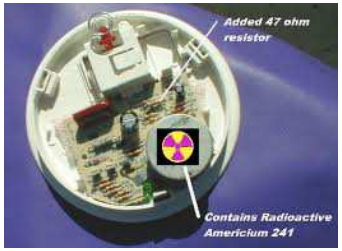
Hazardous Materials in Construction

BCBEC

Vancouver, June 20 2013

Jim Bagley MCIOB, EP



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Who is **LEVELTON**?

Levelton is a Western Canadian firm with 45 years of experience delivering comprehensive and integrated services to clients throughout Canada and the world.

With over 220 people in nine offices in BC and Alberta, we specialize in engineering and scientific services over four main areas: materials engineering, environment and energy, geotechnical, and building science.

Challenges inspire us

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Introductions

Jim Bagley, MCIOB EP

Senior Project Manager

Levelton Consultants Ltd.

- Construction professional for 35 years
- Member Chartered Institute of Building
- Environmental Professional (OHS) 15 Years

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Seminar Outline

- Risks posed by hazardous building materials (Hazmats) to the public, contractors and building professionals
- Key Hazmats of Concern
- Hazardous Materials Legislation
- When do Hazmats become an issue?

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How Hazmats Get into Buildings

- Wide range of Hazmats found in buildings
- Some installed materials largely phased out (Lead PCBs and Asbestos), others still installed (Mercury and RAMs)
- Microbial contamination not installed but caused by water damage, condensation, birds, bats and rodents
- Other hazardous materials can be associated with industrial or commercial use (flammables, explosives)
- Radon a result of natural geology

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Increasing Recognition of Risk

- Risk posed by “Hazmats” were not generally recognized when installed
- Asbestos – wonder mineral in 10,000 building products – risks started to be recognized in 1930s
- Lead – excellent in paint for durability but increasing concern particularly for children
- Radon - Health Canada reduced recommended maximum levels from 800 Bq/M^3 to 200 Bq/M^3 – still higher than USA and WHO standards

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Safety vs. Environmental Risk

- ODS - low safety risk level in situ, but harmful to the environment when released
- Mercury in light tubes – safe if tubes are unbroken, potential environmental impact for disposal
- PCBs in ballasts - generally safe unless skin contact or in fire (dioxins and furans released) environmental impact for disposal

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Safety vs. Environmental Risk

- Lead paint and heavy metals – generally low exposure risk in-situ, but leachate testing prior to disposal
- Conversely mould – naturally occurring, no concerns regarding landfill disposal but may be of concern if amplifying in building, particularly for susceptible individuals

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Summary of Occupant Risks

- Many installed Hazmats are reasonably safe until disturbed by renovation, fire or water damage
- Unless there is loose friable material, occupants of buildings with asbestos present are at no greater risk than those properties without asbestos
- Lead paint can be toxic to children
- PCBs and mercury low risk in undisturbed equipment – potential mercury spillage from thermostats
- Mould growth risk to susceptible individuals

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Summary of Building Contractor and Professional Risks

- Potential exposure during building demolition and renovation
- Potential exposure during destructive testing and site supervision
- Potential liability for non-compliance with regulations
- Potential financial implications of inadequate specifications and contracts

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Most Common Hazmats

- Asbestos
- Lead, Mercury and other Heavy Metals
- PCBs
- Radioactive Materials / Radon Gas
- Mould / Microbial Growth
- Crystalline Silica
- Explosives and Combustibles

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Asbestos Properties and Asbestos in The Environment

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What is Asbestos?

- “Asbestos” – Greek adjective meaning inextinguishable
- Naturally occurring; mined from open pits
- Top producing countries include:
  - Russia
  - China
  - Brazil
  - Kazakhstan
  - Canada (until 2011)

Jeffrey Mine Pit in Asbestos, Quebec

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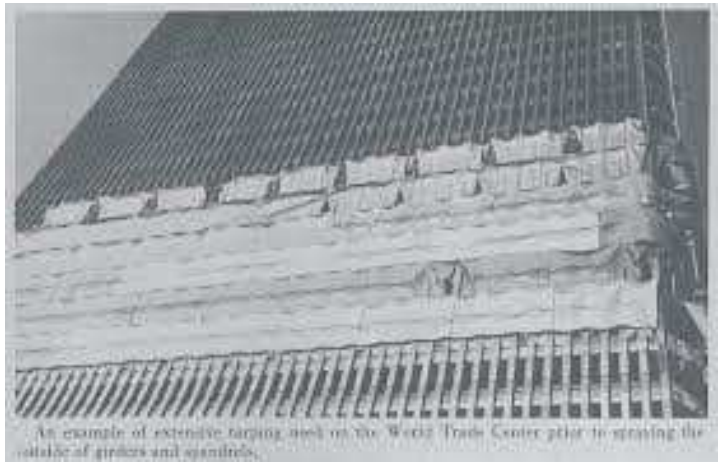
Asbestos in the Air

- Typical background asbestos levels in the air 0.0001 f/cc
- May be 2-10 X as high in urban areas compared with rural areas
- Some events may cause increase in levels
- We inhale 1 asbestos fibre every 5 minutes



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Asbestos in Water

- 400,000 Miles of asbestos pipe carrying drinking water in North America
- Asbestos levels as high as 3000 million fibres per litre
- USA EPA standards 7 million fibres per litre

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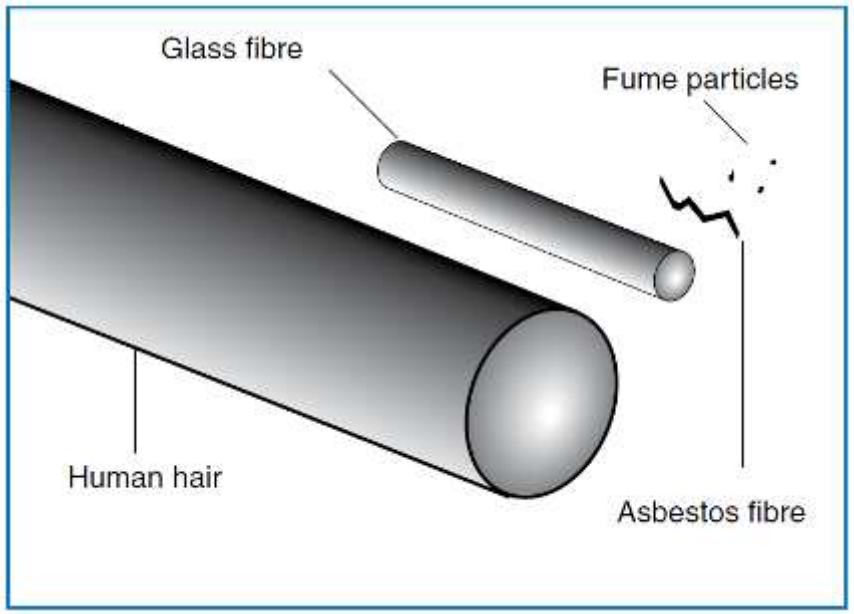
What is Asbestos?

