PHH ARC
ENVIRONMENTAL

Hazardous Building Material Developments in End of Life Decommissioning and Demolition

phharcenv.com
Service. Integrity. Excellence.

HazMat in End-of-Life Facilities

Hazardous Building Materials (HBMs) – commonly encountered during decommissioning and demolition (D&D) activities

Recent developments are changing the way we investigate for and handle certain materials, specifically:

- Polychlorinated Biphenyls (PCBs) in Caulking
- Asbestos Insulation on Piping

Polychlorinated Biphenyls (PCBs)

Used from ~1950 to 1980, peak production in 1970

- Transformers
- Capacitors
- Electrical light ballasts
- Hydraulic fluids
- Lubricants
- Electrical cables
- Plasticizers

PCBs in Building Materials

Newly identified materials containing PCBs

- Caulking, mastic, sealants and adhesives (38,000 ppm)
- Grout, expansion joint materials (3,000 ppm)
- Paints and surface coatings (industrial pre-1976)
- Ceiling tiles
- Window glazing (37,000 ppm)
- Floor finishes (90,000 ppm)

We are seeing a growing awareness of PCBs in building materials… are they the next potential public health hazard abatement initiative?

Health Effects

Effects on humans

- Dioxin and furan like toxins (partial oxidation)
- Liver damage
- Thyroid damage and goiter
- Skin and eye effects
- Immune suppression
- Reflexes, memory, learning
- Reproductive effects
- Developmental
- Cancer

Legislation and Requirements

Canadian Environmental Protection Act

PCB Regulations (2008, amended 2011)

<u>Elimination Plan for PCBs:</u>

- Fluids containing 2 ppm or more of PCB must be eliminated by Dec 31, 2009 or Dec 31, 2025
- Solid materials containing 50 ppm or more of PCB must be removed and destroyed by Dec 31, 2025

Responsibilities for D&D Activities

PCB Identification

- HazMat survey or assessment results
- Waste characterization, packaging and disposal

Worker Protection

- Half face respirators w/ P100 and Organic Vapour
- Nitrile gloves – **not PVC or latex**
- Disposable coveralls
- Safe handling procedures
- Exposure monitoring (air)

PCB Building Materials

The list of potential materials is long…

- Caulking and sealants appear to be of the greatest concern for facility demolition – commonly used
- Soil contamination from leachate another concern
- Substrate materials can become contaminated
  - Wood
  - Masonry
  - Concrete block
  - Brick

Sampling and Analysis for PCB

Identification of PCB in solid

- Bulk sample – approx. 10 grams
- Hand tools for caulking or sealant
- Destructive coring typically required for substrate materials
- Soil contamination can be more difficult to assess

Laboratory Methodology

- EPA Method 8082A, gas chromatography

PCB Abatement and Management

Historical Methods for Removal and Disposal

- Draining and collection of liquids
- Incineration

Removal of Solids

- Separation of PCB materials and substrate
- New techniques – ice blasting, sponge blasting
- Packaging and transport
- Reduction
- Incineration

Methods of Destruction

Incineration

- 1200 ^{o}C, with fuel and oxygen, not suitable for soils

Irradiation

- Gamma ray de-chlorination using nuclear fuel

Plasma arc destruction and treatment

Decomposition and Reduction

- Microbial breakdown – slow and difficult
- Enzymes and vitamins (B12) reducing catalyst
- Chemical methods


NOTICE
We Are NOT Doing
Asbestos
We Can
BRADY® SIGNMARK DIV.® CATALOG NO. 38084


DANGER

Alberta Asbestos Abatement Manual

October 2012 revision, section 5.5.12.4

Removal of Asbestos Insulation on Elevated Insulated Pipelines

- “Trough”, “Catch Basin” or “Open Air”
- For removal from hot lines
- OR on cold lines, where use of glovebag is not practical
- Other options should be considered first

Asbestos Abatement Technique

A ‘High Risk’ abatement procedure

- Water in place of enclosure – no dry removal
- PAPR required – no half face respirators
- Decontamination facility with shower – no street clothes

Considerations in it’s use:

- Outdoor or indoors
- Type and condition of material
- Access
- Environmental conditions and nearby occupants


5963
Genie
RENTALS LTD.
Genie BOOM

An Effective Alternative?

