Hazardous Materials in Buildings

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What are “Hazardous Materials”?

Section 20.112 of the *OHS Regulation* defines a “hazardous material” as:

a) asbestos-containing material

b) lead or any other heavy metal

c) toxic, flammable or explosive material

that may be handled, disturbed or removed in the course of the demolition or salvage of machinery, equipment, a building or a structure, or the renovation of a building or structure.

Who is at Risk?

- Building occupants
- Consultants and engineers
- Abatement contractors
- Building contractors
- Inspectors (e.g., City/Municipal)
- Insurance adjustors
- Recycling facilities workers
- Waste transfer facilities workers
- Regulators

Who is Responsible?

- Owners
- Employers
- Prime contractors
- Supervisors
- Workers
- Consultants (e.g., hazmat and engineers)

Owner

- Must maintain his/her property in a manner that ensures the health and safety of workers.
- Must give the contractor information necessary to identify and control hazards to the health and safety of workers on his/her property.

Employer

- Must ensure the health and safety of:
  - all of their workers, and
  - any other workers present at a workplace where that employer’s work is being carried out.
- Must remedy any workplace conditions that are hazardous to the health and safety of their workers.
- Must assure compliance with the OHSR.

Prime Contractor

- Directing contractor.
- Has “care and control” of the work site:
  - May give direction to other employers or sub-contractors on the site
  - May supervise some of the work.
- Has responsibility for occupational health & safety on the site.
- Must assure compliance with the OHSR.

Hazardous Materials Inspection

Before work begins, the Employer and the Owner must ensure that a Qualified Person inspects the machinery, equipment, building or structure to:

- Identify hazardous materials:
  - Collect representative samples and have them analyzed.
- Write a report of the inspection:
  - Description of hazardous materials
  - Location (using drawings, plans or specifications)
  - Quantity
- Report has to be available on the site.

Hazardous Materials Removal

- All hazardous materials identified, must be safely contained or removed before any other work begins.
- If hazardous materials that were not previously identified are discovered during the course of the work, then the work stops until the Qualified Person conducts an inspection and updates the hazmat report.
- A Qualified Person must ensure and confirm in writing that the hazardous materials have been safely contained or removed (“clearance” document).

“Clearance” Document

This document should contain:

- Address of the abatement project
- Reference to the hazardous materials survey (name of the surveyor or company and when the survey was conducted)
- Name of the abatement contractor
- Description of the scope of abatement work that was performed
- Name of the consultant, surveyor, or contractor who performed the final visual inspection
- A reference to the Notice of Project
- A reference to the waste manifest documentation (BCG#)
- A statement indicating that the abatement was conducted in accordance with regulatory requirements.

Clearance letter issued by a Certified AHERA Building Inspector

Examples of “Hazardous Materials”

Asbestos – building materials	Mercury – thermostats, fluorescent lights
Lead – paint, flashing, ceramic tile, etc.	Radioactive materials – smoke detectors, ceramic tile
Silica – building materials (e.g., concrete, stucco)	Chemicals – paints, solvents, pesticides, etc.
Biologicals – mould, bird/rodent feces, etc.	Storage tanks – fuels, compressed gases
PCBs – light ballasts, transformers, window caulking	

Asbestos

- Fibrous rock found naturally in the Earth's crust.
- Resistant to heat and chemicals.
- Fibrils are very small and not visible to the human eye – form large bundles.
- Flexible – used in many products, including consumer products.