- Asbestos ore (Calcium or Magnesium Silicate) is a fibrous fireproof rock found naturally in the earth's crust.
- Asbestos fibres are microscopic; when bundled together become useful in a variety of products.



WorkSafeBC Toolbox Meeting Guide "Health Hazards of Asbestos"

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How is it used?

Asbestos has been called the “magic mineral” because of its wide variety of desirable physical properties including:

- heat resistance
- electrical resistance
- chemical resistance
- good tensile strength
- flexibility
- thermal and acoustic insulation
- naturally occurring

Because of these unique properties, asbestos was used in a wide variety of commercial products.

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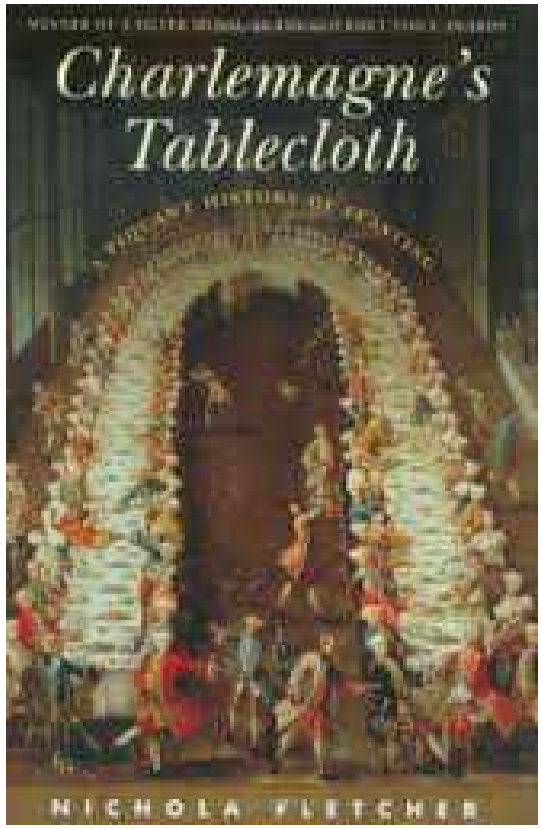
History of Asbestos

- First used in Scandinavia in pottery 3000 years ago
- Used by Romans for Tablecloths and Napkins



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History of Asbestos

- Used in many consumer products including Christmas Tree “Snow”
- Snow in the Wizard of Oz was asbestos

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Friable Asbestos

Material	Approximate end of use
Sprayed fireproofing	Mid 70s
Sprayed thermal insulation	Mid 70s
Sprayed decorative/acoustic	Mid 80s
Asbestos-containing vermiculite	Late 80s
Mechanical/pipe insulation	Early 80s

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Fireproofing

Limpet Fireproofing (Amosite)

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Acoustic, Decorative, Texture Finishes

Texture finish on walls and ceiling

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Loose Fill Vermiculite Insulation

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Description: Vermiculite loose (granular) fill masonry insulation

Location: attics, poured in to cavities of block cores or in cavity wall areas

Mechanical / Pipe Insulation

- Pipes, boilers, tanks, ducts etc.
- Stopped manufacture by 1975, use tapered out by early 1980’s
- Many buildings have a mixture of asbestos and non-asbestos insulation

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Vinyl Sheet Flooring (VSF)

Can be sheet or rolled

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Non-Friable Asbestos

Material	Approximate end of use
Asbestos cement	Still being installed
Gaskets	Still being installed
Vinyl floor tile and sheet flooring	Mid 80s
Flooring compounds	Late 80s
Mastics, coatings and sealants	Late 80s
Roofing materials	Late 80s
Drywall taping/joint compound	Mid 80s
Ceiling tiles	Mid 80s
Plaster	Mid 80s
Window putties and caulking	Mid 80s

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WorkSafe BC Date

- Whilst not explicitly stated in Section 20.112 of Occupational Health and Safety Regulation, 1990 is generally regarded as the date after which a building does not need to be tested for asbestos
- The use of asbestos materials is not yet banned in Canada – though WorkSafe BC requires substitution wherever possible
- Federal Government finally lifted their veto on asbestos being listed as a hazardous substance under Rotterdam Convention in September 2012

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Asbestos Cement

(Transite or Trafford Tile)

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Asbestos Cement Pipe

(Transite or Trafford Tile)

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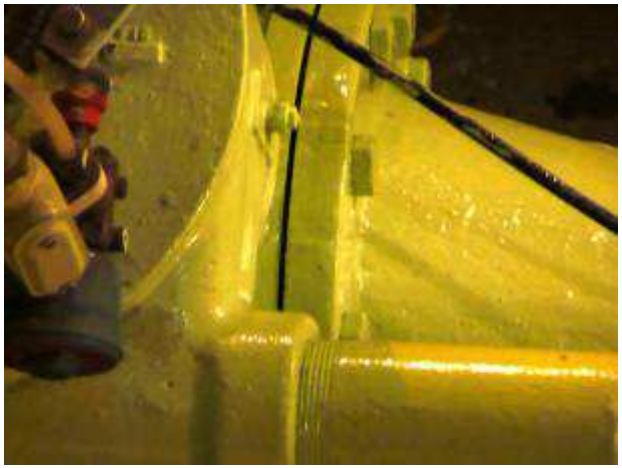
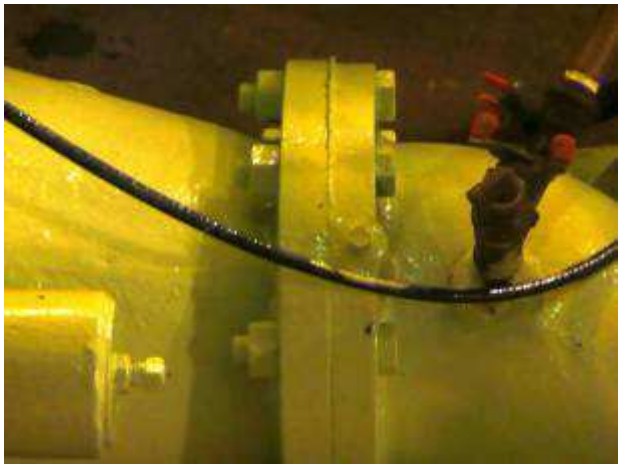
Asbestos Gaskets





