

Weatherization and Vermiculite

Toward Solutions

February, 2015

Marc Companion	Vermont Housing and Conservation Board
Todd Hobson	Clay Point Associates

What we'll discuss today

- Summary of the vermiculite insulation problem
- Asbestos – what you need to know
- Weatherization and vermiculite
- Toward solutions - what we've been exploring
- The Hybrid – a new approach
- Next steps

Summary of the vermiculite problem

- Presumed to contain asbestos
- Ubiquitous: estimated 20,000+ homes in Vermont
- Typically in attics and exterior walls
- Weatherization work often halted until vermiculite is removed
- Certified removal is expensive
- Homes remain unweatherized



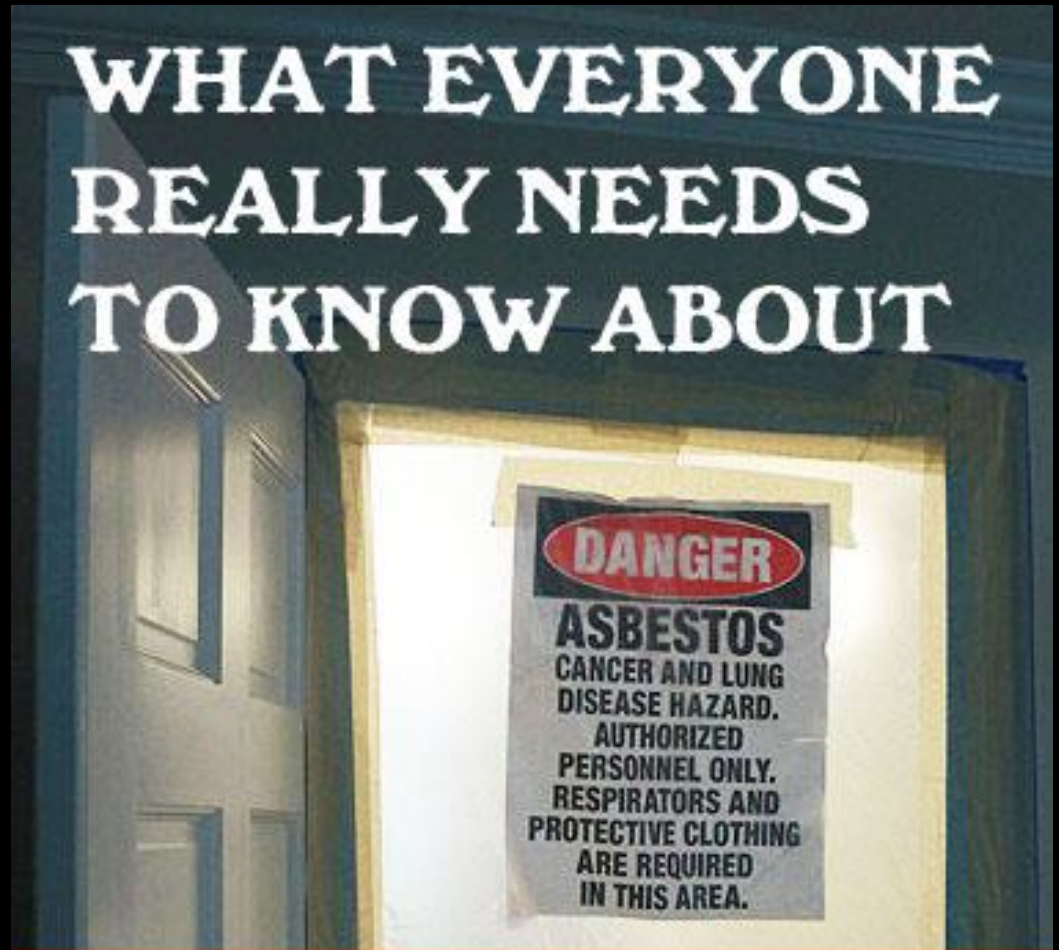
Toward solutions

- Re-activate a dialogue on vermiculite – March 2013
- Formed a diverse group to brainstorm
- Collaborated with an asbestos project designer
- Developed a “Hybrid Vermiculite and Wx” technique
- Identified other potential solutions

More on this later

Asbestos and vermiculite

**WHAT EVERYONE
REALLY NEEDS
TO KNOW ABOUT**



ASBESTOS

What is Asbestos?

“The Magic Mineral”

Fire Retardant (20,000 deg. F)

Insulator

Strength & Durability
(highest tensile strength of
natural material)

