

Safe Work Practices for Handling Asbestos



About WorkSafeBC

At WorkSafeBC, we're dedicated to promoting safe and healthy workplaces across B.C. We partner with workers and employers to save lives and prevent injury, disease, and disability. When work-related injuries or diseases occur, we provide compensation and support injured workers in their recovery, rehabilitation, and safe return to work. We also provide no-fault insurance and work diligently to sustain our workers' compensation system for today and future generations. We're honoured to serve the workers and employers in our province.

Prevention Information Line and contact information

We provide information and assistance with health and safety issues in the workplace.

Call the information line 24 hours a day, 7 days a week to report unsafe working conditions, a serious incident, or a major chemical release. Your call can be made anonymously. We can provide assistance in almost any language.

If you have questions about workplace health and safety or the Occupational Health and Safety Regulation, call during our office hours (Monday to Friday, 8:05 a.m. to 4:30 p.m.) to speak to a WorkSafeBC officer.

If you're in the Lower Mainland, call 604.276.3100, or toll-free at 1.888.621.7233 (621.SAFE) in Canada.

Health and safety resources

You can find our health and safety resources at worksafebc.com/forms-resources.

Printed copies are available for some resources and can be ordered from worksafebcstore.com.

Safe Work Practices for Handling Asbestos

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Introduction

Asbestos is a group of naturally occurring minerals used in many products because it adds strength, heat resistance, and chemical resistance. Asbestos is a hazardous material. If employers and workers do not take proper precautions for work around asbestos, workers may develop serious chronic health problems or even die of an asbestos-related disease. To prevent these health problems, WorkSafeBC has developed requirements detailed in the Occupational Health and Safety Regulation (the Regulation).

Who should read this manual?

This manual is mainly for:

- Consultants who provide services regarding asbestos identification and management
- Employers whose operations may require workers to handle or work in an environment with asbestos or asbestos-containing materials
- Workers who work with asbestos (removing and cleaning up asbestos waste materials) or who may be exposed to potentially harmful levels of asbestos

Consultants and employers will find information to help them do the following:

- Comply with the Regulation.
- Comply with licensing and worker certification requirements for working with asbestos.
- Develop suitable work procedures.
- Ensure a safe environment for workers and others who may be affected by asbestos management, removal, or cleanup.

For company owners who are required to have asbestos abatement carried out on their premises, the sections in this manual describing procedures for low-, moderate-, and high-risk work activities will provide an idea of the scope of such projects.

These sections will also give company owners, property managers, and those who are not experienced with asbestos a better idea of the type of work done by consultants and asbestos abatement contractors.

Workers will find information to help them work safely with asbestos products or waste materials.

ALARA

The ALARA principle governs worker exposure to asbestos — all exposures must be kept as low as reasonably achievable. Although the Regulation specifies exposure limits and action levels, every employer must further reduce or eliminate worker exposure *if it can reasonably be done*. Where possible, asbestos-containing materials should be replaced with products that do not contain asbestos.

Improvements in technology, as well as new work practices and procedures, will help employers decrease worker exposures and move closer to the ultimate goal of zero exposure to asbestos.

Use this manual as a starting point

This manual provides generic information that employers can use to develop their own site-specific procedures. It is not a definitive guide and does not replace the *Workers Compensation Act* or the Occupational Health and Safety Regulation. It complements the Act and the Regulation and is a tool to help industry work safely.

If a worker is or may be exposed to potentially harmful levels of asbestos, the employer must develop and implement an exposure control plan meeting the requirements of section 5.54 of the Regulation.

The employer must also ensure that asbestos surveys and risk assessments on asbestos-containing materials are conducted by a qualified person. Specific procedures must be based upon the risk assessments.

Wording in this manual

When used in this manual, the word *must* means that a particular safety step is required by the Regulation. The word *should* indicates that a particular action, although not specified in the Regulation, is recognized as an industry standard by occupational hygiene or safety professionals and will improve safety in the workplace. The word *worker* includes supervisors, managers, and workers.

In some places in this manual, the term *regular* is used (e.g., “regular worksite inspections” and “regular health and safety meetings”). The term is used in these cases because circumstances vary with each worksite, and it is not possible to provide more specific requirements. For example, some employers may find it necessary to conduct inspections every work shift (during a continuous, high-risk removal). Other employers may need to do only monthly inspections (on sites where circumstances do not change very often).

Some employers may need to hold safety meetings daily (if the workforce changes every day). Other employers may hold meetings monthly (in usual circumstances). A qualified health and safety professional must decide what “regular” means in each particular circumstance involving asbestos.

Related manuals

WorkSafeBC has produced a number of related safe practices manuals, such as *Breathe Safer*, a respirator manual. For copies, visit worksafebc.com or contact the WorkSafeBC Store (see the front of this manual).

Key changes in this edition

This edition of *Safe Work Practices for Handling Asbestos* includes new or revised sections on the following:

- Asbestos certification and licensing (pages 15 to 17)
- Who is a qualified person? (pages 18 to 19)
- Responsibilities (pages 22 to 24)
- Asbestos survey (pages 27 to 38)
- Monitoring the work environment (pages 67 to 75)
- Waste handling and disposal (page 76)
- Ten steps to compliance with asbestos abatement requirements (page 79)

This edition has been revised extensively to reflect changes in the Occupational Health and Safety Regulation and its associated guidelines.

Part 1:

About asbestos

What is asbestos?

Asbestos is the term used to describe a group of naturally occurring fibrous mineral silicates. Three types of asbestos have been used commercially:

- *Chrysotile* (white asbestos) is the most commonly used form of asbestos. It is found in over 95% of asbestos-containing products.
- *Amosite* (brown asbestos) has been used in sprayed coatings, in heat insulation products, and in asbestos cement products where greater structural strength is required.
- *Crocidolite* (blue asbestos) is now rarely found in British Columbia. Before 1973, it was commonly used in sprayed coatings on structural steelwork for fire protection and for heat or noise insulation. It was also used in gasket materials and asbestos cement pipe.

Actinolite, anthophyllite, and tremolite were rarely used in B.C., but actinolite and tremolite may be found as natural contaminants within vermiculite insulation.

Defining asbestos-containing material

The Occupational Health and Safety Regulation defines *asbestos-containing material* as containing 0.5% or more asbestos as determined by polarized light microscopy, electron microscopy, and/or gravimetric analysis. An exception is made for vermiculite-containing insulation materials (e.g., over 25% vermiculite), which are considered asbestos-containing if *any* asbestos (even less than 0.5%) is present. This definition is not intended to include materials with negligible amounts of asbestos, or other situations where the asbestos insulation was properly removed and a few fibres remain sealed in place.

Health hazards of asbestos

Asbestos is a hazardous material. Its fibres are extremely fine and can remain suspended in the air for hours; workers exposed to asbestos-contaminated air can inhale the fibres. If handled improperly, asbestos may cause serious chronic health problems and even death.

Asbestosis is a chronic lung disease resulting from prolonged exposure to asbestos dust. The fibres gradually cause the lung to become scarred and stiff, making breathing difficult.

Lung cancer may be caused by asbestos fibres in the lung. Exactly how asbestos causes lung cancer is unknown. However, research has shown that the combination of smoking tobacco and inhaling asbestos fibres greatly increases the risk of lung cancer.

Mesothelioma is a rare but aggressive, malignant form of cancer affecting the lining of the lungs or the abdominal cavity. There is a confirmed link between asbestos exposure and mesothelioma.

Pleural thickening may develop after heavy asbestos exposure. The lining of the lung (pleura) thickens and swells, causing shortness of breath and discomfort in the chest.

Asbestos warts can develop when sharp asbestos fibres get under unprotected skin and cause hard, benign growths.



Asbestos fibres magnified many times

Industry terms

This manual uses some words and phrases specific to the asbestos industry.

Asbestos-containing material

A manufactured article or other material, other than vermiculite insulation, that would be determined to contain at least 0.5% asbestos if tested in accordance with one of the following methods:

- Asbestos, Chrysotile by XRD, NIOSH Method 9000 (Issue 2, dated August 15, 1994) in the *NIOSH Manual of Analytical Methods*, published by the United States National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention
- Asbestos (bulk) by PLM, NIOSH Method 9002 (Issue 2, dated August 15, 1994)
- *Test Method for the Determination of Asbestos in Bulk Building Materials* (EPA/600/R-93/116, dated July 1993), published by the United States Environmental Protection Agency

Also, vermiculite insulation that would be determined to contain *any* asbestos if tested in accordance with the *Research Method for Sampling and Analysis of Fibrous Amphibole in Vermiculite Attic Insulation* (EPA/600/R-04/004, dated January 2004), published by the U.S. Environmental Protection Agency.

Asbestos certificate

A certificate issued to a person carrying out asbestos abatement work.

Asbestos inventory

A written report that locates and describes, as far as reasonably practicable, the amount, condition, accessibility, and so on, of all asbestos-containing materials in an occupied building or structure.

By contrast, a hazardous materials survey is used for the purpose of demolition or renovations and must:

- Be more detailed than an occupied building inventory
- Include asbestos-containing materials that are hidden or in inaccessible areas

Asbestos management program

A program used to actively manage asbestos in a workplace. It includes inventory and identification of asbestos-containing materials, labelling systems, emergency response, a provision for reassessment, and worker education and training.

Containment

An isolation system designed to effectively contain asbestos fibres within a designated work area where asbestos-containing materials are handled, removed, encapsulated, or enclosed. Glove bags are a type of containment.

CSA-approved filters

WorkSafeBC accepts CSA Group (formerly the Canadian Standards Association) certification requirements for respirators and filter types.

Filtering facepiece respirators, in which the entire facepiece acts as the filter, cover only half the face. They are sometimes called “disposable” or “single-use” respirators.

Respirators with elastomeric facepieces made of silicone, thermoplastic, or rubber material are available in half- or full-facepiece models. In these designs, one or more filters or cartridges are attached to the facepiece. These filters carry an N, R, or P designation that specifies where and for how long the filters can be used.

Note: Employers must ensure that filtering facepiece respirators are not used for protection against asbestos in B.C.

Filter series	Filter type	Minimum efficiency	Comments
CA-N series	CA-N95 CA-N99 CA-N100	95% 99% 99.97%	Intended for removal of any particles, excluding oil-based liquid particles
CA-R series	CA-R95 CA-R99 CA-R100	95% 99% 99.97%	Intended for removal of any particles, including oil-based liquid particles, for one work shift (8 hours)
CA-P series	CA-P95 CA-P99 CA-P100	95% 99% 99.97%	Intended for removal of any particles, including oil-based liquid particles, for a duration not restricted by loss of filter efficiency

Encapsulation

Treatment of an asbestos-containing material or surface with a sealant that penetrates the material and binds the fibres together.

Enclosure

Isolation of asbestos-containing material from adjacent occupied areas in a building by physical barriers (such as drywall, plywood, or metal sheeting) to prevent the release of airborne asbestos fibres into these areas.

Friable asbestos-containing material

Asbestos-containing material that is crumbled or powdered or can be crumbled or powdered by hand pressure. Other materials, such as vinyl-asbestos floor tile or asbestos cement products, have the potential to become friable if handled in an aggressive manner (e.g., cut, drilled, or sanded using power tools) or dropped from a height.

Friable materials containing asbestos may appear:

- Fluffy or spongy (usually applied by spraying)
- Irregular, with a soft surface (usually applied by spraying)
- Textured, dense, with a fairly firm surface (usually applied by trowelling)
- Chalky, with a firm surface in preformed, fitted sections (placed around pipes as insulation), or in some ceiling tiles
- As dust and/or debris on horizontal and vertical surfaces

HEPA filter

Defined in the Regulation as a high-efficiency particulate air filter that is at least 99.97% efficient in collecting an aerosol particle 0.3 micrometre in size. Any HEPA filters used for asbestos applications must be at least 99.97% efficient.

High-risk work activity

A work activity that involves working with or in proximity to asbestos-containing material if a high level of control (e.g., an airtight containment) is necessary to prevent worker exposure to airborne asbestos fibres.

Low-risk work activity

A work activity that involves working with or in proximity to asbestos-containing material, if the material is not being:

- Cut, sanded, drilled, broken, ground down, or otherwise fragmented, or
- Disturbed in such a way that asbestos fibres may be released

Moderate-risk work activity

A work activity, other than a high-risk work activity, that involves working with or in proximity to asbestos-containing material that is being cut, sanded, drilled, broken, ground down, or otherwise fragmented or disturbed, where it is necessary to use personal protective equipment (PPE) or engineering controls to prevent worker exposure to airborne asbestos fibres.

Negative-air unit

A cabinet, usually portable, that contains a fan and one or more HEPA filters. Negative-air units are used to exhaust air from a containment area, reducing the risk of contaminated air escaping into the workplace through a leak in the containment. Negative-air unit efficiency must be tested using a suitable indicator chemical aerosol, such as polyalphaolefin (PAO).

NIOSH 100 series filter

A high-efficiency particulate air (HEPA) filter used for respiratory protection. These HEPA filters, called “100” filters for short, are at least 99.97% efficient in collecting an aerosol particle 0.3 micrometre in size. These filters carry an N, R, or P designation that specifies where and for how long the filter can be used. Note: Employers must ensure that filtering facepiece respirators are not used for protection against asbestos in B.C.

Filter designation	For use in ...	Time-use limitations
N = No oil	Oil-free atmospheres only (atmospheres containing no oil mist)	May be reused only after considering cleanliness, filter damage, and increased breathing resistance.
R = Oil-resistant	Oily atmospheres	A single shift only (or 8 hours of continuous or intermittent use).
P = Oil-proof	Oily atmospheres	Check the manufacturer's specified time-use limitations for each P-type filter.

Practicable

Defined in the Regulation as “that which is reasonably capable of being done.”

Qualified person

A person who has education, training, and experience in the management and control of asbestos hazards. The Regulation requires a qualified person to conduct risk assessments, collect asbestos samples, prepare asbestos surveys and inventories, and write safe work procedures. (See “Who is a qualified person?” on page 18.)

Respirator

A device worn to prevent the inhalation of hazardous airborne substances. There are two basic types of respirators: air-purifying and air-supplying. So-called “single-use” or “disposable” respirators are not permitted for working with asbestos. For more information on respirators and respirator programs, see the WorkSafeBC manual *Breathe Safer*.

Risk assessment

A comprehensive document, developed to select appropriate workplace controls, that evaluates the probability and degree of possible illness, injury, or death in a hazardous situation.

Risk of exposure to asbestos fibres

The likelihood of being exposed to airborne asbestos fibres when using or handling materials containing asbestos or being in proximity to such work. There is a much greater risk of exposure to asbestos fibres when handling friable asbestos materials than when handling hard, well-bonded asbestos materials such as vinyl-asbestos floor tile or asbestos cement products.

Regulation requirements

Several sections of the Regulation and their corresponding guidelines relate to asbestos exposure. The key requirements are found in the following sections.

Sections 6.1 to 6.32, Asbestos

These sections describe specific requirements to prevent workplace exposure to asbestos. Employers and owners are responsible for the following:

- Having a qualified person conduct asbestos inventories or surveys (see “Asbestos inventory” beginning on page 36)
- Having a qualified person conduct risk assessments to determine worker exposure and work classifications (see “Risk assessment” beginning on page 36)
- Developing and implementing an exposure control plan (see “Exposure control plan” beginning on page 39) and a respirator program (see “Respirator program” beginning on page 44) if workers are or may be exposed to asbestos
- Ensuring that persons who perform asbestos abatement work hold valid certificates (see “Asbestos certification and licensing” beginning on page 15)
- Ensuring that asbestos abatement contractors hold valid licences
- Having a qualified person develop and implement safe work procedures for handling and disposing of asbestos (see “Part 3 — Work procedures” beginning on page 51)
- Conducting air monitoring if workers are at risk of overexposure to airborne asbestos fibres (see “Monitoring the work environment” beginning on page 67)
- Posting warning signs at the boundaries of work areas where asbestos exposures could occur
- Instructing and training workers who are at risk of exposure to asbestos
- Maintaining records of risk assessments, worker exposures, and worker training

Sections 5.48 to 5.59, Controlling exposure

These sections describe general requirements for controlling exposure to various hazardous materials in the workplace, including:

- Exposure limits
- Workplace monitoring to assess exposure levels
- Monitoring methods acceptable to WorkSafeBC
- Exposure control plans
- Types of risk controls
- Designated hazardous substances
- Investigating symptoms of overexposure

The current occupational exposure limit for asbestos (all forms) is 0.1 fibre per millilitre.

Section 20.112, Hazardous materials

This section describes the requirements that employers and owners are responsible for before beginning work on the demolition or salvage of machinery, equipment, buildings, or structures. The employer and owner must:

- Have a qualified person inspect the site to:
 - Identify any asbestos-containing materials that may be handled, disturbed, or removed.
 - Prepare a written report of the inspection results, including the identification and location of these materials.
- Ensure that all asbestos-containing materials are safely contained or removed.
- Have a qualified person ensure, and confirm in writing, that the asbestos-containing materials were safely contained or removed.
- Have a written report of the inspection results available at the worksite.

If asbestos-containing materials that were not identified in the inspection report are discovered during the work, the work must cease until the asbestos is contained or removed.

Section 20.2.1, Notice of project — hazardous substances

This section states that if a construction activity involves working with or disturbing asbestos-containing material, the employer, the owner, or the person engaged by the owner to be the prime contractor must file a Notice of Project (NOP) form with WorkSafeBC at least 48 hours before any asbestos work begins on the worksite. For more information or to file an NOP form online, visit worksafebc.com and enter “Notice of Project” in the search box.

Guidelines G6.1 to G6.31

These guidelines are specific to asbestos materials and include the following:

- G6.1-1, Definition of qualified person
- G6.3, Exposure control plan for asbestos
- G6.4, Inventory of asbestos-containing materials
- G6.5, Identification
- G6.6-1, Risk assessment
- G6.6-2, Classification of risk
- G6.7, Control of friable asbestos
- G6.8, Procedures for abatement of asbestos materials during house and building demolition/renovation
- G6.9(3), Prohibitions — Pressure spraying
- G6.10, Substitution
- G6.12(2), Asbestos monitoring
- G6.13, Authorized persons — Designated area

- G6.16, High risk work
- G6.19, Ventilation — Filter testing
- G6.24-1, Friction materials
- G6.24-2, Dry removal of friction material dust
- G6.24-3, Suitable work procedures
- G6.24-4, HEPA-filtered vacuum enclosure systems
- G6.25, Sealed containers
- G6.27, Asbestos waste removal
- G6.31, Contaminated personal protective clothing — Information to laundry workers

Note that guidelines may change and new guidelines may be added from time to time.

Guideline G5.53-4, Occupational hygiene methods acceptable to WorkSafeBC

This guideline provides information on publications that detail occupational hygiene methods (such as sampling and analytical methods) acceptable to WorkSafeBC.

Guideline G20.2.1(1) and (2), Notice of project for hazardous substances — Ongoing asbestos work

This guideline provides information on the requirements for submission of a Notice of Project form for asbestos (“NOP-Hazardous substances” or “NOP-H”) for short-duration, intermittent repair or maintenance work. The guideline is for use by employers who conduct periodic repairs or other minor disturbances of asbestos-containing building materials as part of an ongoing operations and maintenance program. It is not intended for use by asbestos abatement contractors or restoration contractors.

Guideline G20.112, Hazardous materials — Asbestos

This guideline explains the hazards associated with the uncontrolled release of asbestos. It also provides information for owners, employers, consultants, workers, and other involved persons on the following:

- What constitutes a compliant asbestos inspection
- Arranging for and confirming the safe abatement of asbestos
- What to do if additional materials suspected of containing asbestos are encountered during demolition or salvage work

Asbestos certification and licensing

Asbestos abatement contractors must be licensed to operate in B.C. Anyone who performs asbestos abatement work must hold a valid asbestos certificate.

What is asbestos abatement work?

Under the *Workers Compensation Act*, the term *asbestos abatement work* means any of the following activities carried out for the purpose of the abatement of asbestos in relation to a building:

- Identifying material that is or may be asbestos-containing material
- Collecting samples of material that is or may be asbestos-containing material
- Assessing the risk posed by material that is or may be asbestos-containing material
- Assessing the risk posed by working with or near material that is or may be asbestos-containing material
- Removing, repairing, transporting, or disposing of material that is or may be asbestos-containing material
- Planning and supervising any of the above activities

Regardless, all employers must continue to protect workers from asbestos exposure by complying with Parts 5, 6, and 20 of the Regulation.

Who needs a valid asbestos certificate?

Anyone performing asbestos abatement work in relation to buildings must complete mandatory safety training and hold a valid asbestos certificate. For example, people who perform any of the following activities require certification:

- Conducting asbestos surveys of buildings
- Performing abatement of asbestos from buildings
- Transporting asbestos waste from buildings

If you are doing asbestos abatement work that is not in relation to a building, you will not need a certificate. Examples include abatement work related to any of the following:

- Ship building
- Working underground
- Working outdoors on vessels, tanks, or with asbestos cement piping

Other workers, who do not engage in abatement work, may still disturb small amounts of asbestos to perform their work. These workers (e.g., plumbers and electricians) will not need a certificate.

The following table describes the different certification levels.

Certificate level	Scope of practice	Prerequisite
Level 1: Foundational Awareness	<ul style="list-style-type: none"> • General asbestos safety knowledge • Transport of asbestos-containing materials • Disposal of asbestos waste 	None
Level 2: Asbestos Safety	<ul style="list-style-type: none"> • Perform abatement work 	Level 1
Level 3: Asbestos Safety Leader	<ul style="list-style-type: none"> • Perform abatement work • Plan, oversee, and manage asbestos abatement sites 	Level 2
Level 5: Surveyor Safety	<ul style="list-style-type: none"> • Perform asbestos surveys or inventories 	Level 1

Who must have a licence for asbestos abatement work?