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Vinyl Floor Tile (VFT)

Can be 9 inch and 12 inches square

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VFT and VSF

- VSF – asbestos only in backing pad or felt
- Unlike VFT, sheet flooring was not made in discrete squares or tiles
- Both VFT and VSF are made today in identical patterns but without asbestos

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Mastics, Coatings and Sealants

Wall panel glues

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Roofing Materials

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Asbestos Paper, Textiles and Felts

Asbestos paper on ducts (may be friable)

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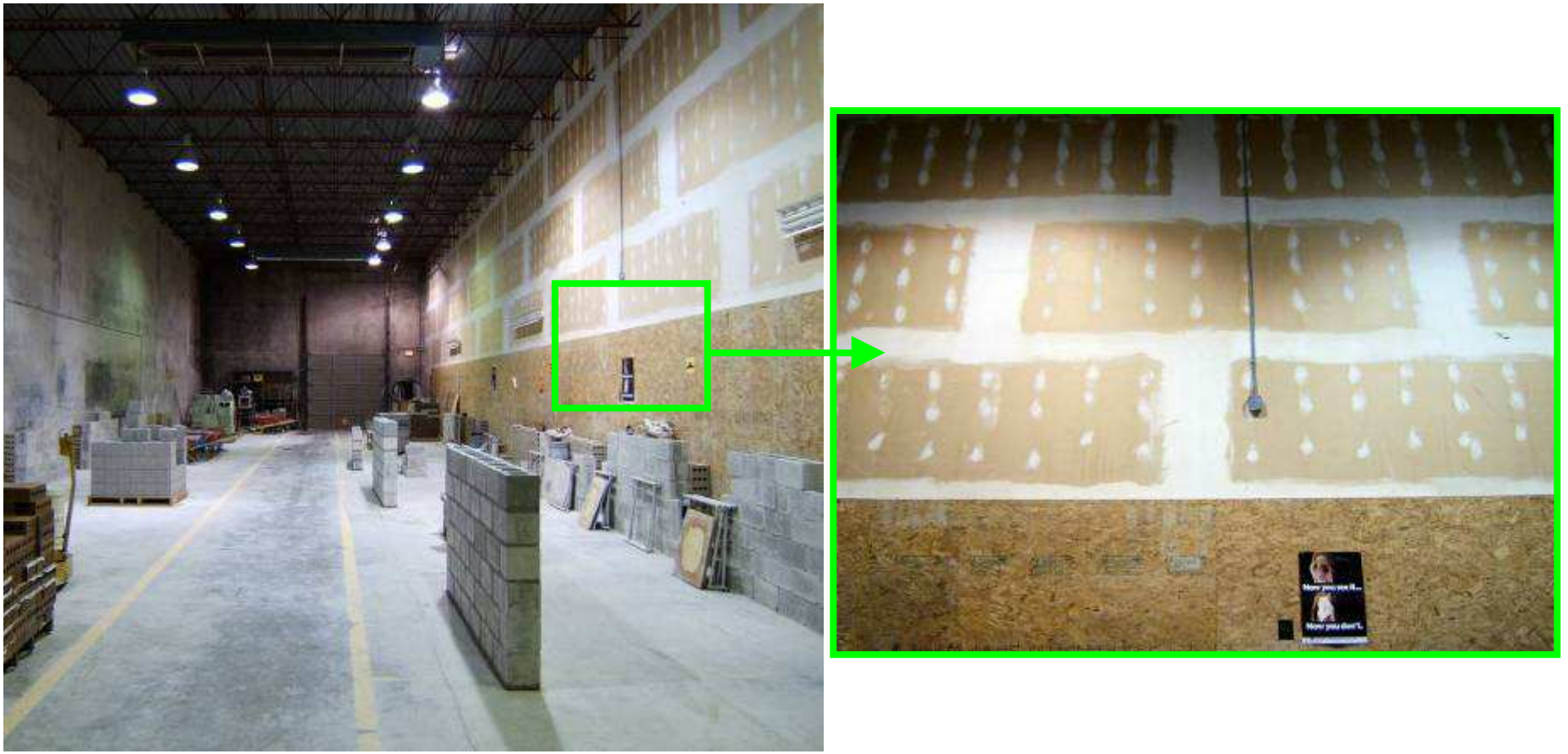
Drywall Taping / Joint Compound (DTC / DJC)



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Ceiling Tiles

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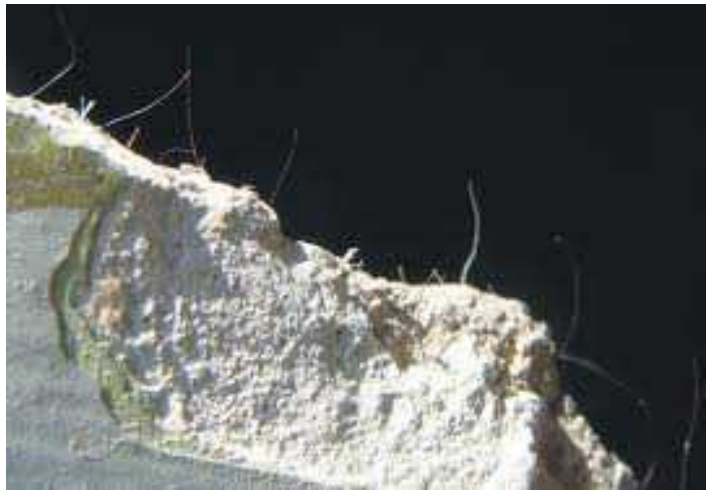
Plaster