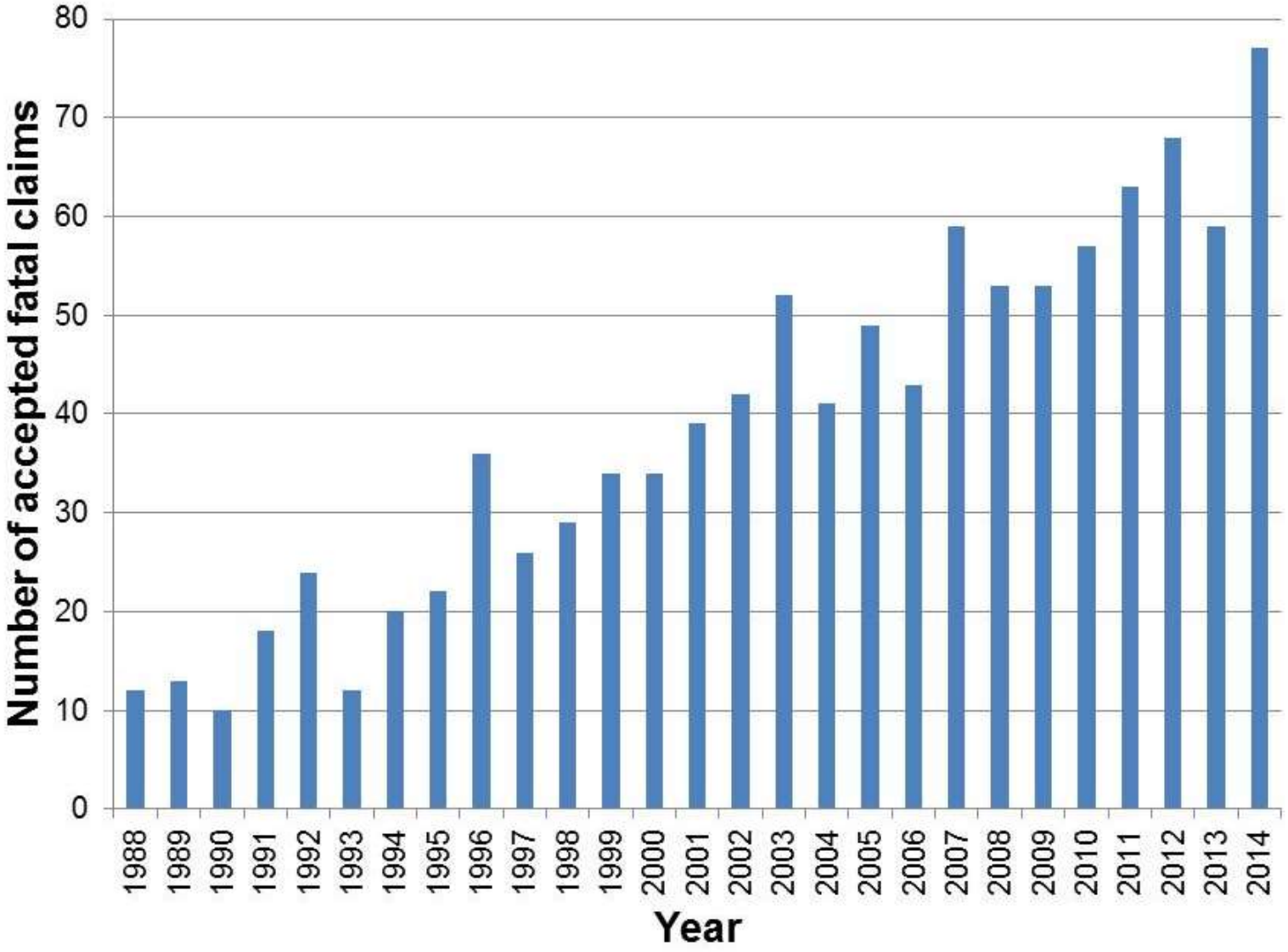
Chrysotile

Amosite

Asbestos Related Diseases

- Asbestosis (10 to 20 years after exposure)
- Lung Cancer (15 to 25 years after exposure)
- Mesothelioma (30 to 45 years after exposure – in some cases as few as 5 years)
- Exposures must be very high to get asbestosis – much lower for cancers

Asbestos – Still with us …



Definition of “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
- Vermiculite-containing insulation materials which contain any asbestos – even less than 0.5%

Asbestos Materials in Commercial and Residential Buildings

Exterior

- Asbestos cement pipes (e.g., drain pipes)
- Roof felting
- Asphalt shingles
- Soffit boards
- Stucco
- Asbestos cement siding
- Brick mortar
- Window putty
- Deck undersheathing
- Asbestos cement shingles

Flooring

- Vinyl sheet flooring and mastic
- Vinyl floor tile and mastic
- Poured flooring/leveling compound
- Asphalt flooring

Walls & Ceilings

- Drywall mud
- Plaster
- Asbestos cement board
- Textured coatings
- Ceiling tiles

Interior insulation

- Spray-applied insulation (acoustic and fireproofing)
- Vermiculite (blown-in) insulation (e.g., in attics)
- Paper backing on fibreglass insulation

Heating (HVAC) and ducting

- Furnace duct tape
- Furnace/boiler insulation
- Pipe (mechanical) insulation
- Hot water tank insulation
- Mastic
- Asbestos rope and gaskets
- Asbestos cement board
- Asbestos cardboard insulation

Other

- Fireplace box and mantel
- Artificial fireplace logs and ashes
- Fire doors
- Insulation on electrical wiring
- Fire blankets
- Chalk boards
- Heat reflectors
- Penetration firestopping
- Candescent light fixture backing (pot lights)

Guideline 20.112 Hazardous Materials - Asbestos

- What is an asbestos survey or inspection?
- Where do you find asbestos in buildings?
- How do you collect building product samples and how many samples should be collected?
- How are asbestos samples analyzed?
- Who is qualified to perform an asbestos survey?

How do You Collect Asbestos Samples?

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 these procedures represent minimum requirements. It may be necessary to upgrade PPE (such as respiratory protection) depending on the condition of the worksite and nature (for example, friability) of the materials.

1. Assemble all required PPE and tools, including disposable Tyvek coveralls (or similar) with integral head covering that fits snugly at the wrists and ankles, booties, half-face respirator with P100 HEPA cartridges, water mister, water supply, cutter tools, scoop, sample collection bags, wiping cloth or disposable talc-free wet-wipes, disposal bags, duct tape, and so on.
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 (this may be necessary when sampling very friable material such as vermiculite insulation).

Bulk material sample collection guide

Type of material	Area of homogeneous material*	Minimum number of bulk samples to be collected**
Surfacing materials, including textured coatings, drywall mud, plasters, and stucco	Less than 90 m^2 (approximately 1,000 ft^2)	At least 3 samples of each type of surfacing material
	Between 90 and 450 m^2 (approximately 5,000 ft^2)	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 and vermiculite insulation (including vermiculite insulation within concrete masonry units, or CMUs)	Less than 90 m^2 (approximately 1,000 ft^2)	At least 3 samples
	Between 90 and 450 m^2 (approximately 5,000 ft^2)	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)
Mechanical insulation, including duct taping, pipe insulation, elbows and boiler/tank insulation	Any size	At least 3 samples
Mastics and putties, including duct mastic (around penetrations) and window putty	Any size	At least 3 samples
Roofing materials, including felting and shingles	Less than 90 m^2 (approximately 1,000 ft^2)	At least 1 sample (each layer of material must be sampled)
	Between 90 and 450 m^2 (approximately 5,000 ft^2)	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
Other materials	Any size	At least 1 sample per type of material

Asbestos Inspection Results (Example)

Project Name:	Chan Residence	**Date of Survey:**	15 Oct 07
Address:	123 Anystreet, North Vancouver, B.C.	**Survey Company:**	Bob's Asbestos Consulting
Description:	Residential (house); One Storey Rancher with an Attic	**Surveyor:**	Bob Smith
Previous Renovations?	Yes, Bathroom and Kitchen (10 years ago)	**Age of Structure:**	45 Years
Laboratory Name:	Asbestos Laboratories Inc	**Analysis Method(s):**	NIOSH Method 9002 EPA/600/R-04/004