Evaluation of the technique has involved:

- Procedural Review
- Observation and Inspection
- Air Monitoring

Compared to traditional abatement methods…

- Glovebag removal
- Full enclosure with negative pressure


RSC


HIGH RIVER
RENTALS
www.highriverrentals.com


STURDY

Review and Initial Thoughts

In a number of ways the trough approach and technique presents reduced risks to workers:

Factor	Effect
Open Work Environment	Easier and more efficient work; potential for injury appears reduced.
Powered Air Purifying Respirator (PAPR) Required over Half Face Respirator	Increased worker protection by a factor of 100.
Decontamination with Shower Required	More thorough decontamination for option for workers.
Less Worker Skill Required	Reduced chance of incident from inexperience or mistakes

Thoughts Upon Observation

Trough process is significantly…

1. **Faster** to execute than either glovebag or full enclosure
2. **Less costly** than either glovebag or full enclosure

- Less setup time – quick mob/de-mob if needed
- Less specialized equipment or materials needed
- Less waste generated

Other benefits? Overall work site hazard exposure is reduced – *injury, falls, impacts, cuts, pinches, exposures*

Air Monitoring Strategy

Air samples were collected in and around the work:

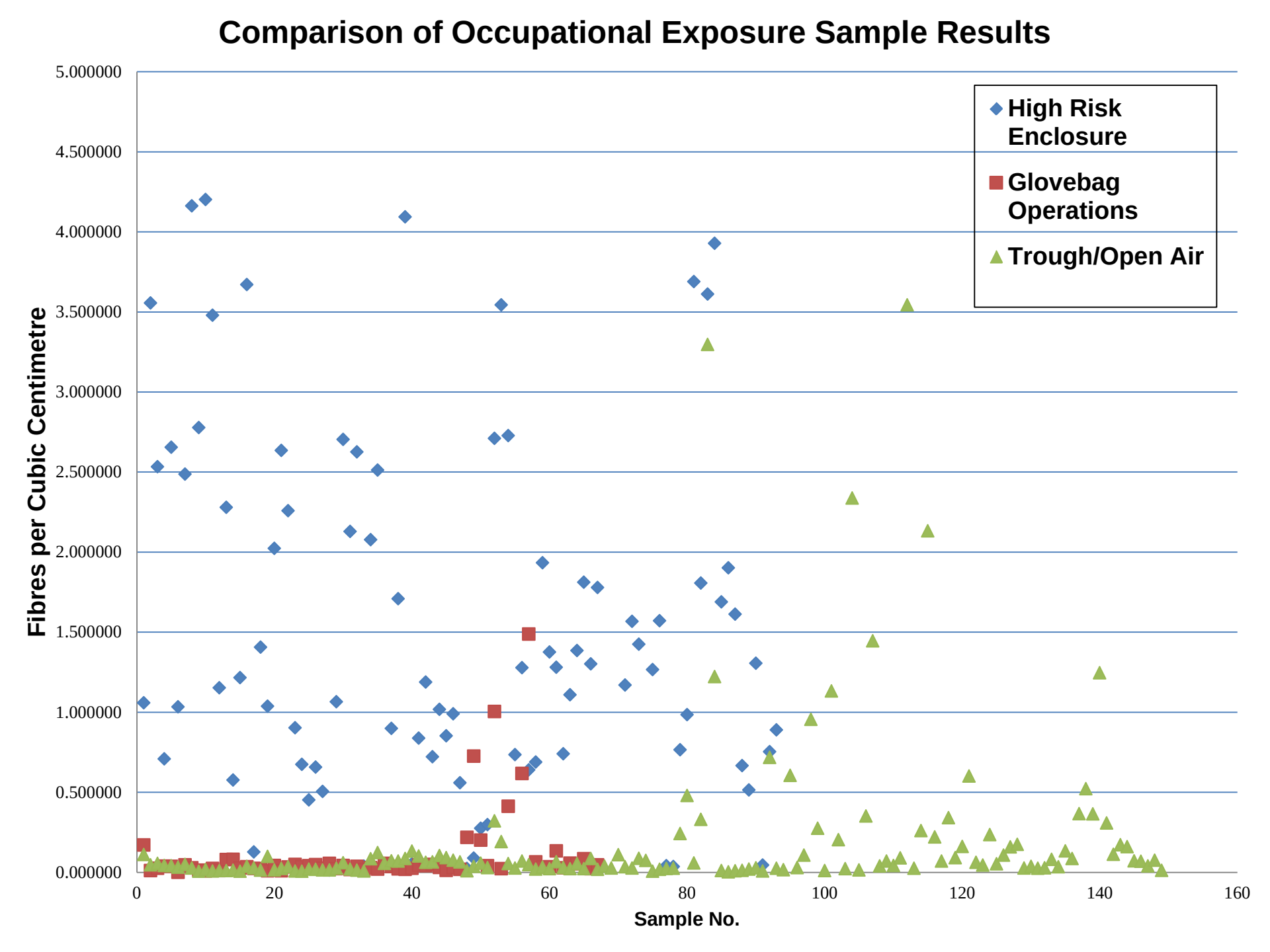
- Personal or Occupational Exposure
- Immediate Vicinity of the Work Activities
- Adjacent to the Work Area
- Downwind of the Work Area