Employers requiring a licence include the following:

- An employer in the business of removing asbestos-containing materials from buildings. The employer’s asbestos activities may include:
 - Asbestos abatement work as part of renovation, restoration, or demolition.
 - Asbestos removal activity as a consequence of the hazardous materials inspection conducted under section 20.112 of the Regulation.
- An employer that, in the course of carrying out work in another industry, carries out asbestos abatement work for someone else.
- An employer performing building surveys for the purpose of asbestos abatement, such as identifying, collecting, and assessing a building’s asbestos-containing materials.
- An employer that transports and disposes of material that is or may be asbestos-containing material for the purpose of abatement of asbestos in relation to a building.

These employers are also required to ensure their workers have valid certificates for conducting asbestos abatement work.

Who is not required to have a licence for abatement work?

The following are examples of employers that will likely encounter asbestos-containing materials but will not require a licence:

- An employer that may disturb or handle asbestos-containing materials in carrying out their usual maintenance, repair, or installation work in their industry, but not for performing asbestos abatement work or demolition (e.g., plumbers, electricians, HVAC contractors, elevator technicians, and flooring contractors)
- An employer whose workers perform asbestos abatement work solely for that employer within the employer’s buildings, but do not perform that work for another person (e.g., property managers, municipalities, utilities, universities, and school boards)

- An employer that conducts work involving asbestos-containing materials being removed from areas other than in relation to buildings (e.g., ships, tanks, and vessels; equipment, machinery, and asbestos cement piping that are underground or outdoors)
- Analytical laboratories that identify asbestos fibres in building materials

Although these employers do not require licences, they must ensure their workers have valid certificates if they conduct asbestos abatement work in relation to a building.

Who is a qualified person?

To perform certain asbestos work activities, a worker must be a qualified person. Under the Regulation, the term *qualified* means a person who has:

- Knowledge of the management and control of asbestos hazards through education and training
- Experience in the management and control of asbestos hazards

Appropriate knowledge and experience in the management and control of asbestos hazards are the key competencies required of a qualified person. It is not sufficient for a qualified person to simply demonstrate certification and licensing. For example, an asbestos surveyor may be certified and licensed to practise in B.C., but they may not be considered a qualified person. Although they may have met education and training requirements, they may lack the necessary experience.

The necessary experience must be clearly seen in the quality of the work undertaken. For example, WorkSafeBC prevention officers may need to evaluate the qualifications of a person who has prepared an asbestos inventory, survey, risk assessment, work procedure, or work classification. During such an evaluation, the officers focus primarily on the quality and accuracy of the documentation rather than the person's credentials.

Deficient documentation may be an indication that the person selected was not qualified. When such situations arise, officers will ask what steps the employer took to assess the person's competencies as well as their credentials.

The following activities must be carried out by a qualified person:

- Preparing asbestos inventories or conducting surveys
- Developing risk assessments and work classifications (e.g., low, moderate, or high risk)
- Preparing work procedures for the safe removal of asbestos waste
- Collecting samples of materials suspected of containing asbestos
- Performing post-abatement clearance inspections

In addition, only a qualified person should do the following:

- Collect air samples to determine the concentration of asbestos fibres in the air.
- Perform regular worksite inspections for high-risk work.

Credentials of a qualified person

When asbestos-containing materials may be present, a qualified person should be an occupational health and safety professional with occupational hygiene experience related to asbestos. These persons would include the following:

- A Certified Industrial Hygienist (CIH), Registered Occupational Hygienist (ROH), or Registered Occupational Hygiene Technologist (ROHT) with education and experience specific to asbestos management and work procedures.

- A Certified Safety Professional (CSP), Canadian Registered Safety Professional (CRSP), or Professional Engineer with education and experience specific to asbestos management and work procedures.
- People with extensive occupational health and safety experience in the asbestos abatement industry who can do the following:
 - Prepare asbestos hazard identification and risk assessments.
 - Prepare asbestos safe work procedures.
 - Collect samples of materials suspected of containing asbestos.
 - Collect air samples during asbestos abatement projects.
 - Conduct workplace inspections and prepare inspection reports.

These people must have specific knowledge obtained through the completion of recognized education and training courses in asbestos consultation and abatement, as well as hands-on experience.

Part 2:

Programs and documentation

Responsibilities

Everyone in the workplace has health and safety responsibilities, including owners, employers, prime contractors, supervisors, workers, and consultants.

Owners

Owners have the following responsibilities:

- Provide and maintain the land and premises that are being used as a workplace to ensure the health and safety of persons at or near the workplace.
- Provide the employer or prime contractor at the workplace with information known to the owner that is necessary to:
 - Identify hazards to the health or safety of persons at the workplace (including asbestos).
 - Eliminate or control those hazards.
- Ensure that the asbestos abatement contractor holds a valid licence.
- Comply with the relevant sections of the Regulation and the *Workers Compensation Act* (the Act), as well as any applicable orders.

Employers

Employers have the following responsibilities:

- Ensure the health and safety of all workers at the worksite. Identify workplace hazards and assess the risks of injury associated with those hazards.
- Conduct a risk assessment for asbestos exposure, develop an exposure control plan, write safe work procedures, and implement controls.
- Ensure that workers and supervisors are adequately instructed and trained, and that they hold valid asbestos certificates, as required.
- Follow the terms and conditions of the asbestos abatement licence if licensed.
- Keep written records of training (detailing who, what, and when).
- Establish and maintain an occupational health and safety program, including a written health and safety policy and a procedure for incident investigations.
- Support supervisors, safety coordinators, and workers in their health and safety activities.
- Take action immediately when a worker or supervisor reports a potentially hazardous situation.
- Initiate immediate investigations into incidents.
- Report exposure incidents to WorkSafeBC.
- Provide adequate first aid facilities and services.
- Provide and maintain personal protective equipment (PPE), clothing, and devices, as required.
- Ensure that workers follow the requirements of the Regulation and the Act, and that they have access to these documents.

Prime contractors

Prime contractors have the following additional responsibilities:

- Ensure the coordination of health and safety activities for employers, workers, and others at the workplace.
- Do everything that is reasonably practicable to establish and maintain a system or process that will ensure compliance with the relevant sections of the Regulation and the Act.

Each employer at a multiple-employer workplace must give the prime contractor the name of the person the employer has designated to supervise their workers.

What is a prime contractor?

In a workplace with multiple employers, the prime contractor is the directing contractor, employer, or other person who enters into a written agreement with the owner of that workplace to be the prime contractor. If there is no such agreement, then the prime contractor is the owner of the workplace.

Reference: Section 24 of the *Workers Compensation Act*

Supervisors

Supervisors have the following responsibilities:

- Instruct workers in safe work procedures.
- Ensure that workers are familiar with and follow the exposure control plan.
- Train workers for all tasks assigned to them, and regularly check that they are doing their work safely.
- Ensure that only authorized, adequately trained workers operate tools and equipment or use hazardous chemicals.
- Ensure that workers follow safe work procedures for handling, storing, and maintaining equipment and materials.
- Enforce health and safety requirements.
- Correct unsafe acts and conditions immediately.
- Identify workers with problems that could affect safety at the worksite, and follow up with interviews and referrals where necessary.
- Create health and safety rules, and inspect the workplace regularly for hazards.
- Follow the terms and conditions and code of practice of the asbestos certificate if certified.

Workers

Workers have the following responsibilities:

- Know and follow health and safety requirements that apply to your job.
- Ask the supervisor for training to perform work tasks and use equipment safely.
- Participate in all required health and safety education and training.
- Work safely, and encourage your co-workers to do the same. Use all required PPE and clothing.
- Correct any unsafe conditions or immediately report them to a supervisor.
- Immediately report any injury to a first aid attendant or supervisor.
- Inform a supervisor of any physical or mental impairments that may affect work safety.
- Make suggestions to improve health and safety.
- Follow the terms and conditions and code of practice of the asbestos certificate, if certified.

Consultants

Consultants:

- Should be occupational health and safety professionals with experience in the practice of occupational hygiene as it relates to asbestos management
- Must follow the terms and conditions and code of practice of the asbestos licence and certificate, if applicable
- Should only provide advice and information based on their education, training, and experience
- Must follow accepted occupational hygiene practices, including those related to:
 - Collection and identification of samples
 - Reporting of sample results
 - Performance of risk assessments
 - Development of safe work procedures
 - Implementation of exposure control methods
- Should provide documentation within a reasonable time frame and clearly explain any results, conclusions, or recommendations

Occupational health and safety program

Under the Regulation, employers must develop and implement an effective occupational health and safety program for their workplace, and they must train workers and supervisors in relevant sections of the program.

An occupational health and safety program helps ensure a safe, productive workplace by describing specific tasks and responsibilities for many different aspects of an employer's operation. An effective occupational health and safety program for any workplace in which asbestos is handled or present must include:

- A written occupational health and safety policy that:
 - States the employer's commitment to health and safety.
 - States the program's objectives.
 - Defines the responsibilities and roles of the employer, supervisors, and workers.
- Written safe work procedures and emergency response procedures.
- Training for supervisors and workers.
- Instruction and supervision of workers.
- Regular worksite inspections. (The definition of "regular" depends on the conditions and number of shifts for each individual site.)
- Regular health and safety meetings.
- Incident investigation.
- Maintenance of records and statistics.
- A joint health and safety committee or worker health and safety representative, if required.

It is important to remember that every worksite is different. Although these general elements may be common to health and safety programs across the province, employers cannot expect to copy a program from another worksite. Instead, they must develop and implement a health and safety program unique to their own operation.

How do you manage asbestos effectively on your worksites?

Employers, building owners, or property managers must do the following to manage asbestos effectively on their sites:

- Keep an up-to-date inventory of all asbestos-containing materials in the workplace, including the condition of those materials.
- Ensure that all asbestos-containing materials are clearly identified.
- Conduct a risk assessment of the potential for exposure to any of the asbestos-containing materials. The risk assessment must be conducted by a qualified person.
- Develop safe work procedures, including the correct use of PPE, for workers who may work near asbestos-containing materials. This must be done by a qualified person to ensure procedures are acceptable to WorkSafeBC.
- Ensure that all workers who could be exposed to asbestos are instructed in all aspects of the asbestos management program.
- Make manufacturers' manuals and instructions available to workers.
- Prepare written work procedures specific to each worksite and make them available to all workers required to follow the procedures.
- Ensure that work is carried out under the supervision of experienced and qualified supervisors.
- Develop and implement an exposure control plan if workers will be exposed to asbestos fibres. For more information on exposure control plans, see page 39.
- Keep accurate and complete records regarding asbestos management, including a record of any changes to the inventory.

Employers, building owners, or property managers must also ensure that all friable asbestos-containing materials are either removed from the workplace (using procedures similar to those outlined in this manual), encapsulated, or enclosed. Asbestos-containing materials that are hidden from view but still accessible (such as materials above a T-bar ceiling) are not considered to be enclosed.

Asbestos survey

The asbestos inspection process is generally referred to as an asbestos survey, and the person conducting the inspection is often referred to as the surveyor. The asbestos survey includes a walk-through inspection, sample collection, sample analysis, and reporting and communicating the results. The results of the survey are used to create an asbestos inventory or a hazardous materials inspection report (a written or computerized report).

The employer and the owner must ensure that a certified surveyor:

- Collects representative samples of suspected asbestos-containing materials
- Prepares a survey report or an inventory of all asbestos-containing materials in the workplace

Two types of asbestos surveys are required under the Regulation:

- The inventory in section 6.4 is typically prepared for an occupied building as part of an asbestos management program. Not all asbestos-containing materials may be identified in the survey, as some are hidden or would be damaged by sampling. However, all suspected and presumed asbestos-containing materials must be included in the inventory. This inventory, and any record of changes to it, must be kept at the workplace and must be kept current.
- The hazardous materials identification report in section 20.112 is a pre-demolition or pre-renovation survey. This survey must locate all asbestos-containing materials in the building or structure — including materials that are hidden or normally inaccessible — before any work begins. This may require some destructive sampling (such as penetrating walls, ceilings, and floors) to identify any hidden asbestos-containing materials.

A number of recognized industry standards provide guidance on conducting asbestos surveys. They include:

- Ontario Regulation 278/05 Designated Substance — Asbestos on Construction Projects and in Buildings and Repair Operations.
- *Asbestos: The Survey Guide*. Health and Safety Executive (HSE) of the United Kingdom.
- *Managing Asbestos in Buildings: A Guide for Owners and Managers*. The Environmental Information Association. This document is an update to the EPA “purple book.”

Asbestos surveyors must have the following documentation and programs in place:

- An asbestos exposure control plan
- A respirator program
- Bulk sample collection safe work procedures
- A valid Level S certificate

They should also be able to provide the following:

- Proof of their training and experience
- Evidence that their laboratory of choice is qualified to analyze asbestos samples
- A survey report template

Site inspection

The first step in the asbestos survey is to identify asbestos hazards through a thorough and systematic walk-through inspection of the site. The site may be a building (commercial, industrial, or residential), a structure, a machine, or a piece of equipment.

Asbestos identification and recognition is a specialized skill. The surveyor must be adequately educated, trained, and experienced in identifying materials known or likely to contain asbestos. Surveyors must hold a valid Level S certificate to perform this work.

The table on the next page lists some of the materials that commonly contain asbestos in older commercial and residential buildings.

Materials that commonly contain asbestos in commercial and residential buildings

<p>Exterior</p> <ul style="list-style-type: none"> • Asbestos cement pipes (e.g., drain pipes) • Roof felting • Asphalt shingles • Soffit boards • Stucco • Asbestos cement siding • Brick mortar • Window putty • Deck under sheathing • Asbestos cement shingles 	<p>Interior insulation</p> <ul style="list-style-type: none"> • Spray-applied insulation (acoustic and fireproofing) • Vermiculite (blown-in) insulation (e.g., in attics and wall cavities) • Paper backing on fibreglass insulation
<p>Flooring</p> <ul style="list-style-type: none"> • Vinyl sheet flooring and mastic • Vinyl floor tile and mastic • Poured flooring/levelling compound • Asphalt flooring • Vinyl sheet flooring with asbestos backing 	<p>Heating (HVAC) and ducting</p> <ul style="list-style-type: none"> • Furnace duct tape • Furnace/boiler insulation • Pipe (mechanical) insulation • Hot water tank insulation • Mastic • Asbestos rope and gaskets • Asbestos cement board • Asbestos cardboard insulation
<p>Walls and ceilings</p> <ul style="list-style-type: none"> • Drywall mud • Plaster • Asbestos cement board • Textured coatings • Ceiling tiles 	<p>Other</p> <ul style="list-style-type: none"> • Fireplace box and mantel • Artificial fireplace logs and ashes • Fire doors • Insulation on electrical wiring • Fire blankets • Chalkboards • Heat reflectors • Penetration firestopping • Light fixture backing (pot lights)

Note

This table is intended as a general guide and does not include every product that may contain asbestos. (See also the WorkSafeBC publication [Asbestos Hazards in Demolition, Renovation, and Salvage](#).)

During the initial walk-through inspection, the surveyor systematically goes through each area and room in the building to make a preliminary determination of whether asbestos could be present. This initial walk-through involves observing the walls, ceiling, floor, and other materials, including any machinery or equipment (such as an old boiler or a heating, ventilation, and air conditioning [HVAC] system) and hidden insulating materials. During this walk-through, the surveyor considers where to collect representative bulk samples of suspected asbestos material. Once the walk-through is complete, the surveyor has the necessary information to begin the sampling process.

The Regulation requires a qualified person to use their education, training, knowledge, and experience to determine which building materials should be sampled to identify hazardous materials. Most asbestos-containing building materials were phased out by the early 1990s. However, hazardous materials specialists in B.C. have found asbestos in a few types of construction materials — such as sealants, adhesives, mastics, caulking, and cement products — in relatively new buildings (built as recently as 2018). It is also possible that asbestos-containing materials that predate 1990 were used in buildings after 1990. A national report (*Asbestos Management in Canada: Assessing the Need for a National Standard*) references a misconception that there are no asbestos-containing materials in buildings built after 1990. Canada banned the import, sale, use, and manufacture of asbestos-containing products as of December 30, 2018, with limited exceptions.

Section 20.112 of the Regulation does not mention a specific date as a cut-off for sampling hazardous materials, including asbestos. That is because section 20.112 covers many types of hazardous materials.

Collecting representative bulk samples of materials suspected of containing asbestos

To confirm or discount the presence of asbestos, representative bulk samples must be collected by a qualified person. Multi-layered materials, such as multiple layers of old tile and linoleum flooring or multiple layers in wall or ceiling materials, will commonly be encountered. Careful consideration must be given to which layers of multi-layered materials to sample. Ideally, a sample should be collected from each suspect layer. The surveyor should identify the sample location in the building with a unique sample number.

The sampling technique and quantity of material sampled are two other important factors to consider. Sufficient quantities of material must be collected. Check the laboratory method for required sample quantities, or check with the laboratory analyst. For materials like loose vermiculite, ensure that the full depth of the material down to the bottom is sampled and that the quantity collected meets the requirements of the analytical method that will be used. (For example, about 4 litres of vermiculite insulation is required for the EPA/600/R-04/004 method.)

Sample collection methods must minimize disturbance as well as minimize exposure to asbestos for the persons collecting the bulk samples. Use of protective clothing and a properly fitted, approved respirator are required. Persons collecting the samples must have a written sample collection procedure as part of their asbestos exposure control plan. (For an example of a bulk sample collection procedure, see pages 56 to 57.) A respiratory protection program is also required.

The number of representative bulk samples collected should be consistent with recognized industry standards and principles of good occupational hygiene practice. The following table provides guidance on the minimum number of bulk samples and the quantity of material that should be collected to identify asbestos-containing materials that might be present in a building.

Bulk material sample collection guide

Type of material	Area of homogeneous material*	Minimum number of bulk samples to be collected**	Minimum recommended quantity per sample
Surfacing materials, including textured coatings, drywall mud, plasters, and stucco	Less than 90 m ² (approximately 1,000 sq. ft.)	At least 3 samples of each type of surfacing material	50 cm ³ (3 cu. in.); for drywall mud, sample the mud only — do not include the drywall or tape
	Between 90 and 450 m ² (approx. 5,000 sq. ft.)	At least 5 samples of each type of surfacing material	
	Greater than 450 m ²	At least 7 samples of each type of surfacing material	
Sprayed insulation and blown-in insulation, including sprayed fireproofing	Less than 90 m ² (approx. 1,000 sq. ft.)	At least 3 samples	50 cm ³ (3 cu. in.)
	Between 90 and 450 m ² (approx. 5,000 sq. ft.)	At least 5 samples	
	Greater than 450 m ²	At least 7 samples	
Loose vermiculite insulation (including vermiculite insulation within concrete masonry units, or CMUs)	Less than 90 m ² (approx. 1,000 sq. ft.)	At least 3 samples	4 L (1 gal.); collect from the top to the bottom of the application to get a representative sample
	Between 90 and 450 m ² (approx. 5,000 sq. ft.)	At least 5 samples	
	Greater than 450 m ²	At least 7 samples	
Ceiling tiles	Less than 90 m ² (approx. 1,000 sq. ft.)	At least 3 samples	5 cm × 5 cm (2 in. × 2 in.)
	Between 90 and 450 m ² (approx. 5,000 sq. ft.)	At least 5 samples	
	Greater than 450 m ²	At least 7 samples	
Flooring, including vinyl sheet flooring (and backing) and floor tiles	Any size	At least 1 sample per flooring type in each room (and 1 from each layer of flooring)	5 cm × 5 cm (2 in. × 2 in.)
Levelling compounds and mortars	Any size	At least 3 samples	50 cm ³ (3 cu. in.)
Asbestos ropes, gaskets, wires, etc.	Any size	At least 1 sample	5 linear cm (2 linear in.) or 5 cm × 5 cm (2 in. × 2 in.)

Type of material	Area of homogeneous material*	Minimum number of bulk samples to be collected**	Minimum recommended quantity per sample
Mechanical insulation, including duct taping, pipe insulation, elbows, and boiler/tank or vessel insulation	Any size	At least 3 samples	50 cm ³ (3 cu. in.); all layers must be collected down to the pipe, tank, or vessel
Mastics and putties, including duct mastic (around penetrations) and window putty	Any size	At least 3 samples	15 cm ³ (1 cu. in.)
Roofing materials, including felting and shingles	Less than 90 m ² (approx. 1,000 sq. ft.)	At least 1 sample (each layer of material must be sampled)	5 cm × 5 cm (2 in. × 2 in.); collect all layers down to the sheathing
	Between 90 and 450 m ² (approx. 5,000 sq. ft.)	At least 2 samples (each layer of material must be sampled)	
	Greater than 450 m ²	At least 3 samples (each layer of material must be sampled)	
Asbestos cement (transite) board and pipe	Any size	At least 1 sample	5 cm × 5 cm (2 in. × 2 in.)
Other sprayed materials	Any size	At least 1 sample per type of material	1 full, small zip-lock bag
Other non-friable products	Any size	At least 1 sample per type of material	5 cm × 5 cm (2 in. × 2 in.)

* Homogeneous material is considered uniform in texture and appearance, was installed at one time, and is likely to be of only one type of material or formulation.

** The professional judgment of a qualified person can be used to reduce the number of bulk samples of homogeneous materials. If fewer samples than the minimum recommended number are collected, surveyors should document the rationale for their position in the survey report.

Bulk sample analysis

Asbestos bulk samples should be analyzed by an accredited asbestos laboratory. (At a minimum, the laboratory must be a participant in a quality control program.) Methods currently accepted by WorkSafeBC for bulk sample analysis include:

- Asbestos, Chrysotile by XRD, NIOSH Method 9000 (Issue 2, dated August 15, 1994) in the *NIOSH Manual of Analytical Methods*, published by the United States National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention
- Asbestos (bulk) by PLM, NIOSH Method 9002 (Issue 2, dated August 15, 1994)
- *Test Method for the Determination of Asbestos in Bulk Building Materials* (EPA/600/R-93/116, dated July 1993), published by the United States Environmental Protection Agency
- *Research Method for Sampling and Analysis of Fibrous Amphibole in Vermiculite Attic Insulation* (EPA/600/R-04/004, dated January 2004), published by the U.S. Environmental Protection Agency

These methods include requirements for laboratory equipment, calibration, quality control, and result reporting. Refer also to the WorkSafeBC publication *Safe Work Practices for Asbestos Laboratories*, available through worksafebc.com or through the WorkSafeBC Store (see the front of this manual).