Area or Room (directions when facing house)	**Building Materials**	**Sampling Location**	**Material Collected (sample #)**	**Asbestos Type and Percentage**	**Approximate Quantity of Asbestos**
Entry	Walls and ceiling are drywall; floor is ceramic tile	Right Wall	Drywall Mud (1)	Chrysotile 1-3%	All walls and ceiling
Hallway	Walls are drywall; ceiling is textured; floor is carpet (concrete beneath)	Ceiling	Texture Coat (2)	Chrysotile 1-3%	All walls and ceiling
Living Room	Walls are drywall; ceiling is textured; floor is carpet (concrete beneath)	Ceiling	Texture Coat (3) Drywall mud (4)	Chrysotile 1-3% Chrysotile 1-3%	Ceiling All walls
Dining Room	Walls are drywall; ceiling is textured; floor is carpet (concrete beneath)	Left Wall	Drywall Mud (5)	Chrysotile 1-3%	All walls and ceiling
Kitchen	Walls and ceiling are drywall; floor is linoleum	Right Wall Floor	Drywall Mud (6) Linoleum (7)	None None	None
Bathroom	Walls and ceiling are drywall; floor is ceramic tile	Left Wall	Drywall Mud (8)	None	None
Right Bedroom	Walls are drywall; ceiling is textured; floor is carpet (concrete beneath)	Ceiling	Texture Coat (9)	Chrysotile 1-3%	All walls and ceiling
Left Bedroom	Walls are drywall; ceiling is textured; floor is carpet (concrete beneath)	Rear Wall	Drywall Mud (10)	Chrysotile 1-3%	All walls and ceiling
Attic	Insulation is fibreglass batt with vermiculite beneath	Left Attic Right Attic	Vermiculite (11) Vermiculite (12) Vermiculite (13)	Actinolite 0.7% Actinolite 1% Actinolite 1%	Entire Attic
Exterior	Exterior is wood; roof is composition shingles; aluminum frame windows	Roof	Shingle (14)	None	None
Furnace		Ducting	Tape (15)	Chrysotile 30%	All Ducting
Crawl Space	Pipe Insulation	Below kitchen	Pipe wrapping (16)	Chrysotile 35%	All crawl space piping

Lead Paint

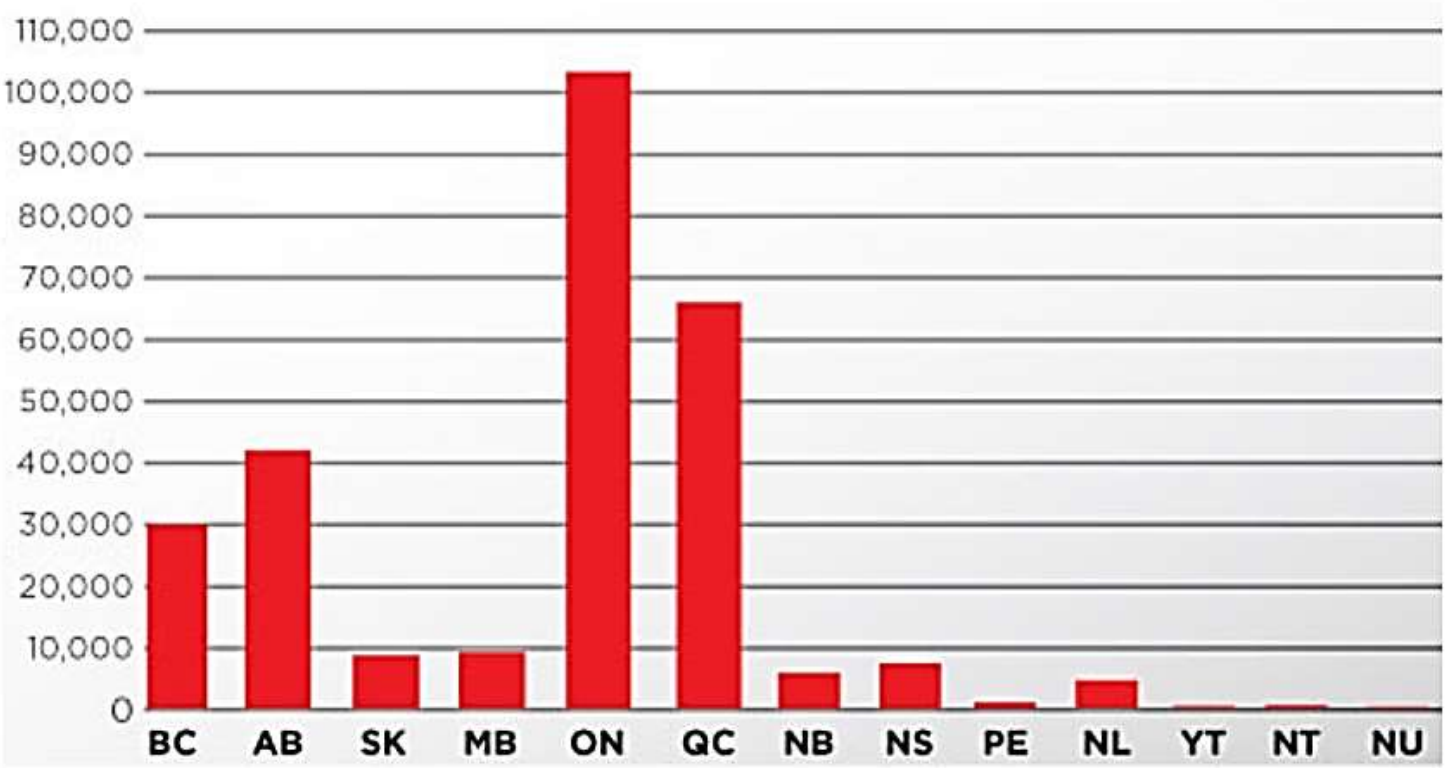
CAREX CANADA

Surveillance of environmental and occupational exposures for cancer prevention

277,000 WORKERS (EST.) > LEAD EXPOSURE IN CANADA

FIVE LARGEST EXPOSURE GROUPS BY INDUSTRY		PROPORTION OF INDUSTRY EXPOSED
Public administration	41,000	<5%
Building equipment contractors	22,000	10%
Automotive repair & maintenence	21,000	13%
Commercial & industrial machinery repair and matenence	18,000	31%
Architectural & structural metal manufacturing	10,000	15%

WORKERS EXPOSED TO LEAD BY REGION



www.carexcanada.ca

How does Lead enter your Body?

- Breathe in lead dust or fume
- Drink or eat food contaminated with lead
- Eat or drink from contaminated cups, plates, or bowls
- Bite your nails or smoke when your fingers are contaminated with lead
- Smoke or chew gum where there is lead dust or fume
- Put objects contaminated with lead in your mouth (such as pens and pencils from the work area)

What are the Health Effects?

