on the potential hazards and how to respond to an incident where there has been a release of fibres. These workers may include disposal site workers, truck drivers who haul asbestos waste to disposal sites, maintenance workers who have been identified within the Asbestos Management Plan as having to work in areas where asbestos may be present, and construction/demolition workers. The asbestos awareness course is generally a one-day course that covers, but is not limited to:

- Uses and common types of asbestos-containing materials found in workplaces
- The health effects of asbestos exposure
- Methods of preventing exposure
- Regulations regarding asbestos specific to Prince Edward Island



CHAPTER 6

Working With Asbestos

ASBESTOS NOTIFICATION

A written notification must be submitted to the Occupational Health and Safety (OHS) Division at least 3 days before any asbestos work can take place. The notification includes:

- A form (as found in *"Appendix C - Asbestos Notification Permit" on page 101*) which includes the name address and phone number of the asbestos contractor.
    - The name, address and phone number of the general contractor.
    - The location of the building or site where the work will be performed.
- A description of the asbestos work to be performed including the type of asbestos-containing materials (ACM) to be disturbed and the approximate amount of material.
- Confirmation that the procedures to be used are included in the work procedure manual submitted by the asbestos contractor during the certification process.
    - If the procedure varies from the manual, new procedures detailing the proposed process shall be submitted for review.
- The names of the workers who will perform the asbestos work. Only those workers who have completed the asbestos abatement course training, and have a certificate on file, will be accepted.
- Identification of the supervisor for the asbestos work site.
- Confirmation that all workers performing asbestos work have participated in the required medical surveillance program and have completed the pre-placement medical examination and subsequent follow-up exams as necessary.

The notification will then be reviewed by the OHS Division to ensure that all of the requirements are met. Once satisfied with the submission of the notification, a permit will be granted to the asbestos contractor.

The asbestos contractor is responsible for ensuring that this permit is posted outside the asbestos work area. No asbestos work, including the handling or disturbing of ACM shall begin until this permit is posted.

The asbestos contractor must ensure that the asbestos work carried out is exactly the same as the notification that was submitted. If the project changes scope, and changes need to be made, the asbestos contractor must submit a new notification for approval.

EXPOSURE TO ASBESTOS DURING ASBESTOS REMOVAL

EXPOSURE LIMITS

Air monitoring is important in evaluating how well workers are being protected, the selection of respiratory protection equipment, the effectiveness of decontamination, and the integrity of the containment during abatement activities.

Occupational Exposure Limits (OEL) are established concentrations of airborne impurities which, if not exceeded, will not generally cause adverse effects to the exposed worker. Exposure levels were developed as guidelines or recommendations in the control of potential health hazards to help protect the health of those that may be exposed to hazardous substances. The most commonly used workplace exposure limits are the Threshold Limit Values® (TLV), guidelines proposed by the American Conference of Governmental Industrial Hygienists (ACGIH). The exposure limits in Prince Edward Island use the TLV as the regulated standard.

> Section 49.8 of the *Occupational Health and Safety Act* General Regulations, states that every employer, owner, and contractor shall take all necessary measures and implement all necessary practices and procedures to ensure that the exposure of workers to asbestos-containing materials does not exceed the Threshold Limit Values (TLV), established by the American Conference of Governmental Industrial Hygienists (ACGIH).

The current ACGIH-TLV for all forms of asbestos is 0.1 fibres per cubic centimeter (f/cc) of air.

For employers, owners, and contractors to ensure that their workers are not being exposed to asbestos fibres being released into the ambient air of a workplace, they must ensure that air sampling and analysis are being performed by a competent person. The collection of reliable data requires a thorough knowledge of air sampling and analytical techniques.

AIR SAMPLING AND ANALYSIS

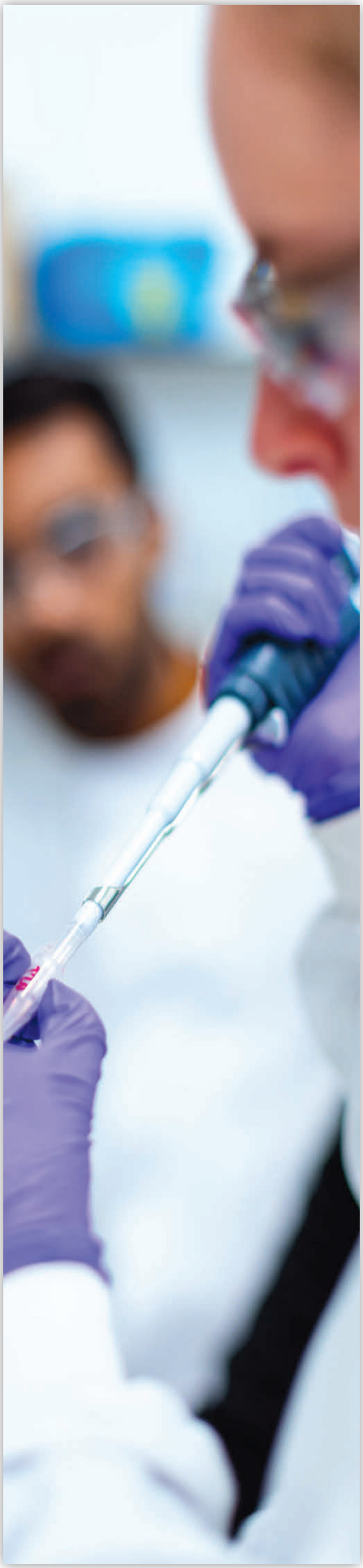
For Type II and Type III asbestos removal activities that use an enclosure, a containment system, or a clean room, a qualified person must conduct daily air sampling of asbestos fibres to monitor the concentration of airborne asbestos fibres in the prescribed work area for the full shift of the asbestos abatement workers.

The air sampling assessment must include:

- Background sampling, ambient areas prior to beginning work;
- Perimeter sampling, areas outside and adjacent to enclosed asbestos work areas; and
- Final clearance inside the enclosed work area upon completion of asbestos work.

The regulations require that the concentration of asbestos fibres in air must be determined in accordance with NIOSH (National Institute for Occupational Safety and Health) Manual of Analytical Methods, latest edition, using:

- NIOSH 7400 Phase Contrast Microscopy (PCM) method: This is the most common and frequently used method because it is the least expensive and has a well-established protocol. However, it does not distinguish between asbestos and other types of fibres and therefore assumes all counted fibres are asbestos; or
- NIOSH 7402 Transmission Electron Microscopy (TEM) method: This method can distinguish asbestos fibres from other airborne fibres, which may be important if there is significant interference from non-asbestos fibres using the PCM method. However, the TEM method is more complicated, takes a longer time for analysis and is more expensive to complete.



The laboratory that does the analysis of the asbestos samples shall participate in a proficiency test program under an accreditation supported association such as Canadian Association for Laboratory Accreditation (CALA) or by the American Industrial Hygiene Association (AIHA) Asbestos Analysts Registry (AAR) in accordance with the NIOSH Manual of Analytical Methods.

Background Air Sample before Work

It may be useful to collect background samples prior to beginning asbestos work when unprotected workers or others occupy areas nearby or adjacent to asbestos work areas. It is expected that airborne concentrations of asbestos fibres outside the area of asbestos work be as close as possible to zero, and not exceed background concentrations, when unprotected workers and others are present.

Perimeter Air Sample during Work

Perimeter air sampling (outside an asbestos work enclosure) must be done daily during Type III removal operations when unprotected people are in the area adjacent to or outside the work areas. Intermittent air sampling for asbestos fibre concentrations outside the perimeter of an enclosed work area, during asbestos work and cleanup should show asbestos fibre concentrations to be as close as possible to zero and not exceeding background levels.

Personal air sampling should be done inside an enclosure to confirm the proper selection of respiratory protective equipment and the effectiveness of removal or control techniques.

For Type II work, when work is done inside an enclosed containment area (enclosure or glove bag), intermittent sampling just outside the area is a recommended best practice that should have asbestos fibre concentrations be as close as possible to zero and not exceed background levels.

Final Air Clearance Sample after Work

After a thorough final visual inspection has been completed and the clean-up is considered acceptable, the abatement contractor encapsulates all surfaces inside the containment with a glue spray. The spray is allowed to settle and dry for a minimum of 4 hours (ideally 8 to 12 hours) and then final air tests can be completed.

In accordance with recognized occupational hygiene practice, upon completion of Type II and Type III asbestos removal, airborne asbestos fibre concentrations inside the asbestos work area (enclosure) must be less than 0.01 fibres per cubic centimetre (f/cc) of air, for all forms of asbestos, before the enclosure is dismantled and workers and others are allowed to reoccupy the area where ACM has been removed. It is recommended that forced air equipment be used inside an enclosure to ensure that any fibres are dislodged from all surfaces immediately before sampling. The dislodged fibres should be kept airborne during air sampling by forced air equipment, such as fans. This is known as an aggressive air sampling technique.

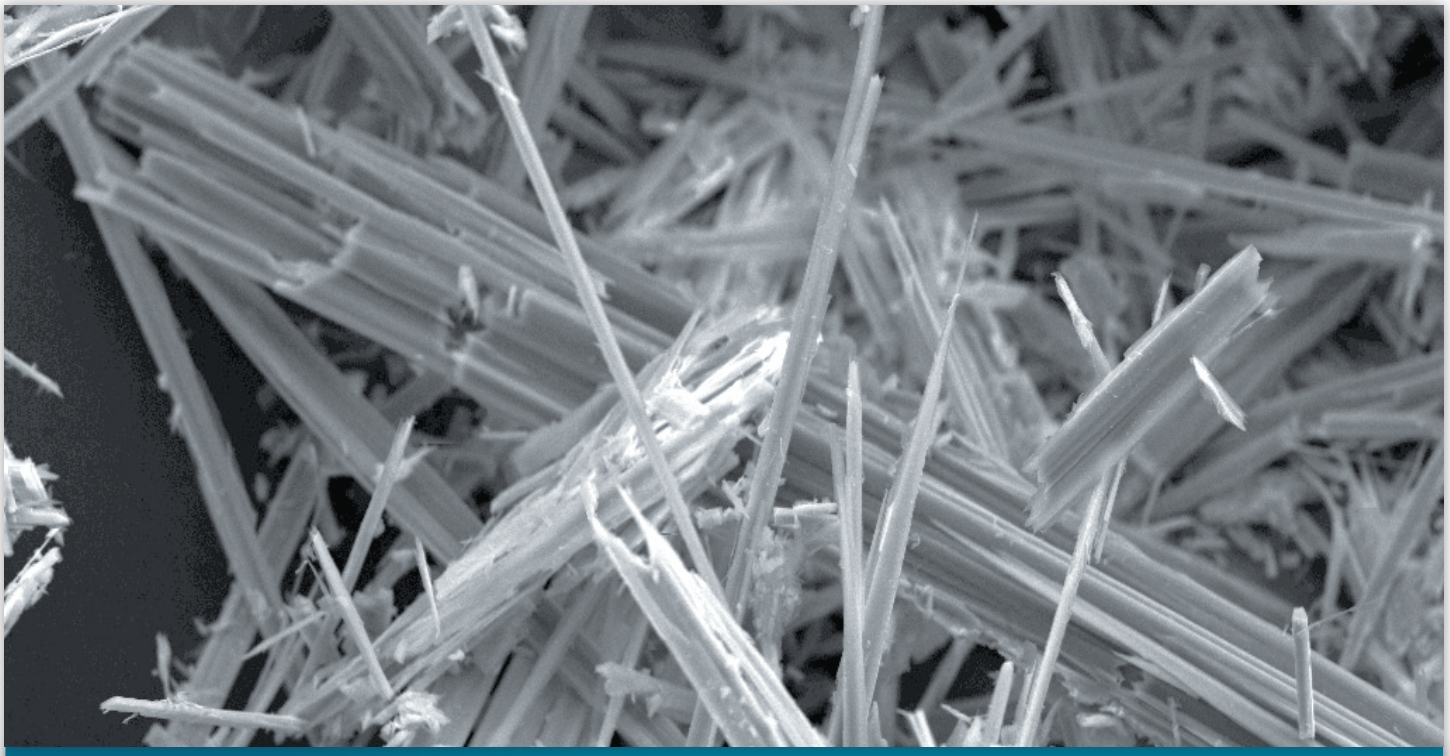
RISK ASSESSMENT FOR WORKER EXPOSURE

Work that may result in worker exposure to asbestos is categorized as:

- **Type I (low risk)** where there is low expectation of asbestos fibres being released or becoming airborne.
- **Type II (medium risk)** where asbestos fibres are expected to be released and must be controlled but in a small area where the work is completed over a short time frame. Glove bag procedures also fit in this category.
- **Type III (high risk)** where airborne fibres are expected to be released and must be controlled.

Factors to consider for categorizing asbestos work include, but are not limited to:

- The amount of ACM disturbed (scope of work)
    - More material = more risk
    - More time = more risk
- Asbestos content in a bulk sample (%)
    - Higher asbestos content = greater risk,
    - Number of asbestos fibres = more risk
- The friability of the asbestos-containing materials
    - Friable materials release asbestos fibres easily (high risk)
    - Non-friable materials have asbestos fibres that are bound and not easily released (low risk)
    - Damaged non-friable materials may become friable over time as a result of weathering, fire, water damage, or during a work activity
- The process used to disturb the asbestos-containing materials
    - The removal of intact tiles or hard board siding with no breakage may have a lower level of exposure risk
    - The use of power tools or hand tools which may cause breakage and dust will increase the level of risk of exposure



Anthophyllite asbestos, scanning electron microscope picture
http://usgsprobe.cr.usgs.gov/picts2.html / Public domain

EQUIPMENT NECESSARY FOR ASBESTOS ABATEMENT

Once the risk has been assessed, the asbestos contractor must ensure that the equipment that is being used during the abatement process is the correct type for the process required, used in accordance with recognized hygiene practices, and is maintained according to manufactured specifications. Industrial standards such as the International Organization for Standardization (ISO) and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) can provide guidance on the adequacy and operations of exhaust equipment and performance testing for the equipment.

VENTILATION EQUIPMENT

The ventilation system must be sufficient for the type of asbestos abatement being completed. Section 49.20(2) requires the ventilation system to be:

- Of a type designed and solely used for asbestos abatement procedures;
- Equipped with a HEPA (High Efficiency Particulate Air) filter;
- Maintained in good working condition and inspected regularly in accordance with the manufacturer's specifications; and
- Certified by a competent person at least once a year.

HEPA filters

HEPA filters must have a minimum filtration efficiency of 99.97% in containing an aerosol of 0.3µm diameter. A coarse pre-filter should be installed upstream of the HEPA filter to prolong its life.

Negative Air Units

Negative air units must be used in all Type III asbestos operations. The HEPA-filtered exhaust unit must remain in continuous operation to maintain negative pressure in the enclosure while the removal is in progress and during clearance procedures.

The negative air unit used in an enclosure shall have an air exchange rate of a minimum of 4 air changes per hour with a differential pressure at 5 Pascals (or -0.02 inches in water gauge).

Vacuum Cleaner Requirements

Only vacuum cleaners equipped with HEPA filters are to be used for collecting asbestos-containing materials. The vacuum cleaner must be designed so that it prevents the ACM from escaping back into the workplace.

- Vacuum bags are to be disposable.
- If the vacuum bag bursts, the vacuum cleaner is isolated from the workplace immediately. The contaminated vacuum cleaner is then cleaned with the use of another vacuum cleaner equipped with a HEPA filter or by wet wiping. The burst bag and its contents are handled as asbestos waste, by an asbestos worker wearing protective clothing and respiratory equipment.
- Vacuum bags and collected waste are disposed of as asbestos waste.

EXHAUST AIR

All exhaust air should be discharged to the outdoors.

Vacuums equipped with HEPA filters can be used to exhaust air from a Type II enclosure if they are dedicated for this purpose and equipment performance testing on the unit has been carried out prior to beginning the project. They may also be used for clean-up of a Type I Asbestos Abatement operation. Air from negative air units in Type III enclosures should be exhausted outdoors.

> Equipment performance testing should be carried out on negative air units before the project begins, in accordance with the manufacturer's specification and certified at least once a year by a competent person. Recertification may be necessary, more often, if the unit sustains damage or parts are repaired or replaced.

Air Exhausted Indoors

The asbestos contractor should include details of additional procedures in the Asbestos Notification Permit respecting conditions where it is not possible to exhaust air from a negative air unit or vacuum system to the outdoors. On-site performance testing of the exhaust ventilation equipment would be required and the exhausted air routinely monitored for airborne asbestos.

EXHAUST AIR EQUIPMENT PERFORMANCE TESTING

HEPA filters should be factory tested using a DOP (Dioctyl Phthalate) test, PAO (Poly Alfa Olefin) testing or similar means.

A measure of best practice is to perform testing prior to each use to ensure that the negative air unit is functioning properly. At minimum, an employer must follow the manufacturer's specifications for performance testing of their filtering units.