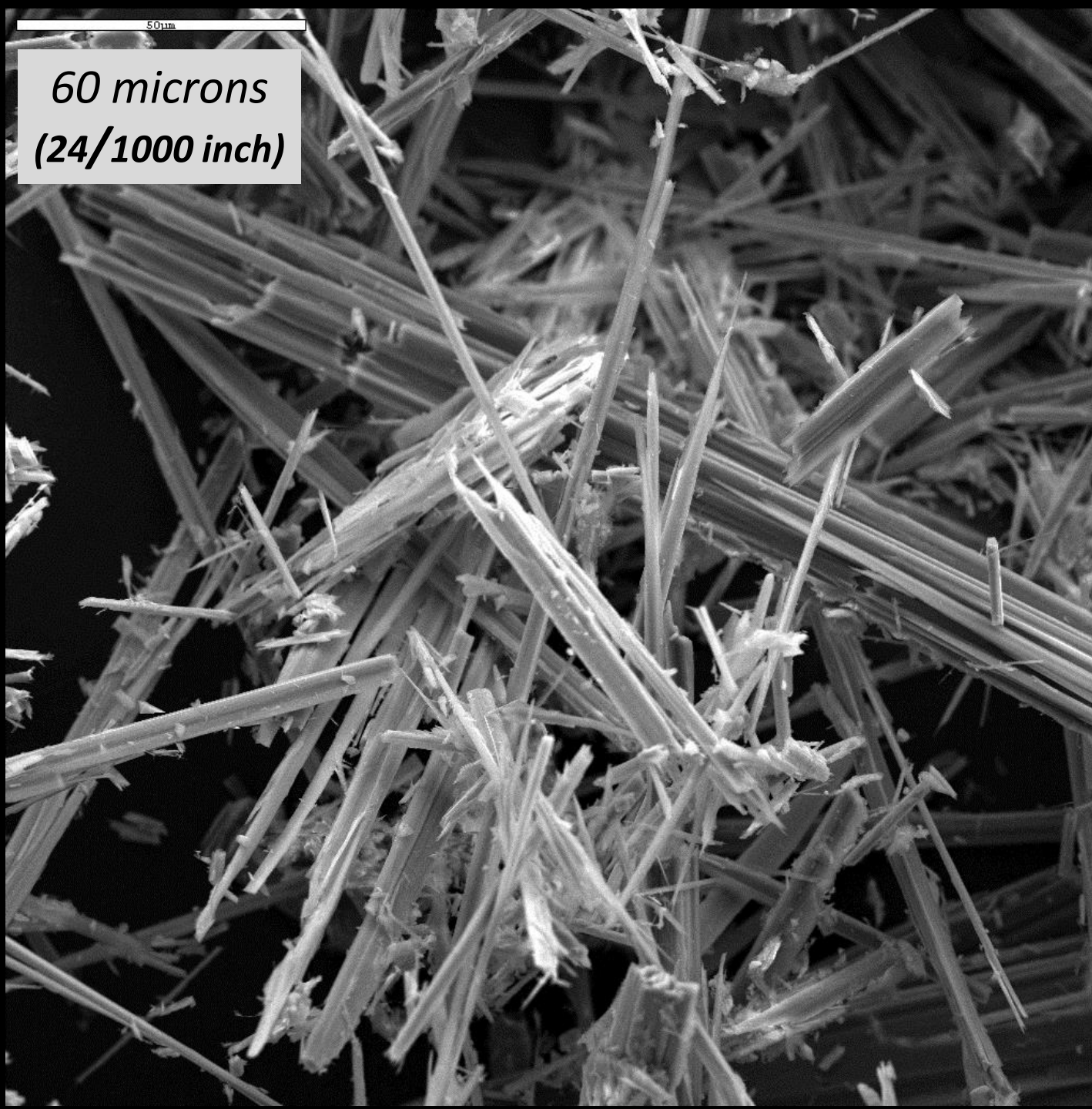
Chemical Resistance

Acoustic Dampening
Properties

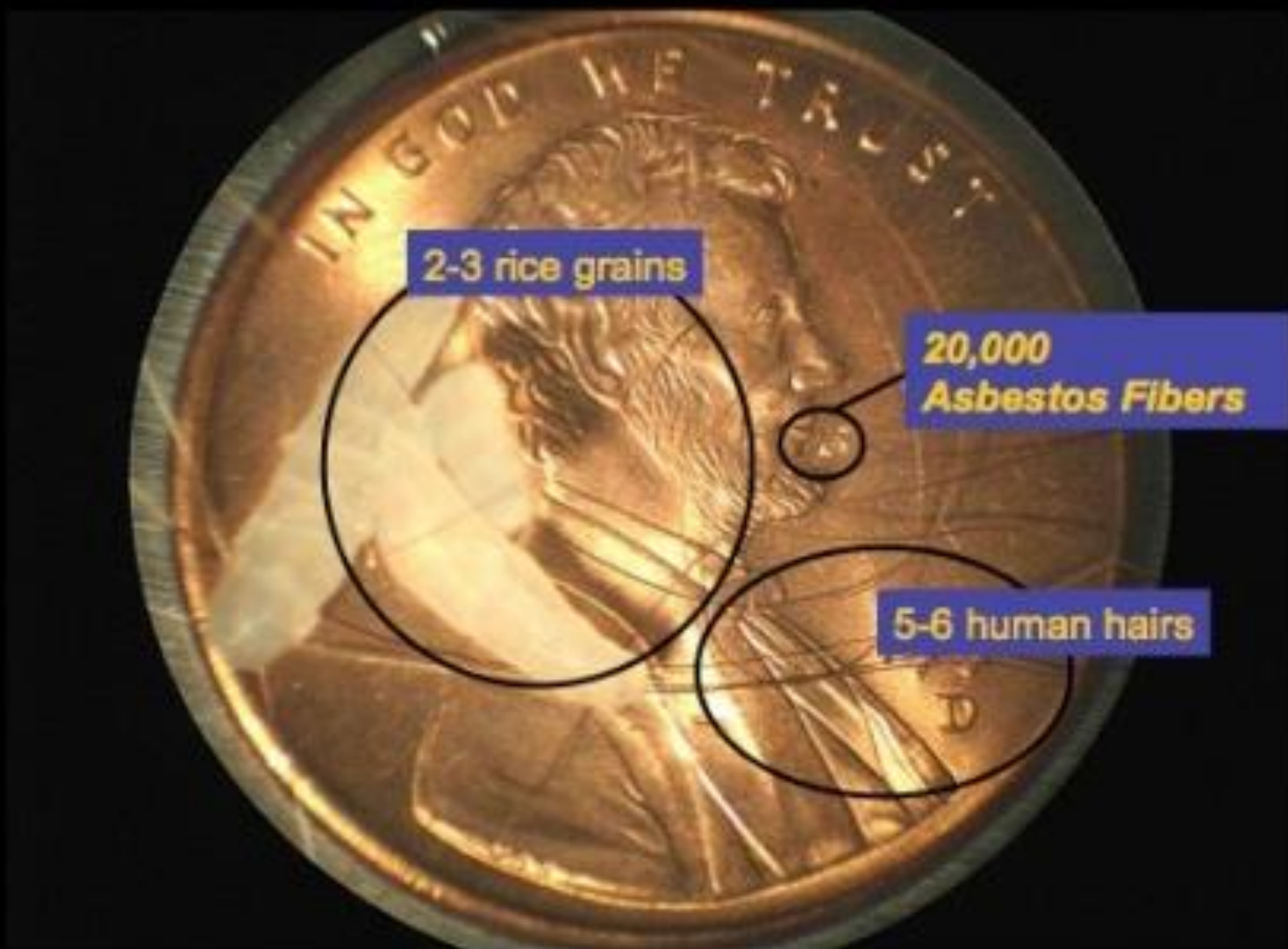


50µm

*60 microns
(24/1000 inch)*

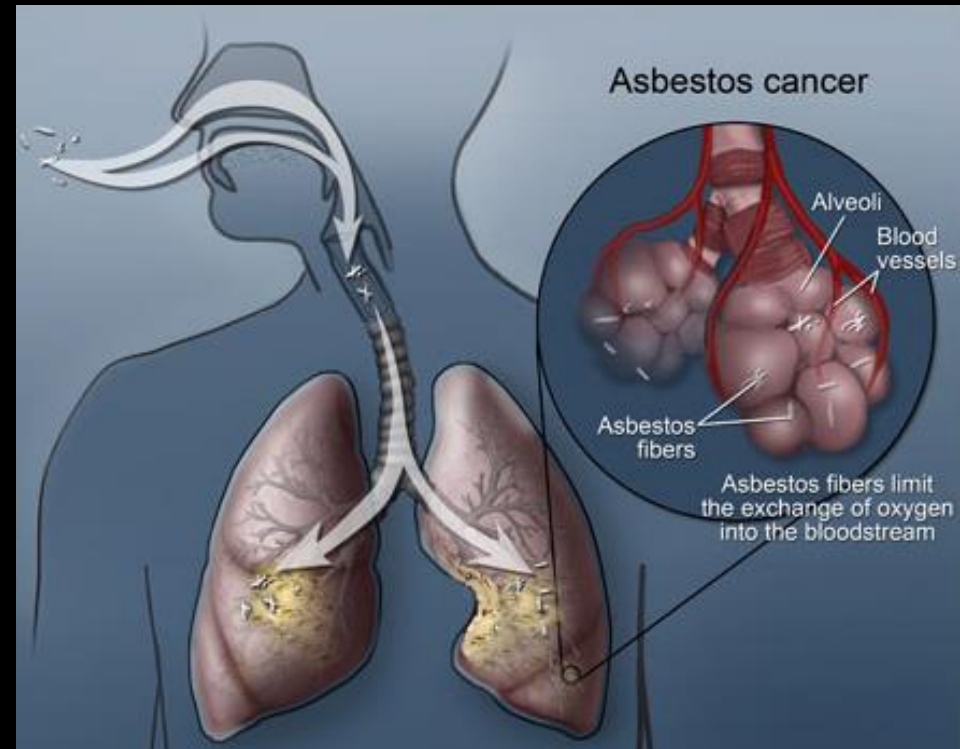


How Small is Asbestos?



Health risk of asbestos exposure

- Asbestos: a known human carcinogen
- Fibers become airborne
- Fibers are inhaled