- Anemia (loss of red blood cells)
- Nerve damage causing muscle weakness
- Decrease in brain function
- Kidney damage
- High blood pressure
- Reproductive effects in both men and women
- Mental and physical problems in children
- Possible/probable human carcinogen

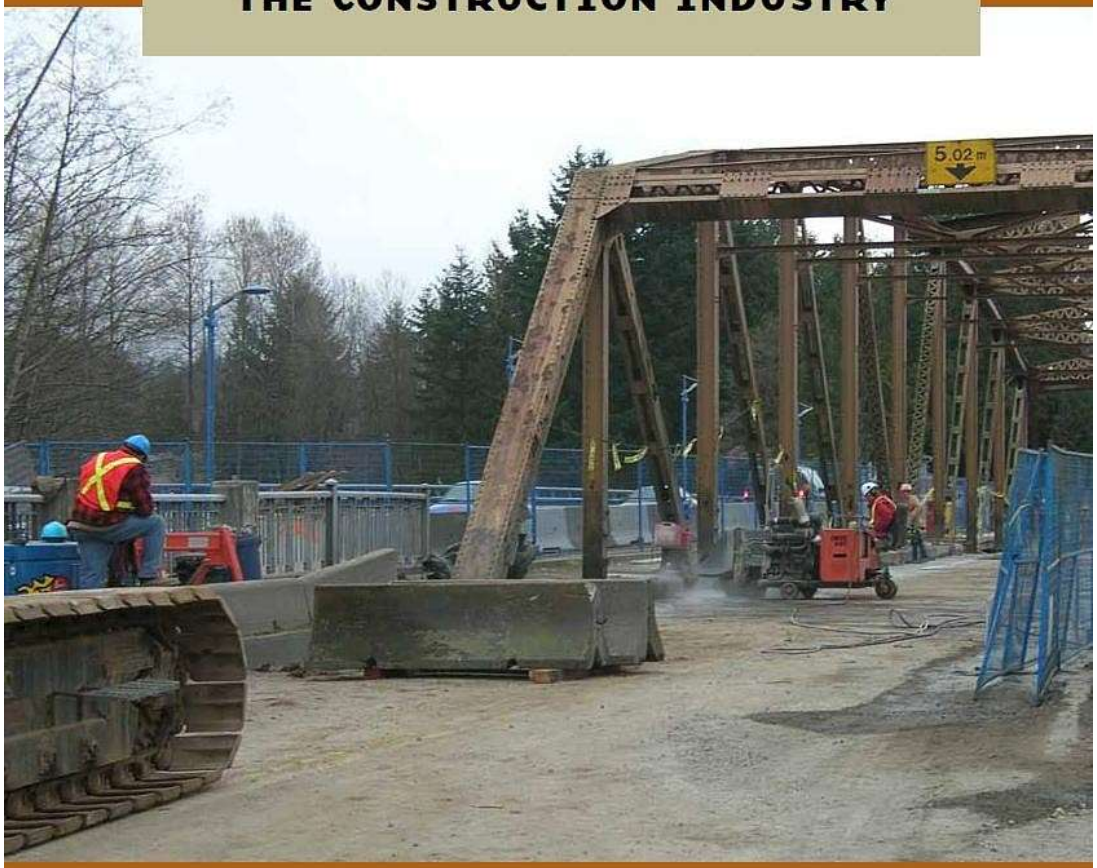
WorkSafeBC Guidance Document

Lead Paint and Coatings – Preventing Exposure in the Construction Industry:

- Provides guidance on lead compliance to assist employers, general construction contractors, trade contractors, environmental consultants and owners.
- Consolidates information from a number of sources (health effects, lead sampling, exposure data, controls, PPE, etc.).
- Can be used to determine appropriate safe work procedures to follow.
- Contains much of the information required to develop an Exposure Control Plan.

Lead-Containing Paints and Coatings

Preventing Exposure in the Construction Industry



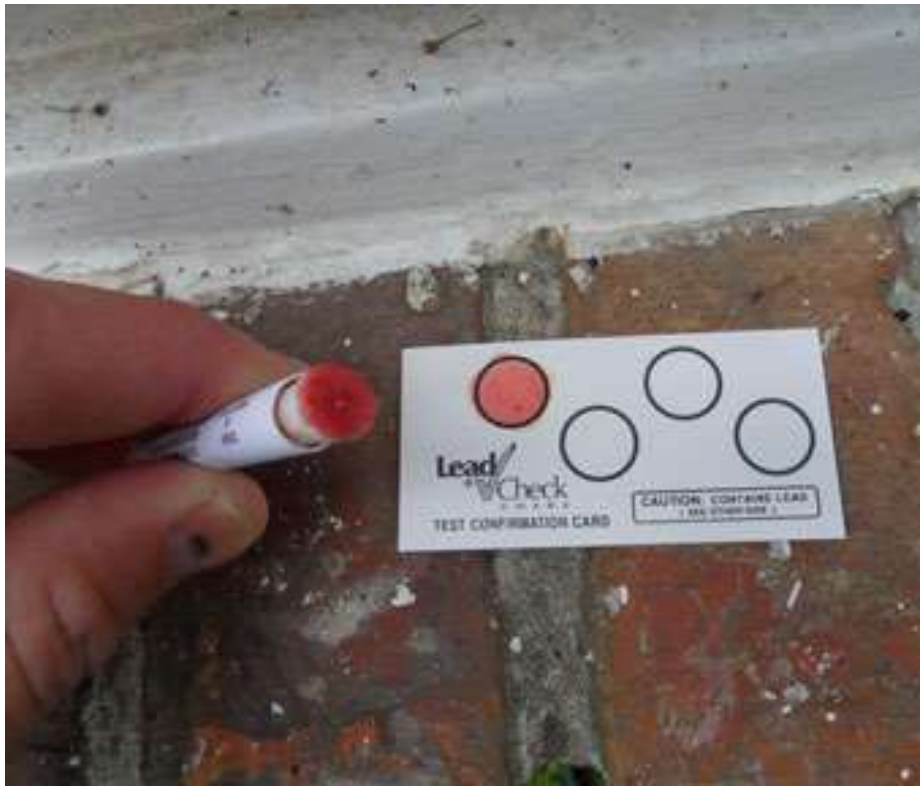
WorkSafeBC
WORKING TO MAKE A DIFFERENCE
worksafebc.com

How do you Test for Lead

- Bulk paint sampling
- Lead test kits – stick (colour change)
- X-ray Fluorescence (XRF) analyzers
- Lead in air
- Lead in surface dust

Bulk paint sampling

Lead test kits



X-ray Fluorescence (XRF) Analyzers

X-ray Fluorescence (XRF) Analyzers

- Operate by exposing a painted or coated surface to X-rays (tube) or gamma radiation (source).
- Users must have a certification from Health Canada (X-ray) or a license from the CNSC (gamma).
- Advantages:
  - Immediate reading without damaging paint
  - Numerous readings can be taken quickly
  - Can also measure lead in wipes, soil, dust and air filters.

