Number 13

BUILDER INSIGHT

BC HOUSING
RESEARCH CENTRE

Builder Insight is a series of bulletins and companion videos designed to provide practical information on new technologies, research results, good building practices and emerging technical issues in residential construction to Licensed Residential Builders and others in the industry.
This bulletin is produced by BC Housing, in collaboration with an industry steering committee and was prepared by RDH Building Engineering Ltd.

Contents

Managing Environmental Risks During a Renovation Project

Renovating and repairing existing buildings can expose contractors, tradespeople and building occupants to a variety of health hazards. Simple precautions taken before work begins can help reduce these risks.

Renovations may release hazardous substances into the environment that create a risk of injury or illness when they are inhaled, ingested or come in contact with skin (e.g. asbestos or lead).

Renovations can also expose organic material. Sewer backups and pest infestations can result in viruses, bacteria or other organisms that negatively affect human health.

Temporary and permanent changes to building venting or heating may result in an accumulation of carbon monoxide or other harmful gases.

Because of the potential for injuries and illnesses from exposure to hazardous materials, several government offices regulate hazardous materials. Contractors, owners and tradespeople are required to comply with these regulations. The three most common regulators are:

Workers removing vinyl-asbestos tiles.

- **Municipalities** – commonly provide demolition and building permits, and regulate the disposal of hazardous or controlled materials.
- **WorkSafeBC** – controls worker exposure to hazardous or controlled materials.
- **Ministry of Environment** – controls the transport and disposal of hazardous or controlled materials, and is responsible for tracking the people, partnerships and companies that generate hazardous waste.

Why should environmental risks be identified as soon as possible?

Ideally, owners should begin thinking about hazardous materials and environmental risks during the first phase of planning a renovation project. Identifying potential environmental risks early in the process will help owners make knowledgeable and informed decisions about the scope, cost and schedules.

Discovering hazardous materials after work has started can cause delays, result in added costs and penalties, and expose workers, occupants and others visiting the site to health risks.

To protect their safety, contractors and tradespeople need to be informed of any environmental risks before they start their work.

As well, the contractor, owners and other tradespeople need time to discuss different options for addressing and reducing risks during construction. Depending on the materials found, they may need to revise the work process or change the scope of work.

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Disposal of materials may also be difficult if the material has not been tested. And finally, contractors and owners may face fines and stop-work orders if hazardous materials are found on site and safe work procedures have not been implemented.