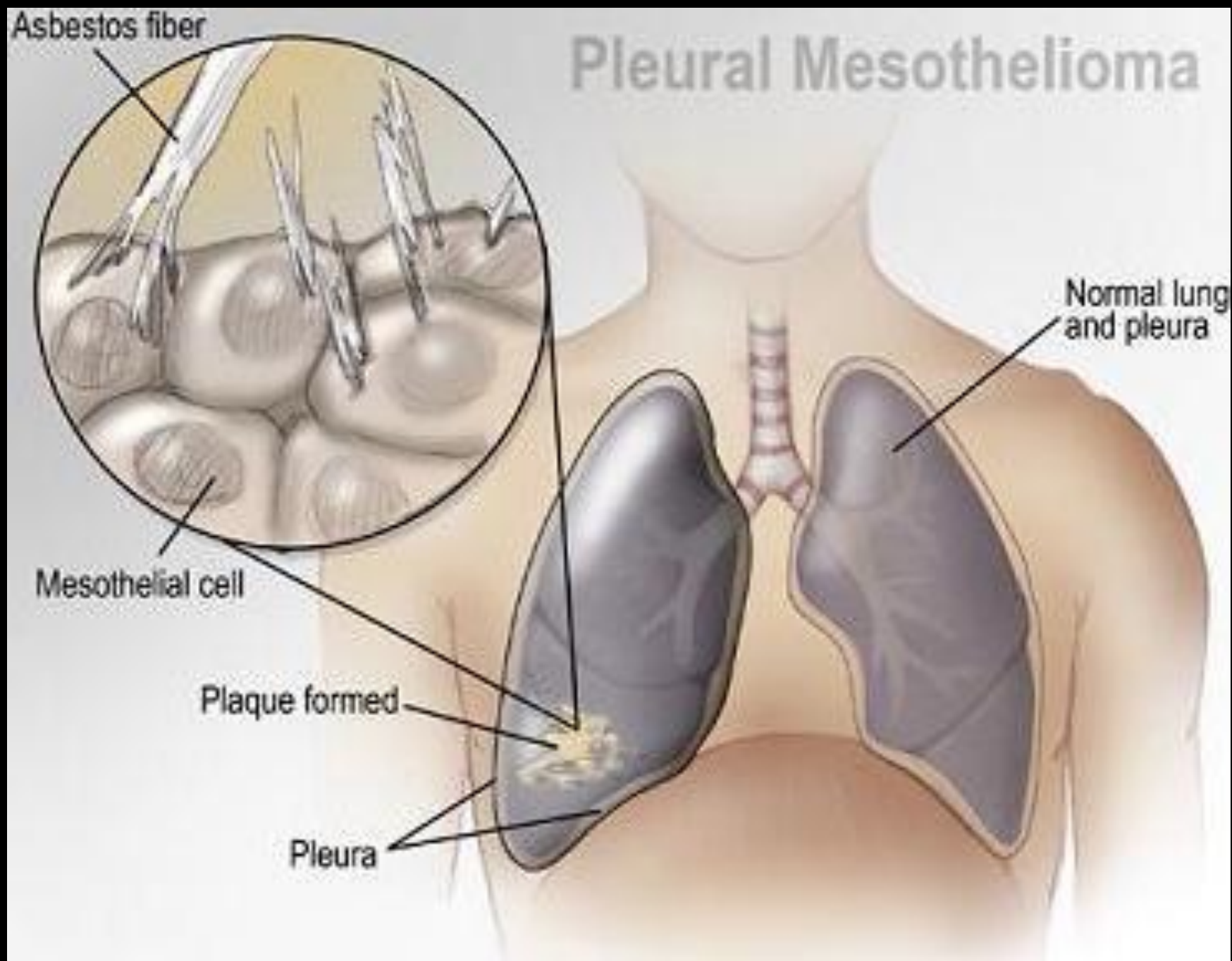


Latency period of disease

(duration from exposure until onset of sickness)

- For asbestos-related cancers: 15 to 45 years
- With continued exposure: a progressive scarring of lung tissue

Pleural Mesothelioma



Over time, damage is done

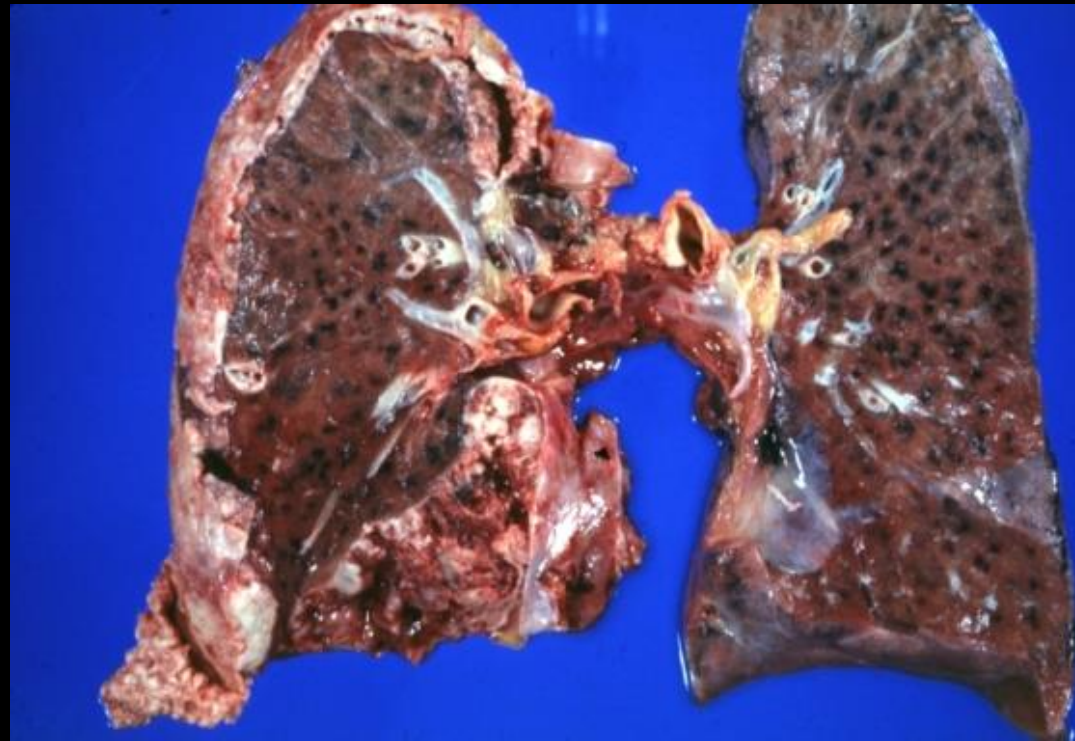
- Asbestosis: inflammation, chronic coughing & chest pain
- Mesothelioma: cancer of the mesothelium
(the lining of several body cavities (chest, abdomen, etc., and surrounds some major organs))

Common causes of
Lung cancer

Smoking (90% +/-)

Radon (5% +/-)

Asbestos (5% +/-)





EXTERIOR SURFACES

Cement Asbestos Siding

Cement Asbestos

Roofing & Felt

Window Putty

MISCELLANEOUS

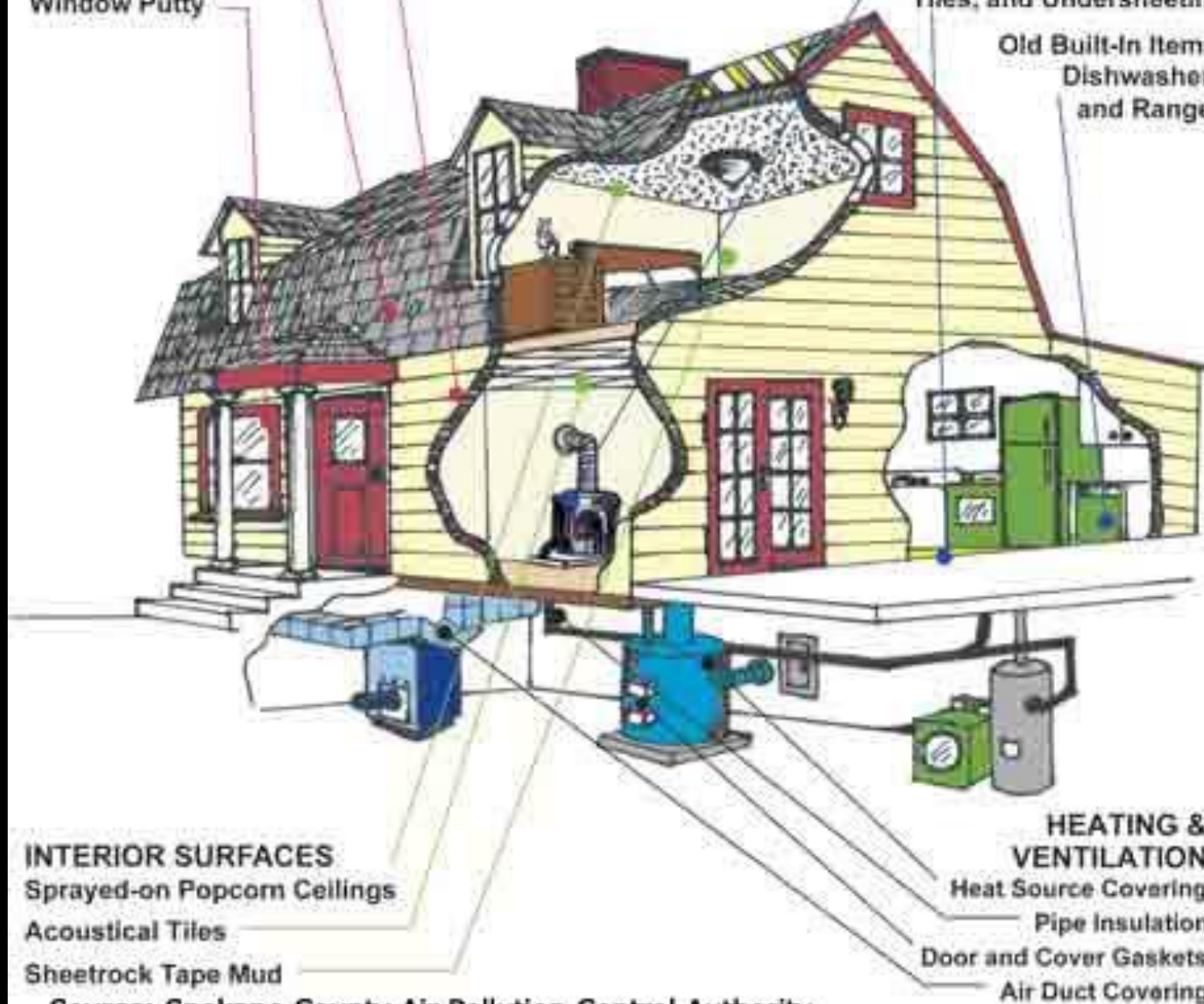
Woodstoves

Flooring:

Vinyl Asbestos Sheets,
Tiles, and Undersheeting

Old Built-In Items:

Dishwashers
and Ranges



INTERIOR SURFACES

Sprayed-on Popcorn Ceilings

Acoustical Tiles

Sheetrock Tape Mud

HEATING & VENTILATION

Heat Source Covering

Pipe Insulation

Door and Cover Gaskets

Air Duct Covering

Source: Spokane County Air Pollution Control Authority

Asbestos building materials fall into 3 general categories

- Thermal system insulation (HVAC systems)
- Surfacing material (sprayed-on, troweled-on)
- Miscellaneous materials (all others)

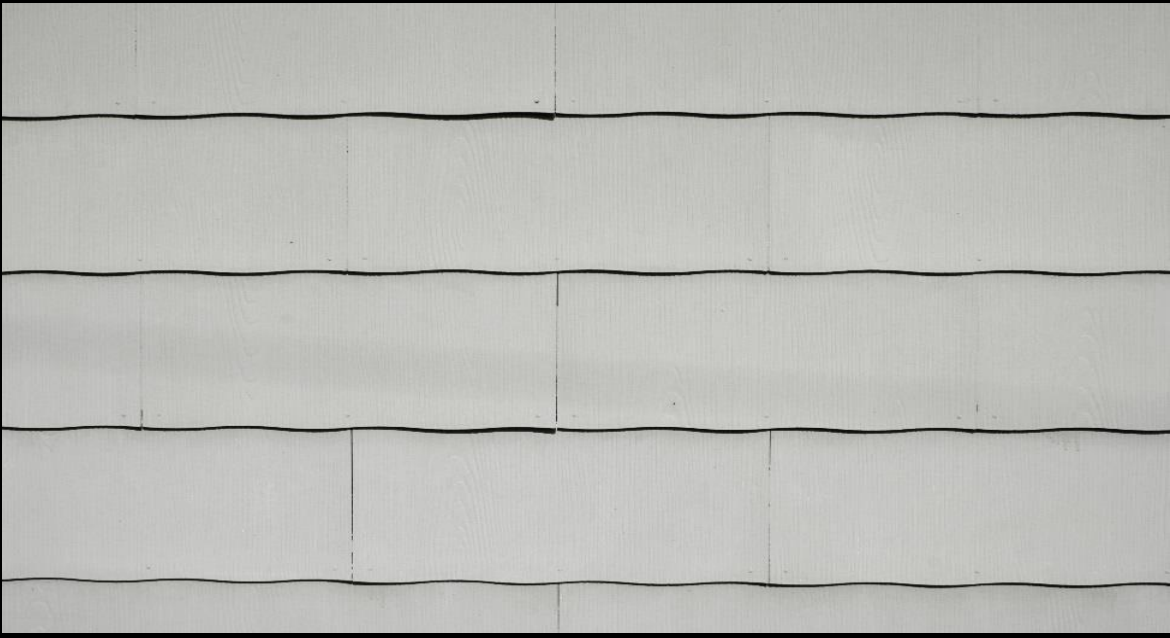
Approximately 3,000 different building materials contained asbestos

Corrugated roofing (cementitious)
likely from Eden & Lowell, Vermont



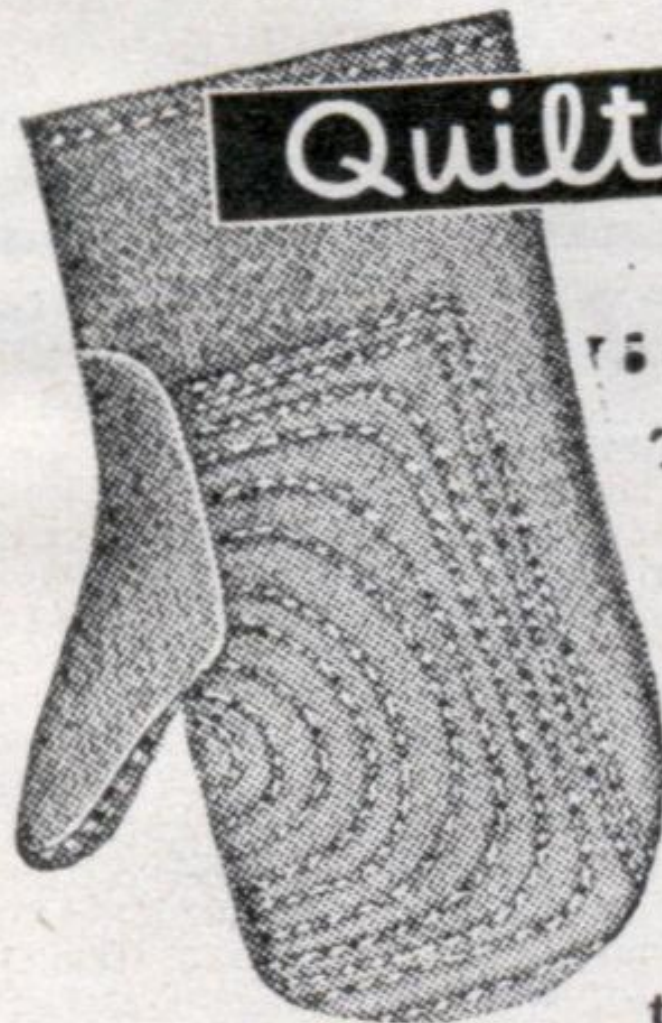






Vermiculite insulation





Quilted

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... they last twice as long

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Fireproof Cloth**



The Original Moulders' Asbestos Shoe



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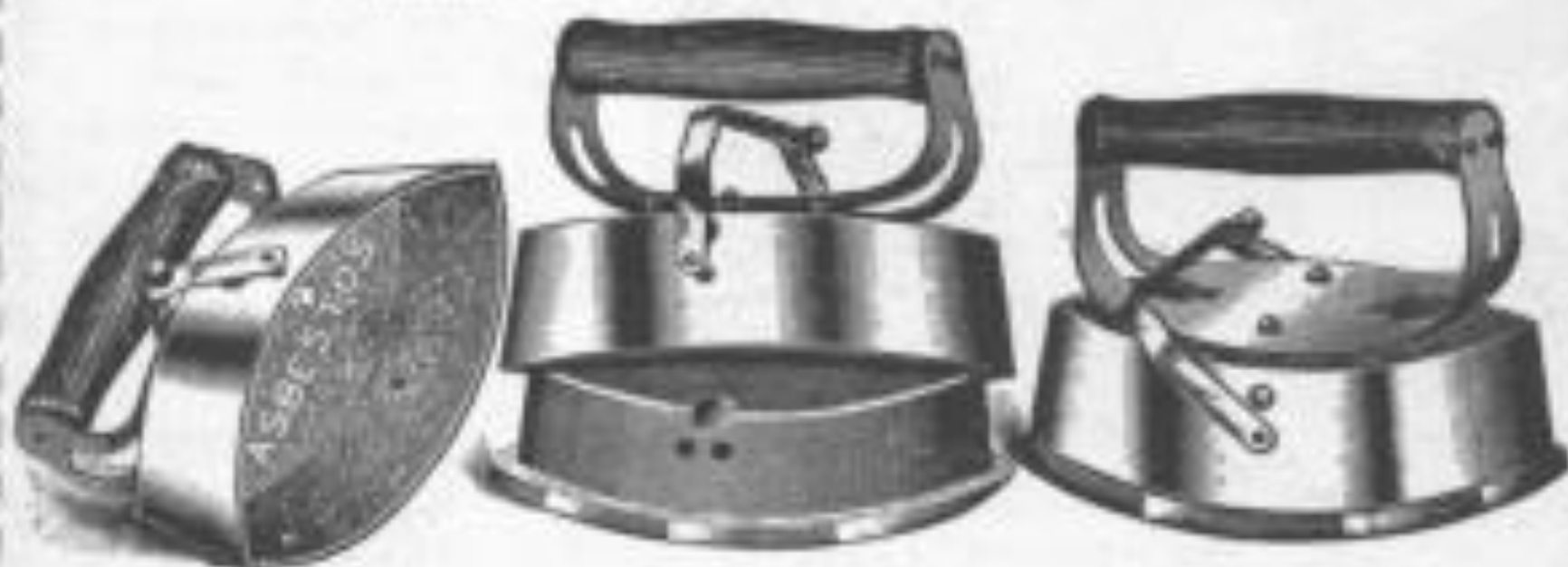
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browned on
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- **PERMANENT IN USE.**