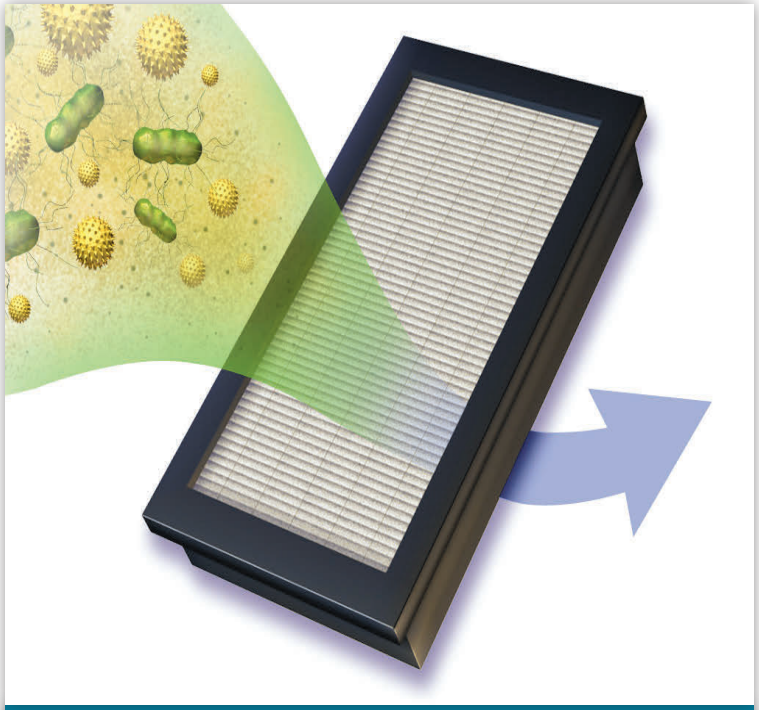
Performance testing for HEPA filters and negative air systems (negative air units and vacuums) used for asbestos work should be:

- Carried out in accordance with manufacturer's specifications; and
- Certified by a competent person, not less than once a year, as being able to function safely and effectively.

When field testing HEPA filtering units, they should:
(a) be tested at their rated air flow for proper results,
(b) not be used in equipment that exceeds their labelled air flow rate, and
(c) be tested to detect leaks in filters, gaskets or related equipment.

Field testing will not be as accurate as factory testing since air flow and temperature cannot be controlled as accurately.

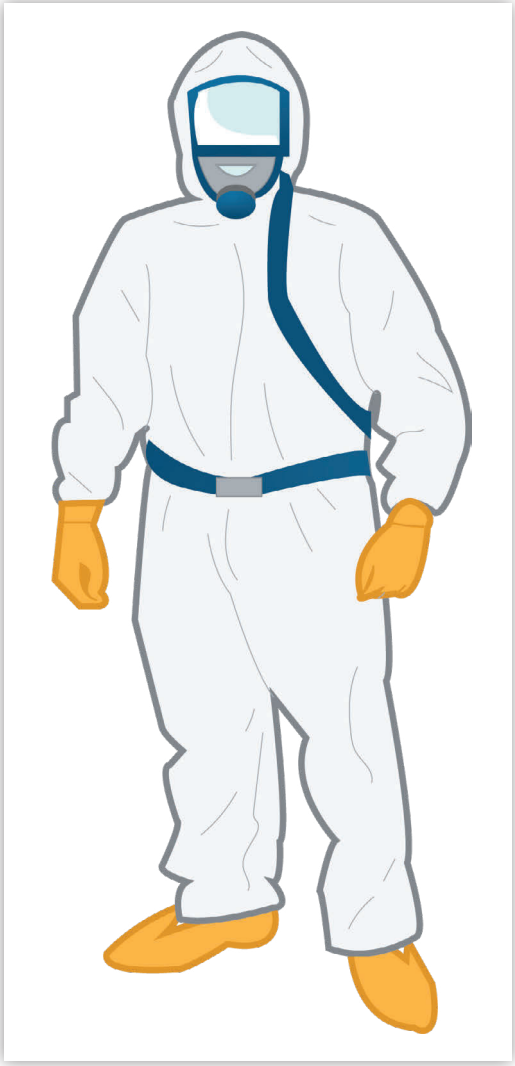
Performance testing must be conducted by a competent person, with suitable training and demonstrated knowledge and experience in conducting performance tests on negative air units and vacuums. Equipment passing the DOP test should be labelled with the test date and the name of the tester on each piece of equipment. Documentation for the analysis should be available at the site.



An illustration depicting a HEPA filter
https://commons.wikimedia.org/wiki/File:HEPA_Filter.png

PERSONAL PROTECTIVE EQUIPMENT

It is the asbestos contractor's responsibility to provide asbestos workers with the appropriate protective clothing to wear while abating asbestos-containing materials.



PROTECTIVE CLOTHING

Workers exposed to asbestos fibres must wear protective clothing that:

(a) is disposable,
(b) is made of material such as Tyvek™ that resists penetration by asbestos fibres,
(c) covers the body and fits snugly at the neck, wrists and ankles,
(d) covers the head and feet (laceless rubber boots are recommended), and
(e) can be immediately repaired or replaced if torn.

Street clothes must not be worn under disposable coveralls. Contaminated clothing or towels must not be taken home by workers for laundering!

RESPIRATORS

Section 49.14 of the *OHS Act* General Regulations requires an asbestos contractor to supply, and ensure that the workers use respirators that are appropriate for the level of risk of the anticipated exposure. Three main types of respiratory protective equipment are available: air-purifying, supplied air, and self-contained apparatus (SCBA). The respirators must be selected, used, cleaned, stored, maintained, inspected, and tested as required by Canadian Standards Association (CSA) Standard Z94.4-18 "Selection, Use, and Care of Respirators."

Respirator Protection Program

One of the requirements of the CSA Standard Z94.4-18 "Selection, Use, and Care of Respirators" is that a Respiratory Protection Program must be established. The employer must ensure that the program is documented and must include:

- Roles and responsibilities of individuals administering the program
- Hazard assessment
- Selection of appropriate respirator
- Respirator fit testing
- Use of respirators
- Inspection, maintenance, cleaning and storage of respirators

- Worker training and instruction on the use, care, maintenance and limitations of the respirator, including:
    - Reasons for using the respirator
    - When to use the respirator
    - How the respirator works
    - How to perform a seal check for daily use
    - How to perform regular servicing
    - The name of the respirator protection program coordinator
- Health surveillance of respirator users
- Program evaluation
- Record keeping

TYPES OF RESPIRATORS

Air-purifying Respirators

Air-purifying respirators clean contaminated air by passing the air through a filter before it is inhaled. A mechanical filter for particulates or fumes, a chemical cartridge filter for vapours, mists, and gases, or a combination of the two can be used. Air is drawn through the filter when the person wearing it breathes in or, in the case of a powered air respirator, by a battery-powered blower. Dual cartridge respirators are classified as air-purifying respirators. An air-purifying respirator does not protect the wearer from an atmosphere deficient in oxygen. The air must already have enough oxygen content to meet the minimum standard for breathable air (19.5%). An air-purifying respirator is also not intended for use in an atmosphere that is immediately dangerous to life or health (IDLH).

Half-face respirator (cartridge)

Filters used for asbestos fibres must be high efficiency (99.97%) as classified by NIOSH. NIOSH approves three types of high-efficiency particulate respirators – N, R and P. N-class respirator filters may only be used where the work area is free of oil. R-class filters are oil resistant and can only be used for a total of 8 hours. P-class filters are oil proof and can be used for more than one work shift. High-efficiency respirators will be denoted with a "100", e.g. P-100.

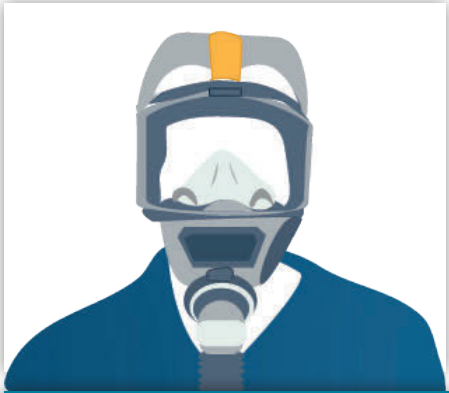
Respirator filters used in asbestos work should be disposed of at the end of each work period or whenever a worker is leaving the contaminated area.It is important to note that single-use (disposable) respirators or dust masks are not an acceptable respirator for asbestos related work.

Supplied Air Respirators

These respirators provide breathable air from an external air source through an air hose connecting the air source to the respirator facepiece. They can provide protection against higher levels of airborne contaminants than can air-purifying respirators. Air supplied to the respirator must meet the air quality requirements of CSA Standard Z180.1:19 Compressed Breathing Air and Systems.

Self-contained Breathing Apparatus (SCBA)

The air supplied in this system is contained in a cylinder that the wearer usually carries on the back. The wearer's air is completely independent of the ambient atmosphere. SCBAs are used in areas where very high levels of protection are required. SCBAs may not be practical for the majority of asbestos abatement projects.



Supplied air respirator

Protection Factor

A respirator must be selected with appropriate protection factor so that the user's exposure does not exceed 0.1 fibres per cubic centimeter of air (f/cc). Protection factor is defined as the concentration of an airborne contaminant in the worker's breathing zone outside the respirator facepiece divided by the concentration of contaminant inside the respirator facepiece:

$$PF = \frac{\text{Concentration of fibres outside respirator facepiece}}{\text{Concentration of fibres inside respirator facepiece}}$$

The higher the protection factor, the greater the degree of protection provided by the respirator. These protection factors should be used to select a respirator that will maintain the asbestos fibre concentration inside the facepiece at an acceptable level.

Type of Respirator	Assigned Protection Factor	Maximum Use Concentration fibres per cc
Air Purifying disposable filtering facepiece or dust mask	Not recommended for protection from airborne asbestos fibres	
half facepiece	10	1
full facepiece	50	5
Powered Air Purifying		
half facepiece	50	5
full facepiece	1000	100
helmut/hood	25*	2.5
loose-fitting facepiece/visor	25	2.5
Air Supplying airline (pressure demand or continuous flow)		
half facepiece	50	5
full facepiece	1000	100
self contained breathing air SCBA (pressure demand)	10000	1000

*With a SWPF study, the APF is 1000
Manufacturer may provide a simulated workplace protection factor study

Factors Affecting Respirator Fit

A major limitation of the protection provided by a respirator is the effectiveness of the seal between the facepiece and the wearer's skin.

Various factors affect the facial seal of a respirator, including:

- **Facial hair** – Facial hair, even a single day's growth of stubble, can seriously reduce the effectiveness of the facial seal. Whiskers lying between the sealing edge of the respirator facepiece and the skin will break the seal and cause leakage. For this reason, the person wearing a respirator must be clean-shaven, at least where the respirator contacts the face.
- **Respirator design** – Since respirators are designed and constructed differently, they tend to fit differently. A proper fit can be difficult to achieve if the facepiece material is too soft or too hard, if the facepiece straps are improperly adjusted, or if the wrong size of facepiece is selected.
- **Headstrap tension** – Some respirator wearers tighten headstraps as much as possible in the belief that doing so provides a better seal and fit. The exact opposite is often the result, with the shape of the facepiece becoming distorted in such a way as to break the seal. Headstraps should be snug, yet comfortable, and fit testing will demonstrate just how tight or loose the straps must be.
- **Facial shapes** – The sizes and shapes of human heads vary widely. High cheekbones, narrow faces, double chins, and broad noses ensure that one size and one design of respirator cannot possibly fit everyone.
- **Other factors** – Facial scars, eyeglasses, wrinkles, and dentures can also affect the seal obtained with certain respirators. Prescription glasses cannot be worn with a full-facepiece respirator, as the arms of the eyeglasses will break the seal. Alternatives such as eyeglass inserts should be considered for those who require prescription glasses.

Methods of Fit Testing

Because there are several factors affecting facial seal, respirator fit testing must be completed at least every two years, but annual testing is recommended. There are two accepted methods for fit testing respirators – qualitative and quantitative tests. Positive and negative pressure fit checks also need to be done each time the respirator is donned; these are not the same as fit testing. The type of fit test method will affect the assigned protection factor for the respirator if air-purifying equipment is used.

Qualitative Fit Test

Qualitative fit testing consists of relatively quick and simple tests to confirm that the worker has an effective seal. This testing consists of positive and negative pressure checks followed by an odourous chemical or irritant smoke test. Qualitative fit testing should be done when the respirator is first issued and then repeated on a regular basis.

Chemical or irritant smoke tests involve the release of an odourous chemical inside a test chamber (enclosure head) or irritant smoke around the edges of the respirator while it is being worn. The wearer performs actions that simulate movements typically made during work activities such as talking, bending, reaching, or nodding. If the wearer detects the chemical or irritant smoke, the respirator must be re-adjusted or exchanged and the test repeated until no odour, tastes, or smoke is detected.

Commonly used test agents include banana oil (isoamyl acetate), irritant smoke (stannic chloride or titanium tetrachloride), artificial sweetener (saccharin), and bittering compound (Bitrex™). The respirator must be equipped with organic vapour cartridges when administering the banana oil test agent; high-efficiency particulate filters must be used for the irritant smoke agent; particulate filters must be used for the saccharin and Bitrex™ agents.

Depending on the test agent, the wearer will either detect the smell of banana, will sense irritation of the nose and throat due to the irritant smoke, or taste the sweetness of the saccharin or the bitterness of the Bitrex™, if there is leakage. The person administering the test relies on the wearer's ability to smell, notice, or taste the test agent. A properly administered qualitative fit test takes a minimum of 15 to 20 minutes to perform, assuming a perfect fit during the first attempt. Additional information describing fit testing can be found in CSA Standard Z94.4-18, "Selection, Use, and Care of Respirators".

Quantitative Fit Test

Quantitative fit tests are more sophisticated and involve measurement of actual respirator leakage

by monitoring inside and outside the facepiece. Unlike qualitative fit testing, it does not depend on a person's sense of smell or taste to tell whether or not the facepiece leaks. Portable computerized equipment accurately measures leakage of contaminant into the respirator during various test exercises.

According to CSA Standard, Z94.4-18, when a respirator undergoes quantitative fit testing, the resulting protection factor must be at least 10 times the nominal protection factor assigned to the respirator. If this condition is not met, the fit of the respirator is inadequate and the respirator should be readjusted or a different respirator selected and tested.

Regardless of the protection factor determined by quantitative fit testing, it is the assigned protection factor that determines the selection of the respirator for use.

Record Keeping

A record of individuals who are fit tested and issued with respiratory protective equipment should be maintained. These records form part of the overall respiratory protection program, are useful for future reference, and can be requested at any time by an Occupational Health and Safety Officer. Fit-test records must be kept for respiratory protective equipment used by workers.

Persons who are required to wear a respirator must ensure they have an effective facial seal each time they put on their respirator. This is done by performing a user seal check following the manufacturer's instructions. Two types of seal checks are commonly used:

- **Negative Pressure Check** – Wearing the respirator, the wearer places the palm of each hand over the cartridge assemblies, or inhalation points, and inhales. The facepiece should collapse slightly as one breathes in and no inward rush of air should be felt against the wearer's face.
- **Positive Pressure Check** – Wearing the respirator, the wearer places the palm of their hand over the exhalation valve and presses lightly while exhaling gently into the facepiece. The fit is satisfactory if no air escapes around the edges of the respirator.

Inspection, Cleaning, Use, Storage, and Maintenance

Regular cleaning and inspection of respirators is extremely important and must be done according to the manufacturer's instructions. Respirators must be cleaned and inspected daily by routine users, and before and after each use by occasional users.

Inspection

Prior to cleaning a respirator, each part of the respirator should be inspected. Defective parts must be replaced before the respirator is used. The facepiece must be checked for cuts, tears, holes, melting, stiffening, or deterioration. If the unit is damaged, it must be replaced. Headstraps must be checked for breaks, frays, tears, or loss of elasticity. Cartridge sockets can be inspected by removing the cartridges. Special attention should be given to the rubber gaskets located at the bottom of the cartridge sockets as cracks or flaws may contribute to an ineffective seal.

The cover on the exhalation valve should be removed and the rubber valve carefully examined to ensure it seals properly and has not become brittle. The edge of the valve should be examined for holes, cracks, and dirt which may interfere with a proper seal. The exhalation valve is a critical component of the respirator and must be replaced if there is any doubt about its ability to function properly. The valve cover is also important and must not be damaged or fit too loosely.

Finally, the interior of the facepiece and inhalation valves should be examined. Dust or dirt accumulating on the inhalation valves can interfere with their operation. Inhalation valves should be soft, pliable, and free of tears or cuts to the flaps.

Cleaning

Following inspection, the respirator should be cleaned according to the manufacturer's instructions. Strong detergents, hot water, or household cleaners or solvents must not be used because they may deteriorate the rubber parts. A stiff bristle brush (not wire) can be used to remove dirt if necessary. The respirator should then be rinsed thoroughly in clean, warm water. This is important because detergents or cleaners that dry on the facepiece may later cause skin irritation. The respirator can be hand-dried with a clean, lint-free cloth, or air-dried, and then reassembled. The respirator should be tested to ensure all parts work properly prior to being used.

Use

There are different makes, models, and sizes of respirators. Workers should use the same make, model, and size of respirator they have been fit tested for. If the worker will be using a variety of different respirator makes and models, employers should ensure that appropriate fit testing is conducted for each respirator make and model.