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Window Putties and Caulking

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Other Uses

Electrical wire insulation

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Other Uses

Fire doors

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Other Uses

Asbestos friction materials

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Health Effects Associated with Exposure to Asbestos

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A Brief History

- Asbestos mining began 4000 years ago
- Reference to negative health effects can be traced back as early as the 1st century
- Pliny the Elder recommended that you should not buy slaves who had worked in asbestos mines
- First health claim related to asbestosis in 1927 in the US and 1942 in Canada
- Link to lung cancer in the 1930s
- Link to Mesothelioma in 1960

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Asbestos Related Diseases

Exposure Pathways

Inhalation of fibres	→	**Asbestosis**
Irritation to the skin		**Lung Cancer**
Ingestion		**Mesothelioma**
		Pleural Plaques

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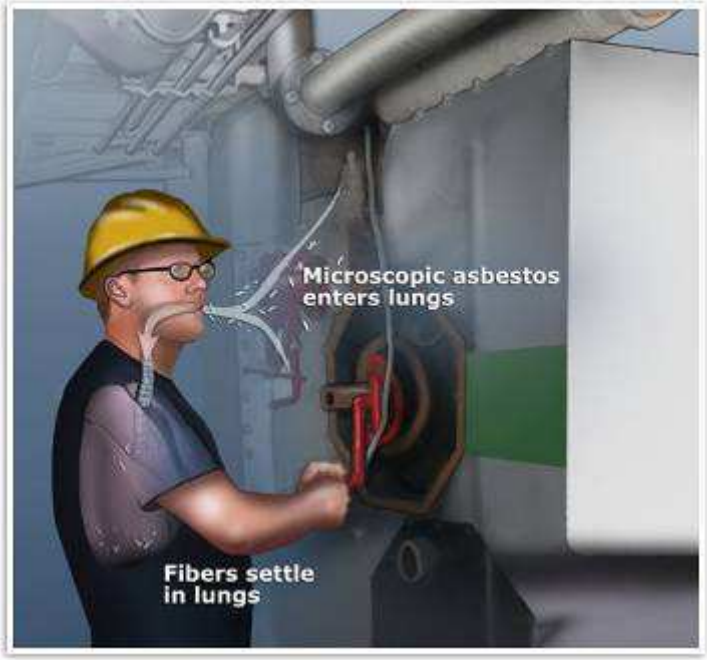
Asbestos Related Diseases



The dimensions of the microscopic asbestos fibres (0.01 to 20µm) and their biopersistence in the lungs are believed to be the major cause of these health effects.

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Local No. 17, Chicago, Ill., float in the 1959 St. Patrick's Day Parade in Chicago. (See article under correspondence)

It is important to keep in mind that these diseases are often linked to prolonged, unprotected exposure to asbestos

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Asbestos Related Diseases

Disease	Latent Period (Years)
Asbestosis	10 to 20
Mesothelioma	30 to 45
Lung Cancer	15 to 25

This means that claims being made today are related to exposure that occurred in the 1970s and 1980s

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Asbestos Related Diseases

Lung Cancer

Exposure	Increased Chance of Lung Cancer
Heavy smoking (versus non-smokers)	10 to 12 times
Heavy asbestos (versus non-exposed, non-smokers	5 to 9 times
Heavy smoking and heavy asbestos	50 to 90 times

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Asbestos Related Diseases

Lung Cancer

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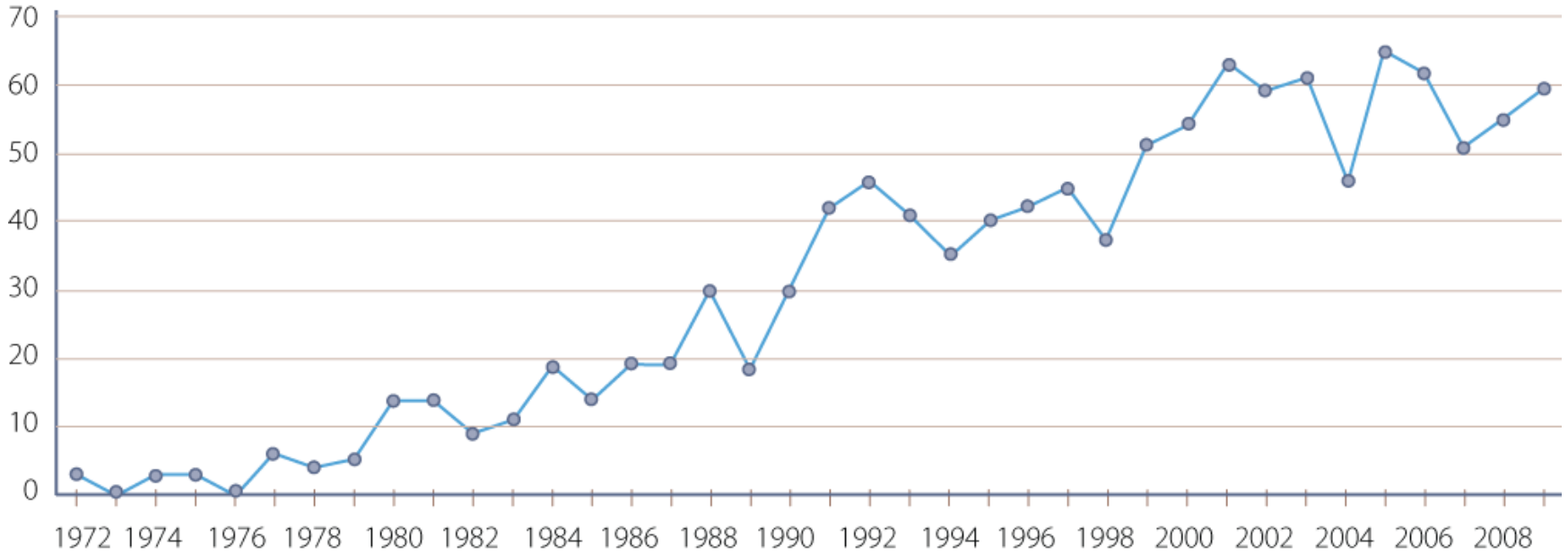
WorkSafeBC Statistics (2009)