Full information available for other applications involving elimination of heat-transfer



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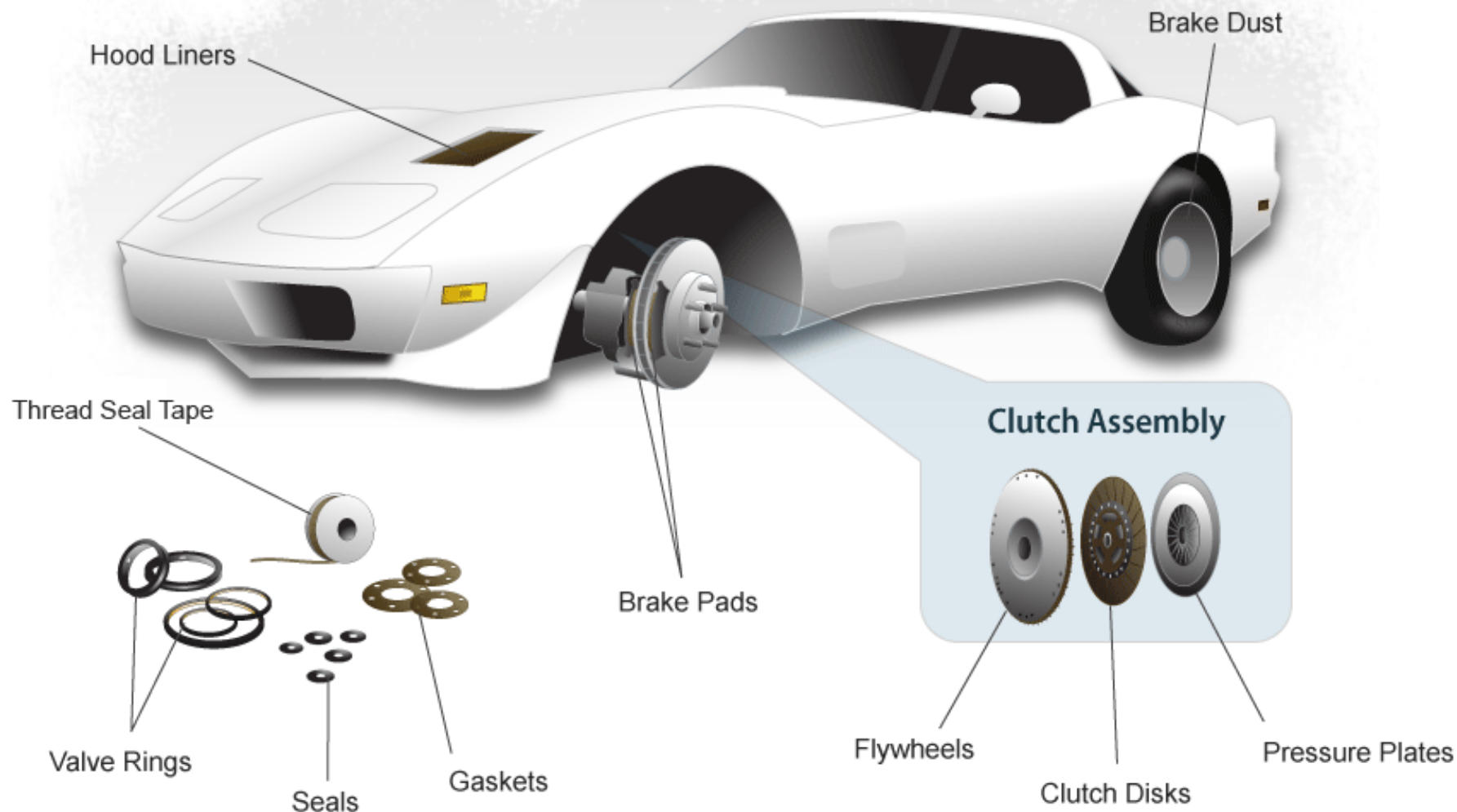
THE CAPE ASBESTOS CO. LTD

MORLEY HOUSE • HOLBORN VIADUCT

PHONE : CEN. 1783

Asbestos in Automobiles

© Asbestos.com



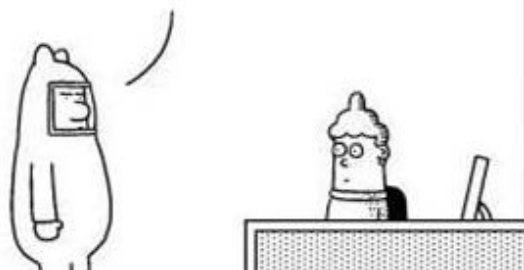


1972 Volkswagen Super Beetle

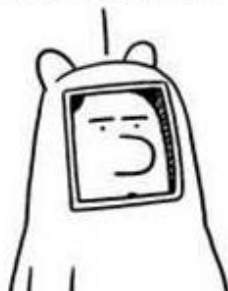
Has 86 asbestos-containing parts



THE FACILITIES
PEOPLE TELL ME
THERE'S ASBESTOS
IN THE CEILING.



THEY SAY YOU
DON'T NEED TO
WORRY ABOUT IT
UNLESS IT GETS
DISTURBED.

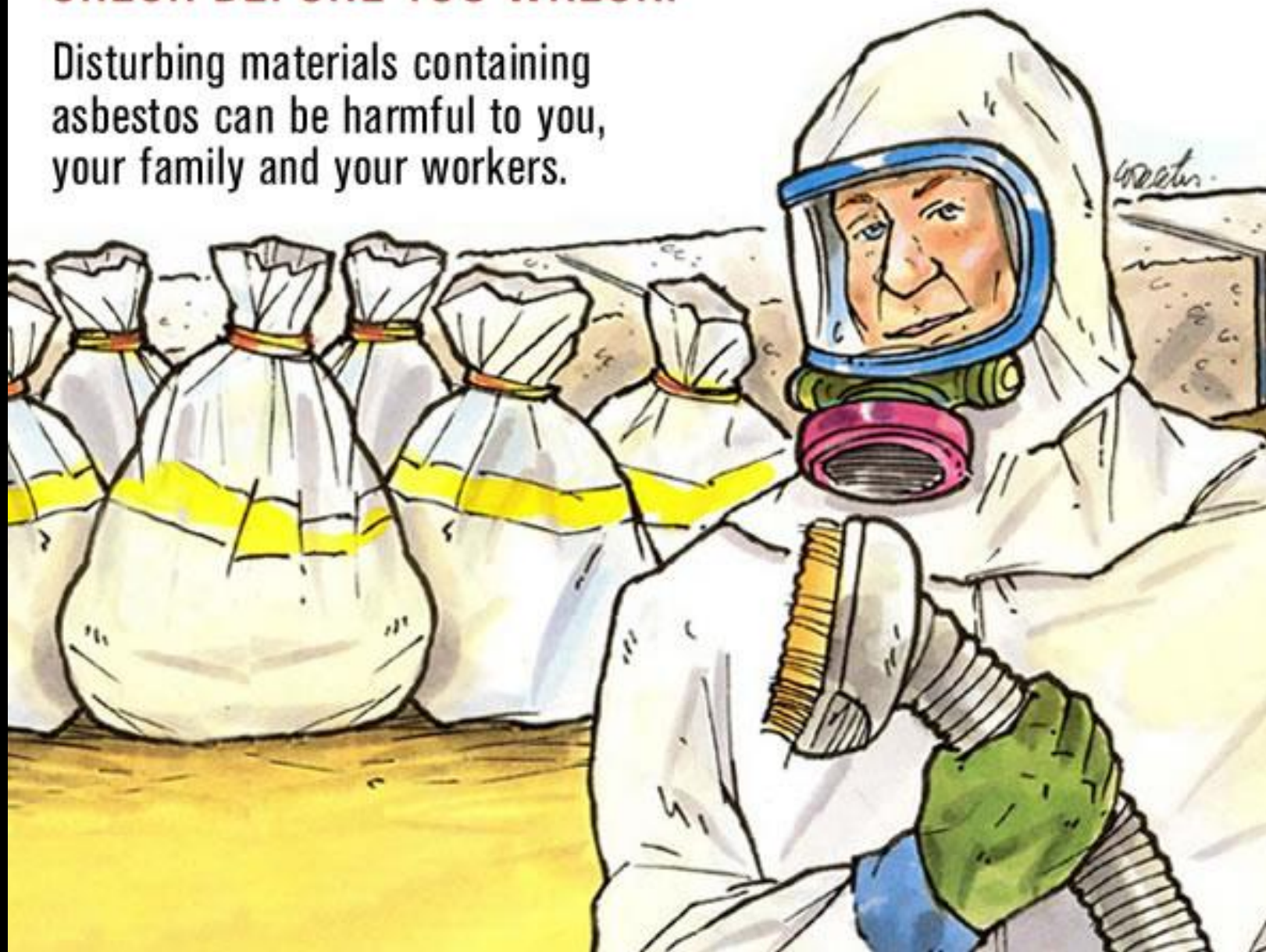


THEY
PLAN TO
DISTURB
IT TODAY.