Sample analysis by NIOSH 7400 – Asbestos Fibres by Phase Contrast Microscopy (PCM), using trained, proficient analysts.

Occupational Exposure Sample Results

Sample Type	Total Samples	[Minimum]	[Maximum]	[Average]
Glovebag	66	<0.01	5.30	0.18
Trough / Open Air	228	<0.01	3.54	0.20
Enclosure	92	0.01	11.94	1.90

Personal exposure monitoring results were only marginally higher (on average 10%) when using the trough method vs. traditional glovebag. Both significantly below enclosure.


Comparison of Occupational Exposure Sample Results
Fibres per Cubic Centimetre
5.000000
4.500000
4.000000
3.500000
3.000000
2.500000
2.000000
1.500000
1.000000
0.500000
0.000000
0
20
40
60
80
100
120
140
160
Sample No.
High Risk Enclosure
Glovebag Operations
Trough/Open Air

Immediate Vicinity Sample Results

Sample Type	Total Samples	[Minimum]	[Maximum]	[Average]
Glovebag	5	<0.01	0.17	0.043
Trough / Open Air	242	<0.01	0.07	0.026
Enclosure	n/a	n/a	n/a	n/a

Insufficient data to draw conclusions on glovebag. However, results of monitoring on similar projects indicate likelihood of airborne fibres in the immediate work area

Adjacent Area Sample Results

Sample Type	Total Samples	[Minimum]	[Maximum]	[Average]
Glovebag	79	<0.01	0.066	<0.01
Trough / Open Air	284	<0.01	0.088	<0.01
Enclosure	n/a	n/a	n/a	n/a

Comparable results between glovebag and trough monitoring in ambient spaces adjacent to the work area. All results below the OEL of 0.1 f/cc, i.e. not a restricted area.

Downwind Sample Results

Sample Type	Total Samples	[Minimum]	[Maximum]	[Average]
Glovebag	29	<0.01	0.026	<0.01
Trough / Open Air	125	<0.01	0.031	<0.01
Enclosure	n/a	n/a	n/a	n/a

Comparable results between glovebag and trough monitoring in ambient spaces downwind of the work area. Results typically at background or baseline concentrations.

Trough Method Conclusions

The “trough”, “catch-basin” or “open-air” method can be a feasible technique for abatement in the right situation, particularly appropriate applications in D&D abatement.

Some Important Considerations…

- Very comparable to traditional approaches – glovebag and full enclosure should still be considered
- Control of the site and personnel is essential – increased presence of inspectors and safety personnel
- Modified air monitoring strategies should be implemented

Closing Thoughts…

The decommissioning and demolition industry is ever evolving – we will continue to see innovation and creativity driving the way we do our work.

Other HazMat considerations on the horizon.

- Crystalline silica, industry best practices
- Lead in paint, regulatory changes and new abatement techniques
- Asbestos in soils, testing methods

Thank you!

Questions? Comments?

Paul Hammond
PHH ARC Environmental Ltd.
Calgary, Alberta