Number of claims[1] accepted for asbestos-related diseases, 1972–2009



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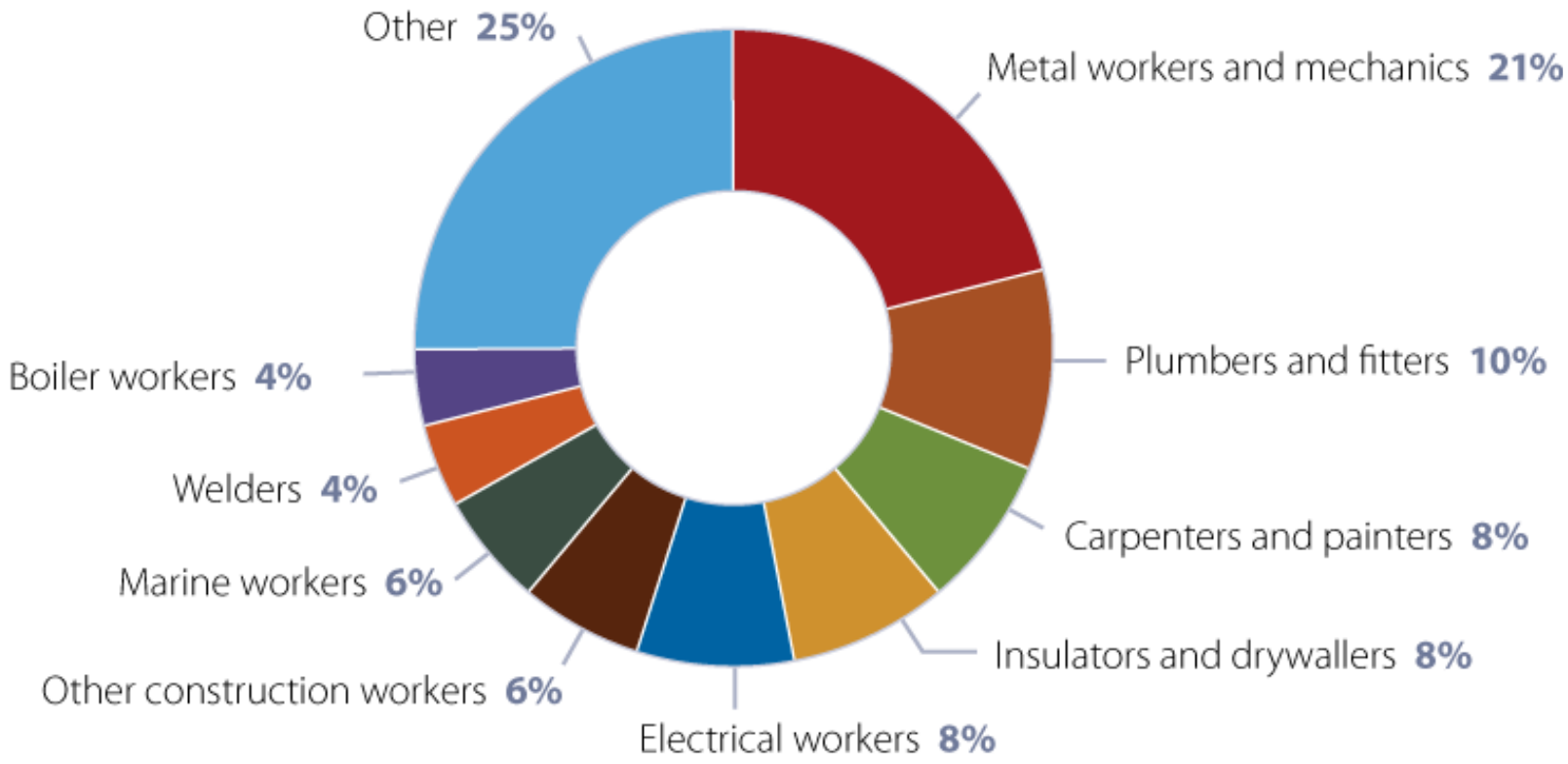
1 Claims accepted for health-care benefits only are not included.

WorkSafeBC Statistics (2009)

Percentage of claims accepted for asbestos-related diseases by occupation group[1], 1990–2009



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1 Claims accepted for health-care benefits only are not included.

Heavy Metals

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Lead – In Buildings

- Paint
- Sheeting for acoustic insulation
- Radiation shielding
- Masonry plugs for fasteners
- Glazes and ceramics
- Pointing mortar
- Lead pipe and solder
- Residue present in firing ranges, soldering operations, foundries
- Batteries in alarm and telecom systems

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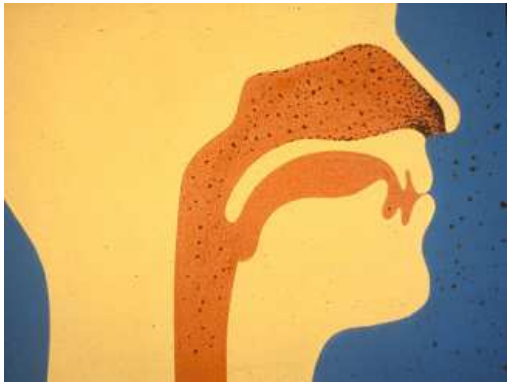
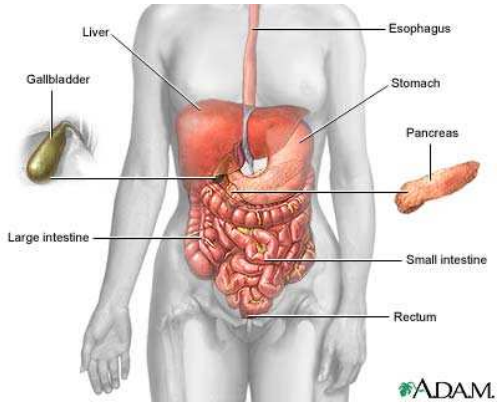
Health Risks of Lead