CHECK BEFORE YOU WRECK!

Disturbing materials containing asbestos can be harmful to you, your family and your workers.



About Vermiculite Insulation

1919 – Zonolite Company formed
and established the vermiculite mine
in Libby, Montana

1963 - W.R. Grace Corporation
purchased the Zonolite Company and
acquired the Libby mine



Business records indicate:

- Approximately 80% of vermiculite insulation in the U.S. came from the Libby mine

Veins of asbestos run through the Libby vermiculite mine

N Idaho



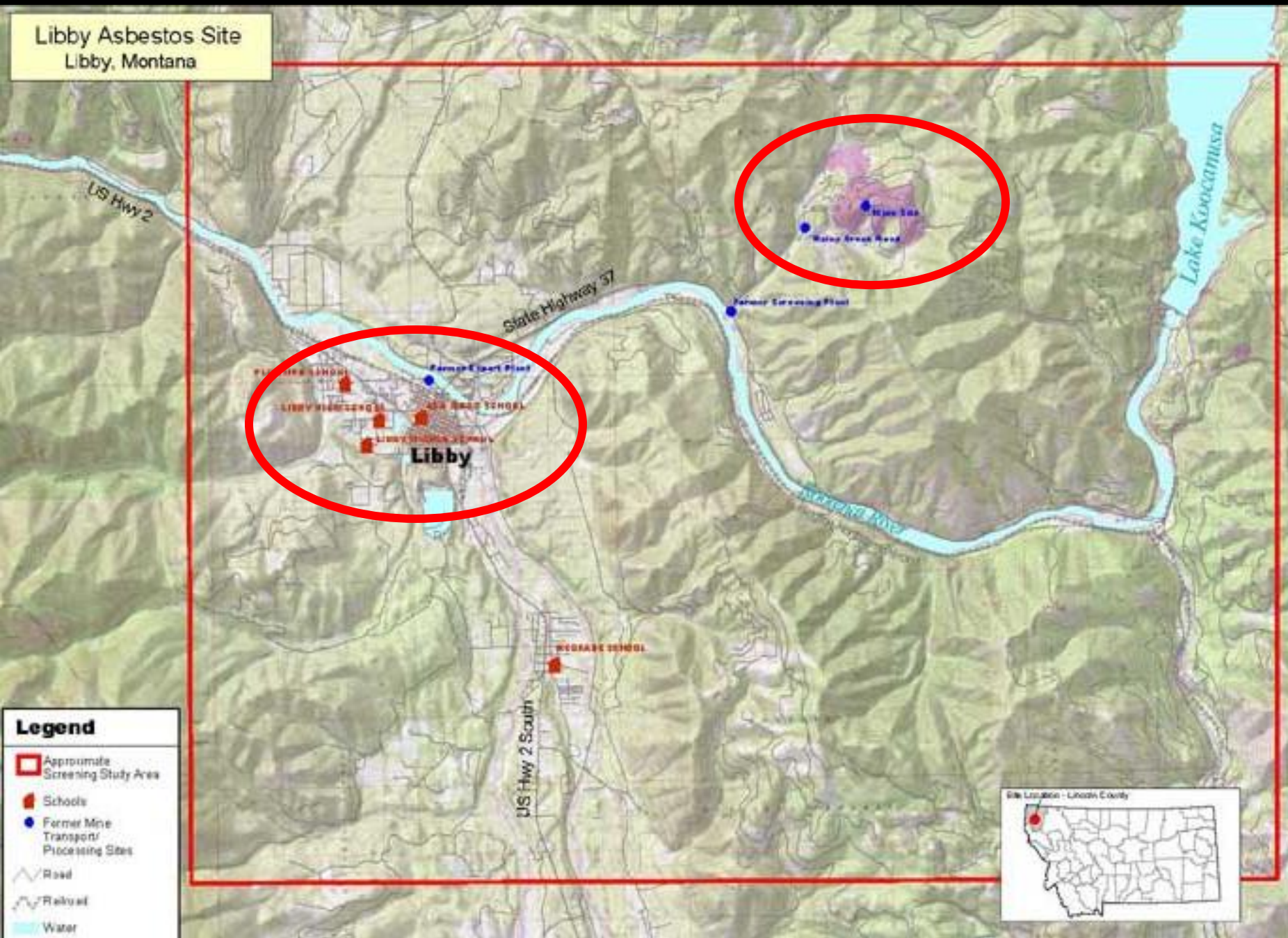
Libby



Libby, Montana vermiculite mine (1919 – 1990)



Libby Asbestos Site
Libby, Montana





Libby – town placed on EPA Superfund list in 2002



WARNING

Libby Amphibole asbestos has been found in and around the rocks and sediments in this creek.

Asbestos is a cancer and lung disease hazard.

Disturbing it can lead to exposure.

Until the USEPA can address this area,

**YOU ARE ADVISED TO
STAY OUT!**



Test this vermiculite to see if it contains asbestos?

\$





At the Libby, Montana mine...

1. Vermiculite with veins of asbestos

2.



3.



4.



5.



6.



7.



Did any bags contain asbestos?

If so, where in attic were they dumped?

Collect multiple samples. If all are negative, is there no asbestos in attic?

There is no recognized testing protocol.

Instead of testing,
assume presence of
asbestos contamination
(VDH & EPA)





EPA

- Regulates demolition and renovation
- Regulates asbestos disposal
- Only applicable for multi-family housing > 4 units

VOSHA

- Regulates employee/employer relationship relative to worker protection
- Training
- Respiratory protection
- Medical monitoring
- Protective clothing
- Exposure monitoring (PEL and STEL)
- Work practices
- Engineering controls
- Record keeping

VRAC Vermont Department of Health

- Certification
 - Contractors, consultants, training providers and analytical services
- 3SD and asbestos abatement project
- Project permit (notification)
- Work practices / engineering controls
- Project clearance
- Containerization, transportation & disposal

Qualified contractors – certification & licensure



Key engineering controls for asbestos abatement

- Critical / containment barriers
- Negative pressure filtration / differential
- Wet removal



Conventional Asbestos Removal Processes









Disposal of Asbestos





Weatherization and Vermiculite

Air seal the attic deck



▲
Winter

?



Constraints around working with asbestos

- Certified contractor
- Insurance
- Liability
- Costs associated with full removal
 - From a typical attic in VT: **\$7,000 - \$12,000**
 - Often beyond means of WAPs or homeowners

Result:

- Low-income weatherization programs used to “walk away”

or
- Other homeowners:
“we can’t afford to remove vermiculite”
- Thus many homes not properly weatherized

406 Vermont homes statewide on deferral list for low-income WAP weatherization services

- Estimate:
20,000+ homes in Vermont contain vermiculite

Toward solutions

- Re-activate a dialogue on vermiculite
- March 2013 – Formed a working group to brainstorm
 - “do we need to remove?”
 - “we just need access to the attic deck”
- Partnered with an asbestos project designer

The Hybrid Vermiculite / Weatherization approach

Key aspects:

- Wx & asbestos abatement occur at same time
in a regulated asbestos abatement area
- Move aside vermiculite and install Wx measures
(do not remove vermiculite)
- Loose fill cellulose blown on top of the vermiculite

Goals of the Hybrid Pilot Program

1. Develop and field test the Hybrid methodology
2. Verify that the Hybrid technique does no harm
 - asbestos monitoring in the living space
 - personal exposure monitoring of workers
3. Compare costs
 - Hybrid technique vs. full vermiculite removal + Wx

Verify “do no harm”

- Vermiculite confirmed to contain asbestos
- High volume air samples before work begins
- Hybrid work disturbs vermiculite, creating dust in attic
- High volume air samples during disturbance and after work completed
- Monitor exposure of workers