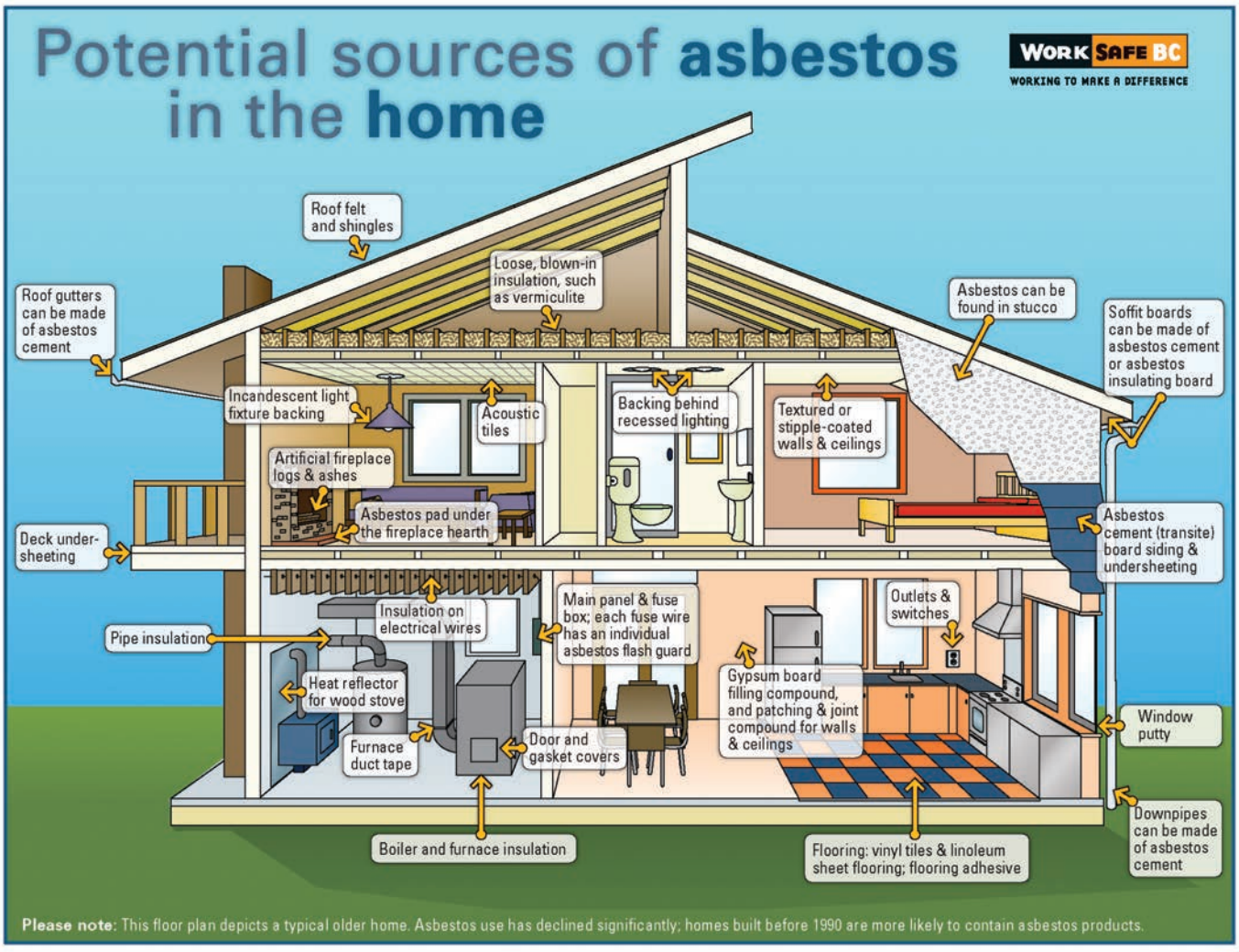
To protect their safety, contractors and tradespeople need to be informed of any environmental risks before they start their work.

Common Sources of Environmental Risks

The most common hazardous materials found in a home renovation are: asbestos, lead, mould and silica. However, other hazardous materials – and occasionally other biohazards – may also be of concern. Some examples include polychlorinated biphenyls (PCBs) in electrical equipment, mercury in fluorescent light bulbs and older thermostats, chlorine in pool rooms and decomposing organic material. Sewage is a source of risk in renovation projects that results from a sewer backup.

Other sources of risk exist during and after construction. When combustion heaters (such as propane heaters) and small engines (such as generators) are used during construction, extra care is required to make sure the area is well ventilated. As well, if the building airtightness is improved after construction, existing combustion appliances such as gas fireplaces and furnaces may no longer vent properly without adding fresh air supply. Backdrafting may occur with exhaust gases being drawn back into the building.

On the surface the building may appear safe, but earlier renovations might have covered existing hazardous materials.



Identifying Environmental Risks

Ask questions to determine how likely it is that hazardous materials may be present.

The building owner should be able to provide some basic information.

› How old is the building?

- In recent decades, substances including asbestos and lead have been banned or controlled. Buildings built since 1990s are low risk.
- Check for documentation outlining what materials were used and where. Is there a documented history of renovations? Are there hidden or covered materials?

› Have the owners already done some testing?

- Many owners have already completed a hazardous materials survey and can confirm if the building is free of hazardous materials.

› How was the building used previously?

- Abandoned piping, mechanical equipment or electrical equipment may contain hazardous materials. This is particularly true of buildings previously used for industrial, agricultural or food preparation.

Identify construction activities or changes to the building that might create environmental risks.

Possibilities include:

- Demolition
- Cutting and grinding
- Cleaning and scraping
- Accessing areas used infequently
- Changing the heating and ventilation of a building

Contractors and owners may face fines and stop work orders if hazardous materials are found on site and safe work procedures have not been implemented.

Flooding remediation.

Black mould revealed during the renovation of a basement bathroom.

Sample Targeted Materials

If you've identified specific construction activities that could disturb hazardous materials in a localized area, targeted sampling might be feasible. However, this approach does not provide information about the overall building and may miss other potential environmental risks.