- Exposure through inhalation or ingestion
- Inhalation unlikely unless activity disturbs lead – grinding sanding welding etc.
- Children eat 200mg of dust every day and absorb 50% of lead from dust





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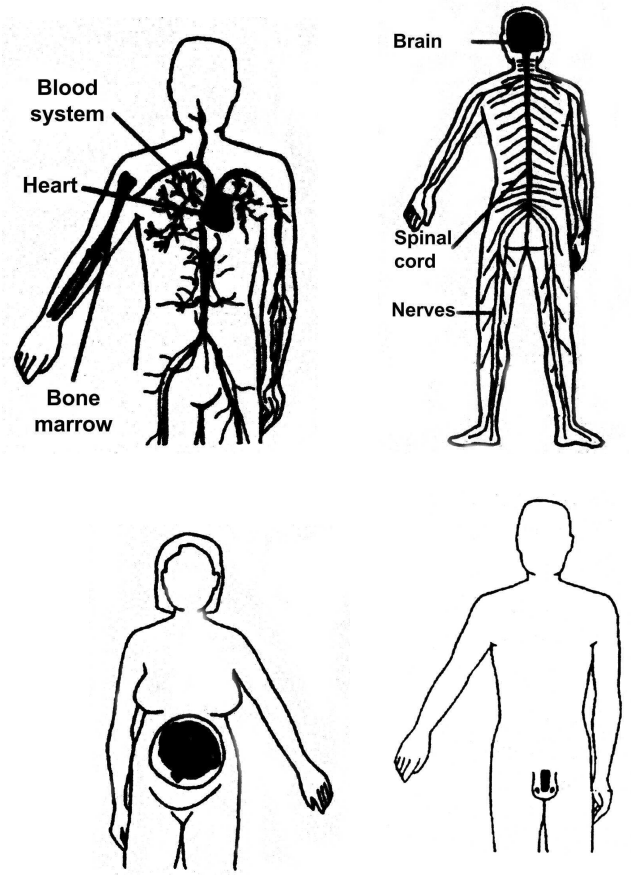
Health Effects of Lead

- Lead exposures can cause:
  - Heart attack and strokes
  - Kidney failure
  - Central nervous system damage
  - Reproductive and fertility problems



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Usage Period

- Phased out of architectural paints from mid 1970s
- Still in use for rust inhibition on metal structures
- Still in use in sheet applications and ceramics

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Mercury – In Buildings

- Current Use:
  - Fluorescent tubes
  - Compact fluorescent lamps
  - Halide lamps
- Historic Use
  - Thermostats

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Health Effects of Mercury

- Mercury exposure through ingestion (more common) and inhalation
- Neurological effects
  - Lighthouse Keepers
  - Mad as a Hatter

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PCBs – In Buildings

- Fluorescent Ballasts and transformers phased out late 1970s
- Hazards mainly associated with burning and overheating and skin contact
- Become concentrated in environment in fish and wildlife

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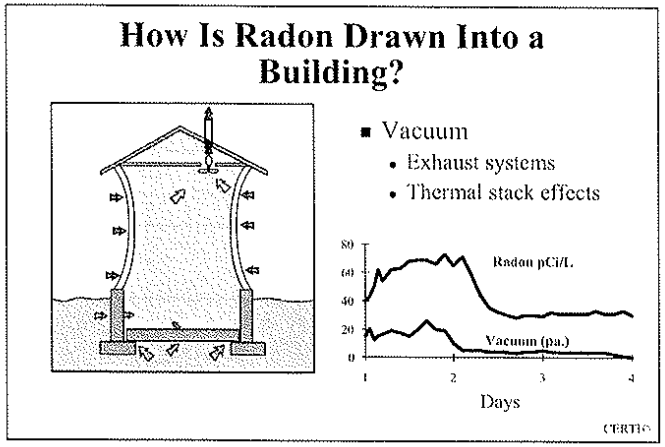
Radioactive Materials – In Buildings

- Americium-241 in smoke detectors, low quantity, low risk
- Radon gas
- 7% of Canadian Building exceed Health Canada Guidelines
- 2nd leading cause of lung cancer after smoking



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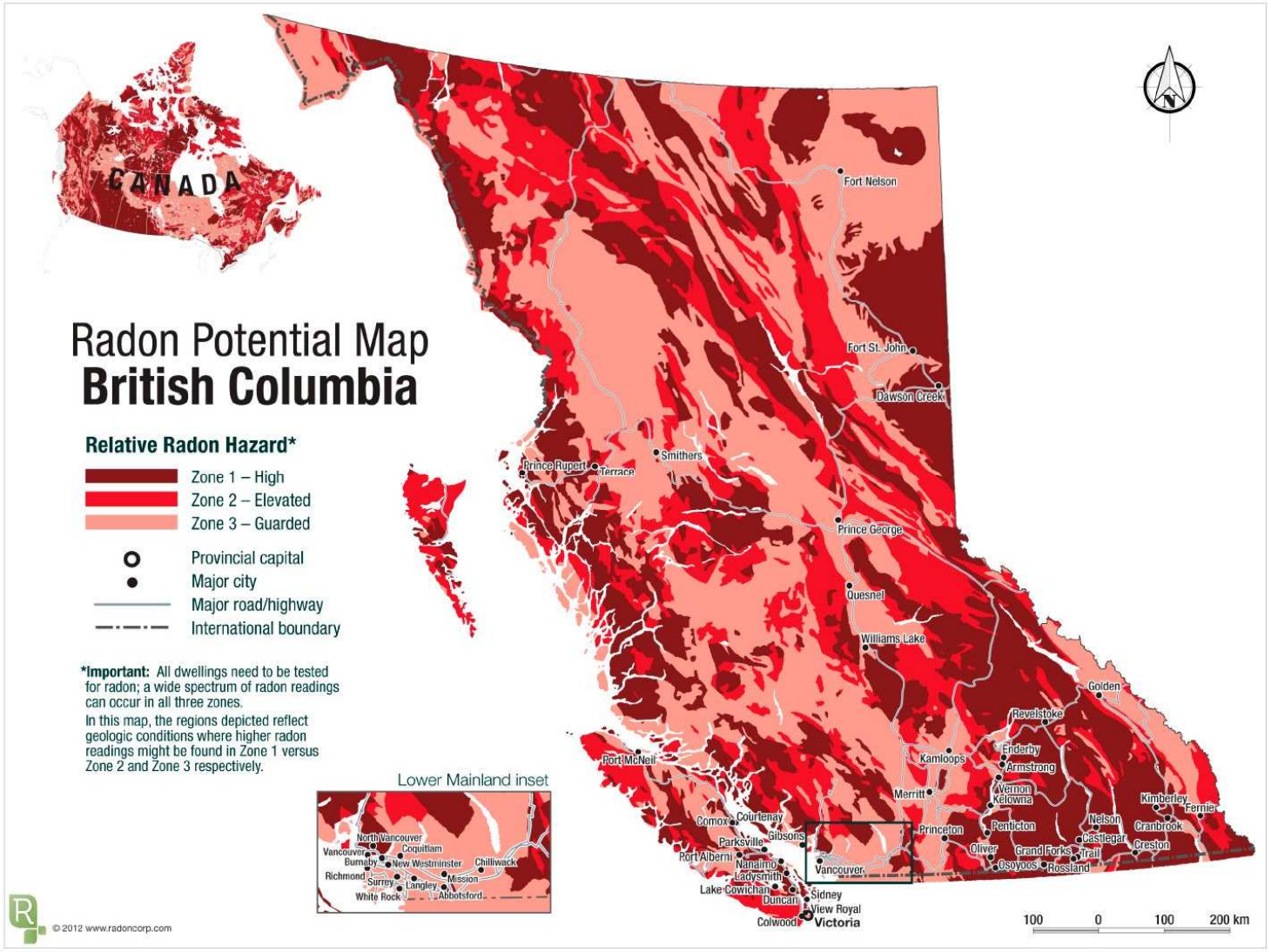
Radon in BC