How do you quantify asbestos percentages below 0.5%?

To quantify asbestos percentages below 0.5%, one of the following procedures should be used (refer to EPA/600/R-93/116):

- 400-point count plus gravimetric reduction
- 1,000-point count
- Analytical transmission electron microscopy (TEM) plus gravimetric reduction

Confidence intervals should be included. For example, a result of 0.3% asbestos with 95% confidence limits of $\pm 0.3\%$ would not be considered to indicate the absence of asbestos, due to analytical variation.

The EPA method for sampling and analysis of asbestos in vermiculite attic insulation is not intended to test products containing vermiculite in cementitious materials (e.g., plaster and cementitious fireproofing). These products, with vermiculite as a component of the material, should be treated and tested following the other analytical methods listed in section 6.1 of the Regulation. If the material contains 0.5% or more asbestos, then it is considered to be asbestos-containing material.

If the material tested contains less than 0.5% asbestos, it would not be considered asbestos-containing material. However, any material with trace amounts of asbestos is still a designated substance, and workers must be protected from exposure to asbestos fibres. This means section 5.57 and other sections of Part 5 of the Regulation would apply. These sections require:

- Employers to use proper control methods (such as wetting the material) to keep worker exposures as low as reasonably achievable
- Workers to wear the appropriate respiratory protection

If a qualified person suspects that an inaccessible material contains asbestos, it must be treated as asbestos-containing material until it has been proven otherwise.

The following “Asbestos inspection results” template illustrates an acceptable method of summarizing asbestos survey results for an owner or contractor.

Asbestos inventory

Under section 6.4 of the Regulation, the asbestos inventory must be prepared by a qualified person and include all of the following information:

- A description and the specific location of each representative sample collected
- A determination of whether or not each sample contains asbestos
- The type and percentage of asbestos, if asbestos is present
- The analytical method used for each sample
- The specific location of all the asbestos-containing materials, using drawings, plans, or specifications

If the specific location of the asbestos-containing materials is not known (e.g., the material is hidden behind walls or under flooring) or it was not practicable to collect samples (e.g., the material might be defaced or damaged), then the qualified person must include an explanation for their decision not to collect a sample. All of these materials must be considered asbestos-containing (unless proven otherwise by sample collection and analysis) and be included in the inventory.

All asbestos-containing materials present in the workplace must be identified by signs, labels, or other effective means.

The employer and the owner of the workplace must keep the inventory current and make a record of any changes to the inventory. The inventory must be available in the workplace and retained until all of the asbestos-containing materials are removed.

The record of changes must be kept until the employer moves locations or the owner sells the building.

Risk assessment

A qualified person must conduct a risk assessment of the asbestos-containing materials in the inventory before any demolition, alteration, or repair where the materials may be disturbed. The purposes of the risk assessment are to:

- Determine the risk of the asbestos-containing materials to workers who may come into contact with these materials during the course of their daily activities.
- Determine the condition of the asbestos-containing materials so that they can be properly managed (e.g., scheduled for repair or abatement).
- Classify the risk level for the work activity (i.e., for the encapsulation, repair, or abatement of the asbestos-containing materials).

Risk assessment process — stage 1

The first stage of the risk assessment is to gauge the location and condition of the material prior to the work, as well as any other potential hazards that might affect the workers. Risk assessments normally aim to answer the following questions:

- What is the type and percentage of asbestos present?
 - Will higher concentrations of asbestos increase the risk?
- How friable is the material?
 - Is it firmly bound?
 - Can the material be broken apart if a worker makes contact with it?
 - Does it break apart easily?
- What is the existing condition of the material?
 - Is the material in good condition with no damage?
 - If damage is present (e.g., areas missing, hanging loose, or water damaged), is it mild, moderate, or severe?
- Is the material accessible?
 - Can workers come into contact with it on a regular basis (e.g., within a hallway or stairway)?
 - Is it beyond the reach of workers and the public?
 - Is it enclosed, such as above a fixed ceiling or within a pipe chase?
- Is asbestos-containing material present in the air-moving system (e.g., in a return-air plenum)?

Risk assessment process — stage 2

During the second stage of the risk assessment process, each of the parameters listed above is assigned a “score” (e.g., from 0 to 10) to indicate the potential for exposure. The individual scores are then combined to determine an overall risk score that can be used to help manage the asbestos-containing materials (e.g., to determine the priority for repairs or abatement). Different approaches can be used to assign scores and determine an overall risk factor. For more information on these risk assessment methods, see G6.6-1 of the OHS Guidelines.

Risk assessment before demolition, alteration, or repair

Section 6.6(2) of the Regulation requires that a risk assessment be conducted “before any demolition, alteration, or repair of machinery, equipment, or structures where asbestos-containing material may be disturbed.” This is different from the risk assessment for materials in the inventory and is related to the requirements in section 20.112 of the Regulation. Section 20.112 deals with the employer’s and owner’s responsibilities for hazardous materials before demolition or salvage of equipment, buildings, etc.

Before any work involving asbestos-containing materials begins, a qualified person must assess the work activity and classify it as a low-, moderate-, or high-risk work activity. The intent is to do the following:

- Assess the likelihood of asbestos fibres being released when asbestos is disturbed.
- Select appropriate safe work procedures according to the level of risk to workers.

Some factors to consider include:

- The potential for occupant exposure
- The potential for worker exposure (e.g., whether any air monitoring is required)
- Other potential hazards present (e.g., biological, chemical, electrical, confined spaces, heat or cold)
- Personal protective equipment (PPE) to be used
- How the work area will be isolated from any occupants
- The amount of asbestos-containing material that might be disturbed (e.g., during an asbestos abatement activity)
- How asbestos waste will be handled

For information on low-, moderate-, and high-risk work activities, see “Part 3 — Work procedures,” starting on page 51.

Exposure control plan

What is an exposure control plan?

An exposure control plan explains the work procedures and other controls that will be used to reduce workers' risk of asbestos exposure. The plan must detail steps to eliminate risk or to control and reduce risk by either:

- Substituting with safer materials, where feasible, or
- Using engineering controls, administrative controls, or PPE

Strict adherence to the ALARA principle (see page 2) as well as exposure limits and appropriate respiratory and skin protection are essential elements of an exposure control plan. Employers must also ensure that qualified persons (see page 18) perform a formal risk assessment to determine which workers may be exposed to asbestos, and the extent of any exposure. The risk assessment applies not only to the asbestos itself but also to the methods used to remove or handle it.

Who needs an exposure control plan for asbestos?

If a worker is or may be exposed to potentially harmful levels of asbestos, the employer must develop and implement an exposure control plan that meets the requirements of section 5.54 of the Regulation.

An exposure control plan may be required by many employers, including:

- Construction and demolition contractors
- Asbestos abatement contractors
- Asbestos building surveyors
- Hazardous materials consultants
- School district maintenance facilities
- Commercial building management agencies
- City and municipal building inspectors
- Insurance adjusters
- City and municipal waste facilities
- Restoration contractors

Elements of an exposure control plan

Each workplace is unique, so an exposure control plan should be specific to the workplace or operation. Exposure control plans should be developed only by a qualified person.

Any exposure control plan must include the following:

- A statement of purpose

- The responsibilities of employers, supervisors, and workers
- Risk identification and assessment
- Risk controls
- Written safe work procedures
- Worker education and training
- Written records
- Hygiene facilities and decontamination procedures
- Health monitoring

A sample exposure control plan for cutting small amounts of asbestos-containing gypsum board is included in the Appendices (see page 96).

Statement of purpose

The purpose of an exposure control plan is to prevent harmful exposure of workers to a hazardous substance (including asbestos) in the workplace. The following is an example of a typical statement of purpose:

[Name of employer] is committed to providing a safe and healthy workplace for all of our workers. A combination of measures will be used to achieve this objective, including the most effective control technologies available. Our work procedures will protect not only our workers but also any other workers who enter our workplace. All workers must follow the procedures described in this plan to prevent or reduce exposure to asbestos-containing materials.

Responsibilities of employers, supervisors, and workers

Employers

Employers have the following responsibilities:

- Ensure that the resources (such as safe work procedures, worker training, and PPE) required to implement and maintain the exposure control plan are readily available where and when they are required.
- Select, implement, and document the appropriate site-specific control measures.
- Ensure that supervisors and workers are educated and trained to an acceptable level of competency and carry valid asbestos certificates.
- Ensure that workers use appropriate PPE (such as disposable coveralls, eye protection, and respirators).
- Conduct a periodic review of the plan's effectiveness, including a review of the available control technologies to ensure that these are selected and used when practicable.
- Maintain records of training and inspections.
- Ensure that a copy of the exposure control plan is available to workers.

Supervisors

Supervisors have the following responsibilities:

- Ensure that workers are adequately instructed in the workplace controls.
- Ensure that workers use appropriate PPE.
- If workers require respirators, ensure that they have been fit tested and that the results are recorded.
- Direct work in a manner that eliminates or minimizes the risk to workers.

Workers

Workers have the following responsibilities:

- Know the hazards of the workplace.
- Follow established safe work procedures as directed by the employer or supervisor.
- Use any required PPE as instructed.
- Report any unsafe conditions or acts to the supervisor.
- Know how and when to report exposure incidents.

Hazard identification and risk assessment

Employers must ensure that potential workplace hazards are identified and that the risks associated with those hazards are assessed. If there may be asbestos-containing materials that will be disturbed at the worksite, the employer will need to do the following before work begins:

- Conduct an asbestos inspection (survey) to identify potential hazards.
- Assess the risks associated with those hazards.
- Control the risks by eliminating or minimizing them.

Exposure limit

The 8-hour occupational exposure limit for airborne asbestos is 0.1 fibre per millilitre. As asbestos is a confirmed human carcinogen, the ALARA principle also applies, and workplace exposure must be reduced to levels as low as reasonably achievable.

Risk controls

Risk controls are measures that are used to eliminate the risk to workers or, if elimination is not possible, minimize the risk.

Hierarchy of controls

Some types of controls are more effective than others, but it may not always be practicable to use the more effective solution. Whenever possible, however, controls must be implemented in the following order of preference:

1. Substitute less hazardous materials or processes.
2. Use engineering controls, such as barriers, containment, and local exhaust ventilation.

3. Use administrative controls, such as signage and proper use of washing facilities.
4. Use PPE. This is considered the last line of defence and should be used only when other controls are not practicable, or in addition to other controls. The proper use, fit, and disposal of PPE must also be considered.

Workplace controls must be based on a risk assessment conducted by a qualified person.

Written safe work procedures

Written safe work procedures describe how to carry out specific tasks safely and efficiently. In general, safe work procedures are written for:

- Hazardous tasks
- Complicated tasks, so that important steps don't get missed
- Frequently performed tasks
- Less routine tasks, to remind workers of the hazards and how to control the risks

Written safe work procedures must be task specific and include any required PPE, when it must be used, and where it can be found. Post the procedures where they will be available to workers. Where a Notice of Project (NOP) form is required, these procedures must be submitted to WorkSafeBC along with the NOP 48 hours prior to the start of an asbestos abatement project.

How to develop a written safe work procedure

Follow these five steps when developing a written safe work procedure:

1. Determine the overall task for which the safe work procedure is needed.
2. Break down the task into its basic steps.
3. Identify the hazards associated with each step.
4. Identify the actions needed to minimize the risks to workers from these hazards.
5. Prepare a list of the actions that workers must do when performing the task.

Hygiene facilities and decontamination procedures

Employers must also provide adequate work procedures and washing facilities to help control asbestos exposure, including:

- Good housekeeping procedures, including end-of-workday procedures
- Washing facilities
- Shower facilities as required (e.g., for high-risk and some moderate-risk work)
- Clean eating and drinking facilities

Worker education and training

Employers must ensure that workers are informed about the contents of the exposure control plan, and that they are educated and trained to work safely. Exposure control plans should describe worker education and training, and how they will be carried out. Education and training are particularly important for new workers. Employers must ensure that young or new workers are given health and safety orientation and training specific to their jobs.

Written records

The exposure control plan must be written down, and records must be kept for each component of the plan. For example, document education and training activities — keep track of who was trained, when the training took place, and what it included.

Documentation for asbestos work must include records of the following, which must be maintained for at least 10 years:

- Risk assessments
- Workplace inspections
- Air-monitoring results
- Instruction and training of workers
- Incident investigation reports

Health monitoring

An exposure control plan for asbestos could include medical monitoring of workers. Monitoring could involve annual lung function testing and periodic (every two to three years) chest x-rays for asbestos abatement workers.

Reviewing the plan

Review the exposure control plan at least once a year, and update it as necessary. During this process, consult with the joint health and safety committee (or the worker health and safety representative, if applicable).

In the Regulation

For more information about the requirements for exposure control plans, see sections 5.54 and 6.3 of the Occupational Health and Safety Regulation.

Respirator program

Providing personal protective equipment (PPE) and ensuring that workers use it are essential to any effective occupational health and safety program. If respirators are required during work, employers must develop and implement a written respirator program as part of their overall PPE program. For more information on respirators, see sections 8.32 to 8.45 of the Regulation.

A respirator program is a formal plan for using respirators at a specific worksite. Employers cannot simply hand out respirators and expect workers to use them properly. If respirators are necessary to protect workers, then an effective respirator program must be in place. Such a program will:

- Help protect the workers' health and prevent illnesses related to breathing hazards in the workplace
- Promote more effective use of respirators
- Make it easier to comply with WorkSafeBC requirements

Ideally, one person in the organization should be designated as the respirator program administrator and have overall responsibility for the program. Parts of the program can be delegated to others, but the final authority for running the program should rest with one administrator. It is important that whoever is assigned the responsibility for respirators has the knowledge to perform the job.

Employers must ensure that workers are trained in proper use and care of respirators. Employers must also provide fit testing (using a protocol acceptable to WorkSafeBC, such as described in CSA Standard Z94.4) when a worker is first fitted with a respirator, and once a year after that.

Fit-test kits are available from respirator suppliers. One type of test, the qualitative fit test, determines whether the worker can detect any amount of a test compound leaking through the respirator. Employers must keep records of these tests and of the fit-test program.

For more detailed information on respiratory protection, see “Respiratory protection” on page 84. A sample respirator program is provided in the Appendices (page 102). You can also find more information on respiratory protection programs in the WorkSafeBC publication *Breathe Safer*.

Training, instruction, and supervision

Written safe work procedures must form the basis of an employer's ongoing training program.

Employers must ensure that workers:

- Are trained and instructed in the safe handling, use, and disposal of any substances (such as chemicals) used in working with asbestos
- Are provided with safety data sheets (SDSs) for these substances
- Are informed of the health hazards associated with exposure to asbestos fibres and other materials used in the workplace
- Can demonstrate competency in doing their work according to the safe work procedures

Employers must document training and instruction, and ensure effective supervision at all worksites.

Employers must record the details of the asbestos certificates of their workers. This includes information such as:

- The individual's name
- The type of certificate held
- The expiry date of the certificate
- The conditions set out in the certificate

For information on educating and training workers in the safe use of hazardous products, see the WorkSafeBC publication *WHMIS 2015: At Work*.

Note

Training should be conducted by a qualified person (see page 18).

Inspection and testing of equipment

Employers must ensure that:

- Equipment is inspected before being used in the work process
- Effectiveness of high-efficiency particulate air (HEPA) filters in vacuum cleaners and negative-air systems is assessed using a suitable indicator chemical, such as polyalphaolefin (PAO), in the following cases:
 - At least annually
 - After a HEPA filter is replaced
 - If the vacuum or ventilation unit is dropped or damaged
 - Before use in a high-risk work activity

The following information should be clearly posted on the equipment:

- Model and serial number of the tested unit
- Name of the testing agency
- Name of the tester
- Date of the test
- Nature of the test (e.g., PAO)
- Results of the test

To ensure maximum effectiveness of the test, PAO (or similar) testing needs to be conducted once the unit has been installed on site, immediately before use in a high-risk work activity (e.g., just before the negative-air unit or HEPA vacuum is used on each worksite). Only if testing is not practicable due to reasons such as a lack of local availability of testing contractors, the employer may be able to rely on an effective, comprehensive, and written HEPA equipment-maintenance program. This program must be prepared and administered by a qualified person and address the maintenance, storage, handling, and transport of HEPA equipment. For more information on how to develop this program, refer to guideline G6.19, “Ventilation – Filter testing.”

Record keeping

Work that involves the handling of asbestos-containing materials can range from major (a large friable-asbestos removal project) to minor (the replacement of a non-friable gasket). Whatever the size of the project, employers need to keep records of the actions taken to prevent exposure to asbestos fibres. Employers must keep the following records for at least 10 years:

- Asbestos risk assessments
- Site inspections
- Air-monitoring results
- Incident investigation reports
- Notices of project (NOPs)
- Training and instruction of workers

The employer and the owner must also retain the current version of the asbestos inventory until all asbestos-containing materials are removed from the workplace. The record of any changes to the inventory must be kept until the employer moves locations or the owner sells the building.

Note

Despite the 10-year time limits identified in the Regulation, employers should keep all records for as long as the company exists. A WorkSafeBC officer may ask to see records at any time. If employers cannot produce records proving, for example, that they have trained workers or conducted risk assessments in the past, they may have to retrain workers or redo risk assessments.

Notice of project (NOP) for asbestos work

The employer, the owner, or the person engaged by the owner to be the prime contractor must ensure that WorkSafeBC receives a Notice of Project (NOP) form for asbestos work at least 48 hours before starting any of the construction work activities outlined in section 20.2.1(2) of the Regulation. A copy of the completed form must be posted at the worksite before the asbestos work activity begins and kept posted for the duration of the construction project.

If the work needs to be done immediately, as in the case of emergency repair or cleanup, work may start immediately, but the NOP must be filed as soon after as possible. Every reasonable effort must be made to contact the local WorkSafeBC office if the NOP cannot be filed before the work starts.

An NOP for asbestos work must be filed if the construction activity includes any of the following:

- Moderate- or high-risk work activities as defined in section 6.1
- The alteration, repair, dismantling, or demolition of all or part of a building or structure in which asbestos-containing materials have been processed, manufactured, or stored

The NOP must include the following:

- The names and addresses of all employers responsible for the asbestos work activity, or of the owner or prime contractor
- The address of the construction project
- The scope of the asbestos work (e.g., portions of the structure affected, asbestos-containing materials to be removed, and quantity)
- The starting date and estimated duration of the work
- Safe work procedures, specific to the task and to the worksite, that will be used to minimize the risk to workers of asbestos exposure
- The hazardous materials report for the building, structure, machinery, or equipment, if section 20.112 applies to the work

An NOP does not have to be filed for the following work activities:

- Conducting a site inspection to identify hazardous materials
- Collecting samples and preparing a written report under section 20.112 (hazardous materials)
- Determining the types of tasks required for the construction project
- Estimating the cost of labour and materials for the asbestos work

If any information regarding the construction project changes significantly, the employer(s) responsible for the work activities and either the owner or prime contractor must do the following:

- Provide the new information to WorkSafeBC.
- Post it at the worksite as soon as possible.

Contracting out projects

An employer or the owner (including the owner's agent, such as a property manager, an insurer, or an insurance adjuster) of a site or building may contract out a project involving asbestos-containing materials. When a project involves the services of two or more contractors and their workers, the prime contractor (or owner, if there is no prime contractor) must coordinate the work activities of subcontractors on the worksite if those work activities may affect workers of more than one firm.

The prime contractor or owner must ensure the following:

- There is a written agreement between the prime contractor or owner and the other contractors that clearly establishes the responsibilities for the health and safety of workers, instruction and training of workers, supervision of work on the project, and any necessary air sampling and testing.
- The project is adequately planned, and all contractors know and understand their responsibilities.
- Each contractor complies with the requirements of the Regulation as they apply to the project.
- All contractors hold a valid licence for asbestos work.
- The work of contractors is carried out in such a way that it does not cause undue risk of injury or occupational disease to workers who are not involved in the project but are working nearby or are affected by the project.

NOP for ongoing asbestos work

Guideline G20.2.1(1) and (2), "Notice of project for hazardous substances – Ongoing asbestos work," provides employers with information on the requirements for submitting an "NOP-Hazardous substances" (NOP-H) form for either of the following:

- Short-duration repair work
- Maintenance work that may take place over an extended period of time

This type of NOP is for use by employers who conduct periodic repairs or other minor disturbances of asbestos-containing building materials as part of an ongoing operations and maintenance program.

The guideline allows the employer to carry out this work without submitting a separate NOP each time one of these routine tasks is performed. It is not intended for use by asbestos abatement contractors or restoration contractors.

Note

For more information regarding the submission process and the information required, refer to G20.2.1(1) and (2) of the OHS Guidelines at [worksafebc.com](https://www.worksafebc.com).

Part 3:

Work procedures

Low-risk work activities

Low-risk work activities are those that involve working with or in proximity to asbestos-containing material if the material is not being:

- Cut, sanded, drilled, broken, ground down, or otherwise fragmented
- Disturbed, such that airborne asbestos fibres may be released

In other words, it would not be necessary to use personal protective equipment (PPE) or engineering controls to prevent worker exposure to airborne asbestos fibres.

Activities that carry a low risk of exposure to airborne asbestos fibres include:

- Disturbing materials that contain less than 0.5% asbestos, provided that dust controls are in place
- Repairing drywall that has asbestos-containing drywall filler, as long as the filler is not disturbed, such as:
 - Adding new filler to the top of painted drywall (e.g., to repair small holes and dents)
 - Sanding the filler, provided there is no contact with the asbestos-containing mud beneath the paint
- Installing a screw, nail, or hanger (e.g., to hang a sign or picture) on drywall that contains painted asbestos-containing filler
- Replacing a single asbestos-containing floor tile without breaking the tile
- Moving asbestos-containing waste material that is contained within a cleaned, properly sealed bag and then double-bagged (as described on page 76)

Workers involved in such activities should have some knowledge of the hazards of asbestos and the location of the materials.