X-ray Fluorescence (XRF) Analyzers

- Disadvantages:
  - Expensive!
  - Thickness of paint may influence results
  - Instrument reports results in µg/cm^2 or mg/cm^2, not mg/kg or percentage
  - Users must develop a “calibration” chart
  - May not be accurate below 1 mg/cm^2 (depending on the instrument).
- US EPA states that 1 mg/cm^2 is equivalent to 5000 mg/kg or 0.5% lead.

Lead in Paint

- EPA – 5000 mg/kg or 0.5% dry weight (present).
- Cal/OSHA – improper removal of lead paint containing 600 mg/kg or 0.06% dry weight can expose workers above the occupational exposure limit (0.05 mg/m^3).
- US (Consumer Products Rule) – 90 mg/kg or 0.009% dry weight (2009).
- Health Canada – 90 mg/kg or 0.009% dry weight (2010).

Lead Paint Risk Assessment

- Age and use of the structure or building.
- Amount of lead in the paint or coating.
- Condition of the paint or coating.
- Removal tasks or procedures (how the paint or coating will be removed).
- Size and duration of the project.
- Presence of vulnerable workers (women of childbearing age, pregnant workers, older workers).
- Presence of unprotected workers.
- Presence of vulnerable occupants (e.g., children).

Lead Risk Assessment

Remember: lead exposure is by 2 routes:

- Inhalation during the work process (e.g., dust from sanding or blasting).
- Ingestion of contamination from surfaces (e.g., improper cleanup or housekeeping).

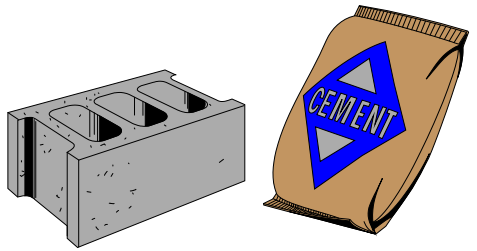
Biological Monitoring – Lead in Blood

- Blood monitoring may be required as part of an Exposure Control Plan (e.g., high lead concentrations or long-term abatement projects).
- Monitoring programs should be set up by an occupational physician.

Silica

What is Silica?

- Silica can be found everywhere …
- Found in substantial quantities in natural materials such as sand, sandstone, granite, stone & rock (aggregates), and in clay, shale, slate.
- Found in building materials such as concrete, masonry products, brick and tile.



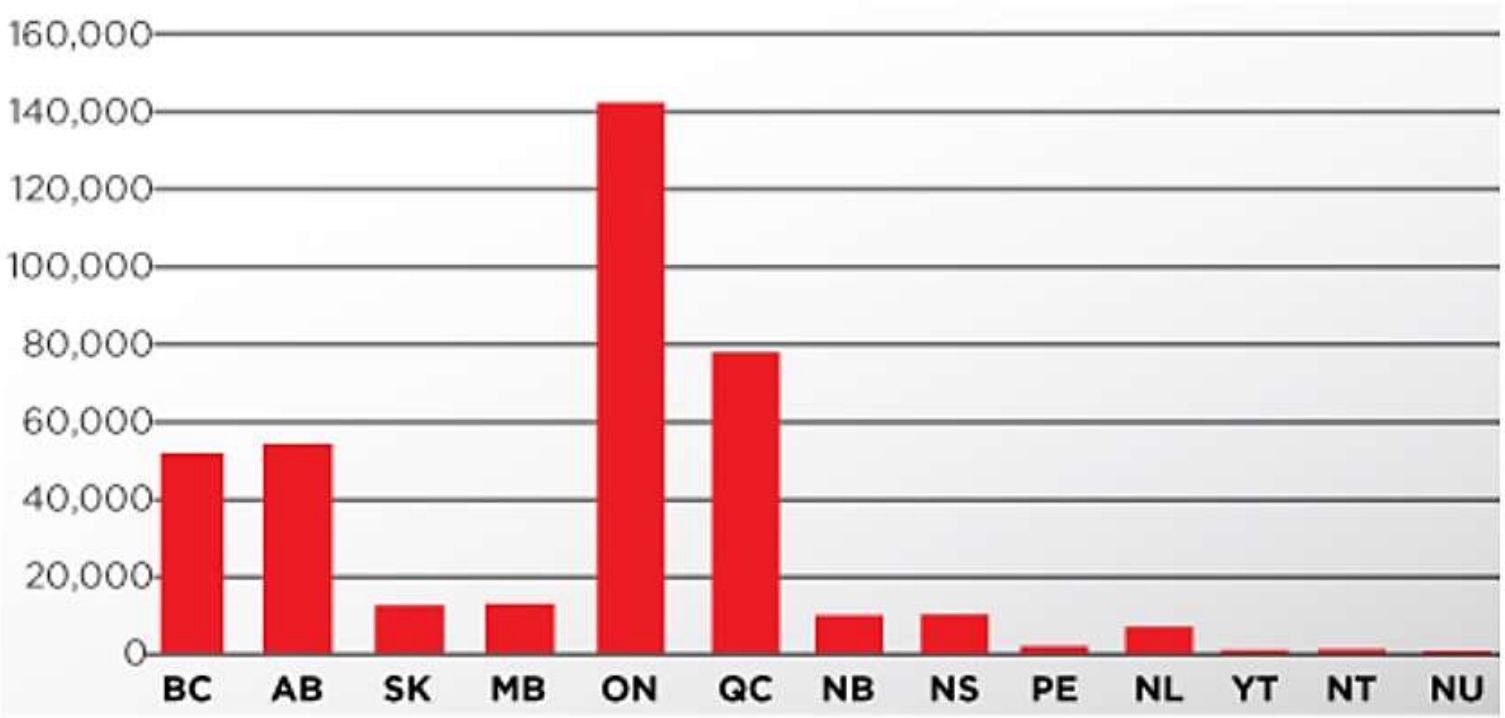
Silica in Construction Materials

Substance	% Silica content
Brick	Up to 30
Concrete, cement, mortar	25 to 70
Tile	30-45
Sandstone, gritstone, quartzite	More than 70
Granite	Up to 30
Sand, gravel, flint	More than 70
Slate	Up to 40
Flint	More than 80

