CPWR THE CENTER FOR CONSTRUCTION RESEARCH AND TRAINING

Asbestos Worker/ Contractor/Supervisor Initial Manual

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Asbestos Abatement Workers Regional Local #207

AHOHC
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Introduction

Decades ago workers and supervisors weren't told that asbestos is dangerous. They did not know to protect themselves while they were working. It has been estimated that upwards of 12,000 workers will die of asbestos-related disease every year. Most of these workers have, or will have, died ten to forty years after they started working with asbestos. Asbestos can cause disease or kill you unless you protect yourself. Asbestos can kill members of your family unless you take steps not to take asbestos fibers home. There are ways you can protect yourself, your family, and those who work with or for you.

During this class you will learn how to protect yourself, to make your work with asbestos as safe as possible, and supervise abatement projects in a health, safe, and productive way.

Protecting yourself and your workers from asbestos overexposure while you work means safe for you, safe for your family, safe for your crew and occupants of the building(s) you work on, and safe for the environment. As you learn the rules for working with asbestos, you will greatly lower your chances of getting sick years from now. You must work smart and carefully.

The goal of this class is to help you learn how to protect yourself – to be a decision-maker. You will learn work or plan, organize, and supervise asbestos abatement – how to keep asbestos fibers out of the air – how to keep asbestos out of your lungs if it gets in the air – how to keep asbestos fibers from spreading outside the work area – how asbestos fibers may affect your health; – how timely and preventative medical exams which are required for you when working around asbestos – and you will be able to make better supervisory decisions about your quality of work – and life.

Each unit contains information for both the contractor/supervisor and worker without distinction; however, when additional contractor/supervisor – specific information is provided, it will be found at the end of the unit under the heading –

CONTRACTORS/SUPERVISORS

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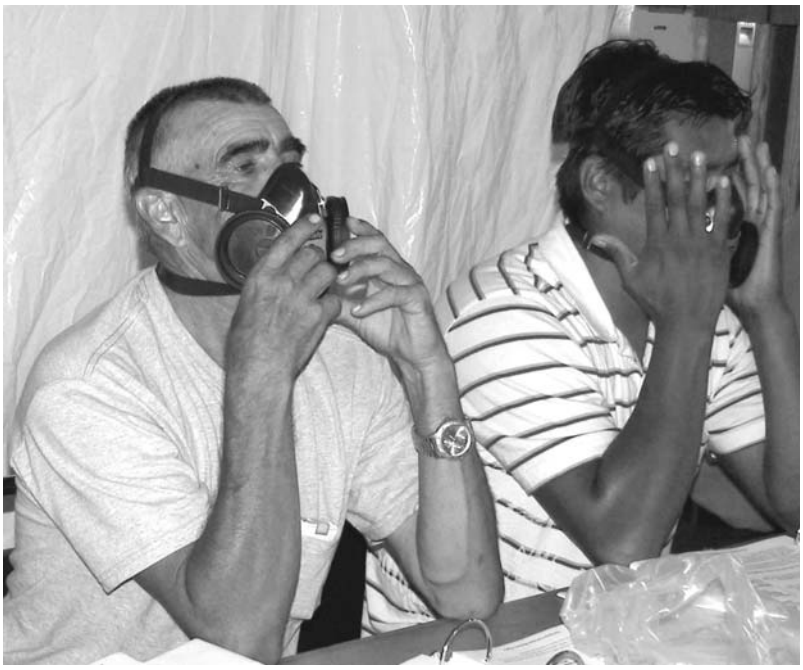
In addition to the knowledge gained from the classroom activities, the manual, demonstrations, and PPT/slides, you will learn from hands-on work practice.

You will learn how to setup and remove ACM from a pipe using a glovebag...