Storage

Respirators should be stored in a clean location, preferably in a plastic bag in a locker or on a shelf. They should be stored away from sunlight, solvents and other chemicals, extreme cold or heat, and excessive moisture. Respirators must not be left out on a bench or hanging in a shop where they can gather dust and dirt or can be damaged or abused.

Maintenance

All respirator manufacturers suggest regular maintenance and parts replacement. Respirators should be maintained and inspected according to the instructions provided with each respirator. Only approved replacement parts should be used. Mixing and matching of parts from one respirator brand or model to another must never be allowed. Makeshift parts for respirators must never be installed.

OTHER PERSONAL PROTECTIVE EQUIPMENT

Other personal protective equipment such as safety boots, hard hats, gloves, and safety glasses appropriate to the other hazards present at the work site must be used. It is necessary that all Personal Protective Equipment used at the workplace, meets the requirements of Part 45 - Personal Protective Equipment of the *Occupational Health and Safety Act* General Regulations.

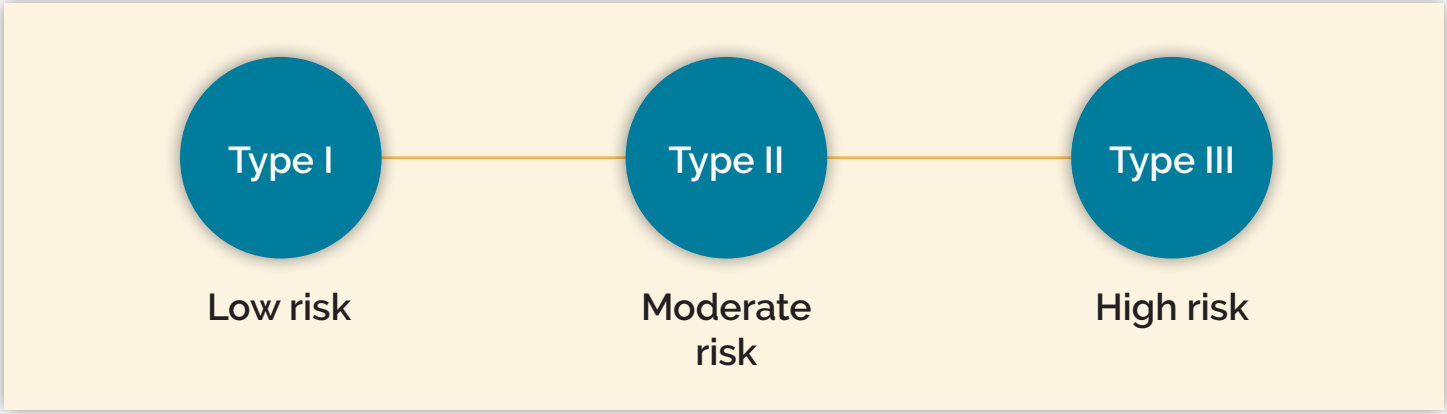
CHAPTER 7

Asbestos Abatement Procedures

ASBESTOS ABATEMENT PROCEDURES

Asbestos abatement procedures vary depending on the type, amount, and location of the asbestos. In general, the procedures can be divided into three categories, depending on their potential to generate airborne asbestos fibres:

- **Type I** which is considered low risk,
- **Type II** which is considered moderate risk; and
- **Type III** which is considered high risk.



TYPE I REMOVAL OPERATION PROCEDURES

DESCRIPTION OF PROJECTS

Work activities classified as "Type I" have a minimal risk of releasing asbestos fibres into the air. The precautions to adequately protect workers are relatively simple to follow.

Type I Removal Operations

In this Part, **Type I Removal Operations** means removal operations that present a minimal risk of releasing asbestos fibres into the air, such as the removal of asbestos-containing material that is non-friable, work that can be done without damaging the asbestos-containing material (along with the use of non-powered handheld tools as long as water is used to control fibre release), including:

(a) removal of asbestos-containing material ceiling tiles where the total area to be disturbed is less than 1 m^2 without damage;

(b) removal of non-friable asbestos-containing material without damage;

(c) removal of vinyl asbestos floor tile, asbestos cement products, and millboard where water is used to control fibre release; and

(d) removal of less than one square meter of drywall where joint-filling compounds with asbestos-containing material were used.

It should be noted that prior to removal, floor tiles should be sampled and checked for backing materials which may also contain asbestos. The backing materials usually are friable and contain considerably more asbestos. Sampling for adhesives and floor-leveling compound should also be completed. Mastic used to glue tiles to the floor and leveling compound under the tiles may also contain asbestos fibres. If these materials are present, Type II or Type III removal procedures may be required, depending on the amount and concentration of asbestos in the materials.

EQUIPMENT

Required equipment should include the following:

- Vacuum cleaner fitted with a HEPA filter
- Polyethylene drop sheets having a minimum 6 mil thickness
- 6 mil thick labelled asbestos disposal bags
- Spray bottle or hand pump garden sprayer to wet asbestos
- Barriers and warning signs
- Hand powered tools for abatement work
- Mops and/or rags and water for clean-up
- Worker decontamination supplies
- Fire extinguisher
- Appropriate first-aid kit

PERSONAL PROTECTIVE EQUIPMENT

Workers who may be exposed to asbestos fibres must wear all of the following:

- Disposable coveralls over work clothing to prevent contamination of the work clothing.
- A NIOSH-approved half-mask air-purifying respirator equipped with a P-100 (oil Proof), R-100 (Resistant to oil) or N-100 (Not resistant to oil) particulate filter. Disposable single-use respirators must not be used.
- Other personal protective equipment, such as safety boots, hard hats, gloves, and safety glasses, appropriate to the other hazards present at the work site must be used. If other airborne contaminants are also present, respiratory protective equipment appropriate to those hazards is necessary.

PRE-JOB PLANNING

(1) Conduct a work site-specific hazard assessment.

(2) Establish the work procedures to be followed and assemble the equipment required to perform the job.

(3) Submit a completed Asbestos Notification Form to the Occupational Health and Safety (OHS) Division at least 3 business days before beginning the asbestos work, including set-up operations that may release fibres (see *"Asbestos Notification" on page 37*).

(4) Ensure workers are adequately trained in the hazards and proper methods of working with asbestos.

(5) Ensure all HEPA-filtered equipment is functioning properly, according to manufacturer's specifications, and is on site before the job commences.

(6) Develop procedures to deal with emergencies such as fire or injury. These must be in place prior to work starting.

WORK SITE PREPARATION

(1) Review the work site-specific hazard assessment with the workers.

(2) Appropriate barriers and warning signs must be positioned in areas where access needs to be restricted until the work is completed.

WORK PROCEDURES

(1) Localized wetting of the material must be done to minimize fibre release. Dry removal of asbestos-containing materials is not permitted. If the material cannot be wetted, the work must be classified as Type II (moderate risk) and applicable procedures must be followed.

(2) Remove visible dust on work surfaces with a damp cloth or a vacuum cleaner fitted with a HEPA filter.

(3) Where necessary, use plastic drop sheets or similar materials to prevent the spread of asbestos dust to other work areas.

(4) When hand tools are used to cut, shape, or drill a non-friable manufactured product containing asbestos, the product must be wetted to minimize the release of airborne fibres.

(5) No person shall eat, drink, smoke, or chew gum or tobacco at the work site except in a designated clean area. Workers must remove protective equipment and clothing and clean their hands and faces prior to any of these activities.

DECONTAMINATION

(1) Immediately upon completing the work:

(a) Clean up dust and waste by wet sweeping, damp mopping, or vacuuming with a vacuum cleaner fitted with a HEPA filter, and

(b) Ensure drop sheets are wetted, folded in on themselves to contain dust, properly bagged and disposed of as asbestos waste.

(2) Before leaving the work area:

(a) Clean protective equipment and clothing using a vacuum cleaner fitted with a HEPA filter, or wipe with a damp cloth.

(b) Place disposable protective clothing, in a sealable container, and dispose of it as asbestos waste. Clothing and protective equipment that is to be reused must be laundered and cleaned using proper procedures.

(c) Wash all exposed skin surfaces prior to removing respirator. All persons in the work area must properly decontaminate themselves prior to leaving the work area. This is to be done under all circumstances, including prior to drinking, eating or using a washroom.

(3) Do not use compressed air to clean up or remove dust or materials from work surfaces or clothing. Techniques that generate excessive fibre levels should be avoided. Cleaning must be done with a vacuum cleaner fitted with a HEPA filter or by wet sweeping or damp mopping.

DISPOSAL

(1) Place asbestos waste into a sealable container labelled as containing asbestos waste. This includes used protective equipment.

(2) Clean the external surfaces of sealed containers of asbestos waste by wiping with a damp cloth that is also to be disposed of as asbestos waste, or by using a vacuum cleaner fitted with a HEPA filter.

(3) Remove containers from the work area.

AIR MONITORING

Daily air sampling for airborne asbestos fibres is not required for Type I removal operations, including low risk activities that last longer than 24 hours if an enclosure, a containment system, or a clean room is not constructed or used. In a Type I removal operation, no airborne asbestos fibres can be generated, only non-friable ACM can be worked on, and an enclosure is not required. If airborne asbestos fibres are generated or friable ACM is encountered, then the risk activity level must be reclassified from Type I to Type II or III.

There may be circumstances where an employer, owner or contractor is required to do air monitoring to accommodate project management specifications.

SITE INSPECTION

Upon completion of the work, the work area must be visually inspected to ensure that all visible asbestos-containing debris has been properly cleaned up. Keeping records of inspections is recommended.

TYPE II REMOVAL OPERATION PROCEDURES

DESCRIPTION OF PROJECTS

Work activities classified as "Type II" have a moderate risk of releasing asbestos fibres into the air.

Type II Removal Operations

In this Part, **Type II Removal Operations** means removal operations that present a medium risk of asbestos exposure to workers, such as the removal or minor disturbance of friable asbestos-containing material with a surface area of less than 0.09 m^2 or 1 square foot during the repair, alteration, maintenance or demolition of all or part of a building, or any machinery or equipment, or where the minor removal or disturbance exceeds the scope of a Type I Removal, including:

(a) using a mechanical or electrically powered tool, fitted with a HEPA filter dust collector, to cut, shape or grind non-friable manufactured products containing asbestos;
(b) removing all or part of a false ceiling to gain access to a work area where friable asbestos-containing material is, or is likely to be, lying on the surface of the false ceiling;
(c) removing, encapsulating, enclosing or disturbing a surface area of less than 0.09 of a m^2 or 1 square foot of friable asbestos-containing material during the repair, alteration, maintenance, demolition or dismantling of a building, structure, machine, tool or equipment, or parts of any of them;
(d) performing glove bag operations;
(e) dry removal of non-friable asbestos-containing material where the material may be cut, broken, or otherwise damaged during removal; and
(f) removing a surface area of up to 9.3 m^2 or 100 square feet of contiguous ceiling tile containing asbestos or sheet vinyl flooring having an asbestos backing.

EQUIPMENT

Required equipment should include the following (there may be some adjustments if a containment is used):

- Vacuum cleaner fitted with a HEPA filter
- Polyethylene sheeting having a minimum 6 mil thickness
- 6 mil thick labelled asbestos disposal bags
- Spray bottles or hand pump garden sprayers to wet asbestos
- Barriers and warning signs
- Appropriate tools
- Mops, rags, brushes, water and other supplies for clean-up
- Worker decontamination supplies
- Fire extinguisher
- Appropriate first-aid kit

PERSONAL PROTECTIVE EQUIPMENT

(1) Workers exposed to asbestos fibres must wear protective clothing that:

(a) is made of material such as Tyvek™ that resists penetration by asbestos fibres,
(b) covers the body and fits snugly at the neck, wrists, and ankles,
(c) covers the head and feet, and
(d) can be immediately repaired or replaced if torn.

Street clothes must not be worn under disposable coveralls if work is conducted inside a containment.

(2) A NIOSH-approved respirator equipped with a P-100 (oil Proof), R-100 (Resistant to oil) or N-100 (Not resistant to oil) particulate filter must be worn. The respirator selected must have a sufficient protection factor to provide adequate protection for the fibre levels encountered during the project. **Disposable, single use respirators must not be used.**

(3) Other personal protective equipment such as CSA approved rubber boots, hard hats, gloves, and safety glasses appropriate to the other hazards present at the work site must be used. If other airborne contaminants are also present, respiratory protective equipment appropriate to those hazards is necessary.

PRE-JOB PLANNING

(1) Conduct a work site-specific hazard assessment.

(2) Establish the work procedures to be followed and assemble the equipment required to perform the job.

(3) Submit a completed Asbestos Notification Form to the OHS Division at least 3 business days before beginning the asbestos work, including set-up operations that may release fibres (see *"Asbestos Notification" on page 37*).

(4) Ensure all HEPA-filtered equipment is functioning properly, according to manufacturer's specifications, on site before the job commences.

(5) Ensure workers are adequately trained in the hazards and proper methods of working with asbestos.

(6) Ensure that building occupants, tradespeople and other workers in the building are notified in advance, of the location, duration and type of work to be performed, as appropriate.

(7) Develop procedures to deal with emergencies, such as a fire or injury, which must be in place prior to work starting. Where a containment is used for Type II work, a worker must be stationed outside the containment to respond to emergencies and contact rescue personnel if needed.

WORK SITE PREPARATION

(1) Review the work site-specific hazard assessment with workers.

(2) Barriers and warning signs must be posted in areas where access to unauthorized persons needs to be restricted until the work is completed. **The signed Asbestos Notification Permit must be posted.**

The immediate work area must be cleared of all objects, materials and equipment other than those required to perform the work.

Windows and doorways are properly secured to prevent release of asbestos fibres into other work areas.

(3) Clearly mark the boundary of the work area by placing barricades, fencing or similar structures around it. Place a drop sheet under the work area.

(4) Prior to starting any work that is likely to disturb friable asbestos-containing materials, the materials must be cleaned by damp wiping or vacuuming with a vacuum cleaner fitted with a HEPA filter.

(5) All air handling and ventilation systems that could cause asbestos fibres to be distributed, disturbed or become airborne during the work must be shut down before work begins. They must be locked and tagged out to prevent accidental starting.

(6) Lock and tag out all other electrical and mechanical equipment within the work area.

(7) Electrical power for abatement work must be supplied through a ground fault circuit interrupter (GFCI).

(8) If required, a containment must be constructed using 6 mil thick polyethylene sheeting. For a Type II project, the containment must be less than 9.3 m^2 (100 sq. ft.) in size. A HEPA-filtered exhaust unit must be connected to the containment to provide negative pressure for the duration of the project. If a larger containment is needed, the project may require re-classification as high risk or Type III removal operation.

WORK PROCEDURES

(1) Wet material thoroughly before and during the work, unless such wetting creates a hazard to workers. Material must be wet but not saturated, as this may cause delamination or disintegration of the material.

(2) Use polyethylene drop sheets and barriers to prevent the spread of asbestos-containing dust to other work areas.

(3) Do not allow asbestos waste to accumulate or dry out before final bagging.

(4) Once abatement work is complete, seal all rough edges or surfaces containing asbestos-containing material at the edges of the work area with an encapsulant.

(5) If a containment is constructed, apply a slow-drying sealant such as glue spray to its surfaces prior to dismantling it. This application ensures that non-visible asbestos fibres are bonded to the surfaces of the containment and cannot become airborne.

(6) If a containment is used, complete a final air clearance test after a minimum drying period of 4 hours.

DECONTAMINATION

(1) Immediately upon completing the work:

(a) clean up dust and waste by wet sweeping, damp mopping or vacuuming with a vacuum cleaner fitted with a HEPA filter, and

(b) ensure drop sheets are wetted, folded in on themselves to contain dust, properly bagged and disposed of as asbestos waste.

(2) Before leaving the work area:

(a) Clean protective equipment and clothing before removing it from the work area using a vacuum cleaner fitted with a HEPA filter or wipe with a damp cloth.

(b) Place disposable protective clothing in a sealable container and dispose of it as asbestos waste. Clothing and protective equipment that is to be reused must be laundered and cleaned using proper procedures.

(c) Wash all exposed skin surfaces prior to removing respirators. All persons in the work area must properly decontaminate themselves prior to leaving the work area. This is to be done under all circumstances, including prior to drinking, eating or using a washroom.

(3) Do not use compressed air to clean up or remove dust or materials from work surfaces or clothing. Techniques that generate excessive fibre levels should be avoided. Cleaning must be done with a vacuum cleaner fitted with a HEPA filter, or by wet sweeping or damp mopping.

DISPOSAL

(1) Place asbestos waste into a sealable container labelled as containing asbestos waste. This includes used protective equipment.

(2) Clean the external surfaces of sealed containers of asbestos waste by wiping with a damp cloth that is also to be disposed of as asbestos waste, or by using a vacuum cleaner fitted with a HEPA filter.

(3) Remove containers from the work area and dispose of waste according to procedures.

AIR MONITORING

Best practices for air monitoring require that samples are taken prior to work starting (baseline or background samples), during abatement activities, and upon completion of the job. Daily air sampling is not a legislated requirement in a Type II removal operation but it may be requested by the property owner or general contractor. Air monitoring must be performed by competent personnel following the methods specified in the OHS legislation.

A final clearance air sample is required before the enclosure, if one is used, is dismantled. Final air monitoring tests should be less than 0.01 fibres per cubic centimeter (f/cc).