Completed 5 Hybrid pilot projects

- Montpelier, Brattleboro (2), Vernon and Perkinsville



Alternative work practices under VRAC

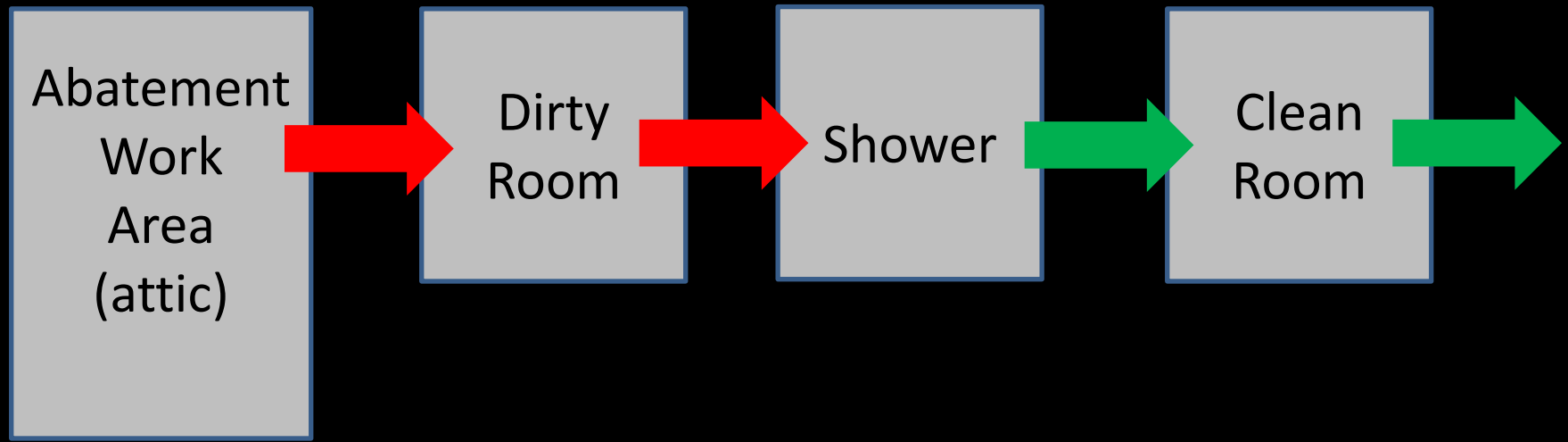
Wx supervisor receives

1. Asbestos awareness training (2 hours)
2. Specific asbestos training (4 hours)
3. On-site work practices training (2 hours)