Employers must do the following:

- Clearly identify all locations of asbestos-containing materials.
- Ensure that all workers have been instructed and trained in any work procedure restrictions needed to prevent disturbing asbestos-containing materials.

A WorkSafeBC officer may request to see asbestos air-monitoring results to confirm that these activities do not expose workers to asbestos fibres.

Note

All decisions about what constitutes a low-, moderate-, or high-risk work activity must be made by a qualified person through a proper risk assessment. For a definition of a qualified person, see page 18.

Moderate-risk work activities

Moderate-risk work activities are those (other than high-risk work activities) that involve working with or in proximity to asbestos-containing material that is being cut, sanded, drilled, broken, ground down, or otherwise fragmented or disturbed such that airborne asbestos fibres are released. It is necessary to use PPE or engineering controls to prevent worker exposure to airborne asbestos fibres.

Moderate-risk work activities require specific procedures to ensure the safety of workers and others who may be affected by the activities. G6.8 of the OHS Guidelines provides information to assist with the development of moderate-risk work procedures that meet the requirements of the Regulation.

Activities that carry a moderate risk of exposure to airborne asbestos fibres include:

- Using hand tools to cut, shape, drill, grind, or remove non-friable manufactured products containing asbestos, such as asbestos cement pipe.
- Using power tools to cut, shape, drill, grind, or remove non-friable manufactured products containing asbestos, provided that each tool is equipped with a HEPA-filtered local exhaust ventilation (LEV) system. Air-monitoring results should be available that demonstrate the effectiveness of the LEV system in protecting workers from exposure to asbestos fibres.
- Backing mounting screws out of asbestos cement products (such as transite board) and removing the boards or tiles intact.
- Buffing vinyl-asbestos floor tiles with a coarse disc.
- Collecting asbestos samples for laboratory analysis (see “Example procedure: Collection of bulk samples” on page 56).
- Removing any part of a false ceiling to gain access to a work area (e.g., during inspection) when materials containing friable asbestos are, or are likely to be, lying on the surface of the false ceiling.
- Removing drywall materials where joint-filling materials containing asbestos have been used.
- Removing asbestos tape or paper on ductwork.
- Removing vinyl-asbestos floor tile or other non-friable materials.
- Removing an entire piece of equipment or pipe with the asbestos-containing material remaining effectively intact (“wrap and cut” procedure).
- Demolishing a block wall (e.g., of cement) that has residual asbestos debris in its cavity (dust controls must be in place).
- Removing asbestos-containing asphalt roofing materials.
- Dismantling a treated containment upon completion of an asbestos removal project.
- Setting up and removing a glove-bag apparatus for the removal of pipe insulation.
- Using a prefabricated glove bag to remove asbestos insulation from piping systems.

Note

While the area outside a glove bag is considered a moderate-risk area, the work activity inside a glove bag is considered high risk. If a glove bag is torn or punctured, the risk level outside the bag may increase (e.g., from moderate to high risk) if a significant amount of debris is released or spilled.

Cleanup activities that carry a moderate risk of exposure to airborne asbestos fibres include:

- Using a HEPA vacuum to clean ceiling tiles or light fixtures with light to moderate contamination
- Using a HEPA vacuum to clean asbestos-containing debris from an area before setting up containment
- Cleaning out or replacing a pre-filter or HEPA filter in a HEPA vacuum

General moderate-risk procedures

Anyone involved in any moderate-risk work activity must follow written work procedures similar to those described here.

To ensure that anyone in or near the work area is not exposed to airborne asbestos fibres, the following must be done:

1. Clearly mark the designated work area boundary by placing barricades, fences, or similar structures around the work area.
2. Place signs around the work area warning people not to enter the work area unless authorized to do so.
3. Wear the appropriate protective clothing:
 - Clothing material must resist penetration by asbestos fibres. Clothing must be impervious to penetration by asbestos fibres if workers are permitted to wear street clothing underneath.
 - Clothing must cover the body and fit snugly at the neck, wrists, and ankles.
 - Clothing must include a head covering and foot coverings (such as laceless rubber boots or “booties”) that are acceptable for the specific worksite conditions.
 - Torn clothing must be immediately repaired or replaced.
4. Wear a respirator fitted with a P100 (HEPA) filter. For more information about respirators, see “Respiratory protection” on page 84.
5. Do not use dry sweeping or compressed air to clean up or remove dust or materials from work surfaces or clothing.
6. Use polyethylene (poly) drop sheets and, if necessary, seal windows, doorways, and other openings to prevent the spread of asbestos dust to other work areas.
7. Before starting any work that is likely to disturb asbestos-containing materials on the surfaces of anything in the work area, clean up any damaged materials by damp wiping or using a HEPA vacuum.

8. Clearly describe how the work will take place, how the asbestos will be removed, what tools will be used, etc.
9. During the work, clean up dust and waste (wetted if possible) using a HEPA vacuum or by wet sweeping or wet mopping (see “Waste handling and disposal” on page 76). Do not use pressure-spraying equipment of any type to remove asbestos-containing materials.
10. Immediately upon finishing the work, complete the following tasks:
 - Wet all drop sheets and barriers.
 - Fold them to contain any remaining dust.
 - Bag or place them in a sealable container.
 - Dispose of them as asbestos waste.
11. Before leaving the work area, complete the following tasks:
 - Clean all protective equipment and clothing by damp wiping or using a HEPA vacuum before taking these items outside the contaminated work area.
 - Leave any reusable protective clothing worn in the work area in the designated storage area or facility for cleaning. Place disposable protective clothing in a sealable container, and dispose of it as asbestos waste.
 - Launder non-disposable clothing as described on page 64.
12. Place asbestos waste in a sealable container. Label the container to identify its contents, the hazards, and the necessary precautions for handling the waste materials. To prevent any interference with the work activity, do not allow containers of asbestos waste to accumulate in the work area. Remove containers from the work area at the end of each work shift, if not more often. Ensure that the containers remain under effective control if they are stored at the worksite before being disposed of.
13. Before removing asbestos waste containers from the work area, clean their external surfaces by wiping with a damp cloth or using a HEPA vacuum. Double-bagging is a good practice and an industry standard.

Emergency spill cleanup

Cleaning up an asbestos spill may require a high level of control. Because of the urgent nature of spill cleanup, however, the spill area should be isolated and cleaned immediately.

Note

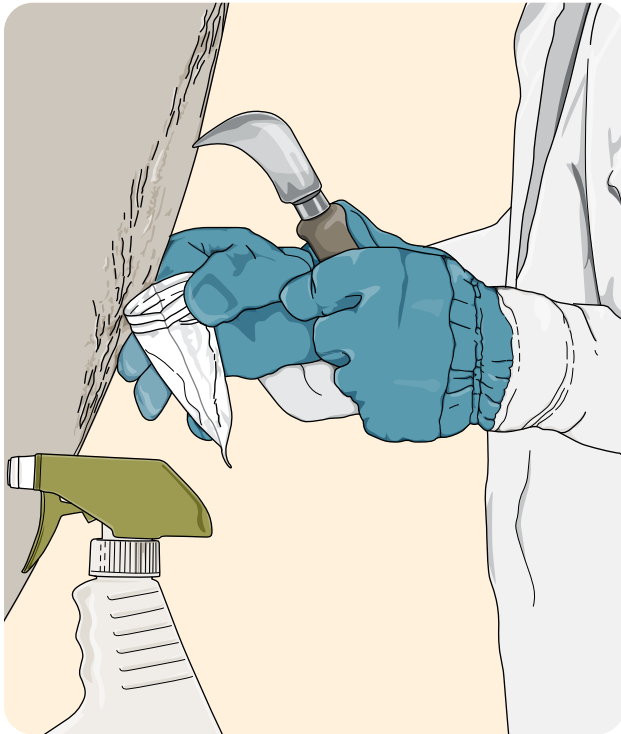
These procedures provide an outline only, and are not specific to any one workplace. Each individual owner, employer, or contractor must adapt the procedures to provide specific work instructions for each individual job.

Example procedure: Collection of bulk samples

Bulk samples of materials suspected of containing asbestos must be collected by a qualified person and sent for laboratory analysis to determine their content.

Please note that this procedure represents minimum requirements and is not specific to any one workplace. It may be necessary to upgrade PPE (such as respiratory protection) depending on the condition of the worksite and the nature (e.g., friability) of the materials.

1. Assemble all required PPE and tools, including:
 - Disposable Tyvek coveralls (or similar) that fit snugly at the wrists and ankles and have an integral head covering
 - Disposable gloves
 - Disposable booties
 - Barrier tape and signage
 - Half-facepiece respirator with P100 HEPA cartridges
 - Water mister
 - Water supply
 - Cutter tools
 - Scoop
 - Sample collection bags
 - Wiping cloth or disposable talc-free wet wipes
 - Poly drop sheets
 - Disposal bags
 - Duct tape
2. Put on disposable Tyvek coveralls and, where deemed necessary, booties. Wear disposable gloves. Determine whether ankles and wrists of coveralls need to be sealed. (Sealing may be necessary when sampling very friable material such as vermiculite insulation.)
3. Mark the boundary of the sampling area (e.g., with barrier tape) and signage. Inform any nearby workers of the potential asbestos hazard, and instruct them to stay outside the area. Any worker in the sampling area must use a respirator. Depending on the condition of the materials, sampling may generate significant amounts of airborne fibres.
4. Put on your half-facepiece air-purifying respirator and do a seal check.
5. Identify locations from which to collect bulk samples.
6. To minimize the release of dust, use a water mister to wet the material to be sampled.
7. Use sampling tools to collect the desired sample (as shown in the following drawing), minimizing disturbance of the material and collecting only the amount necessary. If pieces break off during sampling, clean up the debris using a HEPA vacuum or by wet wiping. Where necessary, cover the area with poly drop sheets to catch and contain loose materials generated during sampling.



Use sampling tools to collect the desired sample. Place the collected sample in a sample bag.

8. Place the collected sample in the sample bag, and label the bag with collection details. Seal the sample bag. Samples should be double-bagged.
9. Using wet wipes, wet paper towels, or a wet cloth, wipe up any visible material that may have fallen or become dislodged during sample collection.
10. Place this waste material (including wipes) in a designated asbestos waste bag.
11. Use tape, caulking, or other effective means, where appropriate, to seal sample collection locations where the sample collection may have resulted in minor damage to the material sampled. (For example, after disturbing drywall or ceiling material, tape, caulk, or spray the area to seal it.)
12. Decontaminate (wipe) tools between sample collections and after completing all sample collections.
13. In a clean area, remove disposable Tyvek coveralls, booties, and gloves, and place them in the designated waste bag. The method of waste disposal will depend on the quantity of the material generated.
14. In the clean area, remove and clean off your respirator. Use a wet cloth or wipe to clean any exposed skin areas.
15. Do a final check of all equipment.
16. Complete sample analysis forms (such as the chain-of-custody form), update sampling notes, and submit samples to the lab.

High-risk work activities

High-risk work activities involve working with or in proximity to asbestos-containing material if a high level of control (such as an airtight containment structure and powered air-purifying respirators or supplied-air respirators) is necessary to prevent worker exposure to airborne asbestos fibres.

High-risk work activities require specific procedures and containment to ensure the safety of workers and others who may be affected by the activities. G6.8 of the OHS Guidelines provides information to assist with the development of high-risk work procedures that meet the requirements of the Regulation.

Activities that carry a high risk of exposure to airborne asbestos fibres include:

- Removing, encapsulating, or enclosing materials containing friable asbestos during the repair, alteration, maintenance, demolition, or dismantling of any part of a building, structure, machine, or piece of equipment
- Cleaning, maintaining, or removing air-handling equipment in buildings where sprayed fireproofing materials containing asbestos have been applied to the airways or ventilation ducts or have been used as spray-on insulation
- Removing asbestos-containing textured materials from ceilings and/or walls
- Repairing, altering, or dismantling any part of a boiler, furnace, kiln, or similar device in which insulating materials containing asbestos have been used or applied
- Using power tools (without water or dust controls) to cut or drill through asbestos-containing materials
- Removing asbestos-containing vermiculite insulation
- Removing any asbestos-containing materials in circumstances where there would be a significant release of fibres

Anyone involved in any high-risk work activity must follow written work procedures similar to those described in the examples that follow.

Note

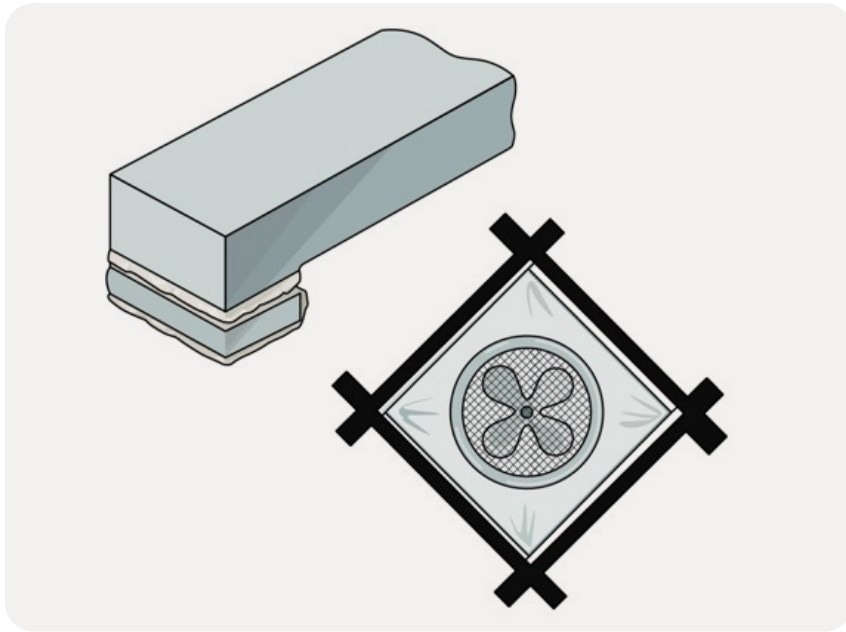
The high-risk procedures described here provide an outline only, and are not specific to any one workplace. Each individual owner, employer, or contractor must adapt these procedures to provide specific work instructions for each individual job.

Example procedure: Isolating the high-risk asbestos work area

Please note that this procedure represents minimum requirements and is not specific to any one workplace. It may be necessary to implement additional controls depending on the condition of the worksite and the abatement methods used.

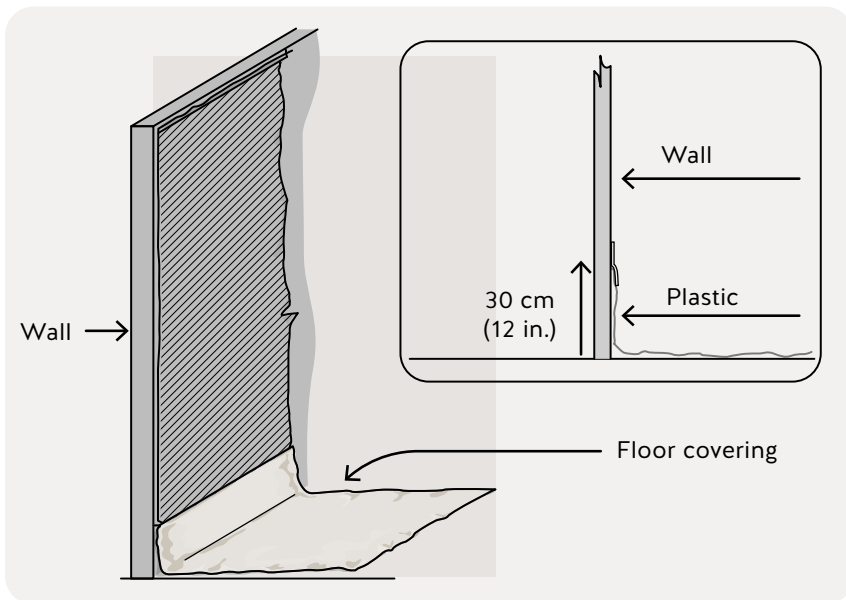
To ensure that the designated asbestos work area is properly isolated, the following must be done:

1. Place signs around the work area warning people not to enter the work area unless authorized to do so.
2. Form an airtight containment by enclosing the entire work area to prevent the escape of asbestos fibres. The most common way to do this is by enclosing the work area with polyethylene (poly) sheeting — at least 0.15 mm (0.006 in. or 6 mil) thick — or a similar impervious material, held in place with duct tape. Where such a containment is impractical, specify the alternative work procedures that will be used to minimize the risk to workers of asbestos exposure. When removing pipe insulation, workers may use a glove-bag apparatus as a containment system to isolate the work operations causing asbestos fibre release.
3. Maintain a lower air pressure (negative pressure) in the containment than in the surrounding area so that air always flows into the contaminated area from the clean outside areas.
 - Test the airflow using a smoke tube.
 - Negative pressure should be maintained at about 5 Pa (0.02 in. of water); however, this figure may vary depending on the nature of the work and the configuration of the abatement area.
 - Maintain negative pressure in the containment until site decontamination work is complete and a visual inspection and air clearance monitoring confirm that fibre levels are low enough to permit dismantling of the containment.
 - Discharge exhaust air to the outdoors through HEPA filters.
 - Ensure that the airflow pattern in the work area is such that the decontamination facility's clean room and shower room are safe for workers not wearing respirators.
 - Containment ventilation must remain operational (in place and running). It must not be removed until the work has been completed and the air clearance has been granted.
4. Seal off stairways, elevators, and any other openings with poly sheeting and tape.
5. Shut down and lock out the air heating and ventilation system to the containment area, and seal the ducts (including outside duct openings) with poly sheeting, as shown in the following drawing.



A duct is sealed with poly sheeting.

6. Clean and completely cover or enclose with poly sheeting all non-removable fixtures, such as lockers, large machinery, and equipment. Clean all fixtures and equipment that can be reasonably removed by damp wiping or using a HEPA vacuum, and remove them from the containment area.
7. Cover the floor with poly sheeting. Make sure that the poly sheeting extends at least 30 cm (12 in.) up the walls, as shown below.



When covering the floor with poly sheeting, make sure the sheeting extends at least 30 cm (12 in.) up the walls.

8. Whenever there is a danger of electric shock, such as during wet removal or encapsulation of materials containing friable asbestos, take appropriate precautions. Use power sources with ground fault circuit interrupters (GFCIs) or equivalent protection against electric shock

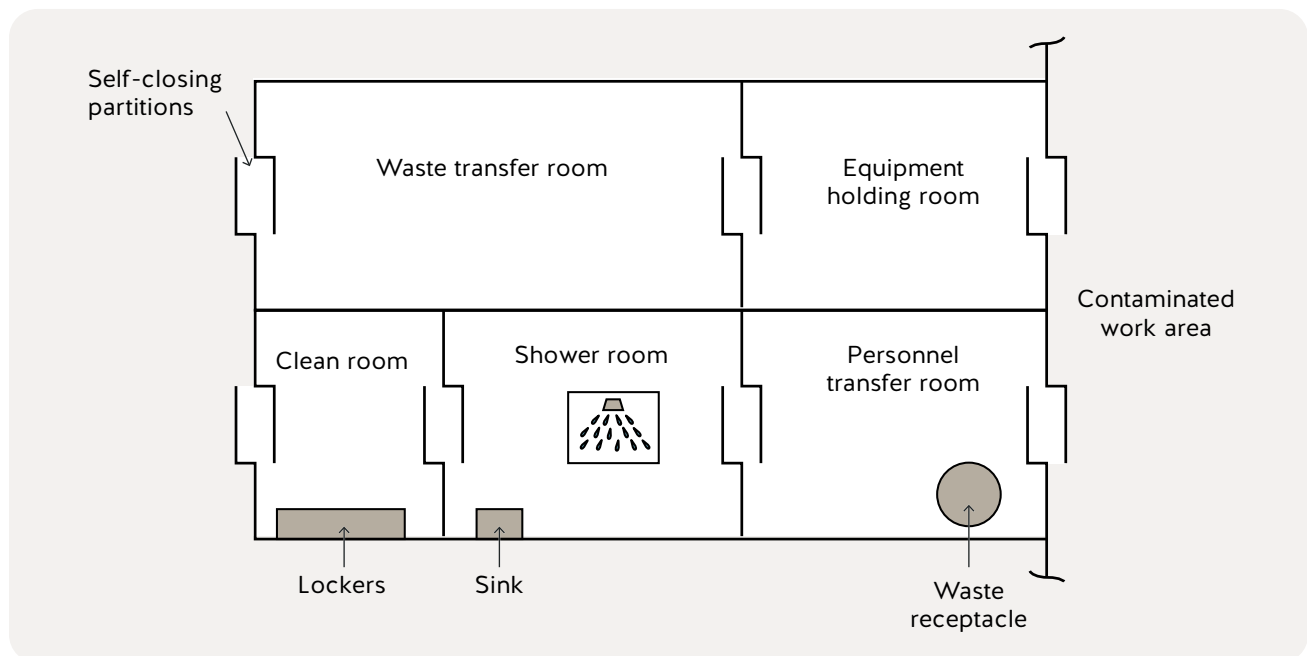
for all electrical equipment operated inside the containment. As required, physically lock out all existing electrical circuits or lighting to prevent electric shock or unintentional start-up of electrical equipment inside the containment.

9. If existing lighting is to be used, clearly specify this in the work procedures submitted with the NOP, and include additional safety precautions that will be used to keep moisture away from the live contacts.
10. Inspect the containment isolating the asbestos work area at least daily. The containment must be inspected during every work shift for gaps, leaks, or breaks. Correct any defects immediately.
11. Transparent panels should be placed in the containment walls so that workers can be observed from outside the containment area (e.g., during the collection of occupational air samples).