Air monitoring may assist the Asbestos Abatement Contractor in determining if the project should be re-classified to a high risk, Type III removal operation if:

- The fibre levels inside the work area exceed the Threshold Limit Value (TLV); or
- The fibre levels outside the work area approach 50% of the TLV.

SITE INSPECTION

A competent person should perform a visual inspection of the integrity of the enclosure, if one is used, prior to work starting. If the project continues for more than one work shift, the enclosure must be checked for damage at the time of the shift change and any damage detected must be repaired immediately.

Upon completion of the work, the work area must be visually inspected by a competent person to ensure that all visible asbestos-containing debris has been properly cleaned up and removed. Records of inspections completed should be kept.

GLOVE BAG REMOVAL OPERATION PROCEDURES

A glove bag allows the removal of asbestos-containing materials from mechanical components such as piping, valves, fittings, and small dimension duct work without constructing an elaborate containment. This becomes cost effective where small quantities of material are removed from within a large area, eliminating the need to completely enclose the area. Glove bag removal of asbestos-containing materials (ACM) is considered a Type II removal operation project unless the work area meets the definition of a "restricted area".

Glove bags come in a variety of types and styles. Some are multi-use, meaning they can be moved along a pipe as removal progresses. Other glove bags are taped in place and used only in that one location before being discarded.

Other equipment required for glove bag removal includes:

- Vacuum cleaner fitted with a HEPA filter
- Polyethylene drop sheets having a minimum 6 mil thickness
- 6 mil thick labelled asbestos disposal bags
- Spray bottle or hand pump garden sprayer to wet asbestos
- Water and wetting agent
- Duct tape or tape having similar or better strength
- Utility knife with retractable blade
- Wire cutters
- Flexible wire saw

Determine the type, style, and quantity of bags appropriate for the job. If possible, work should be performed when building occupants or other workers are not present in the immediate vicinity of the work area. In any event, the work area must be cordoned off using banner tape and warning signs.

Glove bags should not be adhered to pipe insulation that is not covered with a wrap such as Caposite. Without a wrap, fibres can be released during installation of the glove bag and when it is moved along the pipe.

> **Note:** Some glove bags can be used for more than one width of a bag. In this case, the glove bag is washed down and bottom section is twisted closed and sealed with duct tape on the outside of bag. The bag seal on each end of the pipe where the insulation is being abated is then opened and the glove bag is slid along the length of pipe where the next section is to be abated and then resealed. The bottom section of bag is then reopened for more insulation to fall into. The process may be repeated until the bottom section of the bag reaches its capacity, according to manufacturer's specifications. Then the bag removal procedure is initiated.

GLOVE BAG WORK PROCEDURES

Before working with a particular type of glove bag, workers should read and understand the manufacturer's instructions for use. In general:
(1) Place a polyethylene drop sheet beneath the area in which the glove bag is to be installed.

(2) Prior to applying the bag, seal any loose insulation by wrapping it with polyethylene.

(3) Prior to starting the removal, clean up any loose asbestos debris on or around the pipe with a vacuum cleaner fitted with a HEPA filter.

(4) Assemble all the required tools and equipment.

(5) Place the tools in the bag and seal the bag to the pipe. Insert the nozzle of the garden sprayer into the bag and seal the opening. Similarly, insert the nozzle of the vacuum cleaner fitted with a HEPA filter into the bag and seal the hole. Ensure that the weight of the hose does not pull the bag off of the pipe.

(6) Place hands into the gloves and using the tools, cut and remove any jacketing. Wet exposed insulation to reduce fibre release.

(7) Remove the material, wetting it and arranging it in the bottom of the bag.

(8) Using a wire brush, abrasive pad or scraper, clean asbestos residue off of the pipe or fittings.

(9) Wet and seal the exposed ends of the insulation. The sealant must also be applied to the inside upper section of the bag prior to removal of the bag.

(10) Place tools in the glove and pull the glove out of the bag so the tools are inside the glove. Twist and double tape the glove to create a pouch that can be cut off. The tools may now be placed into the next glove bag or into a pail of water for cleaning. For cleaning, open the pouch under water and clean the tools thoroughly.

(11) Remove the air out of the glove bag using the vacuum cleaner. Twist the lower section of the bag containing the waste and seal it with tape. Slowly remove the tape connecting the bag to the pipe. Place the bag into an asbestos waste disposal bag and seal. Drop sheets must also be disposed of as asbestos waste.

(12) All work equipment must be cleaned by damp wiping or with a vacuum cleaner fitted with a HEPA filter.

(13) Workers must wash their hands and face before leaving the work area.

(14) The surfaces from which asbestos has been removed should be visually inspected after removal of the glove bag to ensure that there is no remaining asbestos residue.

Glove bags may be used once and then disposed of unless they are designed for multiple uses.
They must not be cleaned and reused. Standard glove bags must not be used on piping at temperatures exceeding 65°C. Check with the glove bag manufacturer for the recommended range of temperatures in which the bag can be used.

AIR MONITORING

Personal or breathing zone air samples should be taken at least once per shift during glove bag removals to ensure release of asbestos is controlled (measured levels should not be above baseline or background sample results). However, if the work is of very short duration, an air sample is not practical because the sample period must be at least 25 minutes to meet the minimum volume requirements in the NIOSH Method 7400.

TYPE III REMOVAL OPERATION PROCEDURES

DESCRIPTION OF PROJECTS

Work activities classified as "Type III" have a high risk of releasing asbestos fibres into the air.

Type III Removal Operations

In this Part, **Type III Removal Operations** means removal operations during the repair, alteration, maintenance or demolition of all or part of any building, machinery, or equipment that present the highest risk of asbestos exposure to workers, including:

(a) spraying of an encapsulant over friable asbestos using a low-pressure sprayer;
(b) using a power tool not having a dust collection device equipped with a HEPA filter to cut, grind or abrade asbestos-containing material;
(c) any indoor operation involving the removal or stripping of friable asbestos-containing material; and
(d) repairing, altering or demolishing a boiler, furnace or similar device or any part of it that is made in part of asbestos-containing material.

EQUIPMENT

Required equipment should include:

- Portable HEPA-filtered exhaust units with extra fuses
- Replacement HEPA filters
- Flexible or rigid duct
- Vacuum cleaners fitted with HEPA filters
- Airless sprayer for water dispersion
- Electrical extension cords
- Portable ground fault circuit interrupter (GFCI)
- Garden hose
- Hand pump garden sprayer to wet isolated areas
- Wetting agent (50% polyoxyethylene ether and 50% polyoxyethylene, or equivalent)
- Scrapers, nylon brushes, dust pans, shovels, to remove asbestos
- Scaffolds with railings, if required
- Duct tape or an alternative tape with similar or better adhesive qualities
- Polyethylene sheeting having a minimum 6 mil thickness
- 6 mil thick labelled asbestos disposal bags
- Barriers and warning signs
- Mops and/or rags, water and other supplies for clean-up
- Encapsulant for sealing edges
- Manometer, pumps and smoke generator
- Fire extinguisher
- Appropriate first-aid kit
- Decontamination equipment (including shower, soap, shampoo, hot water tank)
- Glue/sealant for use after completion of abatement before final air clearance

PERSONAL PROTECTIVE EQUIPMENT

(1) Workers exposed to asbestos fibres must wear protective clothing that

(a) is made of material such as Tyvek™ that resists penetration by asbestos fibres,
(b) covers the body and fits snugly at the neck, wrists and ankles,
(c) covers the head and feet, and
(d) can be immediately repaired or replaced if torn.

The use of disposable coveralls is recommended. Street clothes must not be worn under disposable coveralls. Disposable underwear may be worn under disposable coveralls and will be considered as contaminated. An additional layer of disposable coveralls may be worn for warmth if needed, but must be considered as contaminated as well. It should be noted that asbestos abatement work can only proceed when conditions are above freezing because of the ample use of water inside the enclosure.

(2) During Type III abatement activities, acceptable respiratory protection is, at minimum, a tight-fitting powered air-purifying respirator (PAPR), equipped with a P-100 (Oil proof), R-100 (Resistant to oil), or N-100 (Not resistant to oil) particulate filters. Positive pressure supplied air respirators may be required if wet removal is not possible. In some cases, dual cartridge half- and full-face respirators with high-efficiency filters are acceptable. The appropriate level of respiratory protection can only be determined by conducting air-monitoring tests and calculating the protection factor needed. Where a level of protection lower than PAPR is chosen for a Type III operation, the suitability of such equipment must be assessed for the duration of the project. If fibre concentrations increase, workers will need to switch to respiratory protective equipment with a higher protection factor. Disposable single-use respirators must not be used.

(3) Half-mask air-purifying respirators equipped with a P-100 (Oil proof), R-100 (Resistant to oil), or N-100 (Not resistant to oil) particulate filter can be used for the set-up and dismantling phases of the removal project.

(4) Other personal protective equipment such as CSA approved rubber boots, hard hats, gloves, and safety glasses appropriate to the other hazards present at the work site must be used. If other airborne contaminants are also present, respiratory protective equipment appropriate to those hazards is necessary.

PRE-JOB PLANNING

(1) Conduct a work site specific hazard assessment.

(2) Establish the work procedures to be followed and assemble the equipment required to perform the job.

(3) Submit a completed Asbestos Notification Permit to the OHS Division at least 3 business days before beginning the asbestos work, including set-up operations that may release fibres.

(4) Obtain the necessary building permit(s) by contacting the municipality or accredited agency that issues building permits.

(5) Have the following documentation available:
- (a) Signed Asbestos Notification Permit posted
- (b) Written procedures
- (c) Proof of worker training, including workplace first-aider available on site
- (d) Name of supervisor on site
- (f) Certification of HEPA-filtered equipment
- (g) Respiratory Protection Program documentation

(6) Ensure all HEPA-filtered equipment has been tested on site before the job commences.

(7) Ensure workers are adequately trained in the hazards and proper methods of working with asbestos.

(8) Workers must have successfully completed a course of instruction approved by the Director of OHS and be in possession of their original valid asbestos worker certificate if they are entering a "restricted area".

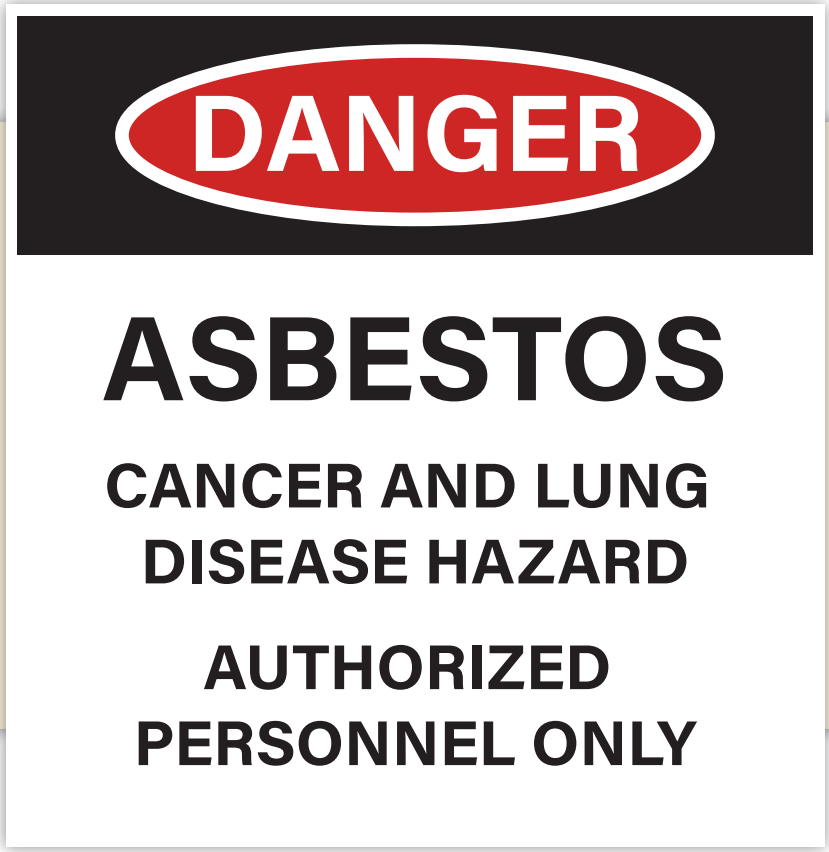
(9) Ensure that building occupants, tradespeople, and other workers are notified, in advance, of the location, duration, and type of work to be performed.

(10) Develop procedures to deal with emergencies such as a fire or injury, which must be in place prior to work starting. One worker, who is appropriately trained, must be stationed outside the containment to respond to emergencies and contact rescue personnel if required. Workers inside the containment must have some form of communication with the worker outside the containment. Emergency exits must be clearly marked, both inside and outside of the containment.

WORK SITE PREPARATION

(1) Review the work site specific hazard assessment with the workers.

(2) Isolate the asbestos work area by placing signs around it warning persons not to enter the area unless authorized to do so. This includes the permit, which would have the name of a contact person on site, along with their contact information. The signs should read as follows:



(3) Clearly mark the boundary of the work area by placing barricades, fencing, or similar structures around it.

(4) The setup process may result in worker exposure to asbestos such as when installing upper seals in a ceiling space containing spray-on fireproofing or building a containment in an asbestos-contaminated environment. The use of appropriate personal protective equipment and airborne fibre generation control must be used during the setup phase where this hazard is present.

(5) The entire work area should be enclosed to prevent the escape of asbestos fibres. Use polyethylene sheeting at least 6 mil thick, or a similar impervious material, held in place with heavy duty tape and adhesive. It may be necessary to erect a temporary wooden or metal frame to which the plastic barrier can be attached. All joints must overlap by approximately 30 cm and be double-taped to ensure the area is completely sealed off.

(6) A HEPA-filtered exhaust unit must be installed to create a negative air pressure of approximately 5 Pascals or -0.02 inches in water gauge within the enclosure relative to the surrounding area. The exhaust unit must provide at least 4 complete air changes per hour. In this arrangement, the major and usually only route of air into the removal area is through the decontamination unit. Maintaining negative pressure for asbestos containments is one way to help ensure the release of asbestos fibres is minimized. A pressure difference of 5 Pascals (or -0.02

inches in water gauge) is required. Relying on visual indicators of pressure difference, such as flap movement, does not provide a reliable understanding of the negative pressure in the containment. Sudden pressure changes, containment breaches, and work activities can all have immediate and unpredictable effects on the negative pressure of an asbestos containment, which may not be obvious from visual cues. A manometer or equivalent should be available and used to monitor negative pressure.

(7) A negative air pressure in the enclosed space relative to the surrounding area must be maintained so that air flow is always from clean outside areas into the contaminated area. Exhaust air from the enclosure should be discharged to the outdoors through a HEPA filter. In the rare case where exhaust air cannot be discharged to the outside, or where it must be discharged to areas close to heating, ventilation, or air conditioning (HVAC) inlets or breathing air compressors, the discharge must be routinely monitored for airborne asbestos. The air flow pattern in the work area must ensure that the clean room and shower room of the decontamination facility are safe for workers who are not wearing respirators.

(8) The HEPA-filtered exhaust unit must remain in continuous operation to maintain negative pressure in the enclosure while the removal is in progress and during clearance procedures after the removal. Negative pressure must be maintained until site decontamination work is complete and air-monitoring tests confirm fibre levels are low enough to permit dismantling of the enclosure.

(9) HEPA-filtered exhaust units should be positioned to allow access to the filters from within the removal area, while the units themselves are kept outside the removal area. This makes decontamination of the units easier. Where it is not possible to change the filter while within the removal area, a temporary enclosure should be constructed around the unit during filter replacement.

(10) HEPA filters must have a minimum filtration efficiency of 99.97%. A coarse pre-filter should be installed upstream of the HEPA filter to prolong its life. Where practical, the discharge point for any exhaust unit should be to the outside air, away from other work areas, air conditioning inlets, or breathing air compressors.

(11) If a complete enclosure cannot be constructed, cover windows and doors leading into the area with a plastic sheeting barrier. Cut the plastic sheeting so it overlaps the framework of the window or door by 10 to 15 cm. Ensure a good seal by wiping the area around the window or door with a moist cloth so that the tape sticks.

(12) Seal off stairways and elevators. Where asbestos is removed from an entire floor of a multi-storey building, all passenger elevators must be prevented from stopping at that floor. Removal workers may gain access to the floor via the fire staircase or from an elevator dedicated for this purpose.

(13) Seal heating and ventilation ducts and close dampers to eliminate air flow. Aside from specific asbestos exhaust units, all ventilation and air conditioning equipment that services the removal area must be shut down for the duration of the removal job. All vents must be sealed to prevent asbestos dust from getting into the duct network. Upon completion, and after final cleaning of the removal area, all mechanical ventilation filters for recirculated air should be replaced if possible.

(14) Use a layer of seamless or seam-sealed, fibre-reinforced polyethylene sheeting on the floor of the containment, covered by a second layer of at least 6 mil thick polyethylene sheeting. Use double-sided tape or adhesive to prevent movement between layers. A turn-up of 30 cm should be used where the floor joins the walls. Sheeting covering the walls should overlap the turn-ups on the inside of the containment to prevent leaks of asbestos-contaminated water running outside of the containment. Extra strength in the containment floor can be achieved by running the double layers of plastic at 90 degrees to one another.