From Arco/BOHS "Construction Dust an Expert Guide", 2014

380,000 WORKERS (EST.) CRYSTALLINE SILICA EXPOSURE IN CANADA

FIVE LARGEST EXPOSURE GROUPS BY INDUSTRY		PROPORTION OF INDUSTRY EXPOSED
Specialty trade contractors (construction)	141,000	24%
Building construction	65,000	17%
Heavy and civil engineering construction	31,000	27%
Metal ore mining	9,800	32%
Cement and concrete product manufacturing	9,300	30%



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Silica-Related Diseases

- Acute Silicosis – can occur after weeks or months of exposure to very high levels of crystalline silica. Death occurs within months.
- Accelerated Silicosis – results from exposures to higher levels of crystalline silica; occurs 5 to 10 years after exposure.
- Chronic Silicosis – usually occurs after 10 or more years of exposure to crystalline silica at low levels. This is the most common type of silicosis.
- Lung Cancer – often associated with silicosis; long latency periods (years to decades).

Workers can be exposed when:

- Cutting, coring, drilling, grinding of concrete and masonry.
- Chipping, drilling, crushing or hauling rock.
- Abrasive or hydro blasting of concrete or masonry surfaces.
- Dry-sweeping or using compressed air for blowing concrete or masonry dusts.