Example procedure: Decontaminating workers

Please note that this procedure represents minimum requirements and is not specific to any one workplace. It may be necessary to implement additional controls depending on the condition of the worksite and the abatement methods used.

The designated work area must include a decontamination facility that enables workers to leave the area without carrying any asbestos fibres on their bodies or their clothing.



A decontamination facility consists of a shower room and a series of connected rooms separated by airlocks.

Partitions between rooms in the decontamination facility must be self-closing so that each room can function as an airlock. These partitions are normally constructed of overlapping sheets of heavyweight poly sheeting suspended to form a curtain. Workers must not open more than one such partition per room at any one time.

Note

Protective clothing worn throughout the job may be stored and put on in the personnel transfer room, as long as acceptable laundering facilities exist and appropriate time intervals for cleaning protective work clothing are established.

To ensure that proper decontamination is achieved, the following must be done.

Entering the contaminated work area

1. Enter the clean room. Remove all street clothes and personal belongings, and leave them in the clean room. Change into protective clothing (disposable coveralls).
2. Put on an appropriate respirator, and ensure that it fits and works properly.
3. Pass through the shower room into the personnel transfer room. Finish putting on any other PPE required for the work, such as footwear or safety headgear.
4. Enter the contaminated work area to perform the work activities.

Leaving the contaminated work area

1. Before entering the personnel transfer room, remove all gross asbestos materials using wet wipe-down procedures or a HEPA vacuum.
2. In the personnel transfer room, remove all protective clothing and equipment except the respirator. Place disposable protective clothing and any waste materials in poly bags for disposal.
3. Enter the shower room and shower while wearing the respirator. (An adequate supply of tempered water and soap must be provided.) After having an initial shower and thoroughly rinsing the respirator facepiece and its harness, place caps or tape over the filters on the inlet side. Then remove the respirator and finish showering. If the respirator filters become wet, they should be discarded and replaced.

Note: Showers must not be removed from the containment area until the work has been completed and air clearance has been granted.

4. Enter the clean room and dress in street clothes. Thoroughly clean and disinfect the respirator, and then store it in the clean room until its next use.

Note: Wet filters are not normally reused (see the respirator manufacturer's instructions). Filters may be disposed of in the work area or taped and taken out of the work area for disposal.

5. Keep hand tools and supplies in the equipment holding room. Use this room as well when transferring asbestos waste containers or any equipment that has been decontaminated to the waste transfer room.

Example procedure: Controlling airborne asbestos fibres

Please note that this procedure represents minimum requirements and is not specific to any one workplace. It may be necessary to implement additional controls depending on the condition of the worksite and the abatement methods used.

To ensure that the release of airborne asbestos fibres is properly controlled, the following must be done:

- Place warning signs at all access points into the permanent enclosure. The signs must warn of the danger from asbestos-containing materials and should identify appropriate precautions.
- Ensure that any permanent enclosure of asbestos-containing materials is effectively airtight. Do not locate electrical, plumbing, or ventilation services inside a permanent asbestos enclosure.
- Pass air from the negative-air unit through a HEPA filter, and discharge the air outdoors.
- Never remove dry materials containing friable asbestos without prior approval from WorkSafeBC.
- Saturate asbestos-containing materials with water before handling or removing them. Surfactants (wetting agents) must be used with the water to help thoroughly wet asbestos-containing materials.
- Do not use dry sweeping to clean up asbestos-containing materials. Never use compressed air for any cleaning purposes.
- Control water streams and application of sealants or encapsulants to prevent excessive fibre generation. Use airless or low-pressure application systems. Pressure sprayers must not be used to remove or wet down asbestos-containing materials.
- When cleaning up small amounts of asbestos-containing materials, use only HEPA vacuums, or wet mop or wet wipe the materials. Gross amounts of asbestos materials inside an asbestos containment can be shovelled into bags.
- Use water to continually mist the air near workers who are removing asbestos or cleaning up waste materials.
- When repairing asbestos-containing materials:
 - Disturb the least possible amount of the materials.
 - Seal exposed friable ends or edges that have resulted from repair or maintenance procedures before removing the work containment.
 - Wash any surfaces that will remain exposed after repair work is complete, and then vacuum and treat the surfaces with an effective sealant or glue.
- Clean all surfaces exposed to asbestos contamination by vacuuming or damp wiping.
- After removing asbestos-containing materials, wash or vacuum exposed surfaces and treat with a sealant or glue designed to seal invisible residual fibres to the substrate.
- If asbestos is encapsulated, test the encapsulated asbestos materials to ensure that the encapsulant has penetrated the materials and that the encapsulant has not disturbed the bond between the friable asbestos materials and their supporting surface.

- Identify encapsulated asbestos materials. Identification must indicate both the dangers and the precautions to be taken while working on or near the materials.
- Complete a final decontamination, including washing down and vacuuming the containment, to remove all visible signs of asbestos contamination from the containment and the equipment. Complete this decontamination before sealing the surfaces from which asbestos has been removed.
- Complete a final visual inspection of the entire containment.
- Before dismantling the containment, take final air clearance measurements of airborne asbestos fibres. Do not remove the containment until the air clearance has passed.

Example procedure: Laundering contaminated clothing

Employers must ensure that workers who launder contaminated clothes, whether on site or at a separate business, are informed of the hazards of asbestos and the procedure required for handling contaminated clothing.

Before sending contaminated clothing to a laundry facility, the following should be done:

1. Clean the clothing using a HEPA vacuum.
2. Place the clothing in waterproof poly bags.
3. Seal and label the bags.

Cleaned clothing should be packaged and used only for asbestos work.

Example procedure: Disposing of asbestos waste materials

Please note that this procedure represents minimum requirements and is not specific to any one workplace. It may be necessary to implement additional controls depending on the condition of the worksite and the abatement methods used.

To ensure that asbestos waste is properly disposed of, the following must be done:

1. Place waste materials in impervious containers — poly bags at least 0.15 mm (0.006 in. or 6 mil) thick — inside the enclosed asbestos work area. Seal the containers, and label or tag them “ASBESTOS.” Asbestos waste should be double-bagged.
2. Before removing the sealed containers from the equipment holding room, and before removing them from the waste transfer room, decontaminate the outside of the containers by damp wiping or by cleaning with a HEPA vacuum.
3. In the equipment holding room, package the sealed impervious containers so that they will not be punctured during handling and transportation to the disposal site. This is normally done by double-bagging them.
4. Ensure that a continuous cleanup and disposal program is in place to prevent unnecessary accumulation of waste materials containing asbestos. By the end of each workday, and preferably by the end of each work shift, place all asbestos waste materials in sealed containers. Remove containers from the work area at the end of each work shift, if not more often. Ensure that the containers remain under effective control if they are stored at the worksite before being disposed of.

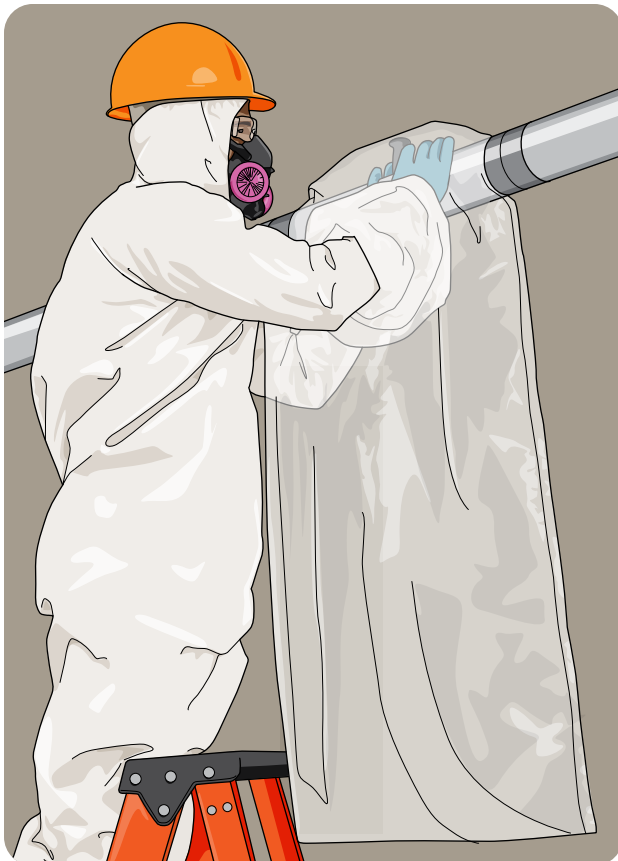
5. Make prior arrangements with the appropriate authorities to deliver asbestos waste to assigned dump sites. Inform transport drivers of precautions they must take. Transport vehicles may be required to display signs or placards specifying the nature of the cargo. (See the federal *Transportation of Dangerous Goods Act*.)
6. Ensure that disposal sites conform to provincial and municipal requirements. (Check with the regional office of the British Columbia Ministry of Environment.)

Example procedure: Removing asbestos-containing pipe insulation

Please note that this procedure represents minimum requirements and is not specific to any one workplace. It may be necessary to implement additional controls depending on the condition of the worksite.

The removal of asbestos-containing pipe insulation is a high-risk work activity that does not require the usual decontamination steps as long as workers use glove bags — prefabricated bags equipped with integral gloves — according to the manufacturer’s instructions. A glove bag is a containment device installed on the pipe using straps or duct tape to seal the ends of the bag around the pipe. Some glove bags are designed for and allow progressive movement along the pipe, and are also considered to be a form of containment.

When using glove bags, follow the manufacturer’s instructions and wear appropriate PPE. At a minimum, this should include disposable coveralls and a half-facepiece respirator equipped with P100 (HEPA) cartridges.



A worker uses a glove bag to remove asbestos-containing pipe insulation.

When using a glove bag to remove asbestos-containing pipe insulation, the following must be done:

1. Thoroughly clean any surfaces exposed by the removal of the asbestos insulation. After removing each section of asbestos insulation, immediately clean the surfaces with a vacuum cleaner equipped with a HEPA filter. If a proper vacuum cleaner is not available, use damp cloths or sponges.
2. Keep the surfaces free of wet sludge that could release asbestos fibres after drying.
3. Treat all cloths, sponges, rags, wire brushes, and so on as asbestos waste.
4. Remove the glove bag. Repeat vacuum cleaning of all surfaces in the work area, including waste containers, reusable tools, and equipment.
5. Seal the exposed ends of the remaining asbestos insulation. Inspect and seal the pipe with glue.

When removing pipe insulation without a glove bag, workers must follow all the procedures for high-risk work activities (see pages 58 to 66).

Work on high-temperature pipe systems must be discussed with the local WorkSafeBC occupational hygiene officer before work procedures are submitted with the NOP.

Monitoring the work environment

Air sampling

Asbestos air sampling methods acceptable to WorkSafeBC

Under section 5.53(4) of the Regulation, workplace exposure monitoring and assessment must be conducted using occupational hygiene methods acceptable to WorkSafeBC. For the purpose of asbestos air monitoring, the following methods published by the National Institute of Occupational Safety and Health (NIOSH) are acceptable:

- *NIOSH Manual of Analytical Methods*
- NIOSH Method 7400, Asbestos and Other Fibers by PCM
- NIOSH Method 7402, Asbestos by TEM
- *NIOSH Occupational Exposure Strategy Manual*

This means that the equipment and procedures listed in these methods are mandatory for asbestos air sampling, including requirements for:

- Sampling cassettes
- Field blanks
- Pump flow rates
- Sampling volumes
- Calibration of equipment
- Chain of custody
- Quality assurance

Consultants and air-monitoring technicians who collect ambient, clean room, occupational, and clearance air samples should have specific education and training in the following:

- Requirements for asbestos air sampling using NIOSH Method 7400, Asbestos and Other Fibers by PCM
- Sampling equipment and procedures
- Pump and rotameter calibration procedures

A NIOSH 582 Certificate course (or equivalent) provides education on these points, as well as:

- Set-up and alignment of the microscope
- Filter preparation and mounting
- Fibre counting
- Statistical evaluation

As per the accepted sampling methods listed above, consultants or technicians conducting air sampling must have the following documentation:

- Pump calibration program, including written calibration procedures
- Pump calibration log sheet
- Calibration chart or table (if rotameters are used)
- Battery maintenance program
- Sample log sheet
- Sample chain-of-custody form

How to determine air sampling duration

During asbestos abatement work, people in the vicinity of the work areas may be exposed to airborne asbestos fibres. These individuals include:

- Workers inside the abatement containment area during both moderate- and high-risk work activities
- Persons outside the abatement containment area
- Workers inside the clean room

Section 5.53 of the Regulation states that air sampling must be conducted where workers may be at risk of overexposure to an airborne contaminant (e.g., asbestos fibres).

Section 6.12 requires that, during high-risk work activities, air samples be collected:

- Outside the containment
- In the clean room
- From workers working inside the containment
- When the abatement is completed (air clearance sampling)

One of the occupational hygiene references acceptable to WorkSafeBC is the *NIOSH Occupational Exposure Sampling Strategy Manual*. This manual lists several air sampling strategies, including:

- Full period single sample — collecting one sample that covers the entire work shift
- Full period consecutive samples — collecting two or more consecutive samples that cover the entire work shift
- Partial period consecutive samples — collecting two or more consecutive samples that cover at least half of the work shift (ideally, 70 to 80% of the full shift)
- Random grab samples (lasting as little as a few minutes each)

Some of these strategies may be more suitable than others depending on the objectives of the sampling, workplace conditions, and work activities. The air sampling methods may also prescribe minimum air volumes and maximum flow rates to ensure adequate detection of asbestos fibres.

Full period single and consecutive sampling may not be practicable for asbestos work due to:

- Cost
- Availability of equipment
- Operational constraints (e.g., where air sampling is being conducted at multiple worksites at the same time)

Random grab samples, although easier to collect, may not represent a worker's true exposure because the sampling times are so short.

The most appropriate sampling strategy for asbestos work is the collection of one or more samples spanning at least half the work shift (ideally as close to a full work shift as practicable). This strategy can result in a representative sample of exposure during work activities and can help determine whether implemented controls are adequate.

There are some situations in which full shift (full period) samples should be collected to ensure the results are representative of the work activities during the work shift. For example:

- If several different abatement activities are taking place over the course of the shift (e.g., ceiling texture abatement followed by drywall and linoleum flooring removal), full shift samples should be collected both outside the containment and in the clean room.
- If unprotected workers are in the vicinity of, or working around, the abatement containment, full shift ambient samples should be collected.
- If the containment construction is quite complex (e.g., many smaller abatement areas connected together), then full shift clean room and multiple ambient samples should be collected.
- Full shift samples should also be collected if any of the following may occur:
 - Frequent leaks in the containment
 - Issues with negative air units
 - Power fluctuations
 - Any other problems that could affect the integrity of the abatement containment

It is up to the qualified person to determine an appropriate air-sampling strategy for the abatement work. A WorkSafeBC prevention officer may request the rationale for the qualified person's decisions.

Independent third-party air monitoring

Third-party sampling for airborne asbestos fibres during an abatement project should be performed by a qualified person on behalf of the building owner or the prime contractor. Such a person may also be subcontracted by the asbestos abatement contractor, but should not be an employee of that contractor. Air-monitoring technicians should be employees of an asbestos laboratory or an asbestos consulting agency. It is not an accepted industry practice for asbestos abatement (or other) contractors to perform their own asbestos air monitoring.

Equipment calibration

Sampling pumps must be calibrated with the cassettes attached, immediately before and after each air sample is collected in the field.

Pumps must be calibrated against a primary standard. Primary standards are those that involve the measurement of volume based on the physical dimensions of an enclosed space. These include a number of electronic bubble meters that measure flow rates when soap bubbles pass through a transparent chamber of known volume. Dry-piston flowmeters also meet the definition of a primary standard.

Electronic primary flowmeters are available in a variety of flow rate ranges, usually “low” (less than 1 L/min), “standard” (between 1 and 7 L/min), and “high” (up to 30 L/min). Standard-type flowmeters must not be used to calibrate pumps to higher flow rates (e.g., more than 8 L/min).

Rotameters and thermal mass flowmeters are considered secondary standards. They can be used in the field, provided they are calibrated against a primary standard. Rotameters measure airflow using a ball inside a vertical tube, whereas thermal mass flowmeters use changes in heat loss from a small electric sensor to calculate flow.

Pumps should be fully charged before use.

Air sampling at moderate-risk sites

Occupational air sampling

Occupational air samples are collected to determine or assess the adequacy of work procedures and controls, or when changes to work procedures occur. When a worker may be at risk of overexposure to an airborne contaminant, periodic air monitoring is required under section 5.53 of the Regulation. The results of occupational air monitoring will determine whether an employer’s safe work procedures and controls provide adequate protection.

When collecting occupational air samples, the following must be done:

- Collect occupational samples from the worker with the highest exposure risk (the worker closest to the asbestos-containing material).
- Attach the sampling cassette to the worker’s clothing so that the cassette is hanging down in the worker’s breathing zone.
- Keep the worker under observation at all times during the sampling. This means that the technician must either enter and remain in the work area during the course of the sampling, or observe the worker from outside the barrier tape or containment. If the technician chooses to enter the containment to keep the worker under observation, the technician must wear the same personal protective equipment and clothing that workers in the containment are required to wear.
- Sample for at least 20 minutes at a flow rate of about 2.5 L/min, for a total volume of at least 48 L. Otherwise, the filters may be overloaded with particulate.
- Submit field blanks to the laboratory along with the occupational samples.
- Analyze filters and notify workers of the results within 24 hours.

Ambient air sampling

Ambient air samples should be collected daily when there are unprotected persons in the immediate vicinity of the work area.

When collecting ambient air samples, the following must be done:

- Set the flow rate at 2.5 L/min or less. Otherwise, the filters may become overloaded with particulate. A qualified person must determine the duration of the sampling. (See “How to determine air sampling duration” on page 68.)
- Place the sampling cassettes about 1.5 m (4–5 ft.) from the ground and at least 30 cm (1 ft.) from any walls. The cassettes should be pointed downward at about 45 degrees.
- Submit field blanks to the laboratory along with the samples.
- Analyze filters and notify workers of the results within 24 hours.

Air-clearance sampling

Air-clearance sampling may be required, depending upon the nature of the facility and the type of asbestos work performed. For example, a school district may request air-clearance sampling following the removal of asbestos-containing floor tile from a classroom.

Sampling may be performed using “passive” or “aggressive” (using fans or blowers to move air around) methods. Aggressive clearance sampling is recommended in situations where the asbestos has been very difficult to remove or “lock down” (such as where asbestos debris has been washed into cracks and crevices) or following an improper or incomplete abatement job. Analysis with transmission electron microscopy (TEM) should be used under these circumstances, as TEM can distinguish between asbestos and non-asbestos fibres. (Analysis with phase contrast microscopy, on the other hand, counts all fibre types and might lead to false positive results.)

When collecting air-clearance samples, the following must be done:

- Collect samples before the containment is dismantled or the barrier tape is removed, and while the negative-air units (if used) are still operating.
- Collect at least one sample for every 270 m³ (9,600 cu. ft.) of work area. If the work area is 270 m³ or less, collect at least two samples.
- In order to use flow rates greater than 8–10 L/min, use cassettes that have been approved by the manufacturer for use at higher flow rates, and calibrate the pumps using a high-flow primary calibrator. (Most “standard” primary calibrators are not rated for flow rates greater than about 8 L/min.) Although NIOSH Method 7400 allows flow rates as high as 16 L/min, flow rates greater than 8–10 L/min may damage the filters in the cassettes. To comply with NIOSH Method 7400, you should collect at least 2,000 L of air.
- Place the filter cassettes about 1.5 m (4–5 ft.) from the ground and at least 30 cm (1 ft.) from any walls. The cassettes should be pointed downward at about 45 degrees.
- Submit field blanks to the laboratory along with the samples.
- Analyze filters and notify workers of the results within 24 hours.

- If filters are damaged (e.g., due to a high pump flow rate), repeat the sampling.
- Ensure that the concentration of asbestos fibres in the work area after all the asbestos waste has been removed and the area has been decontaminated does not exceed 0.02 fibres per millilitre.

For all air samples, as soon as possible but no later than 24 hours after collecting samples, make the sampling results available to the workers involved and to the joint health and safety committee (or the worker health and safety representative, if applicable) at the worksite. Make the sampling results available to a WorkSafeBC officer upon request.

Air sampling at high-risk sites

Under the Regulation, air samples must be collected during high-risk work activities to determine asbestos fibre concentrations. Air sampling must be done during the asbestos work and before the containment is removed.

Occupational air sampling

Occupational air samples are collected to determine or assess the adequacy of work procedures and controls, or when changes to work procedures occur.

When collecting occupational air samples, the following must be done:

- Collect occupational samples from the worker with the highest exposure risk (the worker who is actually disturbing the asbestos-containing material inside the containment during removal and cleanup).
- Attach the sampling cassette to the worker's clothing so that the cassette is hanging down in the worker's breathing zone.
- Keep the worker under observation at all times during the sampling. This means that the technician must either enter and remain in the work area during the course of the sampling, or observe the worker from outside the containment. If the technician chooses to enter the containment, the technician must wear the same personal protective equipment and clothing that workers in the containment are required to wear. The technician must also follow the employer's decontamination and housekeeping procedures required under section 6.8 of the Regulation.
- If the worker will be kept under observation from the outside of the containment, one option is to use viewing windows. In that case, the containment (including negative-pressure containments) will need to include at least one viewing window. Each viewing window should be sufficiently large (a minimum of 60 cm × 60 cm [2 ft. × 2 ft.] is recommended). And each window should be made of a material, such as transparent polyethylene, that will allow a clear view inside the containment.
- Existing sealed windows can also serve as viewing windows provided they are clean, are undamaged, and allow a clear view of the containment. In the case of large containments, there should be enough viewing windows to allow a clear view of all areas of the containment where there are workers.