(15) Power sources with GFCI must be used to protect workers against electric shock from electrical equipment operated in the presence of water inside the enclosure. All existing electrical circuits or lighting must be physically locked out to prevent unintentional start-up of electrical equipment.

(16) Remove all movable furniture, equipment, and fittings from the asbestos removal area. Immovable items should be carefully wrapped and sealed in suitable plastic sheeting so they are effectively isolated from the removal area. In areas of heavy traffic or high wear, additional physical barricading may be necessary.

(17) Where set-up operations may release asbestos fibres, all personnel in the removal area must wear appropriate personal protective equipment, including respiratory protective equipment suitable for asbestos. All other high risk preparation, such as isolation of the work area, shut down of the heating, ventilation and air conditioning system, installation of HEPA-filtered exhaust units, and the worker decontamination facility must be completed first.

(18) The need for appropriate respiratory protective equipment is particularly important when removing barriers or partitions such as false ceilings. Where ACM have fallen onto a false ceiling, the ceiling must be removed by following at least the procedures required during Type II abatement activities. Any utility or service line which hangs down into the ceiling space should be sealed up if it cannot be sealed from outside the removal area.

(19) Care should be taken to ensure that asbestos dust cannot escape at points where pipes and conduits leave the removal area. Additional attention to sealing and compliance testing is required at these points, particularly if service riser shafts pass through the removal area.

(20) When planning and building an asbestos removal containment, special consideration must be given to the impact on the fire rating of the building and to the provision of firefighting facilities and emergency lighting.

(21) Power, telephone, and fire alarm cables may lie beneath asbestos insulation. To prevent the cables from being damaged or creating a hazard to workers, the cables must be clearly identified prior to commencing any cutting. Cables should be re-routed or disabled during the removal period.

(22) The containment and material transfer rooms may be fitted with a clear acrylic panel or some other form of window, so that the work within may be monitored from outside.

(23) A decontamination facility must be attached to the work area to allow workers to remove contaminated clothing and properly shower before leaving the area. The decontamination facility consists of a series of connected rooms separated by airlocks (see *"Decontamination" on page 69*). The use of this facility helps prevent the spread of asbestos beyond the contaminated area. An additional decontamination facility should be attached to the containment for waste transfer. Waste removal from the transfer area should be conducted at separate times from abatement work to avoid a pressure drop within the containment.

WORK PROCEDURES

(1) Unless wetting the ACM creates a more imminent hazard, ACM must be handled and removed only when wet. Surfactants and wetting agents can be used with water to assist in thoroughly wetting ACM. Surface soaking with a spray jet is useful for small areas and where total saturation is not practicable. The spray can be from an adjustable pistol-grip garden hose fed from a main water supply. Where no supply is readily available, a portable pressurized vessel such as a pump-up garden sprayer can be used. Constant water pressure is desirable. **High pressure water spray should not be used.**

(2) Dry sweeping must NOT be used to clean up waste materials. Compressed air must NOT be used for any cleaning purpose.

(3) Exhaust air from the containment must pass through a HEPA filter and be discharged outdoors.

(4) Vacuum cleaners used to clean up asbestos materials must be fitted with HEPA filters.

(5) ACM near workers performing bulk removal activities should be continually misted with water, if practicable.

(6) All surfaces exposed to asbestos fibres must be cleaned by HEPA vacuum cleaning or damp wiping.

(7) If asbestos is encapsulated, the sealant must penetrate the material and effectively bind the asbestos fibres together.

(8) After completing the removal of ACM, exposed surfaces must be washed or HEPA vacuum cleaned and treated with a sealant.

(9) The pressure from streams of water, sealants, or encapsulants must be controlled to prevent excessive generation of airborne asbestos fibres. Use of airless or low pressure application systems is recommended.

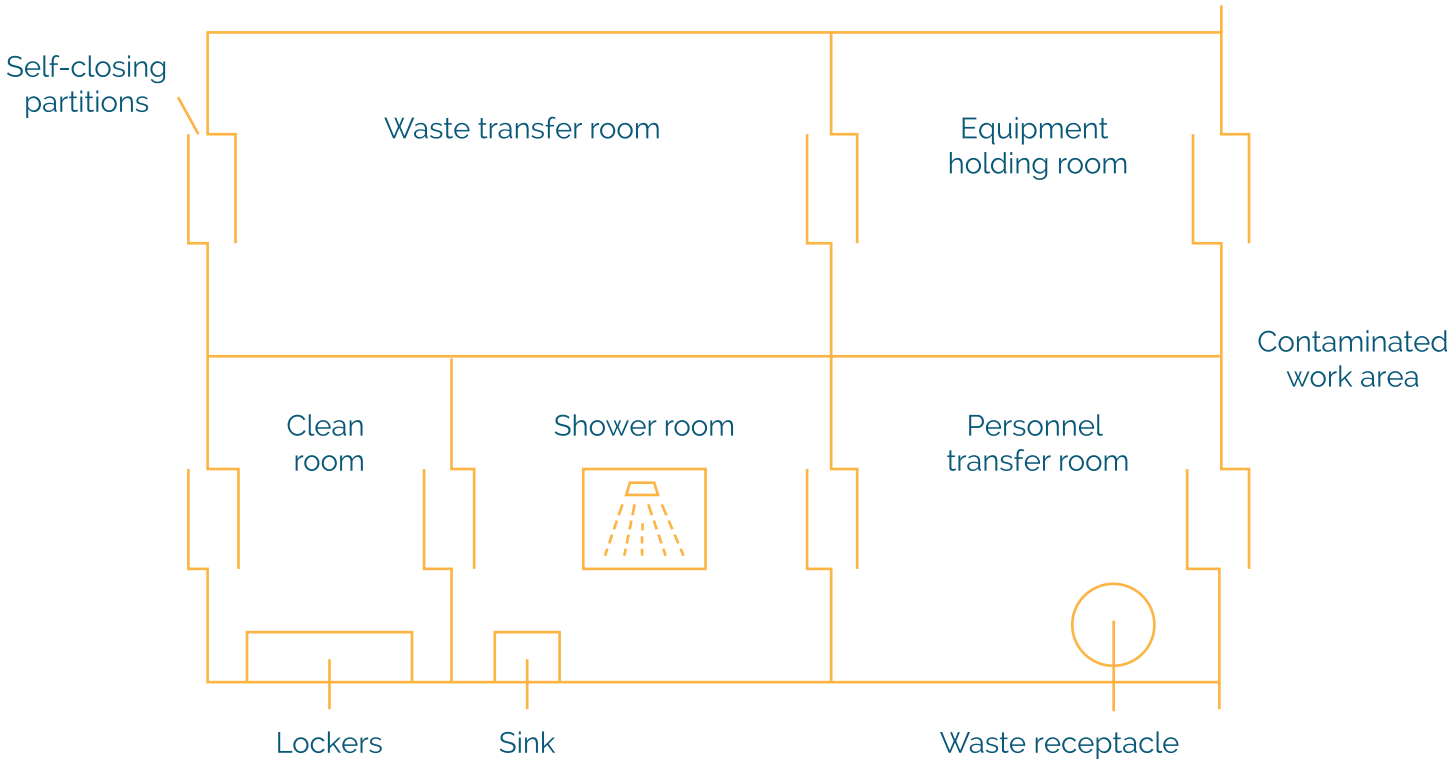
(10) Workers must not eat, chew gum or tobacco, drink, or smoke in the asbestos removal area. Workers must leave the work area and fully decontaminate themselves prior to performing these activities or using a washroom.

(11) Breaking through finishing compound and cutting reinforcing wire in lagging are operations that can generate considerable quantities of dust. Insulation should be kept wet and tools should be selected to allow insulation to be cut into small sections while keeping dust levels in the removal area to a minimum.

(12) Power tools used in asbestos removal activities should be selected carefully, since not all types are appropriate for use in dusty and wet conditions. In general, power tools driven by compressed air or hand tools are preferable.

DECONTAMINATION

(1) For Type III removal operations, the only satisfactory method of providing an appropriate decontamination facility is with a mobile or specially constructed on-site unit. The decontamination facility is located immediately adjacent to, and joined to, the enclosed asbestos removal area. The facility is divided into three distinct rooms: dirty room, shower room, and clean room.



(2) The decontamination facility's three rooms are separated from one another by an airlock or buffer zone. This airlock defines the boundary between each segment of the decontamination facility. The airlock allows personnel to access the removal area and restricts the flow of air between areas. Partitions between rooms in the decontamination facility must be self-closing so that each room functions as an airlock. These partitions are normally constructed of overlapping sheets of heavy weight plastic suspended to form a curtain.

(3) Generally, no more than 10 persons should use one decontamination facility so that adequate access to shower and cleaning facilities is provided and line ups are avoided.

(4) The dirty room should have provisions for:
- (a) hosing down contaminated clothing and footwear or cleaning it with a vacuum cleaner fitted with a HEPA filter,
- (b) storage of contaminated clothing and footwear,
- (c) disposal containers for waste materials, and
- (d) air flow towards the removal area.

(5) The shower room should have provisions for:
- (a) a shower area with an adequate supply of soap, shampoo, and hot and cold water, and
- (b) air flow towards the dirty decontamination area.

(6) The clean room should have provisions for:
    (a) storage of individual respirators in containers or lockers,
    (b) a mirror to assist in donning respiratory protective equipment,
    (c) storage of clean clothing and towels,
    (d) separate storage of clean and dirty towels, and
    (e) air flow towards the shower and dirty area.

(7) All water from the decontamination facility should pass through a 10µm (micrometre) water filter before it passes into the sewer mains.

(8) The worker enters the clean room and removes all street clothes and personal belongings, leaves these in the clean room, and changes into disposable coveralls. A respirator is put on and checked for fit and proper operation. The worker then passes through the shower room into the dirty room. Respirators, however, must always be donned in the clean room.

(9) On leaving the contaminated work area, but before entering the dirty room, asbestos material on the worker or their protective equipment must be removed with a vacuum cleaner fitted with a HEPA filter.

(10) In the dirty room, the worker removes all protective clothing and equipment except the worker's respirator. Any waste material must be placed in plastic bags or bins for disposal.

(11) The worker then enters the shower room and showers while wearing their respirator. After the worker's head and the respirator's facepiece and associated harness have been thoroughly rinsed, the respirator may be removed and the shower completed. An adequate supply of warm water, soap, and shampoo should be provided.

(12) After showering, the worker enters the clean room, dries off, and dresses in street clothes. The respirator is then thoroughly cleaned, disinfected, and stored until required. Respirator cartridges should be discarded after each work shift (if appropriate, reused during a work shift if workers leave the containment for breaks, as long as the cartridge can be kept dry).

(13) Hand tools and supplies must be kept in an equipment transfer room associated with the dirty room. This room is also used when transferring asbestos waste containers or equipment that has been decontaminated.

(14) In circumstances where the decontamination unit cannot be located adjacent to and joined to the removal area, procedures to minimize asbestos contamination must be implemented. Usually this requires workers to discard their coveralls, overshoes or other outer garments in an isolated changing area attached to the removal area enclosure and thereafter change into fresh outer clothing for the journey to the decontamination facility. Following initial cleaning, the worker enters the dirty room, removing coveralls, boots, and any other clothing. While still wearing a respirator, the worker proceeds to the shower room and follows the personal decontamination procedures described in point (11). Following this shower, the worker passes through the second airlock or buffer zone into the clean change area. Here the worker changes into work or street clothing stored in the locker provided.

(15) A final decontamination, including wash down and cleaning of the enclosure area with a vacuum cleaner fitted with a HEPA filter, removes all visible signs of asbestos contamination from the enclosure and equipment. This decontamination must be completed before dismantling the enclosure barriers.

(16) Glue bonding or spraying with an appropriate sealant should be done throughout the containment to seal down dust and fibre undetected during the final inspection following abatement activities. Following confirmation of effective decontamination of the space by final air tests, the containment can be dismantled. All dismantling work should be completed following at least Type I work procedures.

(17) All tools and electrical equipment, such as vacuum cleaners and power tools, must be left in the removal area until completion of the removal job. Before the equipment is removed, it should be vacuumed thoroughly and all accessible surfaces wiped with a damp cloth. Where decontamination is not possible, the item should be plastic wrapped and sealed and only opened when inside the containment area of another asbestos project.

(18) On completion of asbestos removal jobs, all tools and equipment not needed for the final clean up should be thoroughly washed and removed from the work site.

DISPOSAL

(1) Waste material from within the enclosed asbestos work area must be placed in impervious containers (such as doubled polyethylene bags at least 6 mil thick), sealed, and clearly labelled to indicate that:

(a) they contain asbestos,
(b) asbestos is carcinogenic, and
(c) asbestos fibres should not be inhaled.

If the waste materials are likely to puncture polyethylene bags, suitable rigid containers must be used.

(2) Clean the external surfaces of sealed containers of asbestos waste by wiping with a damp cloth that is also to be disposed of as asbestos waste, or by using a vacuum cleaner fitted with a HEPA filter before the containers leave the contaminant area/transfer room.

(3) In the equipment transfer room, sealed containers must be packaged to withstand handling and transportation to the disposal site without being punctured or otherwise damaged.

(4) A continuous clean-up and disposal program must be in place to prevent unnecessary accumulation of asbestos-containing waste materials at the work site. At the end of each work shift, all asbestos waste material must be properly contained. Prior arrangement must be made with appropriate authorities to deliver asbestos-containing waste to assigned dump sites. Transport drivers must be informed of the precautions that must be taken. Transport vehicles may be required to carry signs or placards specifying the nature of the cargo (see Section 3 of the *Transportation of Dangerous Goods Act*).

(5) Disposal sites must conform to provincial and municipal requirements (See "Disposal of Asbestos Waste" on page 85 and contact the Department of Environment, Water and Climate Change for more information).

AIR MONITORING

Air sampling to determine airborne asbestos fibre concentration is required before and during the abatement work, and prior to removal of the enclosure. All air sampling must be completed by competent personnel following OHS legislated methods. Where possible, results should be made available to workers on the same day or a maximum of 24 hours after sampling. More information on sampling procedures is provided in "Asbestos Management" on page 24.

Sampling must include the following:

- **Before work starts in the work areas** – background samples to establish baseline airborne fibre levels.
- **On a daily basis outside the enclosure** – sample when there are unprotected workers in the immediate vicinity of the enclosure. In some cases, sampling may be required in other areas such as the floors above or below, or in adjacent rooms, depending on the set-up of the work site and occupancy of these areas.
- **During initial and subsequent stages of the abatement project** – personal sampling of workers conducting removal. Ensure that results are within acceptable limits for the respiratory protection selected. Personal samples should be collected at least daily, but can be collected more frequently depending on work conditions. Samples must be analyzed and results provided to workers within 24 hours.
- **On a daily basis in the clean room** – sample during bulk removal operations. Sampling must cover at least half of the work shift and at least one shift of decontamination. Samples must be analyzed and results provided to workers within 24 hours.
- **Before the enclosure is dismantled** – the air inside the enclosure must be sampled. At a minimum, one sample must be collected for every 450 m^2 of enclosure area to determine suitability for re-occupancy.

The following criteria should be applied when reviewing airborne-sample test results:

- If fibre levels inside the containment exceed the protection factor (see "Protection Factor" on page 45) of the type of respiratory protective equipment being used, work must stop until appropriate respirators are supplied and airborne fibre levels can be controlled.
- If fibre levels measured outside the containment or in the clean room exceed 50% of the TLV for asbestos, work practices and the containment structure should be reviewed. If elevated levels continue, work must stop until the reasons for the high levels are identified and corrected. If fibre levels outside the containment approach the TLV, work must immediately stop until the reasons for the high levels are identified and corrected. Fibre levels outside the work area must never exceed the TLV. If it is anticipated that the outside area has become contaminated, decontamination procedures should be implemented.
- Final air-monitoring test results must be less than 0.01 fibres per cubic centimetre (f/cc). If the final air test fails, the containment cannot be dismantled. The work area should be glue-sprayed again and re-tested.

SITE INSPECTION

A competent person must perform the following checks regularly during the project:

(1) Check the integrity of the removal area enclosure before asbestos removal begins and before the exhaust units begin operating. If using a smoke test, refer to "Exhaust Air Equipment Performance Testing" on page 42.

(2) Visually inspect the enclosure before the start of removal work and at the beginning of each work shift. Any defect revealed during the inspection must be remedied immediately. Where necessary, additional air monitoring might be required to assess the impact of defect(s) noted.

(3) Inspect all equipment used for the removal of asbestos material before the removal job begins, following repair and at least once every 7 days where continually used. Maintain a record containing details of the equipment inspection and any repairs.

(4) Inspect the temporary enclosure and the entire decontamination facility at least daily for gaps and breaks. This inspection includes a visual check and possibly smoke testing to ensure that air flows from clean areas into contaminated areas. A record of these inspections should be kept.

(5) Continuously measure and record, at regular intervals, air pressure differentials between clean and contaminated areas during the abatement project. Pressure differentials must be maintained at a minimum of 5 Pascals (or -0.02 inches in water gauge).

(6) Complete a walk-through inspection after the removal is complete and before sealant spray is applied to ensure that all visible asbestos in the area has been removed and the clean-up is satisfactory.

(7) To ensure the site is adequate for re-occupancy by unprotected workers, complete a final walk-through inspection after the containment has been removed, but before contractor's complete demobilization.