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Mould – In Buildings

- Mould ubiquitous in environment
- Will grow on wood with MC >17% and Drywall with MC >0.7%
- Health effects generally irritant and respiratory problems
- More serious effects for susceptible individuals

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Other Organisms of Concern

- Bird and bat droppings can contain highly pathogenic fungi
- Histoplasmosis and Cryptococcosis
- Deer mice droppings may contain hantavirus

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Crystalline Silica

- Found in concrete, and other cementitious products, bricks and ceramic tile
- Does not become aerosolized unless cut crushed or ground
- Carcinogen and ALARA

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Regulations

Assessment, Removal, Transport and Disposal of Hazmats

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Regulations

Asbestos is governed by 3 primary legislative documents in BC:

The Occupational Health and Safety (OHS) Regulation

WORK SAFE BC

The Transportation of Dangerous Goods (TDG) Regulation

Government of Canada / Gouvernement du Canada

The BC Hazardous Waste Regulation (HWR)

BRITISH COLUMBIA

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Regulations – WorkSafeBC
Part 5

Table 5.4 Exposure Limits and Designations

- Asbestos has an exposure limit of 0.1 fibers per milliliter and is designated K1 and A

5.7 Designations

- As asbestos is designated a K1 (confirmed human carcinogenic) material the employer must implement and exposure control plan to maintain worker exposure As Low as Reasonably Achievable (ALARA) below the exposure limit listed in Table 5.4

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Regulations – WorkSafeBC
Part 6

6.1 Definition

•“asbestos-containing material” means a manufactured article or other material, other than vermiculite insulation, that would be determined to contain at least **0.5% asbestos**…

6.4 Inventory

•Every workplace must have an survey of asbestos-containing materials by qualified person and keep inventory current

•Level of compliance low – primarily institutional employers

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Regulations – WorkSafeBC

Part 20

20.112 Demolition – Hazardous materials

- Before work begins, the employer or owner must:
  - ensure that a Qualified Person (QP) inspects the site to identify asbestos-containing materials, lead or other heavy metal or toxic, flammable or explosive materials that may be handled, disturbed or removed,
  - have the inspection results available at the worksite, to show the locations of any hazardous substances,
  - ensure that any hazardous materials found are safely contained or removed, and
  - if hazardous materials are discovered during demolition work that were not identified in the inspection, ensure that all work ceases until such materials are contained or removed.

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Regulations – WorkSafeBC
Sample Frequency 20.112

- Minimum of 3 samples required of most types of suspect asbestos construction materials
- Greater numbers for larger areas
- Typical demolition of residential property ~25 asbestos samples and ~12 lead paint samples
- Larger commercial building significantly more samples
- Stop positive approach reduces sample costs
- Inventory survey is not sufficient for pre-renovation/demolition

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Regulations – WorkSafeBC

20.112 Demolition – Hazardous materials

- **1990 GENERALLY ACCEPTED AS CUT OFF DATE BY WORKSAFE AFTER WHICH ASBESTOS TESTING IS NOT REQUIRED**
- **LEAD PAINT NOT USED RESIDENTIALY AFTER LATE 1980S**
- **NO CUT OFF DATE FOR OTHER HAZMATS – ALL BUILDINGS NEED A SURVEY POSTED ON SITE EVEN IF IT SIMPLY STATES THAT HAZMATS ARE NOT PRESENT**

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Regulations – TDG

- Only friable asbestos material is regulated by the TDG Regulations
- More than 5 kg of friable asbestos material must be packaged, manifested and transported fully in accordance with the TDG Regulations
- Friable asbestos materials may only be transported by a licensed waste handler

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Regulations – TDG

MOVEMENT DOCUMENT / MANIFEST
DOCUMENT DE MOUVEMENT / MANIFESTE

GENERAL SAMPLE FORM

BC 12345-6

A — Generator / consignor — Producteur / expéditeur
Registration No.: BCG 12345
Company name: ABC Producer Company Ltd.
Mailing address: 2468 Main Street, Uptown, BC, V1A 2B3
E-mail: abcproducers@company.ca — Tel. (250) 999-9999
Shipping site address: 4567 End Street, Uptown, BC, V2B 6E7

Intended Receiver / consignee: Waste Processors Inc. — RS 4321
1000 Side Avenue, Sidetown, BC, V5D 6E7
wasteprocessors@sidetown.com — (250) 888-8888
Receiving site address: same as above