- Another option for keeping the worker under observation from outside of the containment is to use a live video system. The system can be either wired or wireless. (In a wired system, the wires should be properly sealed where they enter or leave the containment.) The employer must ensure that the worker closest to the source of the asbestos fibres being generated is being monitored accurately. And the worker should be in view of the camera during the entire sampling period.
- Whether the worker is observed from the inside or the outside of the containment, the name or job description of the worker should be recorded, as well as the activity the worker performed during sampling. In addition, the technician is expected to provide an interpretation of the results (e.g., those that are abnormally high or low).
- Sample for at least 20 minutes at a flow rate of about 2.5 L/min, for a total volume of at least 48 L.
- Submit field blanks to the laboratory along with the occupational samples.
- Analyze filters and notify workers of the results within 24 hours.

Ambient air sampling

Ambient air samples from outside the containment must be collected at least daily when there are unprotected persons in the vicinity of the containment.

When collecting ambient work samples, the following must be done:

- Set the flow rate at 2.5 L/min or less. Otherwise, the filters may become overloaded with particulate. A qualified person must determine the duration of the sampling (see “How to determine air sampling duration” on page 68). Sampling should include at least one decontamination sequence.
- Place the sampling cassettes about 1.5 m (4–5 ft.) from the ground and at least 30 cm (1 ft.) from any walls. The cassettes should be pointed downward at about 45 degrees.
- Submit field blanks to the laboratory along with the samples.
- Analyze filters and notify workers of the results within 24 hours.

Clean room air sampling

During removal and cleanup operations, air samples must be collected at least daily for every shift.

When carrying out clean room air sampling, the following must be done:

- Set the flow rate at 2.5 L/min or less. Otherwise, the filters will become overloaded with particulate. A qualified person must determine the duration of the sampling (see “How to determine air sampling duration” on page 68). Sampling should include at least one decontamination sequence.
- Place the sampling cassette about 1.5 m (4–5 ft.) from the ground and at least 30 cm (1 ft.) from the clean room walls. The cassette should be pointed downward at about 45 degrees.
- Submit field blanks to the laboratory along with the samples.
- Analyze filters and notify workers of the results within 24 hours.

Air-clearance sampling

Samples must be collected before the containment is dismantled and while the negative-air units are still operating. Aggressive clearance sampling is recommended in situations where the asbestos has been very difficult to remove or “lock down” (such as where asbestos debris has been washed into cracks and crevices) or following an improper or incomplete abatement job.

When collecting air-clearance samples, the following must be done:

- Collect at least one sample for every 270 m³ (9,600 cu. ft.) of containment. If the containment is 270 m³ or less, collect at least two samples.
- In order to use flow rates greater than 8–10 L/min, use cassettes that have been approved by the manufacturer for use at higher flow rates, and calibrate the pumps using a high-flow primary calibrator. (Most “standard” primary calibrators are not rated for flow rates greater than about 8 L/min.) Although NIOSH Method 7400 allows flow rates as high as 16 L/min, flow rates greater than 8–10 L/min may damage the filters in the cassettes. To comply with NIOSH Method 7400, you should collect at least 2,000 L of air.
- Place the filter cassettes about 1.5 m (4–5 ft.) from the ground and at least 30 cm (1 ft.) from the containment walls. The cassettes should be pointed downward at about 45 degrees.
- Submit field blanks to the laboratory along with the samples.
- Analyze filters and notify workers of the results within 24 hours.
- If filters are damaged (e.g., due to a high pump flow rate), repeat the sampling.
- Ensure that the concentration of asbestos fibres in the containment area after all the asbestos waste has been removed and the area has been decontaminated does not exceed 0.02 fibres per millilitre, as required by the Regulation.

Following the air clearance, workers must use moderate-risk work procedures when demolishing the containment.

For all air samples, as soon as possible but no later than 24 hours after collecting samples, make the sampling results available to the workers involved and to the joint health and safety committee (or the worker health and safety representative, if applicable) at the worksite. Make the sampling results available to a WorkSafeBC officer upon request.

High-risk site inspection requirements

Inspect the containment and all decontamination facility rooms for gaps and breaks at least daily to maintain effectiveness. Inspections must be documented. Complete a visual check as well as a smoke-tube test to ensure that air flows from the clean areas into the contaminated areas. Measuring the air pressure differential between clean and contaminated areas is also recommended.

Before air-clearance sampling takes place, a final visual inspection of the work area must be conducted to ensure that an effective cleanup has been completed and all asbestos waste has been removed.

Keep a record of such inspections for at least 10 years.

Hazardous materials (asbestos) clearance document

After an asbestos abatement project has been completed, section 20.112(8) of the Regulation requires that a qualified person ensure, and confirm in writing, that the asbestos-containing materials have been safely removed. The qualified person, in this case, must be familiar with the work that was conducted and can be one of the following:

- The project consultant
- The prime contractor
- The asbestos abatement contractor
- The demolition contractor
- The asbestos building surveyor

The clearance document should include the following information:

- The date the clearance was conducted
- The address of the abatement project
- The name of the abatement contractor
- A description of the scope of work that was performed (e.g., what was removed and when)
- The notice of project number for the asbestos work
- Waste manifest documentation
- The results of any air-clearance sampling, and the name and signature of the surveyor, consultant, or contractor who collected the samples

The document must also include:

- A reference to the hazardous materials inspection report (including the name of the surveyor or company, and when the survey was conducted)
- The name of the consultant, surveyor, or contractor who performed the final visual inspection
- A statement indicating that the abatement was conducted in accordance with regulatory requirements, and that the asbestos was safely removed or contained

Waste handling and disposal

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 (see “Who is a qualified person?” on page 18).

Waste must be removed:

- While work is in progress, at intervals necessary to eliminate or minimize the risk of exposure
- At the end of each work shift
- At the completion of work involving asbestos

The following methods are most appropriate for the safe removal of asbestos dust and debris:

- Use a HEPA vacuum.
- Wipe surfaces with a damp cloth or sponge to remove residual amounts of asbestos dust and debris.
- Wet sweep or wet mop to remove larger amounts of asbestos dust and debris.
- Use a shovel or similar tool to place larger amounts of dampened asbestos debris into a sealed container or doubled 0.15 mm (0.006 in. or 6 mil) thick asbestos bags.

A combination of these methods might be required, depending on the nature of the work and the risk level. Every worker must be instructed and trained in these written procedures.

Asbestos waste and any other waste contaminated with asbestos must be placed into sealed containers that are labelled as containing asbestos. These containers must be designed and made of a material that will:

- Contain all asbestos-containing waste
- Prevent the release of asbestos waste and fibres during transport to and disposal at an approved disposal site

Examples include double-sealed polyethylene plastic bags, each with a nominal thickness of at least 0.15 mm (0.006 in. or 6 mil), and fibre barrels. The requirement for double-sealed plastic bags to be at least 0.15 mm or 6 mil thick is consistent with clause 40(2)(b)(i)(B) of B.C.’s *Environmental Management Act* — Hazardous Waste Regulation requirements for asbestos-containing waste. When using rigid containers such as barrels and bins, tight-fitting lids or other covers must be used to seal the containers.

The employer must dispose of containers of asbestos waste promptly to prevent the accumulation of large amounts of asbestos waste.

Ensure that asbestos is properly disposed of in accordance with the appropriate provincial and municipal environmental requirements. Disposal site operators may require specific types of containers or may have restrictions on the types of containers that will be accepted.

Demolition and renovation

If performed incorrectly, demolition and salvage work can cause harmful dust exposures in workers and other people, including owners, developers, demolition workers, inspectors, transportation workers, landfill workers, and the public. Asbestos fibres will be released if work proceeds before asbestos-containing materials are properly identified and safely removed. For example, during demolition of interior walls and ceilings, demolition or salvage workers may be exposed to airborne asbestos fibres in the dust from gypsum board filling compound (sometimes called drywall mud) and from textured ceilings and walls. Vermiculite attic insulation containing asbestos fibres can spill out of the attic when the ceiling material is removed.

Asbestos-containing dusts from these demolition activities can contaminate the site and disperse to neighbouring properties, where other people can be exposed to them. As demolition debris is loaded into a disposal truck, the excavator operator and the truck driver can be exposed to asbestos-containing dusts, which can also drift into neighbouring properties. As the disposal truck travels to the landfill site, dust that contains asbestos can blow out of the truck, spreading asbestos dust along its travel route. When the truck discharges its asbestos-contaminated load at the landfill, unprotected workers at the site can be exposed to the airborne hazard. These demolition practices are unacceptable and do not comply with the Regulation.

Section 20.112 of the Regulation requires that before work begins on the demolition or salvage of machinery, equipment, buildings, or structures, the employer and the owner must have a qualified person inspect the site to identify asbestos-containing materials that may be handled, disturbed, or removed. This is separate from the inventory required by section 6.4 of the Regulation. The inventory prepared under section 6.4 is required for the management of asbestos and the protection of workers who may occupy a building. Although it may not include asbestos that wasn't readily accessible (e.g., because it was hidden behind concrete walls or under a number of layers of flooring), the inventory required by section 6.4 will be a useful aid in conducting the inspection specified in section 20.112. The latter inspection will locate and identify all asbestos prior to demolition and renovation activities.

A copy of the inspection results must always be available at the worksite. The site documentation must include the inspection results from the hazardous materials survey, as well as any drawings, plans, or specifications that show the locations of asbestos. In order to avoid exposure to asbestos-containing materials, workers must have the information about the asbestos hazards on hand to use as a reference in planning their work.

Risk assessment for identified asbestos

When the presence of asbestos is confirmed through bulk sample analysis, or material is assumed to contain asbestos (e.g., asbestos furnace duct tape, asbestos cement [transite] board, or asbestos exterior shingles), a risk assessment must be conducted before demolition work begins. One of the main purposes of a risk assessment is to determine the exposure risk of workers and other people. The risk assessment must be conducted by a qualified person and helps define the scope of work for the abatement of asbestos (see "Who is a qualified person?" on page 18).

Asbestos encountered during demolition

If any asbestos is unexpectedly encountered during demolition, such as in walls or some other concealed space or location that was missed during the pre-demolition inspection process, work must cease until:

- A risk assessment has been conducted by a qualified person, and
- Subsequent control measures (usually removal of the asbestos) have been implemented

This means that demolition workers need some basic awareness and skill in order to recognize materials likely to contain asbestos. Having the ability to recognize building materials and products that may contain asbestos is part of the training and instruction that demolition, renovation, and salvage employers need to provide to their workers who may be exposed to asbestos. For asbestos training requirements, see section 6.11 of the Regulation.

Safe removal of asbestos

Before demolition or renovation of a building occurs, all asbestos slated for removal must be removed by certified asbestos workers using safe work practices and procedures. For more guidance on procedures for demolition and renovation activities, see G6.8 and G20.112 of the OHS Guidelines. These guidelines are available on worksafebc.com.

Workers and other persons must not be exposed to asbestos during the demolition of a building or structure. The asbestos removal practices and any containment procedures must minimize the release of airborne asbestos fibres and must comply with all applicable asbestos requirements in Part 6 of the Regulation.

Containment ventilation equipment (negative-air units) must be run 24 hours a day as long as the work is in progress. Ventilation equipment must not be removed from the decontamination containment until the work has been completed and an air clearance granted.

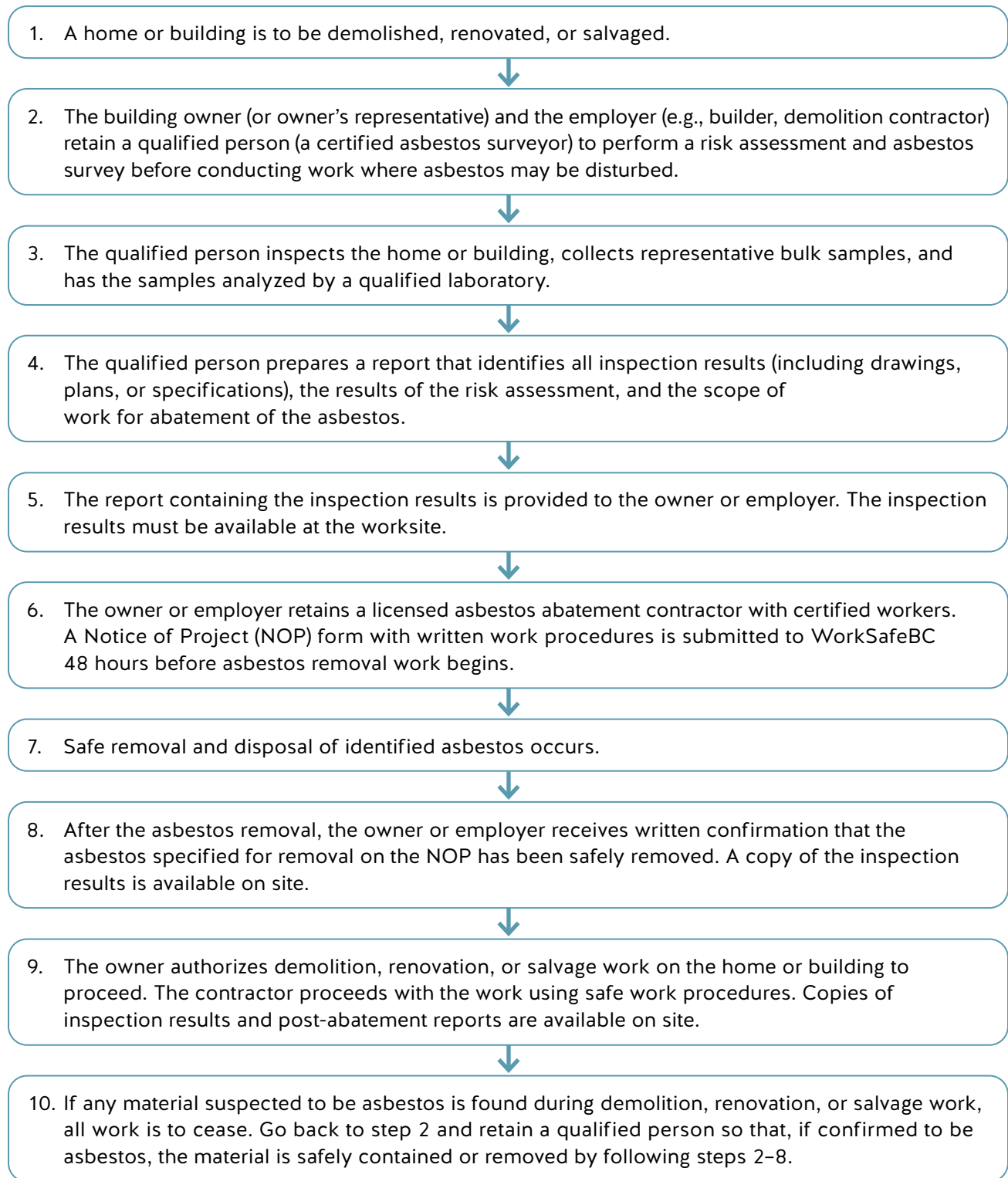
For a summary of the steps required to comply with the asbestos abatement requirements of section 20.112 for a home or a building planned for demolition, renovation, or salvage work, see page 79.

Note

Electrical power may not be available at the demolition site. If this is the case, supplementary power must be provided (e.g., using portable generators or through installation of a temporary power pole). Check local bylaws to determine how long generators can be run over a 24-hour period. Water must also be available for dust control and decontamination purposes (e.g., for a wash station or shower). Tempered water is required for high-risk work.

Ten steps to compliance with asbestos abatement requirements

Most asbestos-containing building materials were phased out by the early 1990s. However, asbestos has been found in a few types of construction materials in relatively new buildings (built as recently as 2018). The qualified person must use their education, training, and experience to determine a sampling strategy.



Part 4:

Personal protective equipment

Protective clothing

All workers must wear protective clothing that:

- Is made of a material that resists penetration by asbestos fibres
- Covers the body and fits snugly at the neck, wrists, and ankles
- Covers the head
- Covers the feet (laceless rubber boots are strongly recommended)
- Can be immediately repaired or replaced if torn

The use of disposable protective clothing is recommended. The employer must ensure that workers remove contaminated protective clothing before they leave the designated work area.

Reduce exposure with PPE

Personal protective equipment (PPE), including respirators and protective clothing, is essential in controlling worker exposure to asbestos. Workers should be familiar with and understand the PPE requirements of their employer's written exposure control plan.

Despite the necessity of PPE, employers and workers should remember that it is always a supplementary line of defence and should not be relied upon exclusively. The other controls mentioned in this manual must also be used to minimize exposure to airborne asbestos.

Heat stress

When a person's body temperature rises above the normal range, the body tries to get rid of the excess heat. If the body continues to gain heat faster than it can get rid of it, body temperature will increase, and the person will experience heat stress. Health problems that result from heat stress are known as heat-related disorders.

Asbestos workers often have to wear tight-fitting, impervious protective clothing while working in hot, confined areas (such as an attic) where there is not a lot of air movement. As a result, they may be at a higher risk of experiencing heat stress and heat-related disorders (such as heat stroke or heat exhaustion).

On all jobs, employers must assess the risk of workers' exposure to conditions that exceed the heat action levels or the clothing correction values specified in section 7.28 of the Regulation. If the risk assessment indicates the possibility of workers' exposure to unacceptable heat action levels, employers must implement an exposure control plan. The plan must include:

- How the heat stress hazard will be assessed
- What controls will be used to eliminate or minimize worker exposure to conditions that could cause heat stress
- Information, instruction, and training of workers

Employers must also ensure that workers know how to recognize the signs and symptoms of heat-related disorders and how to prevent them.

You can find more information on heat stress in the WorkSafeBC publication *Preventing Heat Stress at Work* and in sections 7.26–7.32 of the Regulation.

Cold stress

Similar requirements exist when a worker may be exposed to conditions that could cause the body's core temperature to drop below 36°C, which can result in cold stress. Cold stress can lead to health problems such as hypothermia and cold-related injuries such as frostbite.

The requirements for risk assessment, implementation of an exposure control plan, and instruction and training of workers are the same as for heat stress. In addition, if the thermal environment has an equivalent chill temperature below -7°C, a heated shelter must be provided. This may be necessary when workers are working on the exterior of a building or working in an unheated building during winter.

Any worker who shows or reports signs or symptoms of thermal stress (heat or cold) must be removed from further exposure and examined by either a physician or a Level 2 or 3 first aid attendant. Employers must ensure adequate access to this level of care.

You can find more information on cold stress in sections 7.33–7.38 of the Regulation.

Respiratory protection

Employers must supply workers with respirators that are adequate for the anticipated hazard and level of exposure. Employers must also ensure that workers wear those respirators.

In most cases, workers must use respirators during all stages of a project in which the risk of exposure to airborne asbestos fibres exists or could develop. During initial set-up at a site, the type of asbestos and the amount of contamination in the area will determine the need for a respirator. For example, with non-friable materials such as vinyl-asbestos tile, workers normally do not need a respirator until the actual work begins. With other materials, workers may need a respirator even during survey and set-up.

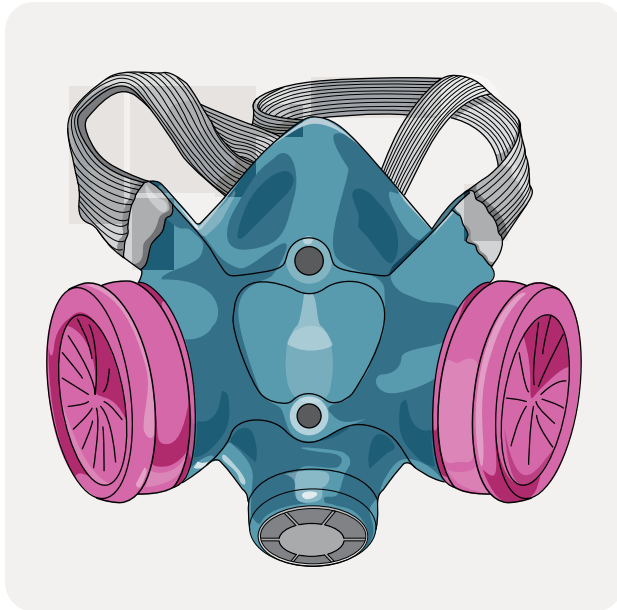
The need for and type of respirators are two of the elements that will have been determined during:

- The risk assessment, which establishes whether the work involves low-, moderate-, or high-risk activity
- The development of the exposure control plan and the site work procedures

Respirators for use around asbestos fall into one of two categories: air-purifying respirators or air-supplying respirators. So-called “single-use” or “disposable” respirators are prohibited for protection against asbestos.

Air-purifying respirators (APRs and PAPRs)

Air-purifying respirators (APRs) for protection against asbestos have P100 (HEPA) filters to remove asbestos fibres from the air around workers and protect them from breathing in asbestos fibres. A powered air-purifying respirator (PAPR) uses a battery-powered blower to pull air through the P100 (HEPA) filter(s) and into the facepiece. Both APRs and PAPRs may be either half-facepiece or full-facepiece respirators, and will have different assigned protection factors. For more information, see the WorkSafeBC publication *Breathe Safer* and Part 8 of the Regulation.



Workers can use half-facepiece, dual-cartridge respirators with P100 (HEPA) filters in asbestos concentrations up to 1 fibre per millilitre.



Workers can use full-facepiece PAPRs with P100 (HEPA) filters in asbestos concentrations up to 10 fibres per millilitre.

Air-supplying respirators (SARs and SCBAs)

Unlike air-purifying respirators, air-supplying respirators provide an attached supply of breathing air. The two basic types of air-supplying respirators are supplied-air respirators (SARs, or airline respirators) and self-contained breathing apparatus (SCBAs).

Air-supplying respirators feed clean air through a hose called an airline, which is attached to either an air tank or an air compressor. Air-supplying respirators may be either pressure-demand or continuous-flow types, as described below:

- Pressure-demand respirators maintain a positive pressure in the facepiece, which allows clean air to leak out without allowing contaminated air to leak in.
- Continuous-flow respirators deliver a constant supply of air to the facepiece, which also maintains a positive pressure.