Targeted sampling may be appropriate when construction work is limited or easily defined, such as during a window replacement program.

If the scope of work expands for other reasons (e.g. you decide to renovate an extra room), you may need to do additional testing that could delay the work schedule.

According to WorkSafeBC, *qualified person* means "being knowledgeable of the work, the hazards involved and the means to control the hazards, by reason of education, training, experience or a combination thereof."

Complete a Hazardous Materials Survey

A hazardous materials survey is a more comprehensive investigation intended to identify a wide range of hazardous materials in a building. These surveys must be completed by a qualified person (see definition below) and typically require some destructive testing.

Some municipalities require a hazardous materials survey when applying for a demolition permit, and whenever demolition and removal is part of the renovation process.

If you are planning on removing material that is contaminated with lead, leachate testing is required to determine if lead containing material can go to the regular landfill.

Common Approaches to Dealing with Hazardous Materials

For some hazardous materials, a qualified person must perform a risk assessment and develop safe work procedures. A qualified person is typically a third party to both the owner and the contractor. See the table on pages 8-9 to determine when a risk assessment may be required.

Recommended strategies for addressing hazardous materials or controlling environmental risks include:

- Managing and maintaining in place
- Encapsulation or enclosure
- Abatement or removal
  - Moderate-risk disturbances
  - Monitoring of air quality

Example: When removing old carpets, the original tile flooring was discovered beneath. The tiles likely contained asbestos, and the owner decided to leave them in place and install new flooring over top.

Managing and Maintaining in Place

Sometimes, it is possible to avoid disturbing potentially hazardous materials, by changing the work method or the scope of work. The owner/ contractor is responsible for identifying potential hazardous materials to workers, and taking steps to prevent workers from accidentally creating an environmental risk. This normally means putting up some form of barrier, containing the material, and posting signs.

Encapsulation or Enclosure

Encapsulation refers to covering over or containing the hazardous material with a sprayed lock down sealer or painted finish, so that the material is not released into the interior environment. This is a short term solution, as materials may be disturbed through mechanical abrasion or flood.

Enclosure refers to covering the hazardous material with a rigid barrier, such as gypsum or plywood. This is a longer term solution because the material cannot be disturbed without significant demolition.

Note that encapsulating or enclosing the hazard has implications on maintenance and future work, and the hazard needs to be tracked for future reference.

Abatement or Removal

Abatement often requires the removal of all hazardous material. Depending on the hazard, various controls might be needed during the removal process. For example, abatement of asbestos containing materials, lead and large amounts of mould generally requires the services of a qualified person to perform a risk assessment and prepare safe work procedures. Abatement of mould requires the source of moisture to be addressed to prevent reoccurrence.

This approach is the best long term solution because it reduces the possibility of a future environmental risk and decreases the potential for future maintenance costs if the materials are left in place. However, abatement or removal of a material often has a cost premium.

Moderate-Risk Disturbances

A moderate-risk disturbance simply means that the environmental risk created by a particular type of work is not high. In many cases, a few small changes to procedures can significantly reduce the environmental risk. This includes: keeping unauthorized people out of the work area, avoiding the use of power tools and minimizing dust, implementing engineering controls (e.g. ventilation), wearing personal protective equipment, and cleaning up disturbed materials in an appropriate manner.

Depending on the hazardous material, a qualified person may be required to help assess the risk level and modify the safe work procedures. See the table on pages 8-9.

Abatement of asbestos containing materials, lead and large amounts of mould generally requires the services of a qualified person to perform a risk assessment and prepare safe work procedures.

Example: A homeowner has vermiculite that contains asbestos in his attic. He was planning on installing more insulation on top of the vermiculite, but the contractor pointed out that if the owner ever wanted to do electrical work, the cost would be much higher if the vermiculite was left in place. The owner decided to remove the vermiculite and install new insulation.

Monitoring of Air Quality

Air quality monitoring can be used in a variety of circumstances and is often required when removing hazardous materials. Air monitoring involves collecting samples of air and measuring the quantity of contaminants. Depending on the hazardous material, WorkSafeBC may require a qualified third party (not the contractor) to perform this activity. WorkSafeBC also has specific requirements for the type, frequency and location of sampling, and analysis methods, based on the level of risk.