(8) Records should be maintained for all inspections completed.

> Section 1.4(f) of the *OHS Act* General Regulations defines a "**competent person**" as a person who:
>
> (i) is qualified because of that person's knowledge, training and experience to do the assigned work in a manner that will ensure the health and safety of persons in the workplace, and
>
> {ii) is knowledgeable about the provisions of the *Act* and the regulations that apply to the assigned work, and about potential or actual danger to health or safety associated with the assigned work.

SPECIAL CASES

DESCRIPTION OF PROJECTS

Removal of the numerous forms of asbestos-containing products, from various types of facilities, under a wide variety of circumstances, creates the potential for non-standard approaches.

Ensure that any method used is outlined in the Asbestos Notification Permit form submitted to the OHS Division and that it has been approved prior to starting the asbestos removal project.

Dry Removal

Dry removal should only be done where wetting the asbestos would create unacceptable safety hazards. Examples include working adjacent to electrical power sources that cannot be suitably protected from moisture or working around very sensitive equipment where the risk of water damage is unacceptable.

Workers must wear supplied-air respiratory protective equipment during dry removal of friable asbestos. For dry removal of non-friable materials, the respirator selected must provide adequate protection to ensure that worker exposure is below the TLV. Potential non-asbestos-related hazards, such as electrical contact, should be reviewed and appropriate procedures developed to protect workers.

The dry removal area should be continually cleaned to prevent the accumulation of waste. Once debris is removed, the area should be cleaned with a vacuum cleaner fitted with a HEPA filter or by wet wiping if it is safe to do so. Barriers should be inspected regularly to ensure there are no breaks or holes.

Waste must be immediately placed in disposal containers. Where possible, use a high velocity local exhaust system at the point of removal to capture fibres released at the source. Where very small quantities of waste are involved, direct vacuuming with a vacuum cleaner fitted with a HEPA filter will greatly reduce fibre levels.

Since dry removal results in much higher airborne fibre levels within the containment, frequent and more intensive monitoring and more stringent procedures are required to minimize fibre release.

Outdoor Removal

Weather conditions will influence whether or not work can be performed, with heat, cold or high winds making work unsafe. Mobile decontamination facilities, special work platforms and other specialized equipment may be required for outdoor removal.

Air samples taken each shift should include the air downwind of the removal area, around workers in the removal area, as well as personal sampling of workers performing the removal. Personal samples should be taken at least once per day.

Exposure to the cold can be an important consideration for workers if work must be done outdoors in the winter or indoors if a building's heating system must be shut down.

Removal under Hot Conditions

Hot removal should be avoided unless circumstances do not allow for the shutdown of equipment and cooling off of the work area and equipment. In such cases, the standard high-risk procedures are blended with

special equipment and techniques to allow removal of asbestos from pipes, vessels, or systems at high ambient temperatures.

Standard glove bags can be effectively used up to 65°C. Where boilers, vessels, and other large systems are involved, hoardings must be erected to contain asbestos fibres. Fire resistant polyethylene is recommended where very high temperatures are encountered. The circulation of cooled air into the enclosure and very high rates of air exhausted through HEPA units will assist in controlling ambient temperatures. Only encapsulants with a temperature rating equivalent to the surface temperatures encountered should be used.

Workers should wear gloves, aprons and other heat resistant clothing to protect themselves from burns. Cloth coveralls rather than disposable ones will be more comfortable and afford greater protection. Vests with the ability to circulate a coolant may be considered.

An enclosure must be capable of withstanding and compensating for expected heat loads. Appropriate fire extinguishers and first-aid supplies for burns and heat stress must be available in the work area. Localized exhaust at the point of removal activities can help cool the area and minimize the spread of airborne fibres via heat convection. Thorough wetting of ACM may be difficult when working next to extremely hot surfaces. Dry removal techniques may be required. The work area should be inspected to ensure that combustible materials cannot come into contact with hot surfaces.

The employer must have an emergency plan in the event of a fire or heat-related injury. Appropriate firefighting equipment and personnel must be able to respond quickly. Workers should be trained and drilled in emergency escape routines in the event of fire. Workers must also be trained to spot and treat heat stress illnesses and minor burns.

Heat stress and burn hazards are potential problems. Therefore,

- a buddy system for workers should be used to monitor signs of heat stress,
- a plentiful source of cool drinking water located outside the work area should be available for break periods,
- strict work/rest schedules must be carefully followed to prevent heat stress – frequent rest breaks will be needed depending on the working conditions, and
- cool lunchrooms or break areas should be provided.

Crawl Spaces and Attics

Work in crawl spaces may present unique problems such as the presence of dirt floors and confined space or restricted space entry hazards. Wheeled dollies may be needed to allow greater mobility, as well as extra lighting, kneepads, and hard hats.

Areas considered confined spaces or restricted spaces require stringent site-specific procedures in addition to work procedures for asbestos abatement. Appropriate training and a written procedure for confined space entry would be required.

Where Type III procedures are followed, and the dirt floor is contaminated, polyethylene sheeting on the floor is not required. Openings in the floor or walls must be sealed airtight and the rest of the preparation practices for Type III followed.

Where dirt floor crawl spaces are encountered, asbestos mixed in with the dirt must be removed. Contaminated dirt must not be spread around either within or outside of the work area. All dirt removed must be disposed of as asbestos waste. If it is not practical to remove contaminated dirt, it may be possible to apply a sealant to the surface to trap asbestos fibres.

After removal of the contaminated dirt, the crawl space should be checked to verify that all gross contamination has been removed. This can be done by digging through the dirt in several test spots, taking samples and checking them for asbestos.

If the contaminated dirt is left in place, a management plan is required.

Encapsulation

Encapsulation involves the application of a sealant to the surface of ACM to prevent or minimize the release of asbestos fibres. This process is not recommended on highly friable surfaces because of the risk of fibre release during sealant application. Two categories of encapsulants – bridging or penetrating—may be used. Bridging encapsulants bond to the surface of ACM to provide a protective seal, while penetrating encapsulants are absorbed into the material and bond fibres together.

Manufacturers' directions should be followed to determine the appropriate equipment required when applying an encapsulant. No active standard for encapsulants exists, but as a best practice, encapsulants should comply with Canadian General Standards Board (CGSB) Standard CAN/CGSB-1.205-2003, *Sealer for application to asbestos fibre releasing materials*, or an equivalent standard.

Type II or Type III removal operations must be used, depending on the size of the job, the friability of the asbestos and the potential for fibre release. Encapsulated ACM must be inspected to ensure:

- the entire asbestos surface has been adequately encapsulated,
- the thickness of the encapsulating film meets the manufacturer's requirements if a bridging encapsulant has been used (make test holes as required), and
- entrance of a penetrating encapsulant meets the manufacturer's requirements if a penetrating encapsulant has been used (make test holes as required).

Enclosure

Enclosure involves covering ACM with a physical barrier such as plywood or gypsum board. For mechanical insulation, the physical barrier may consist of painted and labelled canvas wrap or labelled metal jacketing. The intent of enclosure is to prevent physical contact with ACM, thereby preventing fibre release.

When enclosing friable materials the same precautions used for Type III removal in terms of work area set-up, personal protection, decontamination, etc., must be followed. Type II procedures may be appropriate where the potential for fibre release is much lower, as may be the case when enclosing non-friable products.

The appropriateness of enclosure, the materials, and their means of application must be considered. The disadvantages of enclosure include its complexity and the fact that asbestos is still left in place.

Personal protective equipment selection must be based on expected levels of airborne fibre concentrations generated during the project. Equipment selection and use criteria appropriate for Type I and Type III abatements must be used.

During installation of the enclosure material and required support system, the release of asbestos fibres can be minimized by lightly misting the ACM and using care when contacting them. All barriers and materials used during the installation that cannot be cleaned must be disposed of as asbestos waste.

Upon completion, the enclosure must be inspected to ensure:

- the entire surface of the ACM is adequately enclosed,
- the enclosure forms an airtight barrier, and
- the enclosure is securely fastened to nearby support structures or directly to the ACM.

Pre-demolition Asbestos Removal

Prior to demolition of a building, all asbestos-containing materials that can release fibres during the demolition must be removed. The type and quantity of materials present will dictate the procedures used for abatement, although some special considerations need to be made for demolition projects. Because the building is being demolished, all asbestos-containing materials must be removed, including those hidden in shafts, chases, between walls, above false ceilings, and in other hidden locations. Cutting holes into these spaces may be required. Care must be taken to ensure that all these spaces are examined. All pipes should be traced from their source to their termination and all asbestos-containing materials removed. The work procedures must take into account the structural integrity of the building before the start of work and the impact of the abatement activities on the structural integrity of the building.

A method for removing asbestos covered pipes during demolition projects is "wrap and cut". The method involves wrapping a portion of the insulated pipe with polyethylene and then the pipe itself is cut through on either side. The wrapped pipe and insulation are then disposed of as asbestos waste. Normally this "wrap and cut" operation can be conducted as a Type I removal. Glove bag removal of asbestos-containing materials at the points where the pipe is to be cut must be done first.

Where Type III procedures are used, applying polyethylene sheeting to floor and wall surfaces is usually unnecessary. Openings in the floor or walls must be sealed airtight and the rest of the preparation practices for Type III removal must be followed. Drop sheets are useful in collecting bulk debris during early stages of removal.

Air monitoring can be less intensive for pre-demolition if the building is not occupied. Personal or breathing zone, clean room, and final air test samples will suffice.

In some cases, ACM may be left in place during demolition. However, an Asbestos Notification Permit is required prior to demolition. Criteria evaluated when granting the acceptance include:

- Assessing whether the material is problematic to remove and removal would create more of a hazard to workers.
- Determining if alternative work procedures will provide equivalent or better protection to workers.
- Determining the asbestos content of the material.
- Assessing the friability of the ACM.
- Determining if demolition will be done by machine.
- Determining if water will be used for dust control.

Note that "problematic to remove" is not the same as difficult to remove or expensive to remove. Cost considerations to remove asbestos prior to demolition are not factors evaluated when an acceptance request is reviewed. An example of "problematic to remove" could be a building with compromised structural integrity from fire or flood which is unsafe to enter.

Mechanical Abatement

Mechanical abatement techniques apply in cases where the structure is destroyed so asbestos cannot be abated. For example, the building has been consumed by fire, or has independently collapsed due to structural damage.

> Mechanical abatement is completed independent of any demolition activities. The use of this abatement procedure must not be considered a way to avoid complying with the requirements to remove asbestos prior to demolition. An Asbestos Abatement Permit must be approved for this activity.

Set-up

Conduct a hazard assessment and review with workers on site.

A work perimeter of 30 metres, or up to the property boundary, should be established including visible separation (such as fencing) and signage.

The signage must state "Danger, asbestos, authorized personnel only, eating, drinking, and smoking are prohibited."

When no work is occurring, the work site must be secured to prevent unauthorized personnel from entering.

The waste receptacles and equipment used for the project should be inside the perimeter.

All workers, including equipment operators, transport drivers, and labourers must have suitable training related to asbestos hazards and the work procedures to be used on the project.

Work Procedures

Workers, including equipment operators, transport drivers, and labourers, must have Asbestos Awareness Training and be protected with personal protective equipment suitable for Type I asbestos abatement projects. Additional protective equipment may be required depending on the hazards present at the work site.

The structure must be pre-wetted and continuously wetted during the removal of the debris with enough volume to ensure the material is saturated and minimize airborne dust generation. During winter, if it is too cold to use water, alternative procedures must be in place for dust control.

Work must be suspended if wind speeds above 20km/hr are measured (measured by an anemometer). The material must be wetted and covered if possible.

Procedures must be developed to address a possible collapse of the whole or part of the structure during the work if portions remain standing.

All debris should be scooped up by the heavy equipment and placed directly into the disposal bins. For dump trucks, the driver of the truck should remain inside the cab, with the windows closed while the bin is filled. Disposal bins must be covered during transport to the disposal site. Disposal bins should be positioned for easy pick-up by the truck so the driver does not have to enter the work perimeter during pick-up.

Materials removed from the structure may not be recycled.

The landfill must be informed in writing that the waste contains asbestos.

Should the work take more than one day to complete, the debris and waste should be wetted and covered overnight, if this is possible.

Any visible contamination on the ground must be removed. Once the clean-up is complete, but before the perimeter is removed, the work area should be inspected by a competent person to check for debris or contamination left behind.

DECONTAMINATION

Workers, including the equipment operators, must decontaminate prior to leaving the work perimeter.

All personal protective equipment, equipment, and tools must be decontaminated prior to leaving the work perimeter. Decontamination of heavy equipment should include interior and exterior cleaning and removal of air filters.

The disposal bins should be lined with polyethylene sheeting or there should be procedures in place to decontaminate them at the end of the project.

A decontamination area for workers and small equipment should be set up near the entrance to the work perimeter, which includes a source of clean water, wipes, soap and towels. Workers must remove personal protective equipment (which remains inside the work perimeter) and clean their hands and face before leaving. If respirators are taken with the worker, the filters should be removed and disposed of.

Large equipment may be cleaned by hoses or a pressure washer before leaving the work perimeter. Special attention should be paid to tires and buckets on heavy equipment.

No eating, chewing gum or tobacco, drinking, or smoking is permitted in the work perimeter. Workers should have a clean area where they can do these activities once they have decontaminated.

AIR MONITORING

An occupational air sample should be collected on a worker inside the work perimeter each day of work.

Air monitoring should be conducted in appropriate locations at the work perimeter including downwind.

If sample results are at 50% of the TLV within the work perimeter or at 10% of the TLV at the work perimeter, work should be suspended and work procedures evaluated.

Air sample results must be available prior to the commencement of work the following day so they can be reviewed by workers, supervisors and employers and adjustments made to work procedures, if required.

HANDLING OR REMOVAL OF VERMICULITE CONTAINING ASBESTOS

Some forms of vermiculite insulation, (for example Zonolite, which was produced from the W.R. Grace and Company mine in Libby, Montana from the 1920s to 1990), may be contaminated with asbestos. Not all Zonolite that was produced came from the same mine, and even within the product from the Libby mine there was considerable variation in the concentration of asbestos fibres. The only way to know whether the material contains asbestos is to have it tested. While the concentration of asbestos fibres is often less than 1% in the product, hazardous concentrations of airborne fibres can result when the material is disturbed.

If vermiculite insulation is known or suspected to be contaminated with asbestos, it must be treated as an ACM, even if the concentration of asbestos in the product is less than 1%. For demolition projects, the materials must be removed from a structure before the building is demolished due to their potential to release asbestos fibres when disturbed.

Two of the most common removal scenarios are when loose vermiculite is present in concrete vertical cavities or in attics as insulation.

Vermiculite in Vertical Cavities of Buildings

Vermiculite may be found in the vertical cavities of chimney enclosures and sometimes in concrete block walls. Usually the material is removed by creating an opening at the base of the wall and allowing the material to drain by gravity. Where holes will be made in a wall to remove the vermiculite, an engineer may need to be consulted to ensure that the removal does not compromise the building integrity. Wetting the insulation in the wall is usually not effective, as the insulation will then stick to the inside of the wall. As a result, fibres will be released as the material drains from the wall. For this reason, abatement projects involving the removal of vermiculite from concrete block vertical cavities are considered Type III removal operations.

Loose Fill Insulation in Attics

Vermiculite used in attics as insulating material is generally loose and exposed. There is a high risk of fibre release if the material is disturbed. Fibre levels ranging from 0.15 to more than 1 f/cc have been measured in the breathing zone of workers involved in the removal of this material. If a HEPA equipped vacuum truck is used, the project may be done using Type II removal procedures. However, monitoring must be done during the removal to ensure that fibre levels do not exceed the TLV. Otherwise, Type III removal procedures are required.

(1) Removal of material must include:

(a) Isolation of the work area to control fibre release.

(b) Use of a HEPA filtered vacuum truck to suck out loose insulation. This should be done with as little direct contact with the insulation as possible.

(c) If a HEPA filtered vacuum truck is not used, then a negative air unit equipped with HEPA filters must be installed to remove air from the work area and maintain a high level of air movement (6 to 12 air changes per hour). This will help reduce airborne fibre levels in the work area and reduce the chance of leakage to occupied areas of the structure.

(d) Water may be used to control dust; however, it may also cause the vermiculite and asbestos fibres to adhere to the rough surfaces of the attic space.

(2) Workers must be provided with appropriate protective equipment suitable for Type II abatement procedures (usually full facepiece powered or non-powered air-purifying respirator with P-100 filters) and decontamination facilities (depending on the extent of work, showers may be required).

(3) Waste must be disposed of in leak-tight containers.

(4) Air sampling must be conducted during the work to ensure that workers are protected. Air monitoring must be done in the area where the material is being disturbed, as well as in a location outside this area.

(5) Once the removal is complete, the area, particularly rough surfaces, must be thoroughly HEPA vacuumed and visually inspected for residual material. Once this is complete, all surfaces must be glue sprayed and final clearance air sampling must be done to ensure that the cleanup is complete.

> **Note:** If the material is contained in an enclosed space where there is little potential for contact or being distributed, it can be left in place until future renovations or demolition is done. If it is left in place, the employer must develop an asbestos management plan.