Self-contained breathing apparatus provide a supply of air from a cylinder. Asbestos-related activities rarely require the use of SCBAs. When they do, however, asbestos-related activities require pressure-demand SCBAs, which draw air into the facepiece whenever pressure in the facepiece goes down due to leakage or inhalation.

Note

All types of air-supplying respirators used for protection against asbestos fibres must be equipped with backup P100 (HEPA) filters or an escape bottle in case the air source is cut off.

Choosing the right respirator

Employers must establish a respiratory protection standard for a specific job. This is done by selecting an appropriate respirator based on anticipated or established airborne asbestos concentrations for that job. The following table outlines appropriate respirator choices, which are determined by maximum use concentrations as detailed in Table 8-1 of the Regulation.

As the asbestos fibre concentration approaches the maximum use concentration for the respirator being used, workers must switch to a respirator with a higher protection factor.

Asbestos (all types) maximum use concentration (in fibres per millilitre*)	Minimum respirator choice for the specified maximum use concentration	
	Air-purifying respirators with P100 (HEPA) filters	Air-supplying respirators
Up to 1 f/mL	<ul style="list-style-type: none">Half-facepiece respiratorLoose-fitting facepiece or hood, powered (PAPR)	
Up to 5 f/mL	<ul style="list-style-type: none">Full-facepiece respirator	
Up to 10 f/mL	<ul style="list-style-type: none">Powered full-facepiece respirator (PAPR)Hood or helmet facepiece, powered (PAPR), provided the manufacturer has demonstrated a protection factor of at least 1,000	
Up to 100 f/mL		<ul style="list-style-type: none">Pressure-demand full-facepiece supplied-air respirator (SAR)Continuous-flow full-facepiece supplied-air respirator (SAR)
Up to 1000 f/mL		<ul style="list-style-type: none">Pressure-demand self-contained breathing apparatus (SCBA)

* Fibres per millilitre (f/mL) is equivalent to fibres per cubic centimetre.

Workers must use respirators and air filters approved by the CSA, NIOSH, or the U.S. Mine Safety and Health Administration (MSHA). Before workers can use respirators that are not approved by these agencies, the respirators must meet other standards acceptable to WorkSafeBC. Employers must submit the respirator in question and its documentation to WorkSafeBC.

Checking for proper operation and fit

Employers must provide fit testing when a worker is first fitted with a respirator and once a year after that. For more information, see “Fit testing” beginning on page 108.

Using one of the following procedures, workers must check the operation of their respirators and perform a seal check before each use.

Note

If a worker is required to wear a respirator that requires an effective seal with the face for proper functioning, the worker must be clean-shaven where the respirator seals with the face.

How to perform a seal check

Non-powered air-purifying respirators (APRs)

1. Check the seal of the APR using one of the following methods:
 - Block the inhalation valves by placing your hands over the filters and inhaling. If the respirator is sealed correctly, cutting off the air supply will cause the facepiece to collapse.
 - Block the exhalation valve and blow into the respirator. If the respirator is sealed correctly, the facepiece will bulge.
2. If the facepiece does not collapse or bulge, either it is not sealed correctly or the valves are leaking. Correct the problem and recheck.

Powered air-purifying respirators (PAPRs)

1. Install a new battery in the blower unit, and remove the blower hose from the facepiece.
2. Test the battery using a PAPR flow tester to ensure an adequate flow of air, in accordance with the respirator manufacturer’s specifications.
3. Install filters in the PAPR unit and retest it on the flow tester to ensure that the filters are not plugged. Dispose of the filters as asbestos waste if the flow tester indicates inadequate airflow or if the cartridges become wet. Reattach the blower hose to the facepiece.
4. Put on the facepiece and adjust the straps to ensure a proper fit.
5. Switch on the PAPR and hold the palm of one hand over one facepiece exhaust port. With the other hand, feel the release of air from the other exhaust port. If no air is released, take a deep breath and blow sharply into the facepiece. This should free the stuck diaphragm in the exhaust port and allow air to be released. Do this step for both exhaust ports.
6. For loose-fitting facepiece, hood, or helmet PAPRs, check the fit in accordance with the manufacturer’s instructions.

Air-supplying respirators

Air-supplying respirators must be fit tested in accordance with CSA Standard Z94.4. You can find information on the fit testing and proper use of air-supplying respirators in the WorkSafeBC publication *Breathe Safer*.

Part 5:

Emergencies and incidents

Preparing for emergencies

Employers must conduct site-specific risk assessments and prepare for emergencies. Written emergency procedures must describe what to do in the event of any likely incident. Examples of such procedures include what to do if a worker's air supply or negative-pressure ventilation system fails, how to avoid contamination if a fire breaks out, or how to deal with an injury.

Employers must prepare a written emergency plan for each individual worksite. This plan must include written procedures for evacuating workers from the contaminated work area in a medical emergency. Employers must also assign a worker (e.g., an occupational first aid attendant) to coordinate the implementation of the procedures.

As soon as a written emergency plan is developed, employers must do the following:

- Conduct emergency drills to determine whether the procedures work in practice and to thoroughly familiarize workers with their roles in an actual emergency.
- Keep records of emergency drills to monitor efficiency.
- Provide enough training to ensure that workers clearly understand the procedures.
- Post the procedures and other relevant information (such as telephone numbers) in appropriate, prominent locations.

Medical emergency procedures

If a medical emergency occurs in an asbestos work area as a result of an incident or collapse, standard protective measures may be temporarily ignored if they would otherwise cause an immediate threat to the worker's life or recovery. For example, a worker's respirator may be immediately removed so that mouth-to-mouth resuscitation can be performed, or a worker's contaminated clothing may be left on if a spinal injury is suspected.

If protective equipment and clothing can be left in place without interfering with the emergency care of the injured worker in a contaminated area, they should not be removed until the worker has been brought to an uncontaminated area. On-site decontamination procedures should be carried out only if they do not interfere with medical emergency procedures.

When first aid, ambulance, or other emergency personnel have to enter a contaminated area, they must be warned of the hazard and be provided with, and told how to use, respirators, coveralls, and other PPE before entering the area. (In view of the hazard, some emergency responders may refuse to enter the contaminated area.)

Employers must ensure that emergency procedures and preparations provide emergency personnel with clear instructions, provisions, and the means to adequately decontaminate or clean themselves and the injured worker before leaving the worksite. For example, first aid or ambulance personnel accompanying an injured worker can remove contaminated equipment and clothing in the equipment holding room to minimize the risk of contaminating other areas outside the containment area.

Injured workers who have not been decontaminated must be covered in such a way as to minimize contamination of clean areas. The cover should not hinder access to the worker by first aid or ambulance personnel. Someone familiar with the handling and disposal of asbestos-contaminated clothing should accompany the injured worker to the hospital. If the worker is still contaminated with asbestos upon arrival at the hospital, the employer must inform hospital staff of this and instruct them on the appropriate disposal of contaminated clothing. The employer's written emergency procedures must detail the collection and handling of contaminated materials in such a situation.

Investigating incidents

Investigation of incidents is important for preventing accidents. As far as possible, the investigation must do the following:

- Determine the causes of the incident.
- Identify any unsafe conditions, acts, or procedures that contributed to the incident.
- Recommend corrective action to prevent similar incidents.

Employers must conduct a formal investigation to discover the causes of an incident. Any of the following should be considered an incident:

- An individual encounters asbestos unexpectedly.
- An air sample indicates high asbestos levels in a clean room or outside area.
- An individual sustains an exposure that has the potential to cause serious injury or death.

Note: Because the health effects of asbestos tend to show up years after exposure, the seriousness of an exposure should not be judged by whether or not the individual requires immediate medical attention.

The formal investigation must also examine measures that will prevent similar situations in the future. Employers must forward the final investigation report to WorkSafeBC.

For more information on employer incident investigations and the reporting process, visit [worksafebc.com](https://www.worksafebc.com) and enter “employer investigations” in the search box.

What is an incident?

The Regulation defines an incident as “an accident or other occurrence which resulted in or had the potential for causing an injury or occupational disease.”

Emergency information

Fill in this information now, before an emergency occurs.

Ambulance telephone	
Fire department telephone	
Doctor/first aid telephone	
Hospital telephone	
Contacts to notify in emergency situations:	
Name	Telephone
Name	Telephone
Name	Telephone
Name	Telephone
Name	Telephone
Name	Telephone
Name	Telephone
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Appendices

Sample exposure control plan for cutting small amounts (<3 m ²) of gypsum board containing asbestos	96
Sample respirator program for asbestos work.	102

Sample exposure control plan for cutting small amounts (<3 m²) of gypsum board containing asbestos

Note

Cutting asbestos-containing gypsum board or drywall mud without proper controls can release asbestos fibres into the air. Breathing in asbestos fibres can cause asbestosis (a serious lung disease characterized by scarring and thickening of the lungs), mesothelioma, and other lung cancers. These diseases can result in death.

Contractor company information

- Name
- Address
- Contact information (names and phone numbers)

Worksite information

- Project name
- Address

Health hazards from asbestos exposure

Asbestos is a hazardous material. Its fibres are extremely fine and can remain suspended in the air for hours. Workers exposed to asbestos-contaminated air can inhale the fibres. If handled without precautions, such as appropriate respiratory protection, asbestos may cause serious chronic health problems or even death. Potential health problems include the following:

- Asbestosis is a chronic lung disease resulting from prolonged exposure to asbestos dust. The fibres gradually cause the lungs to become scarred and stiff, making breathing difficult.
- Asbestos fibres in the lungs may cause lung cancer. Smoking tobacco in combination with inhaling asbestos greatly increases the risk of developing lung cancer.
- Mesothelioma is a rare, rapidly progressing, malignant form of cancer affecting the lining of the chest or the abdominal cavity. There is a strong link between asbestos exposure and mesothelioma.

Due to the relationship between asbestos exposure and cancer, exposure to asbestos fibres must be kept as low as reasonably achievable.

Purpose and responsibilities

We have a duty to protect our workers from exposure to asbestos fibres when asbestos-containing materials are disturbed. Studies show that the cutting or breaking of asbestos-containing gypsum board or drywall mud can release asbestos fibres into the air.

Effective controls are available to protect workers from exposure to these fibres.

We know that a combination of control measures will be required to achieve this objective. We commit to being diligent in our efforts to select the most effective control technologies available, and to ensure that the best practices, as described in this exposure control plan (ECP), are followed at our worksites.

The work procedures we establish for cutting asbestos-containing gypsum board will protect not only our workers but also all other workers on site.

Employer responsibilities

- Ensure that the materials (such as tools, equipment, personal protective equipment [PPE]) and other resources (such as worker training) required to fully implement and maintain this ECP are readily available where and when they are required.
- Conduct a periodic review (at least annually) of the effectiveness of the ECP. This includes a review of available asbestos control technologies to ensure that these are selected and used when practicable.
- Ensure that all required tools, equipment, and PPE are readily available and used as required by the ECP.
- Ensure that supervisors and workers are educated and trained to an acceptable level of competency.
- Ensure that all workers have valid asbestos certificates and that the company is licensed. Ensure that the licence is valid and current.
- Maintain records of training, fit-test results, crew talks, and inspections (e.g., of equipment, PPE, and work methods).
- Coordinate the work with other employers to ensure a safe work environment.

Asbestos program administrator [insert name here] responsibilities

- Administer the overall program, including the maintenance of records.
- Review the program on an annual basis with the joint health and safety committee (or the worker health and safety representative, if applicable).

Supervisor responsibilities

- Provide adequate instruction to workers on the hazards associated with the cutting of asbestos-containing gypsum board.
- Select and implement the appropriate control measures.
- Ensure that workers using respirators have been properly fit tested and that the results are recorded.

- Direct the work in a manner that ensures that the risk to workers is minimized and adequately controlled.
- Liaise with other employers to ensure a safe work environment.
- Follow the terms and conditions of the asbestos certificate, if certified.

Worker responsibilities

- Use the assigned protective equipment in an effective and safe manner.
- Follow established work procedures as directed by the supervisor.
- Report any unsafe conditions or acts to the supervisor.
- Know how to report exposure incidents.
- Follow the terms and conditions of the asbestos certificate, if certified.

Risk identification and assessment

Asbestos is a fibrous mineral that's very tough and resistant to chemicals and heat. It was regularly used in a large number of building products, including ceiling texture, drywall mud, flooring, and attic insulation. If these materials are disturbed (such as when they are drilled, sawed, sanded, or broken up during renovations or demolition), workers can breathe in asbestos fibres. If people breathe in enough asbestos fibres, their lungs can suffer damage, making breathing very difficult and potentially resulting in cancer and death.

Gypsum board taping or finishing compounds (also known as drywall mud) can contain from less than 1 to 3% asbestos fibres. Rarely, the gypsum board itself may also contain small amounts of asbestos.

When cutting asbestos-containing gypsum board, the use of proper dust controls, PPE, and safe work procedures can help reduce worker exposure to asbestos.

Exposure limit

The 8-hour occupational exposure limit for asbestos (all forms) is 0.1 fibre per millilitre (fibre per cubic centimetre).

Because asbestos exposure is linked to lung cancer, the ALARA principle also applies. Workplace exposures must be reduced to levels as low as reasonably achievable.

Control of asbestos fibres

The Regulation requires employers to select asbestos controls based on the following hierarchy:

- Engineering controls (e.g., local exhaust ventilation using a HEPA vacuum)
- Administrative controls (e.g., cutting when other workers are not in the area)
- PPE (e.g., respirators and disposable coveralls)

Respirators will be used in conjunction with other controls, such as local exhaust ventilation, to reduce worker exposure to asbestos fibres.

A HEPA vacuum will be used for cleanup and decontamination.

Acceptable control methods for cutting asbestos-containing gypsum board

The work methods that appear in Table 1 are acceptable, provided that the respirator selection and other controls are adhered to. The control options in the following table will be used to eliminate or reduce the risk to workers from the hazards of exposure to asbestos fibres.

Table 1

Work activity	Dust suppression	Other controls	PPE
Small cuts of less than 1 m ² , using a knife or a hand-powered gypsum board saw	<ul style="list-style-type: none"> Water misting 	<ul style="list-style-type: none"> Remove all unnecessary objects from the work area. Use poly drop sheets. Use barriers (e.g., tape barrier) to restrict access to the work area and identify the hazard. 	<ul style="list-style-type: none"> Half-facepiece respirator with P100 series (HEPA) filters Disposable coveralls (e.g., Tyvek type)
Larger cuts (less than 3 m ²) or multiple cuts in one area, using a knife or a hand-powered gypsum board saw	<ul style="list-style-type: none"> Water misting HEPA vacuum extraction 	<ul style="list-style-type: none"> Remove all unnecessary objects from the work area. Use poly drop sheets. Use barriers (e.g., tape barrier) to restrict access to the work area and identify the hazard. 	<ul style="list-style-type: none"> Half-facepiece respirator with P100 series (HEPA) filters Disposable coveralls (e.g., Tyvek type) with head covering
Larger cuts (less than 3 m ²) or multiple cuts in one area, using a Kett saw (saw blade powered by an electric drill, provided with a HEPA vacuum attachment)	<ul style="list-style-type: none"> HEPA vacuum extraction 	<ul style="list-style-type: none"> Remove all unnecessary objects from the work area. Use poly drop sheets. Use barriers (e.g., tape barrier) to restrict access to the work area and identify the hazard. 	<ul style="list-style-type: none"> Half-facepiece respirator with P100 series (HEPA) filters Disposable coveralls (e.g., Tyvek type) with head covering

Respirators

- Each worker will be fit tested if a respirator is required.
- If a worker is required to wear a respirator that requires an effective seal with the face for proper functioning, the worker must be clean-shaven where the respirator seals with the face.
- When the worker notices a resistance to breathing, the respirator filters must be replaced.
- Respirators will be used, cleaned, and stored in accordance with the respirator program.

Other PPE and hygiene

- Workers will wear disposable coveralls (e.g., Tyvek) when working with asbestos-containing materials or entering a work area contaminated with asbestos.
- Other PPE, such as protective eyewear or hearing protection, will be worn as required.
- On active construction sites that require equipment such as hard hats or high-visibility vests, this PPE will be worn in work or sampling areas. If equipment worn in a contaminated area cannot be adequately decontaminated, the equipment will be disposed of.

Safe work planning

- Select one or more of the methods described in Table 1. Establish a barrier around the work zone to restrict access by unprotected workers.
- Place polyethylene sheeting below the work area to catch any debris released during the work activity.
- Inspect all dust-control equipment and tools to make sure they are in good working order.
- Use and maintain all tools and equipment as specified by the manufacturer. For example, test the effectiveness of HEPA filters using polyalphaolefin (PAO) testing or similar means at least annually and any time a HEPA filter is replaced in a vacuum cleaner or ventilation system.
- When working on a multi-employer site, provide the general contractor with a copy of the asbestos exposure control plan and safe work procedures. Review the procedures and work schedule to determine whether additional measures are required to reduce worker exposure to asbestos fibres.
- Ensure that workers inspect their respirators before beginning work.
- If a Kett saw (saw blade powered by an electric drill, provided with a HEPA vacuum attachment) is used, visually monitor dust release from the equipment during use. When tools and equipment are working properly, very little dust should be visible in the air. Stop work if excessive dust is observed.

Cleanup and decontamination

There are a number of different methods of decontamination. Selection of the correct method will depend on factors such as the work activities being conducted, the type of PPE worn, the nature of the containment, and the extent of the contamination. The following procedure can be considered a general guideline for decontamination after moderate-risk activities:

1. All decontamination must take place within the restricted zone.
2. Use a certified HEPA-filtered vacuum cleaner or wet methods (washcloths, mops, etc.) to remove all visible asbestos-containing materials in the work area.
3. Wet wipe all equipment and PPE. Wiping rags should only be used once. If using a bucket to wet the rags, wet the rags before wiping, and do not rewet the rags.
4. Damp wipe the work area.
5. Place waste material (including wipes) in a designated waste bag.

6. Carefully roll up any polyethylene drop sheets and place them in a designated waste bag.
7. In a clean area, remove and discard disposable coveralls (and booties) in the designated waste bag.
8. Use a wash bucket and wet cloths to wipe any potentially contaminated exposed skin areas (forehead, cheeks, etc.).
9. Seal the waste bag, wet wipe the outside of it, and then place it in a second bag. Label the outer bag to identify its contents, the hazards, and the necessary precautions for handling the waste materials. All asbestos waste must be disposed of in a duly authorized hazardous waste landfill.
10. Remove and clean respirators. Use duct tape to cover HEPA cartridge inlets.
11. Wash hands and face.

Worker training for asbestos exposure

Training will be conducted by the employer or the employer's designate. Records of attendance, dates of training, and training material will be documented and retained.

Additional training or reference material on asbestos exposure will be made available to workers upon request.

Training topics will include:

- Asbestos recognition
- Health hazards of asbestos exposure (including signs and symptoms of asbestosis and mesothelioma)
- Operations and materials that can produce asbestos exposures
- Engineering controls and safe work practices used to protect workers
- The importance of proper equipment control and maintenance
- Proper use of respirators and the respirator program
- Personal hygiene procedures to reduce exposures
- The details of the exposure control plan for asbestos

All abatement workers must hold valid asbestos certificates.

Health surveillance

Workers who are regularly exposed to asbestos fibres should receive regular medical examinations from their family physicians. These examinations may include lung function testing and chest x-rays.

Workers will report any symptoms of asbestos exposure to the employer and WorkSafeBC for tracking and investigation.

Annual review

This ECP will be reviewed at least annually and updated as necessary by the employer, in consultation with the joint health and safety committee (or the worker health and safety representative, if applicable).

Sample respirator program for asbestos work

Purpose

[Company name] has determined that our workers in [locations/departments] are potentially exposed to the following respiratory hazards during routine operations:

Asbestos	
Respirable silica	

The purpose of this program is to ensure that respirators used by our workers provide effective protection against airborne contaminants in our workplaces.

Note that before considering respirators as a way to control exposure, the employer is required to first consider engineering or administrative controls to eliminate or minimize the risk of exposure. Examples of such controls include ventilation, enclosing the process, substituting less hazardous products, and other effective means.

Responsibilities

Employer

The employer is responsible for the following:

- Implementing a written respirator program and designating a respirator program administrator
- Ensuring that the worksite is evaluated for breathing hazards
- Eliminating or minimizing all breathing hazards
- Providing and maintaining respirators needed for any airborne hazard present at the worksite, and ensuring that workers use the equipment when required
- Providing materials for workers to use to clean their respirators
- Providing supervisors with the education and training necessary to ensure that workers use respirators safely
- Providing workers with the education, training, and supervision necessary for safe use of respirators

- Developing emergency evacuation procedures and ensuring that supervisors and workers receive appropriate training in any workplace where workers may need to be rescued or evacuated because of breathing hazards
- Ensuring that all illnesses or injuries resulting from breathing hazards and requiring medical aid are reported and recorded
- Requiring a medical assessment if there is a concern about a worker's ability to wear a respirator

Program administrator

The program administrator [insert name] is responsible for the following:

- Assessing the type and amount of exposure
- Selecting the appropriate respirators
- Implementing training and instruction programs
- Administering the overall program, including the maintenance of records
- Reviewing the program on an annual basis

Supervisors

Supervisors are responsible for ensuring the following:

- Workers are aware of breathing hazards at the worksites.
- Respirators are available when required.
- Workers use respirators correctly, as required.
- Workers are clean-shaven if using a respirator that requires a seal with the face.
- Respirators are properly cleaned, inspected, maintained, and stored.
- Workers are aware of any equipment or clothing that may interfere with respirator use.
- Working conditions are monitored in order to alert supervisors to exposure to higher concentrations of a contaminant or to a new contaminant.
- Workers are aware of potential issues that may develop during respirator use, such as discomfort, skin irritation, or breathing difficulty.
- The program administrator is notified of concerns or conditions that might affect workers' respiratory protection.