Carbon monoxide monitoring may be temporarily required during construction if combustion heaters or small engines are used. Permanent carbon monoxide alarms are recommended for all buildings and may be required if a building is more airtight after renovation work.

Environmental Hazards

	Asbestos	Vermiculite	Lead
What is the health concern?	Cancer, asbestosis and mesothelioma	May contain asbestos	Anaemia, nerve damage, reduced brain function, high blood pressure, reproductive effects
Where is it commonly found?	Finishing products like flooring, drywall and ceiling texture Exterior cladding and roofing Materials that require fire resistance, such as pipe insulation, electrical insulation Adhesives and putties	As insulation in attics and framed wall cavities Cavities in block walls	In paint, ceramic tile glazing, cast iron pipe joints and as solder on copper pipes
What age of building/ product may contain the substance?	Any, but construction after 1990 is at low risk	Any, but few buildings after 1990 use vermiculite	Interior paint: any, but construction after 1980 is at low risk Exterior paint and other materials: any, but construction after 1990 is at low risk
What activities can create an environmental risk?	Friable – any contact Non-friable – mechanical abrasion, drilling, sanding, when dust is created	Any contact	When scraping, grinding or sanding creates airborne material
How can you confirm if the material is present?	Bulk sampling and testing	Bulk sampling and testing (to confirm asbestos)	Bulk sampling and testing
Is a risk assessment by a qualified person required?	Yes	Yes	Yes
Is an exposure control plan required?	Yes	Yes	Yes
Is a Notice of Project required by WorkSafeBC?	Yes	Yes	Yes
What steps are appropriate for minimizing environmental risks?	Avoid disturbing Risk assessment by qualified person Controlled disturbance by qualified person Encapsulating / enclosure Abatement and temporary air monitoring Asbestos exposure control plan	Avoid disturbing Risk assessment by qualified person Enclosure Abatement and temporary air monitoring Asbestos exposure control plan	Avoid disturbing Encapsulating Risk assessment by qualified person Lead exposure control plan

Environmental Hazards

	Mould	Silica	Carbon Monoxide
What is the health concern?	Irritations Allergic or asthmatic reactions	Silicosis	Asphyxiation and death
Where is it commonly found?	Areas of high moisture and condensation	Quartz rock and sand Concrete Fibre cement board Granite	Buildings with combustion appliances
What age of building/product may contain the substance?	Any	Any	Any
What activities can create an environmental risk?	Surface contact Aggressive air movement (fans)	Grinding, sanding, drilling, concrete, granite counters, terrazzo floors, etc. Cutting fibre cement board siding	Airtightening the building enclosure (installing new windows and cladding)
How can you confirm if the material is present?	Air sampling	Sampling	Carbon monoxide detector
Is a risk assessment by a qualified person required?	Yes, if a large area of mould is present or suspected	Not normally required	No
Is an exposure control plan required?	Possibly, requirement varies with extent of mould growth	Yes	No
Is a Notice of Project required by WorkSafeBC?	No	Yes	No
What steps are appropriate for minimizing environmental risks?	Remove moisture source Risk assessment by qualified person Abatement, temporary air monitoring and clearance air sampling	Adhere to an effective silica exposure control plan Avoid disturbing Risk assessment by qualified person Encapsulating Abatement	Measure building airtightness Flue gas spillage test if required Completion

Roles and Responsibilities

Owner

The building owner is responsible for:

- Designating and entering into a written agreement with a prime contractor to coordinate health and safety activities, if several companies are hired (without a designated prime contractor, the owner is responsible for the safety of all workers and might be held liable if an injury or illness were to occur).
- Hiring capable companies and people, including contractors, consultants and a qualified person to do a hazardous materials survey.
- Checking qualifications, including asking for information on: experience related to hazardous materials and certifications.
- Confirming contractors have registered with WorkSafeBC and are up-to-date paying their premiums (this can be verified online at worksafebc.com).
- Passing on any information regarding potential or known hazardous materials, including historical information, to the prime contractor.

Contractor / Prime Contractor

Any contractor who employs other people is responsible for the health and safety of his or her employees (including self-employed contractors), and for complying with WorkSafeBC regulations.

If a contractor is the designated prime contractor, he or she is also responsible for coordinating health and safety activities at the jobsite for both employers and workers. The prime contractor should establish and maintain a system or process to ensure compliance with regulations.