B — Carrier — Transporteur
Registration No.: LT 1234
Company name: Quick Trucking Company
444 Front Street, Uptown, BC, V6F 7G8
quicktrucking@uptown.ca — (250) 777-7777
Vehicle registration: 3456 - DW, BC
Name of authorized person: TOM BROWN — (250) 777-7788
Date: 09 02 15

C — Receiver / consignee — Réceptionnaire / destinataire
Waste Processors Inc. — RS 4321
Date received: 09 02 15 — Time: 03:45 PM

Shipping name	Class	UN No.	Packing group	Quantity shipped	Units	Packaging No.	Code	Phys. state	Quantity received	Units	Comments	Handling code	Accepted	Refused	Pack.	Veh.
Leachable Toxic Waste (benzene) - contaminated soil	N/A	N/A	N/A	800	kg	01	05	S	900	kg	discrepency +100 kg (scale)	05	x		N	N
waste oil	N/A	N/A	N/A	1025	L	05	01	L	1025	L		07	x		N	N
WASTE POLYCHLORINATED BIPHENYLS (PCB)	9	UN2315	II	25	L	01	07	L	25	L		02	x		N	N
WASTE FLAMMABLE LIQUID, N.O.S. (gasoline)	3	UN1993	II	205	L	01	01	L	205	L		07	x		N	N

international use only

Receiver certification — Name of authorized person: JOE SMITH — (250) 888-8888

PLACARDS REQUIRED: DANGER
IN CASE OF EMERGENCY CALL:
ABC EMERGENCY CENTRE AT 1-800-999-9999

Generator / consignor certification — Name of authorized person: JOHN DOE — (250) 999-9999
Date shipped: 09 02 15 — Time: 10:30 AM — Scheduled arrival date: 09 02 15

MOE 04 1017

Instructions for completion and distribution on reverse / Instructions pour compléter et distribuer au verso

Copy / Copie 1 (white / blanche)

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Regulations – HWR

- “waste asbestos” a waste containing friable asbestos fibres or asbestos dust in a concentration **greater than 1%** by weight either at the time of manufacture, or as determined using a specified laboratory method.
  - Waste asbestos can only go to a secure landfill unless:
  - a permit or an approval has been issued under the Act to operate the landfill
  - The asbestos is contained in two 6 mil plastic bags
  - the asbestos is immediately buried with a minimum of 0.5 m of cover material at the landfill
  - approval of the landfill owner is received before disposal takes place
  - the deposit is authorized by a director

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Asbestos Disposal

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Asbestos Cleanup

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Regulations – Lead

- Lead paint is not specifically defined in WorkSafe BC Regulations
- Federal Regulations define lead based paints as paint containing more than 0.5% lead
- WorkSafe guidelines state that: removal of paint with a lead concentration as low as 0.06% by aggressive techniques can approach the occupational exposure limit
- Prior to disposal at a landfill all lead-painted materials must be tested for leachability. (N.B. Local Practices)
- All other lead products should be recycled.

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Regulations – PCBs

- All ballasts and transformers containing PCBs may only be disposed of at a hazardous waste facility. The only hazardous waste facility accepting PCBs in Canada is Swan Hills in Alberta.
- PCBs awaiting disposal must be stored. PCB-containing lighting ballasts must be stored in approved containers in a secure, weather protected area. The containers must be on a sealed surface. Gravel, dirt or other permeable surface is not acceptable and any floor drains must be sealed.
- PCB ballasts and fluorescent tubes can be collected and disposed of FOC through the BC LightRecycle program

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Regulations – Mould

- Mould is not specifically referred to in the WorkSafe Regulations Section 6 – Hazardous Substances
- Mould is however recognized as hazardous by WorkSafe and any work disturbing mould must be carried out in accordance with WorkSafe Guideline 4.79
- Mould contaminated materials may be disposed of at any landfill site.

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Regulations – Silica

- Silica is carcinogenic and ALARA – must have ECP
- Exposure underestimated in construction and demolition
- Produced by cutting and grinding concrete, bricks and tile, sanding drywall compound and mixing cement, tileset etc.
- Health effects are dose related (unlike some asbestos related illnesses)

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When do Hazmats Become an Issue?

- For workplace owners / employers inventory mandatory at all times
- When renovation or demolition disturbs materials
- When fire or flood damages building
- Property transaction – Stage 1 PSA, financial due diligence and liability
- Change of use – lead paint

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Responsibilities - Contractors

- Must have ECP for each material if potentially exposing workers to asbestos, lead or silica
- Must ensure that materials have been tested before employees disturb them
- Must file NOPA or NOPL with WorkSafe before disturbing asbestos or lead

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Responsibilities - Professionals

- Should verify that appropriate testing has been done before specifying demolition, repair or refurbishment work
- Should verify that contractors have adequate training, and insurance for hazmat work
- Should stop work if un-tested suspect asbestos materials are exposed

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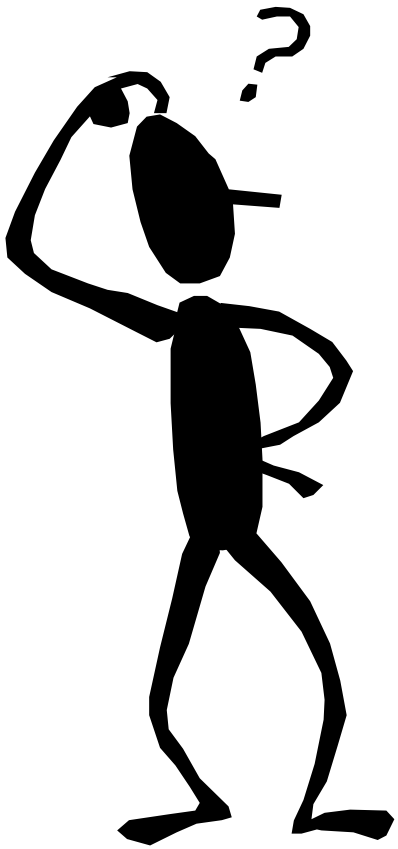
Questions?



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Contact Us

Lower Mainland – Arvind Chowdharri
604-207-6118
Vancouver Island South – Kathy Muirhead
250-475-1000
Vancouver Island North – Jim Bagley
250-218-0490
BC Interior – Jeff Widmer
250-419-9778

hazmat@levelton.com

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