Workers

Workers are responsible for the following:

- Understanding and following safe work procedures
- Using respirators as instructed
- Understanding the limitations of respirators and following the manufacturers' instructions
- Inspecting respirators before use
- Immediately reporting any equipment problems to a supervisor
- Properly cleaning and storing respirators

Respirator selection

The selection of a respirator must be appropriate to the contaminant, its concentration, and the level of protection provided by the respirator (i.e., the protection factor and maximum use concentration).

Only respirators bearing NIOSH/MSHA (U.S. Mine Safety and Health Administration) approval or other respirators acceptable to WorkSafeBC will be provided to workers.

The following respirators are available to workers and are to be worn for the work activities listed below.

Work activity	Contaminants	Type of respirator
Moderate-risk asbestos abatement	Asbestos (and silica where drywall is removed)	<ul style="list-style-type: none">• Half-facepiece respirator• Loose-fitting facepiece or hood, powered (PAPR)
High-risk asbestos abatement	Asbestos (and silica where drywall is removed)	<ul style="list-style-type: none">• Full-facepiece powered (PAPR) respirator

Always read cartridge or filter labels and instruction manuals prior to use, and be certain the correct cartridge or filter is selected. For example:

- Organic vapour cartridge respirators may not provide adequate protection against isocyanate-based automotive paints.
- Only fume-rated particle masks provide protection against welding fumes.

Respirator fitting

To fit properly and provide protection, respirators that are designed to fit the face, such as elastomeric half-masks, must have an effective seal. Workers using this type of respirator must be clean-shaven in the area where the respirator seals with the face (i.e., no visible stubble). Workers will receive a fit test once a year.

[insert name] will arrange fit testing and keep records of the results of these tests.

Worker training

Every worker who may have to wear a respirator will be trained in the proper use of the respirator. Both the worker and their supervisor will receive this training. The training includes:

- A description of the type and amount of exposure
- A description of the respirator
- The intended use and limitations of the respirator
- Proper wearing, adjustment, and testing for fit
- Cleaning and storage methods
- Inspection and maintenance procedures

This training is repeated as often as necessary, at least annually, to ensure that workers remain familiar with the proper use of the respirators. A record will be kept of this training.

The training program is evaluated at least annually by [insert name] to determine that it continues to be effective.

Always refer to the manufacturer's respirator instruction manual for information.

Proper use of respirators

- Corrective eyewear or other equipment must not interfere with the seal of the respirator.
- No covering that passes between the respirator facepiece and the wearer's face can be used.
- Respirators will be inspected before and after each use. Straps, valves, cartridges, other respirator parts, and general cleanliness will be checked. See the respirator instruction manual.
- User seal checks will be performed, where applicable, by respirator users each time they put on their respirators.
- High contaminant levels and other factors, such as high humidity, can affect filters or cartridges. Workers noticing a resistance to breathing, a smell or taste of chemicals within the respirator, or an irritation must immediately leave the work area and report to their supervisor. After an investigation rules out other reasons, such as failure of ventilation systems, respirators must be checked and new filters or cartridges installed.
- When wearing respirators, workers experiencing any of the following must leave the contaminated area:
 - Nausea
 - Dizziness
 - Eye irritation
 - Unusual odour or taste
 - Excessive fatigue
 - Difficulty breathing

- The program administrator will determine whether or not a worker may be allowed to wear a respirator. Where there is any doubt on the part of the worker or program administrator about the worker's ability to wear a respirator, the worker is to be examined by a physician. Certain medical conditions, such as lung disease (e.g., asthma or emphysema) or heart disease, may affect the worker's ability to wear a respirator.

Cleaning, maintenance, and storage of respirators

Respirators will be cleaned, maintained, and stored as described by the manufacturer's instructions. Where respirators are shared, they will be cleaned and sanitized after each use. Follow the manufacturer's recommendations for sanitizing.

The following procedure can be used to clean and sanitize most respirators:

1. Remove any filters, cartridges, or canisters.
2. Wash the respirator (and associated parts) in warm water mixed with a mild detergent (or a mild detergent plus bleach).
3. Rinse the respirator in clean, warm water.
4. Wipe the respirator with disinfectant wipes (70% isopropyl alcohol) or a sanitizing foam to kill germs.
5. Air-dry in a clean area.
6. Reassemble the respirator (e.g., replace the cartridges).
7. Place in a clean, dry plastic bag (or other container).

Defective respirators must not be used. If during an inspection a worker discovers a fault or defect in a respirator, the worker will bring it to the attention of the supervisor. The worker or supervisor will attempt to repair the defective respirator. If the respirator cannot be repaired, it will be given to the program administrator.

The program administrator will then do one of the following:

- Perform a simple fix, such as the replacement of a valve or head strap.
- Take the respirator out of service until it can be repaired.
- Dispose of the defective respirator and provide a new one.

A supply of replacement parts, filters, cartridges, and so on is available at [location].

After inspection, cleaning, and necessary repairs, respirators will be properly stored in plastic bags, storage cabinets, or lockers.

Respirator fitting procedures

When you are satisfied that you have found a respirator that fits, there are two simple checks to test the seal. You must do at least one of these checks each time you put on your respirator.

Before doing any seal check, make sure your respirator has all its inlet and exhaust valves. Make sure that the valves are in good condition and lie flat. Doing these checks will help you tell whether you have a good seal and whether the valves are in place and working.

If the respirator is to be used with any other PPE — such as goggles, hearing protection, or a hard hat — all seal checks must be done while you are wearing this equipment.

Negative-pressure user seal check

This test is called a “negative-pressure” user seal check because you create a slightly negative air pressure inside the respirator facepiece by inhaling. Follow these instructions:

1. Put on the respirator and other associated PPE. Tighten the head straps until the respirator feels snug but comfortable. Wear the respirator for a few minutes so that it will warm up and conform to your face.
2. Close off the inlet opening of the cartridges or filters by covering them gently with the palms of your hands, a plastic bag, a special adapter, or gloves. (In some cases, you may have to remove the cartridges so you can cover the inlet valves.) If you are carrying out this test while wearing a powered air-purifying respirator (PAPR) or an air-supplying respirator, close off or disconnect the hose to stop the airflow.
3. Breathe in slightly to create a vacuum.
4. Hold for 10 seconds.
5. If you have a good seal, the facepiece should collapse slightly against your face and stay collapsed. No air should leak into the facepiece past the sides, top, or bottom.



For a negative-pressure seal check, close off the inlet openings with your palms and inhale gently.

If the facepiece doesn't collapse and stay collapsed, there is an air leak. Check the exhalation valves and try repositioning the respirator on your face and adjusting the head straps. (Do not over-tighten the straps to force a seal.) Carry out the negative-pressure seal check again. If you cannot get a seal after a few attempts, try another size, make, or model of respirator. Repeat the check until you find a respirator that passes the seal check.

Positive-pressure user seal check

This test is similar to the negative-pressure user seal check except that you breathe out slightly while gently covering the exhaust valve with your palm. This creates positive pressure in the facepiece. If you have a good seal, the facepiece will bulge or puff out slightly from your face. Again, no air should leak past the sides, top, or bottom of the respirator.

1. Put on the respirator and other associated PPE. Tighten the head straps until the respirator feels snug but comfortable. Wear the respirator for a few minutes so that it will warm up and conform to your face.
2. Close off the exhaust valve opening by covering it with the palm of your hand.
3. Breathe out slightly to force air into the facepiece.
4. Hold for 10 seconds.
5. If you have a good seal, the facepiece should bulge out and stay out. No air should leak out of the facepiece past the sides, top, or bottom.



For a positive-pressure seal check, cover the exhaust valve and breathe out slightly.

If air does leak out, check the inhalation valves and try repositioning the respirator on your face and adjusting the head straps. (Do not over-tighten the straps to force a seal.) If you cannot get a seal after a few attempts, try on another size, make, or model of respirator. Repeat the check until you find a respirator that passes the seal check.

Note that the configuration of some air-purifying respirators may make it impossible to conduct an effective positive-pressure check without dislodging the facepiece. Consult the manufacturer's instructions to see whether the positive-pressure user seal check applies to the respirator.

Fit testing

After the respirator has passed either the positive- or the negative-pressure user seal check, another test of the seal, called a fit test, must be done and the results recorded.

When fit tests are performed, workers must be clean-shaven and must wear all other protective equipment that they need, such as goggles and hard hats. Prescription eyeglasses must not interfere with the seal of the respirator (specialty eyeglasses are available). Ideally, fit tests should be done under operating conditions similar to those that workers would experience at the worksite.

There are two types of fit testing: qualitative and quantitative. In qualitative fit testing, workers with poorly sealing respirators will detect an irritant, an odour, or a taste when exposed to a test agent. In quantitative fit testing, specialized equipment is used to actually measure the amount of the test agent or particulate leaking into the facepiece.

Please note that fit testing of a full-facepiece PAPR must be conducted in negative-pressure mode with the airflow pump shut off and the pump inlet sealed.

The aerosol test agents (e.g., irritant smoke, Bitrex, corn oil, etc.) used in qualitative fit testing and some quantitative methods may cause unintended reactions if the person has acute allergies, asthma, or a severe lung or respiratory problem. In these cases, it is recommended that another fit-testing method be used.

Our workplace uses qualitative fit-testing procedures conducted in accordance with CSA Standard CAN/CSA-Z94.4, Selection, Use, and Care of Respirators. Irritant smoke or bitter aerosol will be used to fit test our workers.

Irritant smoke fit test

In this test, a worker wearing a respirator is exposed to an irritating smoke (stannic chloride). If the respirator fits properly, no smoke will leak into the facepiece and be detected by the worker. If smoke does leak in, it will cause an involuntary reaction in the worker, such as coughing. It is important to follow instructions carefully to avoid exposing workers to any unnecessary smoke irritation. The smoke can be irritating to the eyes and airways.

Caution: This test agent may be an irritant to the worker being fit tested or to the tester. Do not use this test agent to fit test workers with respiratory sensitivities. The tester should consider wearing a respirator if a number of fit tests are being performed.

Irritant smoke sensitivity screening

1. Break off both ends of the smoke tube and insert one end into the rubber bulb. (Watch for the other, exposed sharp end.)
2. Squeeze the bulb to force air through the tube and produce smoke.
3. Warn the worker that the smoke can be irritating and that they should keep eyes closed throughout the test.
4. Carefully direct a small amount of the smoke in the worker's direction.
5. Discard used tubes in sharps containers at the end of the test.
6. After the worker coughs, proceed with the fit-test procedure.

Irritant smoke fit-test procedure

The worker should put on the respirator and all other PPE, such as eye protection or a hard hat. A successful seal check must be done before the fit test.

Irritant smoke tests must be conducted with facepieces equipped with combination organic vapour/acid gas (OV/AG) and P100 (HEPA) filter cartridges. After the respirator has passed the fit test, the facepiece can be fitted with the appropriate filter or cartridge necessary for protection in the workplace.

Do not place a hood or bag over the head of the test subject. The test must be performed in a location with sufficient ventilation to prevent contamination of the work area and ventilation system.

Use a well-ventilated room or area to carry out the irritant smoke tests (both threshold screening and the fit test).

The following exercises shall be performed while the respirator seal is being challenged by the smoke:

1. Normal breathing.
2. Deep breathing. Make sure breaths are deep and regular.
3. Turning head from side to side. Make sure movement is complete.
4. Nodding head up and down. Make sure motions are complete. Alert the test subject not to bump the respirator on the chest. Have the test subject inhale when their head is in the fully up position.
5. Talking. Slowly and distinctly, count backward from 100.
6. Normal breathing.

Each exercise shall be performed for one minute.

The tester will do the following:

1. While the worker performs the first fit-test exercise (above), pass the smoke stream around the perimeter of the facepiece. Direct the smoke at the facepiece seal, starting with the smoke stream about 30 cm (12 in.) away from the respirator. Go around the seal a total of three times, gradually bringing the smoke to within 5 cm (2 in.) of the respirator. If the worker does not detect the stream of smoke by coughing, continue with the next fit-test exercise. Repeat this step for each of the six exercises.
2. Because the smoke can be irritating, do not direct puffs of smoke at the eyes, and keep the smoke tube at least 5 cm (2 in.) away from unprotected skin. Ask workers to keep their eyes closed if they are being fitted with a half-facepiece respirator.
3. If the worker does not cough, then no smoke has leaked into the facepiece, and the respirator has passed the fit test. Fill out the fit-test record.

Caution: Testers must be careful with the sharp, broken end of the smoke tube. Coughing workers may unexpectedly jab themselves if they make sudden movements. The fit tester may wish to cover the broken end of the tube with a short length of tubing. Always discard used tubes in sharps containers at the end of the test.

Bitter aerosol taste fit test

In this test, a worker is exposed to a spray containing denatonium benzoate. It has an extremely bitter taste. The worker wears a respirator equipped with any particulate filter and puts on a hood that covers the head and shoulders. The fit tester exposes the worker to the bitter aerosol by spraying the test solution into the hood. Because it is a very bitter solution, it can be easily detected by the worker if it leaks through the face seal. If the worker cannot taste the bitter aerosol after the predetermined number of squeezes, it means that the respirator fits properly.

A bitter aerosol fit-testing kit can be purchased from suppliers of safety equipment. These kits contain premixed solution as well as instructions for administering the fit test.

Workers should not eat, drink (except plain water), smoke, or chew gum for at least 15 minutes before taking the bitter aerosol fit test.

Before conducting the test, make sure the worker being fit tested can detect the bitter taste by performing a threshold screening check. The threshold screening should be done under a test hood, and the worker being tested should not wear a respirator.

Caution: This test agent may affect workers with respiratory sensitivities.

Bitter aerosol threshold screening

1. Instruct the worker to breathe through a slightly open mouth with the tongue extended.
2. Ask the worker to let you know when a bitter taste can be detected.
3. Insert a nebulizer containing the threshold check solution into an opening located at the front of the test hood. Direct the spray away from the worker's breathing zone.
4. Rapidly squeeze the bulb of the nebulizer 10 times and ask whether the worker can taste the bitter aerosol.
5. If the worker cannot taste the bitter aerosol, rapidly squeeze the nebulizer bulb 10 more times and ask again whether the worker can taste it. If the response is still negative, squeeze the nebulizer bulb 10 more times.
6. Once the worker reports tasting the bitter taste, proceed with the fit test. If the worker cannot detect the bitter taste after 30 squeezes, perform a different fit test.

Bitter aerosol fit-test procedure

The worker should put on the respirator and all other PPE, such as eye protection or a hard hat. A successful seal check must be done before the fit test.

1. Prepare a solution made of bitter aerosol and salt in warm water. (The test kit may include a premixed solution.) Pour the solution into a nebulizer.
2. Have the worker put on a test hood while wearing the respirator. The front portion of the hood should be clear of the respirator and provide sufficient room for free head movement.
3. Instruct the worker to breathe through a slightly open mouth with the tongue extended. Ask the worker to let you know if a bitter taste can be detected.
4. Insert the nebulizer filled with prepared solution into the opening in the test hood directly in front of the worker's nose and mouth. Direct the spray away from the worker's breathing zone.
5. Firmly squeeze the bulb of the nebulizer containing the test solution either 10, 20, or 30 times, depending on the worker's sensitivity to the bitter aerosol (as determined by threshold screening).
6. Instruct the worker to perform the fit-test exercises on page 110 and to tell you if a bitter taste can be detected.
7. Every 30 seconds, replenish the aerosol concentration by squeezing the nebulizer bulb for half the number of squeezes used previously (i.e., use 5, 10, or 15 squeezes). Squirt the solution into the test hood.
8. If the worker reports tasting the bitter aerosol, the respirator has failed the fit test. If the worker cannot detect the bitter aerosol, the respirator has passed the fit test.

Respirator selection information form

Process/operation information		
Work area location	Various locations	
Work area characteristics (open area, confined space, etc.)	Generally within buildings — not confined spaces; some exterior work	
Location of hazardous area relative to safe area	Barrier tape, barricades, or containments will separate work areas from safe areas	
Work description/operation	Removal of asbestos-containing materials from buildings by scraping, cutting, sawing, shovelling, etc.; construction and teardown of containments	
Anticipated length of time that respirator will be used	Full shift — up to 8 hours per day	
Worker activity level (light, moderate, or heavy)	Moderate to heavy work	
Information for each breathing hazard		
Step 1	Oxygen level (if below 19.5%, air-purifying respirators cannot be used)	20.9%
Steps 1, 2	Air contaminant and concentration	<ul style="list-style-type: none"> Asbestos (moderate-risk work) — up to 0.5 fibres per millilitre (f/mL) Asbestos (high-risk work) — up to 5 f/mL Silica — up to 0.02 mg/m³
Step 3	8-hour TWA limit	<ul style="list-style-type: none"> Asbestos — 0.1 f/mL Silica — 0.025 mg/m³
Step 4	IDLH concentration	
Step 5	Can the contaminant cause eye irritation?	Yes, from particulates
Step 6	Can the contaminant irritate skin or be absorbed through the skin?	No
Step 7	Respirators under consideration and assigned protection factors	<ul style="list-style-type: none"> Half-face elastomeric — PF 10 Loose-fitting facepiece or hood, powered (PAPR) — PF 25 Powered full-facepiece respirator (PAPR) — PF 100
Step 8	Hazard ratio (minimum protection factor) = expected contaminant concentration divided by the 8-hour TWA	<ul style="list-style-type: none"> Asbestos (moderate-risk work) = 5 Asbestos (high-risk work) = 50 Silica = 1

Step 9	Maximum use concentration = 8-hour TWA multiplied by the assigned protection factor	<ul style="list-style-type: none"> • Half-face elastomeric (for asbestos) = 1 f/mL • Loose-fitting facepiece or hood, powered (PAPR) (for asbestos) = 2.5 f/mL • Powered full-facepiece respirator (PAPR) (for asbestos) = 10 f/mL • Half-face elastomeric (for silica) = 0.25 mg/m³ • Loose-fitting facepiece or hood, powered (PAPR) (for silica) = 0.63 mg/m³ • Powered full-facepiece respirator (PAPR) (for silica) = 2.5 mg/m³
Step 10	Air-supplying or air-purifying respirator?	Air-purifying respirators
Step 11	State of contaminant	<ul style="list-style-type: none"> • Asbestos — fibre • Silica — particulate
Step 12	Adequate warning properties (odour, irritation, etc.)?	None
Recommended approved respirator(s)	Half-face elastomeric can be used for moderate-risk asbestos work (and silica)	
	Loose-fitting facepiece or hood, powered (PAPR) can be used for moderate-risk asbestos work (and silica)	
	Powered full-facepiece respirator (PAPR) can be used for high-risk asbestos work (and silica)	
Recommended approved filter or cartridge	P100 HEPA filters	

Inspection checklist for air-purifying respirators

Filtering facepiece (not for use with asbestos)

Check for:

- Holes in the filters
- Worn-out (torn, no longer elastic) or missing straps
- Missing or curled valves
- Folds, creases, or distortion in the facepiece

Air-purifying respirators with replaceable cartridges or filters

Check the facepiece for:

- Dirt
- Cracks, tears, holes
- Warped surfaces
- Broken fittings (e.g., strap holders)
- Cracked, scratched, or loose-fitting lenses (full-facepiece models)
- The presence of filter seal gaskets (if the respirator has gaskets)

Check the head straps for:

- Wear and tear
- Lack of elasticity, knots
- Broken or faulty buckles

Check the valves for:

- Soap residue or dirt on valves or on the valve seat
- Cracks, tears, hardening, or warps in the valves or the valve seat
- Missing or damaged valve cover
- Valves that are curled under the valve seat

Check that the cartridges or filters are:

- Made by the same manufacturer as the respirator
- The correct type for the hazard
- Fitting securely in the facepiece (threads are not worn)
- Free from cracks or dents
- Marked with the date they were put into service

Powered air-purifying respirators (PAPRs)

In addition to the previous checklist items, check the:

- Condition of battery pack, wires, and connections
- Airflow (does it meet manufacturer's specifications?)
- Condition of breathing tube (if respirator has one)

Respirator fit-test form

Name of worker:		Date:	
Does the worker wear/have:			
<input type="checkbox"/> Eyeglasses	<input type="checkbox"/> Contact lenses	<input type="checkbox"/> Dentures	<input type="checkbox"/> Facial hair
If yes to any of the above, discuss how the respirator seal will be affected (workers must be clean-shaven where the respirator seals with the face). Other comments regarding counselling on eyeglasses, dentures, contact lenses, and facial hair:			
Does the worker have any medical concerns about wearing a respirator?			
<input type="checkbox"/> Yes <input type="checkbox"/> No			
If yes, refer the worker for a medical assessment.			
Fit-test results			
Fit testing must be repeated annually to ensure that a proper face seal is maintained.			
Check when completed successfully:		<input type="checkbox"/> Correct positioning of respirator and strap adjustment <input type="checkbox"/> Negative- and positive-pressure user seal check	
Qualitative fit testing using:		<input type="checkbox"/> Irritant smoke with HEPA/organic vapour cartridges <input type="checkbox"/> Bitter aerosol with particulate filter <input type="checkbox"/> Isoamyl acetate (banana) oil with organic vapour cartridges <input type="checkbox"/> Saccharin with particulate filter <input type="checkbox"/> Other:	
Qualitative fit testing		<input type="checkbox"/> Pass	<input type="checkbox"/> Fail

Respirators fit tested by worker			
When a worker wears different makes and models of respirators, fit testing must be done on each make and model of respirator and the results must be recorded. The worker should also wear all other required PPE, such as hearing and eye protection, while undergoing the test.			
Type of respirator	Make	Model	Size
1.			
2.			
3.			
Points discussed with the worker			
<input type="checkbox"/> Respirator selection <input type="checkbox"/> Respirator limitations <input type="checkbox"/> Storage and maintenance		<input type="checkbox"/> Cartridge dating, change frequency, and limitations <input type="checkbox"/> Where to get replacement parts	
Fit-test date:		Next fit-test date:	
Fit tested by:			
Comments:			