Hazardous Materials Tradespeople

When abatement or removal of hazardous materials is required, tradespeople with specific training and experience should be hired. These tradespeople are responsible for complying with safe work procedures outlined by the qualified person. A hazardous materials contractor should have extensive experience in abatement of hazardous materials and the demolition industry.

Example: The cedar siding at a townhouse complex was being replaced, but the paint on the existing siding contained lead. The contractor provided a hand-washing station for workers, placed drop sheets below the work area to collect any paint chips, and posted signs and warning tape to keep residents out of the work area. Workers wore respirators to prevent inhaling any fragments and protective suits to avoid carrying lead containing fragments home.

Qualified Person – Environmental Consultant

A qualified person may have different titles and different competencies, but typically has formal education, training and certification. A qualified person should have education and occupational hygiene experience specific to the hazardous materials on the jobsite, and would normally have one of the following designations:

- Certified Industrial Hygienist (CIH) or Registered Occupational Hygienist (ROH)
- Certified Safety Professional (CSP) or Canadian Registered Safety Professional (CRSP)
- Professional Engineer (P.Eng)

In general, a qualified person is required to conduct a hazardous materials survey, collect sample materials and complete a risk assessment. They may help prepare an exposure control plan or review the exposure control plan (safe work procedures). During construction, they would provide air monitoring services if required.

Design Professional

Depending on the scope and nature of the project, an owner might hire a design professional, such as an engineer, interior designer, architect or building designer. Typically these professionals help plan a renovation project, including preparing drawings and specifications. These professionals should be aware of the potential for environmental hazards and should refer owners to a qualified person.

In general, a qualified person is required to conduct a hazardous materials survey or sample materials, and to complete a risk assessment.

After Construction

The building owner is required to record the location of known hazardous materials, and should disclose any known hazardous materials and their management to future purchasers and residents. Permanent warning labels and signs might be appropriate for some locations, such as inside attics, mechanical rooms or crawlspaces – particularly if regular maintenance might accidentally disturb those materials.

Key Points

Renovating and repairing existing buildings can expose contractors, tradespeople and building occupants to a variety of hazards. Simple precautions before work begins can help reduce the risks.

- Identifying potential hazards before construction starts reduces the risk of unexpected delays, cost increases and exposure to workers and others on site.
- Disturbing older building materials, addressing water or sewer leaks, or changing a building's ventilation system can result in environmental hazards both during and after construction.
- Building owners have several options to manage the environmental risks associated with hazardous materials, including managing in place, removal, enclosing/encapsulating, and not disturbing the materials. Air monitoring during and after construction can help ensure any risk management measures were effective.
- Owners, contractors, tradespeople, environmental consultants and design professionals all have a role to play in reducing environmental risks.

For More Information

1. Subscribe to receive Builder Insight bulletins published by BC Housing and available online at www.bchousing.org
2. Carbon monoxide: What you should know, FortisBC publication available at www.fortisbc.com
3. Due Diligence Checklist: Building Owners and Managers Association of British Columbia (BOMA) publication available at www.boma.bc.ca
4. WorkSafeBC bulletin series, available at www.worksafebc.com, including the following titles:
   - 10 simple steps to complying with asbestos abatement
   - Asbestos Hazards in Demolition, Renovation, and Salvage
   - Safe Work Practices for Handling Asbestos
   - Exposure control plan for cutting small amounts (< 3 square metres) of gypsum board containing asbestos
   - Lead Containing Paints and Coatings: Preventing Exposure in the Construction Industry
   - Exposure Control Plan for the Removal of Lead Containing Paint, Using Hand Tools
   - Developing a Silica Exposure Control Plan

About BC Housing Research Centre

BC Housing's Research Centre works in collaboration with housing sector partners to foster excellence in residential construction and find innovative solutions for affordable housing in British Columbia. Sharing leading-edge research, advances in building science, and new technologies encourages best practice. The Research Centre identifies and bridges research gaps to address homelessness, housing affordability, social housing challenges and the needs of distinct populations. Mobilizing knowledge and research expertise helps improve the quality of housing and leads to innovation and adoption of new construction techniques, Building Code changes, and enhanced education and training programs. Sign up to receive the latest news and updates from BC Housing's Research Centre at www.bchousing.org/subscribe.

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