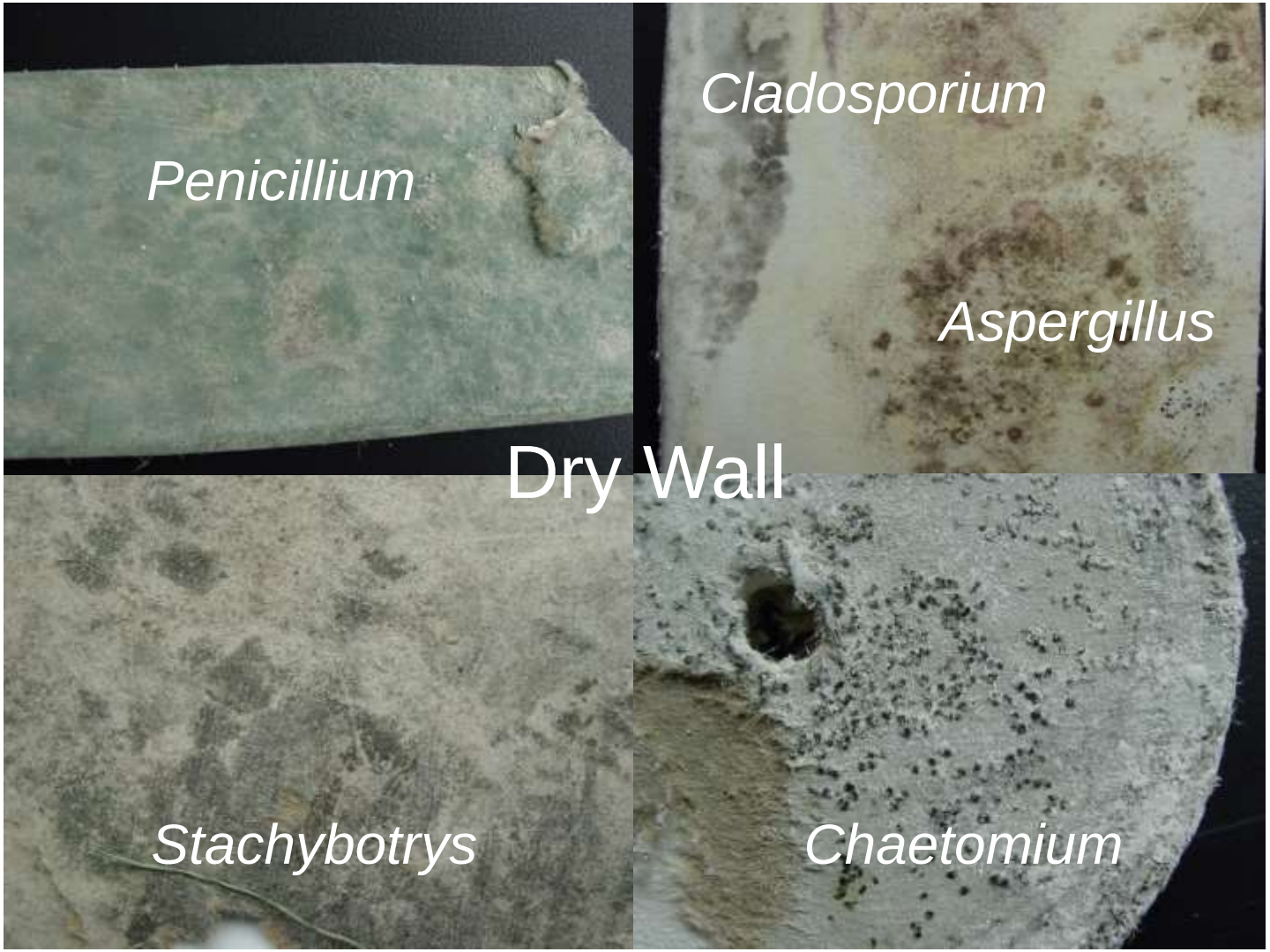
Mould

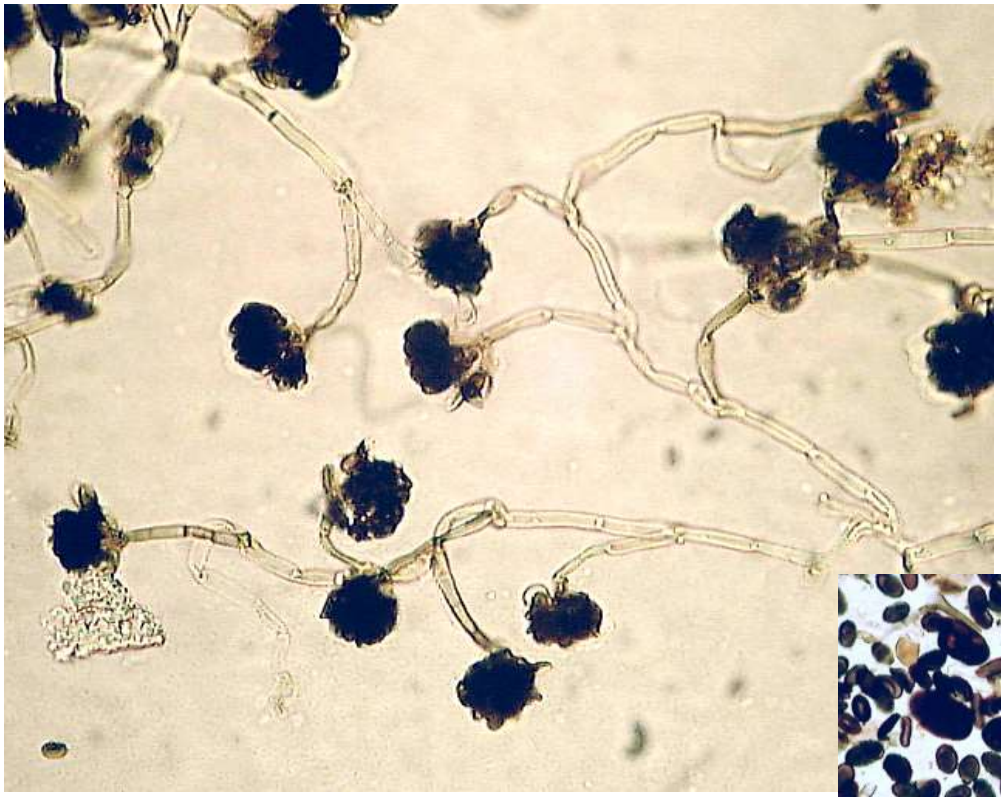
Why Worry about Mould?

- Allergic reactions to hyphae and spores
- Fungi may be toxic
- Infectious diseases
- Damage to building materials
- Damage to building contents (documents, clothing, electronics, furniture, etc.)
- Not very “aesthetic”

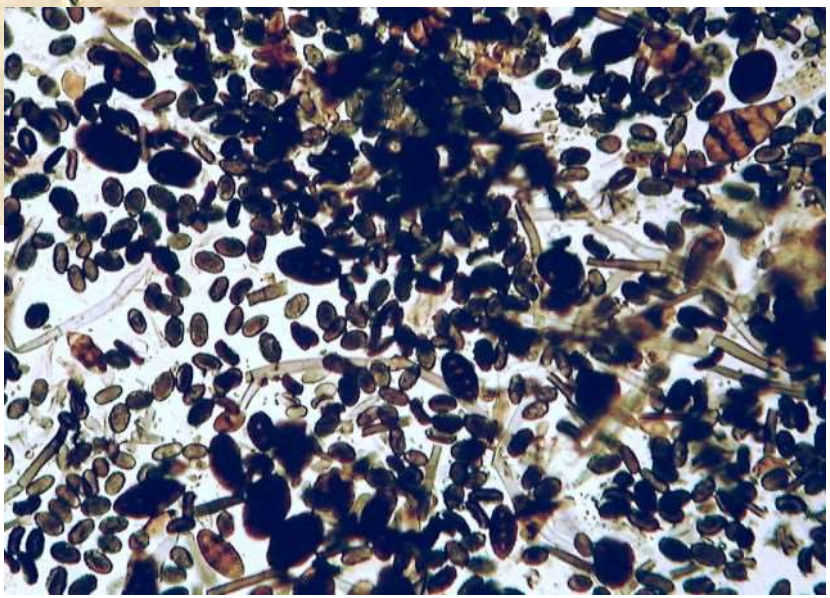
Types of Samples

- Bulk building materials
- Surface samples (tape and swabs)
- Wall/floor/ceiling cavity samples
- Dust samples
- Air samples


Penicillium
Cladosporium
Aspergillus
Dry Wall
Stachybotrys
Chaetomium



Tape samples



Where do You find “Hidden” Mould?

- Within wall cavities
- Behind baseboards
- Behind wallpaper
- Above ceilings
- Below flooring (e.g., hardwood)
- Anywhere!

How are Workers Protected?

Where Workers may be exposed to hazardous materials, the Employer must have:

- A Risk Assessment and Exposure Control Plan.
- A Respirator Program.
- Personal protective equipment (e.g., a respirator and protective clothing).
- Safe work procedures for handling and removing hazardous materials.

Air Sampling

- Conduct air sampling when a risk of overexposure is suspected.
- Select one or more workers who are likely to be the most heavily exposed (worst-case sampling).
- Use air sampling results to determine worker exposure.


P3504

Who is Qualified?

- A person who has, through education, training and experience, knowledge of the management and control of hazardous materials.
- Experience applying the principles of occupational hygiene.
- Experience with specific elements or tasks related to hazardous materials:
  - Hazard identification and risk assessments
  - Collection of samples of materials suspected of containing hazardous materials
  - Worker exposure monitoring (e.g., air monitoring)
  - Preparation of safe work procedures
  - Conduction of workplace inspections
  - Preparation of inspection reports.

Qualified Professionals?

More Hygiene Knowledge

Less Hygiene Knowledge

- Certified Industrial Hygienist (CIH) and Registered Occupational Hygienist (ROH)
- Registered Occupational Hygiene Technologist (ROHT)
- Certified Safety Professional (CSP)
- Canadian Registered Safety Professional (CRSP)
- Professional Engineer (P. Eng.)

Professional Accreditation?

- The Canadian Registration Board of Occupational Hygienists maintains contact information on persons with an ROH designation and can be accessed at www.crboh.ca.
- A list of persons with CIH can be found on the American Board of Industrial Hygiene web site at www.abih.org.
- Lists of persons with CRSPs, which are issued by the Board of Canadian Registered Safety Professionals, are available at www.bcrsp.com.