CHAPTER 8

Emergency Plan

Emergency responders (fire department personnel, paramedics, on-site emergency response teams) may be required to deal with situations such as fires, spills, and medical emergencies during an asbestos abatement project. Though dealing with the emergency will take precedence over standard asbestos abatement work procedures, care must still be taken to protect all workers who may be involved.

The employers involved in the abatement activities must prepare an emergency response plan, in consultation with the Joint Occupational Safety and Health Committee (JOSH) or Health and Safety representative, if there is one, and ensure that workers are trained on the procedures to follow.

The emergency response plan must address:

- Identification of potential emergencies that could occur at the work site.
- Procedures for dealing with emergencies, including:
  - instructions for who to contact in the event of an emergency,
  - procedures for decontamination or segregation of workers who may be contaminated, and
  - procedures for repair and clean-up of the abatement work area once the emergency has been dealt with.
- Emergency response training requirements.
- Identification and location of emergency equipment, facilities and communication equipment such as work site fire alarms and fire extinguishers.
- Additional first-aid requirements or services, including the posting of workplace first-aiders on site and the location(s) of the first-aid kits.
- Procedures for rescue and evacuation, including:
  - exit routes out of the enclosure and immediate work area,
  - evacuation procedures and routes out of the building, and
  - muster point for workers wearing contaminated clothing (this should be separate from the muster point used for other personnel evacuated from the building).
- Any designated rescue and evacuation workers at the work site, if applicable.

The employer must ensure that they know who is present at the work site at any given time so that all personnel can be accounted for if an evacuation is necessary.

When emergency responders arrive at the worksite, the employer must provide information on where the safe entry and exit points are located and whether all workers are accounted for. The employer must also ensure that emergency responders are informed that the area is contaminated with asbestos.

EMERGENCY PROCEDURES

FIRE, EXPLOSION, AND SPILLS

Fire can create an immediate danger to life and health. A fire hazard may become so severe that workers may need to break through the polyethylene barriers on the abatement containment. In a fire emergency, workers may not have time to decontaminate before leaving the work area. If this is the case, workers should keep all protective clothing and respirators on while they evacuate to the muster area.

In the course of responding to the fire or spill, fire department personnel and emergency responders may disturb materials that contain asbestos. Standard duty gear and SCBAs will provide acceptable protection from the asbestos hazard. However, this equipment must be properly decontaminated by fire department personnel before responders enter their vehicles and leave the work site. Cleaning with water and a mild detergent solution is acceptable for this purpose. Gear that cannot be wetted can be vacuumed with a HEPA filtered vacuum and then wiped with a damp cloth or disposable wipe.

Decontamination should be done in a separate outside area, designated for this purpose. Workers should wash their face and hands once they have removed their protective equipment. Water used should be collected and may be disposed of in a sanitary sewer. If it is not possible to decontaminate gear before leaving the work site, the equipment (including respirators and footwear) must be placed in plastic bags which then must be sealed and labeled as asbestos contaminated. This equipment must be sent to the appropriate location for decontamination before it is used again. Workers must not take equipment or clothing home for cleaning or laundering.

In responding to circumstances that involve a fire or spill, there may be additional chemical or physical hazards at the work site for which responders require protection, over and above the asbestos hazard. Depending on the hazards involved, standard duty gear may not be sufficient or appropriate. Prior to entry into the work site, responders must ensure that they check with on-site personnel to identify other hazards that may be present and that they have the appropriate protective clothing and equipment for these hazards.

Medical Emergencies

A serious injury or medical emergency is an immediate concern. The employer must ensure workers are trained on how to respond to a medical emergency and designated first-aiders must be present at the work site. If it is safe to do so, first-aiders must remove the injured worker from the abatement area to the clean room unless the worker has sustained a head, neck, or back injury. Moving the worker minimizes exposure of emergency response personnel and their equipment to asbestos. The first-aiders must decide whether it is appropriate (or possible) to decontaminate the injured worker or remove other protective clothing and equipment.

In cases where it is not safe to move the worker from the abatement area, external emergency personnel may be contacted to do so, such as the fire department. Standard duty gear and SCBAs will provide acceptable protection to fire department personnel from the asbestos hazard. Paramedics who respond to a medical emergency must at least wear disposable coveralls and properly fitted half-face respirators equipped with R- or P-100 filters. Emergency responders may be required to remove the worker's contaminated protective clothing. If so, this clothing should be placed in a plastic bag which is sealed and labeled as asbestos contaminated. If not, contaminated clothing should be covered with a blanket or towel while the worker is transported to hospital for treatment. Emergency response personnel must inform hospital staff that the worker is wearing contaminated clothing or equipment. The worker should be placed in a negative air room until they can be decontaminated, if possible. Paramedics should continue to wear their protective clothing while transporting the worker in this case.

Emergency response personnel should ensure that their protective clothing and respirators are removed before leaving the work site unless the injured worker cannot be decontaminated. Disposable equipment and clothing should be placed in a plastic bag which is sealed and disposed of as asbestos waste. Re-useable equipment should be cleaned with water and mild detergent solution or vacuumed with a HEPA filtered vacuum and wet wiped. If it is not possible to decontaminate protective equipment and clothing before leaving the work site, the equipment (including respirators and footwear) must be placed in plastic bags which then must be sealed and labeled as asbestos contaminated. This equipment must be sent to the appropriate location for decontamination before it is used again. Workers must not take equipment or clothing home for cleaning or laundering.

If the worker is transported while wearing contaminated equipment or clothing, the ambulance may also require decontamination. The employer must ensure that workers involved have suitable training and equipment. This may be limited by covering the worker with a blanket or towel (the blanket or towel must be treated as asbestos contaminated). Cleaning with a HEPA filtered vacuum and wet wiping should be done to ensure that surfaces in the vehicle are decontaminated.

CHAPTER 9

Disposal of Asbestos Waste

Employers must ensure that asbestos waste is stored, transported, and disposed of in impervious, sealed containers. Handlers must take precautions to ensure the waste will not spill as a result of handling or shipping of the materials. All workers handling asbestos waste must, at the minimum, have Asbestos Awareness Training.

> Workers who have Asbestos Awareness Training are not permitted to clean up asbestos waste if there is an accidental release of asbestos-containing materials. Only workers who have Asbestos Abatement Training are permitted to handle asbestos-containing materials.

PREPARING WASTE FOR DISPOSAL

BAGGING AND PACKAGING OF WASTE

The waste must be disposed of in double bags of at least 6 millimetres in thickness, known as 6 mil polyethylene bags, or other appropriate sealed containers impervious to asbestos and the asbestos waste.

Whole building demolition debris that cannot be readily packaged must be placed in a sealable bin lined with 6 mil polyethylene and sealed to prevent asbestos fibers and particulates from escaping. For example, the plastic could be overlapped and tucked down the sides of the bin. If this is done, the landfill operator must be informed so they can ensure work practices at the landfill address the hazards associated with the dumping of this type of material. Special landfill cell preparation and additional wetting may be required.

The filled bags must be tightly sealed at the neck. The neck must be tightly twisted and taped. The twisted neck is then folded over on to itself and taped again (goose necked).

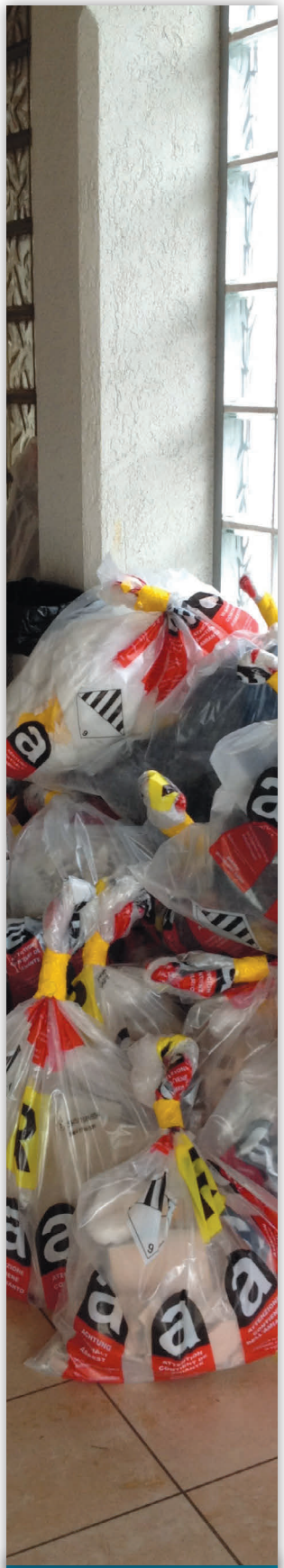
Preparing Waste for Transport

Asbestos waste must be securely packed for transport and disposal so it does not pose a hazard to transport workers, landfill workers or the public. Bags should not be over-filled and the bags should be placed gently into disposal bins so they do not rupture. Bins should be lined or lubricated so that bags do not freeze to the steel bin during the winter. Frozen bags may rip while dumping and attempting to dislodge them from the inside of the bin. Alternatively, single bags can be placed inside larger totes which can be lifted out of the bin by the landfill operator and placed into the prepared disposal cell.

Labelling Packaging

All bags must be clearly labelled to indicate that the contents are asbestos, that they are carcinogenic, and that they must not be inhaled. Where materials are packaged in a bin, the labelling can be placed on the outside of the bin (in addition to any applicable labelling required for transportation).

Asbestos bagged twice.
Source: https://commons.wikimedia.org/wiki/File:Asbestos_bagged_twice_(8715137096).jpg



Asbestos bagged and labelled.
Source: https://upload.wikimedia.org/wikipedia/commons/2/2c/Retrait_d%27amiante_d%27un_immeuble.JPG

TRANSPORTING ASBESTOS WASTE

In addition to Transportation of Dangerous Goods (TDG) Regulations for transportation, workers transporting asbestos waste must comply with OHS legislation. Employers must:

- Establish procedures to minimize worker exposure during loading, unloading and to address emergency situations such as spills. This includes the use of administrative controls such as ensuring vehicle windows are closed and air supply to the cab is shut off during loading, the selection and use of appropriate personal protective equipment and ensuring decontamination of workers and the vehicle, as required,
- In addition to training required under TDG legislation, ensure workers have completed the Asbestos Awareness Training course and are informed of the specific safe work procedures for the project, and
- Ensure the handler/transporter of asbestos waste is equipped with emergency numbers to call an asbestos contractor who has the necessary equipment to deal with an accidental spill.

LANDFILLING ASBESTOS WASTE

Landfill operators can be put at risk by poor packaging, transportation, and disclosure practices for wastes. In Prince Edward Island, all asbestos waste must be delivered to the East Prince Waste Management Facility (EPWMF). It is the only designated industrial landfill site for hazardous waste in the province.

The disposal of hazardous wastes is regulated by the Prince Edward Island Department of Environment, Water and Climate Change under the *PEI Environmental Protection Act*. The health and safety of the workers at the disposal site, however, is covered under the OHS legislation. Appropriate measures must be implemented at landfills to ensure risk to workers and the public is controlled.

Identifying Asbestos Waste

Landfills should have site screening procedures in place to ensure the materials coming in are accurately identified. Without identification of the hazard, appropriate controls cannot be developed and implemented. Possible screening procedures include:

- Random sampling and testing of construction waste,
- Requesting documentation that confirms asbestos in the building was removed prior to demolition,
- Requiring bulk sampling reports for the waste prior to accepting it at the landfill, and
- Inspection of waste packaging.

Once the landfill takes possession of the material, the landfill (employer) is responsible for ensuring the OHS legislation is met for worker training, waste handling, worker exposure, and decontamination. Transfer station operators, as the first point of contact at the landfill, must be informed about these obligations and the hazard asbestos poses on their sites. Screening waste before disposal will provide landfill operators the necessary knowledge about the hazards on their work site and provides the landfill the ability to control what is being disposed of at the site.

Receiving the Waste

A disposal permit from the Department of Environment, Water and Climate Change must be obtained prior to disposal at EPWMF.

There are a number of controls that can be implemented to minimize the asbestos hazard to workers. The most important control is for the landfill operator to know what type of waste is being received. Additional controls include:

- Mandating specific packaging that facilitates safe receipt and burial processes; such as requiring bagged waste to be further packaged in large totes that can be easily placed rather than dumping bags into waiting cells,
- Inspection of loads to ensure the material is properly packaged(torn bags or inappropriate packaging could be criteria for rejecting the load),
- Developing procedures to safely handle loose demolition waste that cannot be packaged in bags, and
- Completion of specific ground and cover preparation in advance of receiving waste to ensure materials can be buried quickly and effectively and documenting the location of the material.

Managing the Waste on Site

Where containers of asbestos waste are being unloaded, the unloading must be performed so that no loose asbestos waste, or punctured, broken, or leaking containers, is landfilled. Asbestos waste in a container that is punctured, broken, or leaking must be double bagged in 6 mil thick polyethylene bags immediately upon discovery.

Asbestos waste may be deposited only at locations in a landfill site that have been adapted for the purpose of receiving asbestos waste or are otherwise suitable for that purpose. Asbestos waste may be deposited at a landfill site only while supervised by the site operator.

The surfaces of vehicles and reusable containers that have been in contact with friable asbestos waste must be thoroughly cleaned prior to leaving the disposal site. Only the minimum amount of water necessary to wet the asbestos fibres should be used during cleaning.

Every person directly or indirectly involved in the transportation, handling, or management of asbestos waste must take all precautions necessary to prevent asbestos fibres from becoming airborne.

Protecting Workers

When ACM are received at a landfill, the employer must ensure:

- A hazard assessment is completed and the necessary controls identified to protect workers,
- Workers must, at a minimum, have completed Asbestos Awareness Training and must be trained on site specific controls and procedures,
- The TLV for asbestos is complied with, which may require exposure monitoring for workers,
- Workers have and wear the appropriate personal protective equipment,
- Decontamination facilities are provided for equipment and workers,
- Requirements for restricted areas are complied with, as appropriate, and
- Workers are provided with health assessments if they are exposed to the materials.

CHAPTER 10

Medical Surveillance of Workers

Asbestos-related diseases develop slowly over time and symptoms are not usually noticed by affected workers until the disease is at an advanced stage. To allow for earlier detection of such diseases, Section 49.25 of the *OHS Act* General Regulations requires medical examinations for all workers who are exposed to asbestos at airborne concentrations in excess of 0.1 fibres per cubic centimeter (f/cc), which is the TLV.

The Occupational Health and Safety Division of the PEI Workers Compensation Board has ensured that the updated regulations require the asbestos abatement contractor to provide proof of ongoing medical surveillance by requiring recertification of their Asbestos Abatement Contractor Certificate. "Appendix D - MEDICAL SURVEILLANCE FORM TEMPLATE" on page 103 provides sample templates for medical surveillance requirements.

LEGISLATED REQUIREMENTS

The Asbestos Abatement Contractor shall ensure that all workers who hold a valid Asbestos Abatement Certificate who perform asbestos work for that contractor have medical examinations and procedures performed by, or under the supervision of, a health care provider at no cost to the worker.

PRE-PLACEMENT MEDICAL EXAM

Before a worker who holds a valid Asbestos Abatement Certificate starts asbestos work for an Asbestos Abatement Contractor, a pre-placement examination must be completed by a health care provider. The pre-placement examination must include, but is not limited to:

- A physical examination, with emphasis on the respiratory system
- A screening chest radiograph or x-ray
- A lung (pulmonary) function test, which includes:
  - Forced Expiratory Volume (FEV1)
  - Forced Vital Capacity (FVC)
  - FEV1/FVC ratio
- An occupational exposure history

PERIODIC FOLLOW-UP EXAMINATION

An Asbestos Abatement Worker who holds a valid certificate and continues to be exposed to asbestos fibres in excess of the TLV of 0.1 f/cc for at least 100 hours of accumulated exposure time must complete periodic medical examinations. The examination shall be performed by a health care provider and include:

- An annual lung (pulmonary) function test, which includes:
  - Forced Expiratory Volume (FEV1)
  - Forced Vital Capacity (FVC)
  - FEV1/FVC ratio
- A documented annual exposure history
- A screening chest radiograph or x-ray, where if the worker has been exposed to asbestos for:
  - One to twenty (1-20) years, then the radiograph must be completed every five (5) years; or
  - More than twenty (20) years, the radiograph must be completed every two (2) years.

REPORTING INDIVIDUAL RESULTS

It is important that records of worker medical tests are kept confidential. Confidential medical results, such as individual test results, can only be shared with the expressed written permission of the worker.

In order to ensure a worker may safely carry out the work, the employer must provide the worker with a form, to be returned to the employer, for the health care provider to complete and sign, indicating whether the worker is:

- Fit for assigned work,
- Able to work with specified restrictions, or
- Unfit for work.

All chest radiographs must be interpreted and reported on by a licensed radiologist. All abnormal Pulmonary Function Tests (PFTs) must be interpreted by a licensed physician experienced in reporting such tests.

If abnormal results are found during the medical examinations, it is the responsibility of the worker's health care provider to forward the results to the worker's physician. The physician will then initiate the appropriate medical investigation, treatment, and follow-up.

All work-related disease must also be reported to the Workers Compensation Board of PEI.