Typical access to an attic



Decontamination structure



Each chamber separated by flapped doorways

Is source of make up air for the abatement work area

Establish critical barriers



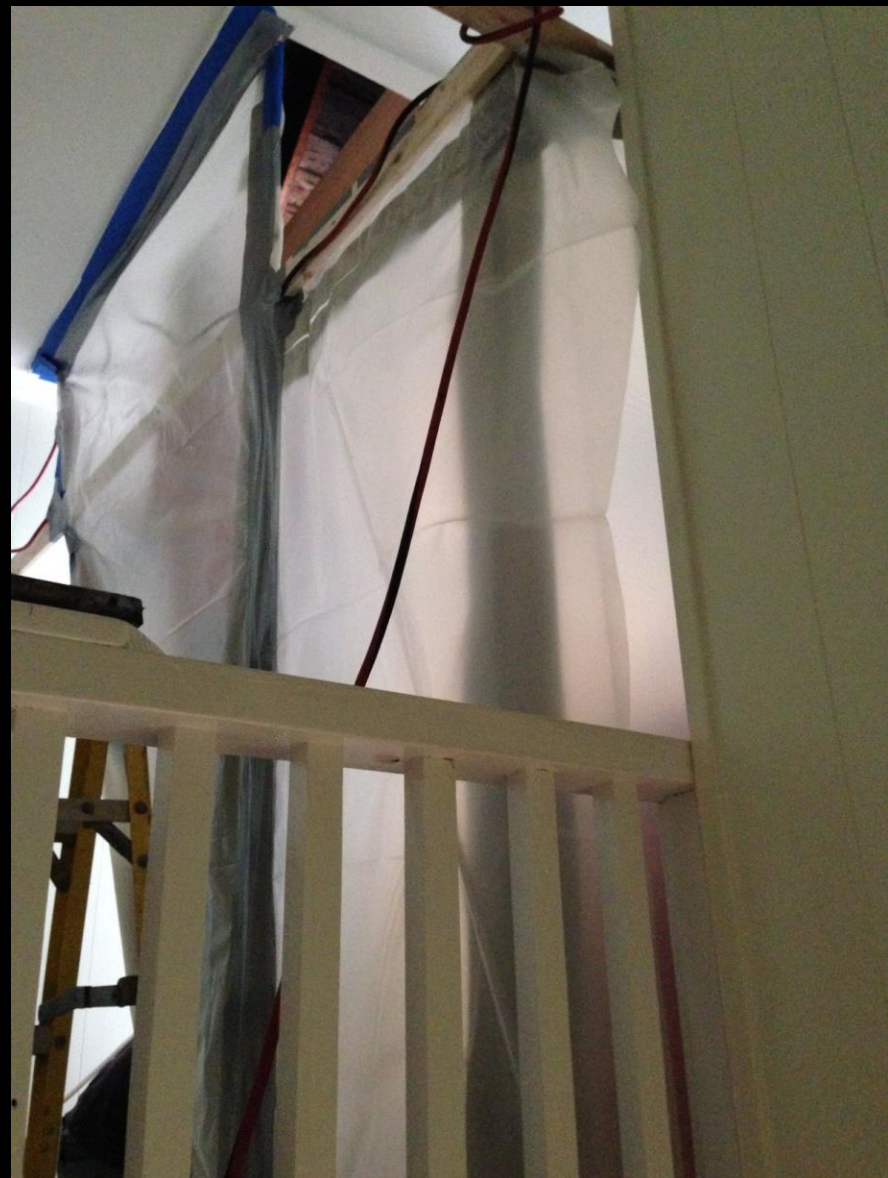




A shower in the decontamination zone









Critical barriers for penetrations in the ceiling





Containment zone: authorized personnel only



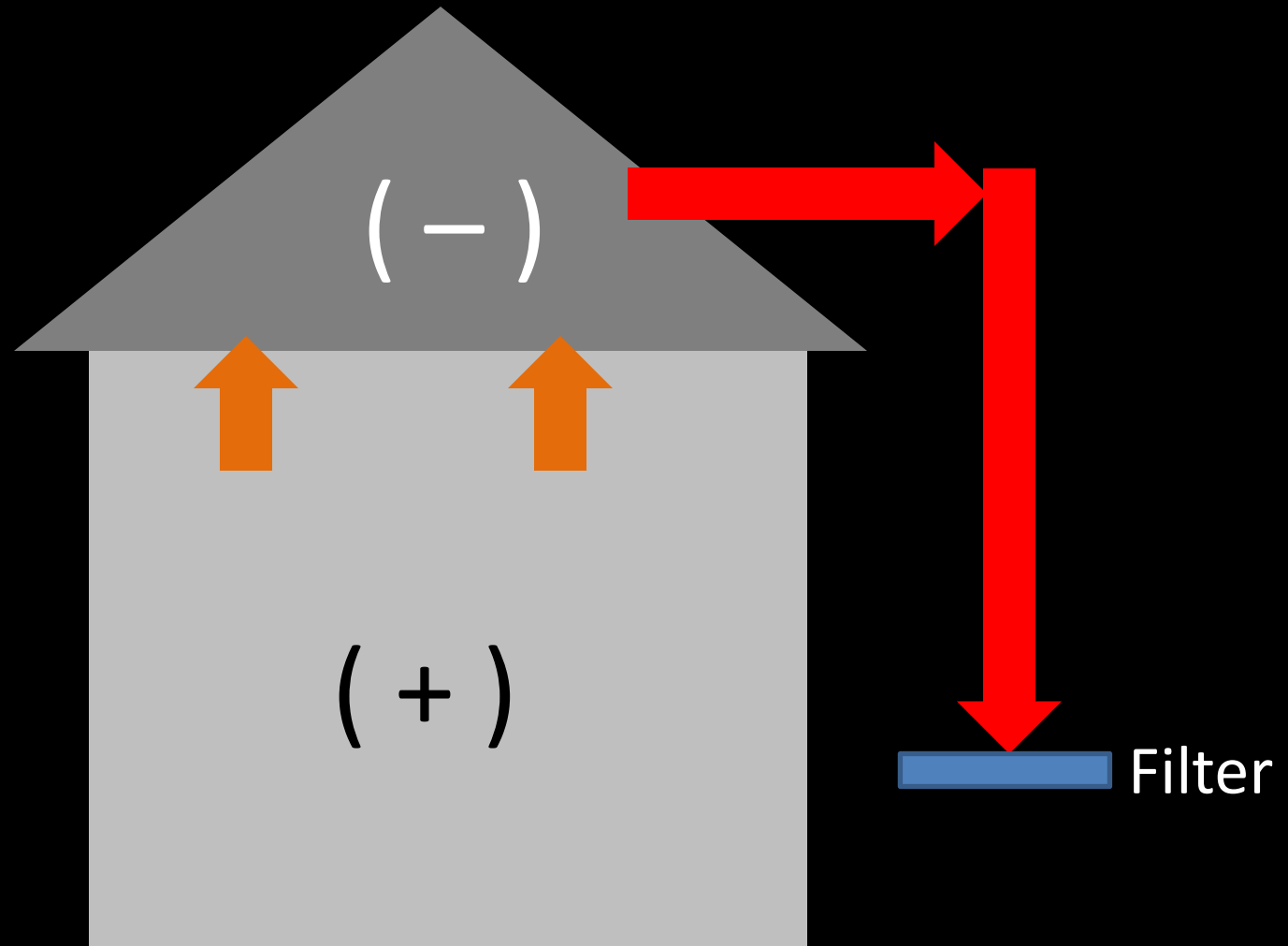
Personal Exposure Monitoring



High-volume air sampling



Depressurize the attic



Attic depressurization equipment













Images from the attics











Abatement worker moves vermiculite aside under the guidance of “Weatherization Supervisor” also in attic









Abatement worker applies spray foam to air seal











Install hazard warning signs





A warning placard hung in the attic



ASBESTOS HAZARD

This attic contains vermiculite under the
cellulose insulation

**DO NOT DISTURB THE
VERMICULITE**

Abatement worker blows loose-fill cellulose on top of vermiculite

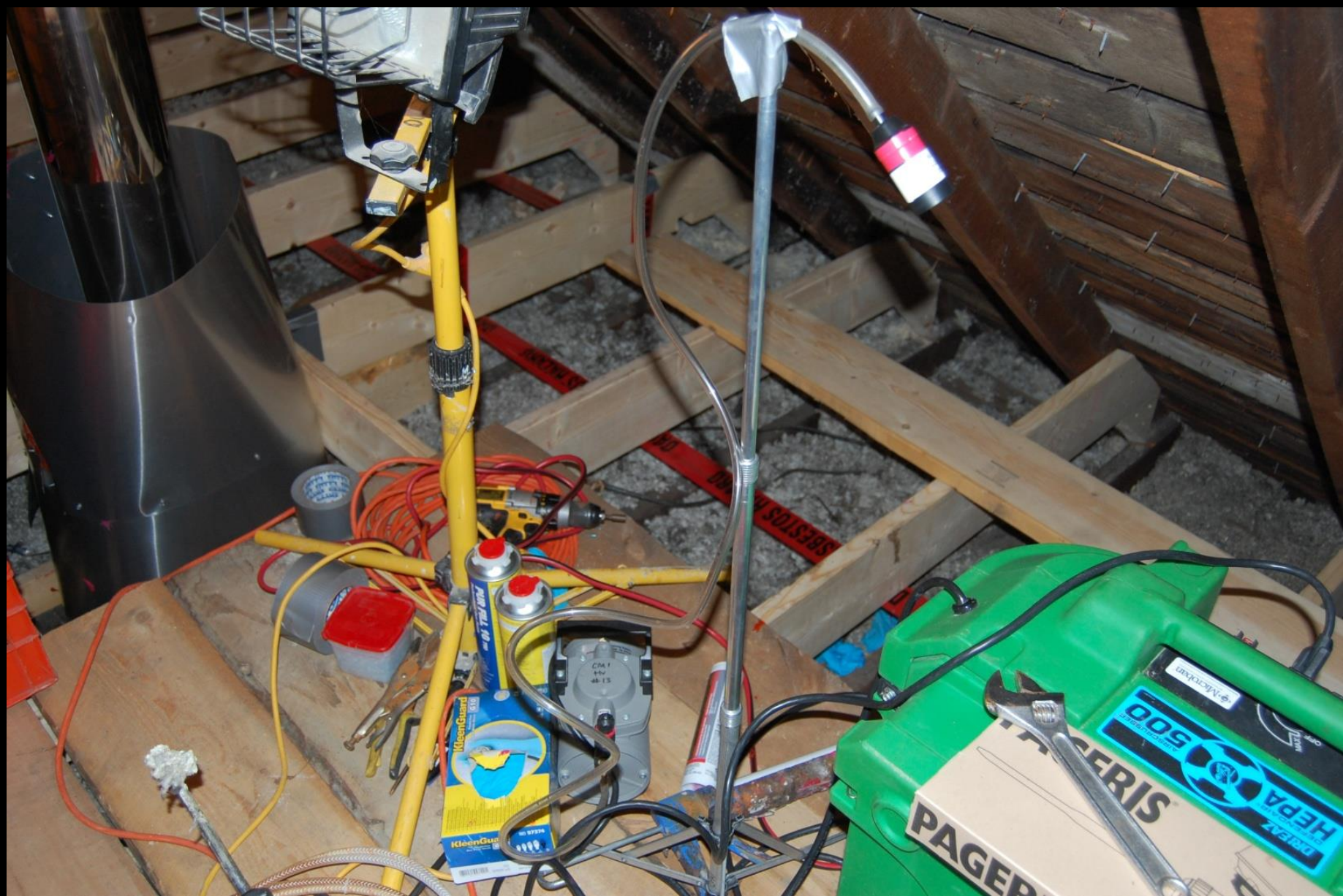






Post construction:
High-volume air samples in attic and living space





Results of air samples

- Air sampling data confirm:
 1. Worker/occupant health and the living environment can be protected.
 2. No vermiculite-related asbestos detected in living area directly below attic during or after disturbing vermiculite

Results – air sampling in living area

Project	Pre 1	2	During 1	2	Post 1	2
1	NSD	NSD	NSD	NSD	NSD	NSD
2	NSD	NSD	NSD	NSD	NSD	NSD
3	NSD	NSD	NSD	NSD	NSD	NDS
4	NSD	NSD	NSD, 1 (CR), NSD	NSD	NSD	NSD
5	NSD	NSD	OL	1 (CR)	NSD	NSD

NSD = No asbestos Structures Detected

CR = Chrysotile asbestos



Cost data: Hybrid vs. full removal + Wx

- Hybrid: 45% - 65% less

- Source of cost savings



- a) Wx and asbestos activities occur simultaneously
- b) Leaving the vermiculite in place rather than incurring the cost of expensive disposal

Results – cost data for vermiculite aspect of pilot projects

Project	Removal Low Bid	Hybrid Low Bid		Project Design *	Project Monitoring
1	\$6,585	\$3,474	53%	\$500 - \$1,100	\$400 - \$2,500
2	\$9,459	\$3,457	37%	"	"
3	\$10,800	\$3,534	33%	"	"
4	\$9,359	\$4,322	46%	"	"
5	\$6,680	\$3,847	58%	"	"

* Affected by location of property. Value in multiple sites.
Project design will lower abatement contractor bid prices.

Cost data for 7 other vermiculite projects (removal performed – not Hybrid)

Project	Removal Low Bid	Hybrid Low Bid		
A	\$10,578	\$5,018	47%	
B	\$12,221	\$4,350	36%	
C	\$10,086	\$4,400	44%	
D	\$9,450	\$3,900	41%	
E	\$14,195	\$4,240	30%	
F	\$13,858	\$5,393	39%	
G	\$8,901	\$3,195	36%	

Lessons learned

- Hybrid not for every situation
- More Hybrid project value in larger attics
- Slopes = Hybrid (can't remove from slopes)
- Abatement contractor skills are critical
Asbestos contractors need Wx training
- Auditors: don't walk away – assess possibilities

Small Scale, Short Duration (3SD) asbestos projects

Completed 7 projects in last 18 months (< \$1,500 each)

For a 3SD:

- Less than ten (10) square feet of asbestos/vermiculite
- No permit required from VDH
- Must notify VDH after work is completed
- Asbestos abatement worker/supervisor required

Other

- Wx techniques that DO NOT disturb vermiculite
- Hybrid industry
 - Abatement contractors with Wx expertise?
 - Wx contractors with abatement certification?
 - 2 seminars for Wx supervisors thus far

Next steps for development of Hybrid

- Project #6 might happen soon
- Complete a Report on Findings
- Abatement contractor education on Wx install
- Continue working with VDH to reduce consultant costs
- Searching for funds: HUD technical study, etc.
- An innovative solution for vermiculite in walls?

fin

Marc Companion

Vermont Housing and Conservation Board

Todd Hobson

Clay Point Associates