CITY OF VANCOUVER

PLANNING & DEVELOPMENT SERVICES
ENVIRONMENTAL PLANNING
Office of the Chief Building Official

BULLETIN 2015-008-EV *October 21, 2015*

DEMOLITION AND ABATEMENT REPORTING REQUIRMENTS

QUALIFICATIONS

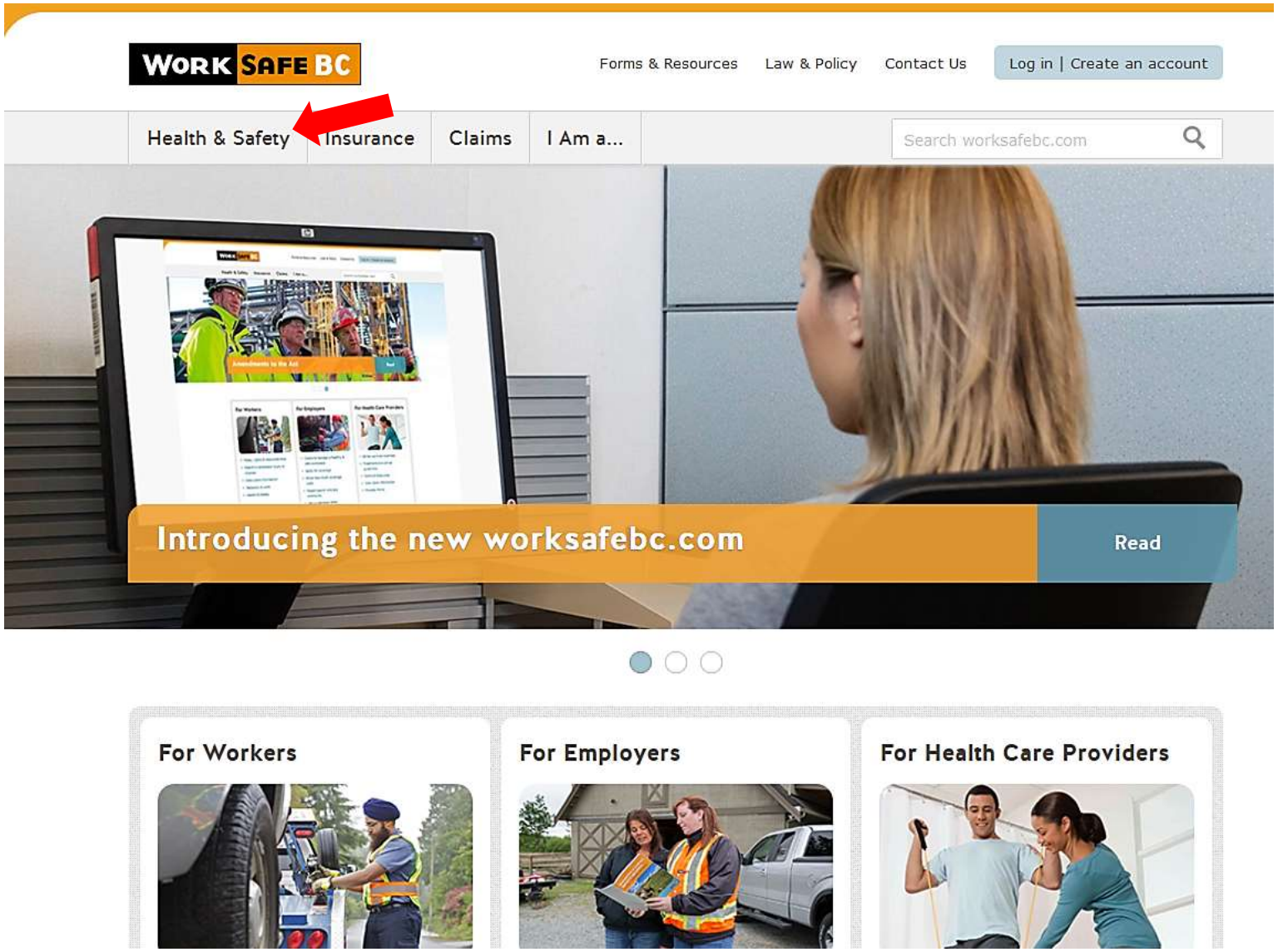
The City's Hazardous Materials Report Form (Attachment 1) **must** be completed by a qualified professional, as defined by the City. The qualified professional (QP) must be an active member of a recognized professional body. Appropriate designations for a qualified professional include Certified Industrial Hygienist (CIH), Registered Occupational Hygienist (ROH), Certified Safety Professional (CSP), Canadian Registered Safety Professional (CRSP), or Professional Engineer (P. Eng.), provided that the holders of these qualifications have experience in the recognition, evaluation, and control of asbestos hazards and other hazardous materials that may be encountered during demolition or renovation work. Other professional designations with appropriate specializations (e.g. AScT with a specialization in Occupational Health & Safety) may be accepted upon approval by the City.

The QP must be declared on the Building Permit Application Form and their emergency contact information must be included in the Construction Safety Plan. The QP must sign and stamp/seal the Hazardous Materials Report Form (Attachment 1) certifying that, to the best of their knowledge, all hazardous materials have been identified and managed according to all applicable regulations.

Due Diligence

- Due diligence in all cases includes a review of the Qualified Person’s experience as well as their accredited credentials.
- A deficient survey or risk assessment may be an indication that the person selected was not qualified.

Where can you get more information?



Hazards & exposures

How do I ...

- Look up an exposure limit for a chemical or biological substance
- Search the OHS Regulation & related materials
- Submit a Notice of Project form
- Register an exposure to a hazardous substance
- Use online tools to understand lifting guidelines
- Get health & safety resources

Animal handling

Biological hazards

- Mould
- Toxic plants

Bullying & harassment

Chemical & materials

- Ammonia
- Asbestos
- Asphalt fumes
- Carbon dioxide
- Carbon monoxide

Domestic violence in the workplace

Driving for work

Electricity

Ergonomics

Extreme temperatures

- Cold stress
- Heat stress

Falls from elevation

Hearing loss prevention

Human factors

Questions?