RECORDS

Section 49.26 of the *OHS Act* General Regulations states that an asbestos abatement contractor shall establish and maintain an accurate and complete record for each worker, containing:

- The health care provider's reports from examinations performed, which assess the worker's potential exposures, ability to use a respirator and any specified limitation of use;
- A detailed work history containing dates and length of jobs performed, including the types of jobs and the material handled; and
- The worker's training records.

The asbestos abatement contractor must ensure that all worker records are kept for a period of at least 40 years.

Appendix

APPENDIX A - GLOSSARY OF TERMS

Abatement — procedures to encapsulate, enclose or remove asbestos-containing material.

AIHA — American Industrial Hygiene Association.

Air-line Respirator — a supplied air respirator through which breathable air is delivered to the worker via an air line. Air is supplied from a compressor or compressed air cylinder.

Airlock — a device allowing movement of persons from one room to another while permitting minimal air movement between those rooms. Curtained doorways are typically constructed by placing two overlapping sheets of plastic over an existing or temporarily framed doorway, securing each sheet along the top of the doorway, securing the vertical edge of one sheet along one vertical side of the doorway and securing the vertical edge of the other sheet along the opposite side of the doorway. The door flaps must be constructed to allow make-up air to flow into the containment area. Two curtained doorways spaced a distance apart form an airlock.

Air Monitoring — the process of measuring airborne fibre levels in a specified area over a period of time. This involves drawing a known volume of air through a filtered cassette with an effective pore size, counting the fibres that collect on the filter and expressing the result as fibres per cubic centimeter (f/cc).

Air Purifying Respirator — a respirator that filters air inhaled by the respirator wearer. Air is exhaled through a valve in the bottom of the respirator.

Amended Water — water that is used during asbestos removal to reduce airborne fibre generation. This water has a non-ionic surfactant added to it which allows for more thorough wetting of asbestos fibres by reducing the water's surface tension.

Asbestos — a generic name given to a number of naturally occurring hydrated mineral silicates. These silicates are incombustible, separate into fibres and have a unique crystalline structure.

Asbestosis — a fatal lung disease caused by the inhalation of high concentrations of asbestos fibres, leading to a build-up of scar tissue around the fibres. It is a chronic lung disease with symptoms that include coughing, weight loss and difficulty in breathing.

Asbestos Waste — discarded materials that contain or could possibly contain asbestos and includes disposable protective clothing that has been used in a restricted area.

Asbestos Worker — a worker who handles, disturbs, or removes asbestos-containing materials and has successfully completed an asbestos abatement course that meets the provisions of the *Occupational Health and Safety (OHS) Act* General Regulations Section 49.7(4a).

Bulk Sample — a representative sample taken of any material that is suspected of containing asbestos.
Clean Room — the uncontaminated area of a decontamination area in which workers change into their disposable clothing and back into their street clothes. It is adjacent to the shower room and opens to the outside of the decontamination area.

Competent Person — a person who is qualified because of knowledge, training, and experience. This person is also knowledgable about the *OHS Act* and General Regulations that apply to the assigned work.

Decontamination Area — an area constructed to prevent the spread of asbestos fibres beyond the work area. It is a series of rooms consisting of a dirty room, shower room, equipment transfer area and clean room. Decontamination facilities may be constructed for workers leaving the work area or waste that must be removed from the work area.

Dirty Room — a room adjacent to the containment area where workers dispose of waste or remove personal protective equipment before entering the shower room.

APPENDIX A - GLOSSARY OF TERMS

DOP Testing — testing of equipment fitted with HEPA filters such as vacuum cleaners and negative pressure units after filter installation has been completed. An aerosol of Dioctyl Phthalate (DOP) is introduced on the upstream side of the HEPA unit and if aerosol particles are detected on the downstream side, the unit is shut down and inspected and/or repaired. The particles generated are 0.3µm in diameter or larger. The test is used to determine whether there are imperfections in the filter or in the seal between the filter and the cabinet frame. Where signs of leakage in excess of 0.03% are detected with a photometer, the filter must be repaired or changed and equipment retested.

Encapsulation — the process of coating asbestos-containing materials to control the release of asbestos fibres into the air. A sealant is applied that hardens the material (penetrant sealant) and/or provides a protective cover (bridging sealant).

Enclosure —a structure built to completely seal asbestos-containing materials behind airtight, impermeable, permanent barriers.

Equipment and Waste Transfer Section — allows for the removal of asbestos waste material and contaminated equipment. This section can include a dirty room, a holding room and a transfer room. The section can be part of the decontamination facility. Friable Material — material that can be crumbled by hand. The more friable the material, the greater the potential hazard due to fibre release.

Glove Bag — a clear polyethylene plastic bag with attached long-sleeve gloves. It is designed to permit the removal of insulation on pipes and pipe fittings.

HEPA Filter — a High Efficiency Particulate Air Filter. HEPA filters are used in both respirators and air handling equipment. The filters have a minimum particulate removal efficiency of 99.97% for thermally generated mono-dispersed DOP aerosol particles with a diameter of 0.3 micrometers and a maximum pressure drop of 1.0 inch water gauge when clean and operating at their rated airflow capacity.

Negative Air Pressure System — reduced air pressure within the work area compared to the ambient air pressure, produced through the use of negative air units. Reduced pressure in the work area prevents leakage of contaminated air out of the work area. Airborne fibres will tend to be trapped by the HEPA filter equipped filtration system instead.

Negative and Positive Pressure Fit Check — a method of testing a respirator's facepiece-to face seal by covering the inhalation or exhalation valves and either breathing in or out to determine the presence and location of leaks.

NIOSH — the National Institute for Occupational Safety and Health. It is the United States-based approval agency for respiratory protective equipment and methods of analyzing air samples.

PF — protection factor as provided by a respirator.

Phase Contrast Microscopy (PCM) — a method used to determine the airborne fibre concentration in sampled air. A segment of the sampling filter is mounted and then analyzed using a phase contrast microscope at 400X to 500X magnification. Any fibres meeting the 3:1 aspect ratio that are greater than 5 micrometers in length are counted.

Plural Mesothelioma — a disease mainly associated with asbestos. It is an inoperable and fatal form of cancer of the lining of the lungs.

Powered Air Purifying Respirator (PAPR) — a full-face mask into which filtered air is pumped at approximately 100 – 150 litres per minute (4 - 6 cubic feet per minute). The PAPR consists of a full-face mask, a battery pack, an air pump, high efficiency filter and hoses.

Qualitative Fit Test — a method of testing a respirator's facepiece-to-face seal by injecting an agent such as isoamyl acetate, saccharin or Bitrex™ inside a test chamber (enclosure head), or irritant smoke around the facepiece and subjectively determining whether the wearer detects the agent.

APPENDIX A - GLOSSARY OF TERMS

Quantitative Fit Test — a method of testing a respirator's facepiece-to-face seal using instrumentation that quantifies the actual protection factor provided by the respirator.

Respirator — personal protective equipment that protects a worker against the inhalation of airborne contaminants providing it is the correct type of respirator and is worn properly.

Restricted Area — an area of a work site where there is a reasonable chance of the concentration of airborne asbestos exceeding the 8-hour Threshold Limit Value.

SCBA (Self Contained Breathing Apparatus) — respirator that provides breathing air from a compressed air cylinder, usually located on the wearer's back.

Shower Room — part of a decontamination facility, this room is situated between the clean room and the dirty room and contains a walk-through shower.

Surfactant — substance added to water to reduce the water's surface tension. The surfactant allows for more thorough wetting of asbestos-containing materials.

Threshold Limit Value (TLV) — the occupational exposure limit for asbestos as specified by the American Conference of Governmental Industrial Hygienists (ACGIH) in its publication Threshold Limit Values and Biological Exposure Indices".

Transmission Electron Microscopy (TEM) — an analytical procedure used to determine asbestos fibre concentrations. Compared to phase contrast microscopy, it has more resolving power and can be used to positively identify asbestos fibres.

APPENDIX B - ASBESTOS MANAGEMENT PLAN TEMPLATE

The *Occupational Health and Safety* (OHS) *Act* General Regulations Section 49.6 requires an up-to-date Asbestos Management Plan for a workplace where asbestos-containing material (ACM) is identified, or is likely to be present. It must be implemented and communicated to the workers so as to ensure they are made aware of the contents of the plan. The asbestos management plan must be reviewed at least annually or when work changes occur, in consultation with the Joint Health and Safety Committee/Representitive, if any.

1. Workplace

If asbestos-containing material is identified at your workplace, the employer or the owner must make sure that the ACM is detailed in an inventory.

This Asbestos Management Plan covers the management of asbestos and any asbestos-containing material (ACM) at:

BUSINESS NAME	
STREET ADDRESS OF WORKPLACE	

If your workplace has other physical addresses (in a different location to the one above) you need to prepare site-specific documents for each location.

Employer/Property Owner Contact Information:

NAME	
POSITION/ JOB TITLE	
EMAIL	
PHONE	

2. Plan Preparation and Review

This plan must be prepared by a competent person, according to the *OHS Act* General Regulations (49.5)(1)(a).

Plan Prepared by:

NAME	
POSITION/ JOB TITLE	
EMAIL	
PHONE	
DATE	

APPENDIX B - ASBESTOS MANAGEMENT PLAN TEMPLATE

Reviewing and revising this plan

The Employer or Owner must review:

- at least annually;
- if asbestos at this workplace is removed, disturbed, sealed or enclosed; and
- in consultation with the Joint Health and Safety Committee or Representative, if any.

DATE PLAN HAS BEEN REVIEWED/ REVISED	

3. Identification of Asbestos-Containing Material (ACM)

The *OHS Act* General Regulations 49.5(1)(a) requires that a competent person prepares an inventory of ACM in the workplace. The inventory must be inspected annually by a competent person. Section 49.5(2) requires that the inventory indentifies the location of the ACM and the potential for the ACM to release fibres. The inventory must provide a general description of the ACM, including the type of asbestos, and the percentage of the sample that is comprised of asbestos.

LOCATION OF ACM *Provide as much detail as possible, such as which wall or room on what level.*	PRODUCT/ ITEM CONTAINING ASBESTOS	TYPE OF ASBESTOS/ PERCENTAGE OF SAMPLE	ESTIMATED VOLUME OR AREA	FRIABLE (F) OR NON-FRIABLE (NF)		CONDITION	CONTROL MEASURES *(e.g. removal; encapsulation; sealing; enclosure)*	ABATEMENT SCHEDULED *If YES, include the date the abatement is scheduled.*
				F	NF			
e.g. Plant Room 1 Ground Floor Steel Pipe Factory – 555 Main Street, Charlottetown, PEI	*Pipe insulation*	*Chrysotile / 0.3%*	*0.5 metres*	☐	☐	*Good condition, no damage evident*	*Pipe wrap clearly labelled to indicate presence of asbestos*	NO ☐ YES ☐ DATE:
				☐	☐			NO ☐ YES ☐ DATE:

Signature of person completing the inventory

Date:

4. Communication with workers at the workplace

All asbestos management plans must be implemented and communicated to the workers so as to ensure that they are made aware of the plan and its contents.

DATE	
NAMES OF WORKERS PRESENT	
LOCATION	
JOSH COMMITTEE/ REPPRESENTATIVE CONSULTED	

5. Procedures for managing incidents or emergencies involving Asbestos-Containing Materials

How will incidents or emergencies involving asbestos-containing materials be managed?

ACTIONS	NAME AND ROLE OF PERSON/S RESPONSIBLE
For example, stop work immediately, secure and evacuate work area, contact site manager. Add additional steps – see your workplace emergency plan for details.	

Main contact person/s for incident/emergency management: (eg site manager, facilities manager)

NAME	
POSITION/ JOB TITLE	
EMAIL	
PHONE	

6. Procedures for recording details of incidents or emergencies involving asbestos or ACM

After you have handled an incident or emergency, make sure that everyone at the workplace knows what happened and how to prevent a similar event happening again.

HOW AND WHERE WILL INFORMATION ABOUT INCIDENTS OR EMERGENCIES BE RECORDED? *For example, in a database or other electronic record, in a risk register, in a site diary or notebook.*

7. Workers carrying out work involving asbestos – information and training

All asbestos work must be completed by an asbestos abatement contractor with a valid certificate, obtained through the Director of Occupational Health and Safety of the Workers Compensation Board of PEI. A list of Asbestos abatement contractors can be found on the Worker's Compensation Board of PEI's website at (http://www.wcb.pe.ca/DocumentManagement/Document/pub_ohsserviceproviders.pdf)

ASBESTOS CONTRACTOR	
DATE	
ASBESTOS REMOVED	

8. Adding additional information

It's good practice to keep written notes about asbestos-related results, records or other documents relating to this plan. For example: schedules for completing asbestos work, air monitoring test results, asbestos survey results, training records.

You can add photos, site plans, or other relevant documents here. Link to electronic files or attach printed or photocopied records.

OTHER COMMENTS/ INFORMATION	

APPENDIX C - ASBESTOS NOTIFICATION PERMIT

Safety Matters @Work
Workers Compensation Board of PEI

ASBESTOS NOTIFICATION PERMIT

Phone: 902-368-5680 Fax: 902-368-5696 Email: ohs@wcb.pe.ca

Abatement Contractor Company Name:		
Address:		Phone:
General Contractor/Owner Name:		
Worksite Address:		Phone:

ASBESTOS NOTIFICATION PERMIT MUST BE RECEIVED AT OCCUPATIONAL HEALTH AND SAFETY A MINIMUM OF THREE DAYS PRIOR TO COMMENCEMENT OF WORK.

Proposed Start Date:	Projected End Date:	Duration of Work (# of days):
Removal Operation Type: ☐ Type I ☐ Type II ☐ Type III		
Site Supervisor Name:		Supervisor Contact #:
Asbestos Sample Analysis completed by:	Type of Asbestos Identified:	Estimated Quantity of Asbestos :
Company Conducting Air Monitoring Name:	Disposal Site:	

Names of certified workers carrying out the abatement work.

1.	4.
2.	5.
3.	6.

ATTACH A FULL DESCRIPTION OF ABATEMENT AND WORK PROCEDURE TO BE CARRIED OUT

NO WORK IS TO COMMENCE UNTIL THIS FORM IS REVIEWED AND SIGNED BY AN OHS OFFICER

THIS SIGNED PERMIT MUST BE POSTED AT THE WORKSITE

Contractor's Signature	Date:
Officer's Signature	Date:

ANY VIOLATION OF THE *OCCUPATIONAL HEALTH AND SAFETY ACT* AND REGULATIONS BY THE CONTRACTOR OR THEIR WORKERS MAY RESULT IN THE SUSPENSION OR CANCELLATION OF THEIR CERTIFICATE.

APPENDIX D - MEDICAL SURVEILLANCE FORM TEMPLATE

PRE-PLACEMENT REPORT
ASBESTOS WORKER
Employer's Files

Part A – Personal Details (to be completed by worker)

Last Name:	Date of Birth (YYYY/MM/DD
Given Names:	TEL: Cell:
Address:	
Occupation/Job Title:	Hire date

Part B - Employer Details

Employer Name:			
Address:			
Contact name:		TEL:	Fax:

Part C Work and Asbestos Exposure History:

Detail past work history starting from first to current job. Include all jobs

If "Yes" to asbestos exposure, please describe (Example: Drill/cut asbestos cement material with power tools, demolish asbestos buildings, renovate asbestos buildings, service/brake linings, crawl through ceiling spaces. Add a separate sheet if needed.

Dates:	Employer Name	Asbestos Exposure? (Yes/No)	Job Title and Work Tasks. Describe any personal protective equipment worn

Part D – Health Care Professional's Examination
As required under Part 49.25 of the PEI OHS Act General Regulations

Date of Examination:

Confirm the following were part of the examination:

☐ Chest X-ray	☐ Spirometry	☐ FEV_1 FVC	☐ Physical Examination	☐ Exposure history

☐ Worker is Fit

☐ Worker is Fit with Limitations (specify)

☐ Worker is Unfit

Health Care Professional Name:	Signature:	Date:

APPENDIX D - MEDICAL SURVEILLANCE FORM TEMPLATE

PERIODIC EXAMINATION REPORT
ASBESTOS WORKER
Employer's Files

Part A – Personal Details (to be completed by worker)

Last Name:	Date of Birth (YYYY/MM/DD
Given Names:	TEL: Cell:
Address:	
Occupation/Job Title:	Hire date

Part B - Employer Details

Employer Name:			
Address:			
Contact name:		TEL:	Fax:

Part C Work and Asbestos Exposure History:

Detail past work history starting from first to current job. Include all jobs

If "Yes" to asbestos exposure, please describe (Example: Drill/cut asbestos cement material with power tools, demolish asbestos buildings, renovate asbestos buildings, service/brake linings, crawl through ceiling spaces. Add a separate sheet if needed.

Dates:	Employer Name	Asbestos Exposure? (Yes/No)	Job Title and Work Tasks. Describe any personal protective equipment worn

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As required under Part 49.25 of the PEI OHS Act General Regulations

Date of Examination:

Confirm the following were part of the examination:

☐ Chest X-ray*	☐ Spirometry	☐ FEV_1 FVC	☐ Physical Examination	☐ Exposure history

☐ Worker is Fit

☐ Worker is Fit with Limitations (specify)

☐ Worker is Unfit

Health Care Professional Name:	Signature:	Date:

*Required every 5 years or every 2 years for workers with more than 20 years exposure