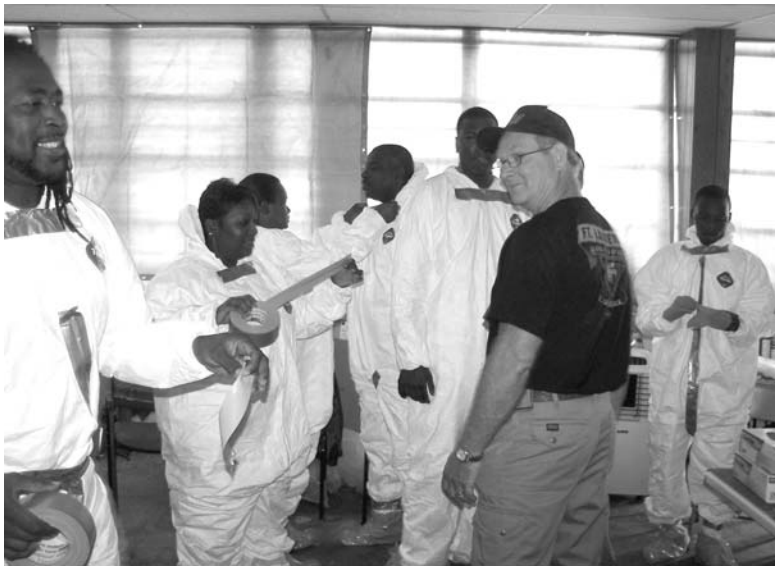
... how to lay and hang poly...

... the joy of taping
with gloves on ...



... and you will learn about wearing
and seal-checking an APR.

Notes and Scribbles



Dressing-out (Tyvek suits, gloves & boot covers) and getting instructions for hands-on activities.

ASBESTOS CONTRACTOR/SUPERVISOR

Class Agenda

DAY ONE	TOPIC	TAB
7:00 a.m. - 7:30 a.m.	Welcome and Introduction	
7:30 - 8:00	Video Tape	
8:00 - 9:00	Background Information: History, Physical Characteristics, and Uses of Asbestos ● Training Fact Sheet ● Supervisory Techniques: Asbestos Bulk Sampling[1]	**1**
9:00 - 9:15	**Break**	
9:15 - 11:00	Health Effects of Exposure and Medical Exams ● Supervisory Techniques: Medical Surveillance/Recordkeeping • Asbestos Medical Questionnaire	**2**
11:00 - 11:30	**Lunch**	
11:30 - 3:30 (w/break)	State and Federal Law and Regulations ● Supervisory Techniques: Legal & Insurance Considerations ● Supervisory Techniques: Contract Specifications	**3**

[1] "●" indicates additional special topic(s)

DAY TWO	TOPIC	TAB
7:00 a.m. - 7:30 a.m.	Day One in Review	
7:30 - 9:15 (w/break)	● Respiratory Protection and PPE ● Caring for Your Respirator ● Other Safety Equipment	**4**
9:15 - 11:00	Respirator Fit Testing & PPE (Hands-on Workshop) ● Inspection ● Donning ● Negative and Positive User Seal Checks ● Doffing ● Fit-testing (Supervisory Techniques) ● Cleaning/Sanitizing a Respirator ● PPE Dress-out	**4**
11:00 - 11:30	**Lunch**	
11:30 - 3:30 (w/break)	Respirator Fit Testing & PPE (Hands-on Workshop)	

DAY THREE

7:00 - 7:30 a.m.	Day Two in Review	
7:30 - 8:15	Supervisory Techniques/Recordkeeping Respiratory Protection Program	**4**
8:15 - 9:30 (w/break)	Control Methods	**5**
9:30 - 11:00	Worksite Setup/Engineering Controls/ Decontamination ● Supervisory Techniques: Pre-work Activities and • Assessing the work area • Supervisory Techniques/Recordkeeping: Design and Use of a Project Log Book ◦ Log Book Organization ◦ Daily Log	**5**

DAY THREE	TOPIC	TAB
	• Supervisory Techniques: Sample Inventory Checklist • Supervisory Techniques: Negative Pressure Systems • Supervisory Techniques: Entering/Exiting the Decon Unit	
11:00 - 11:30	**Lunch**	
11:30 - 1:45 (w/break)	Worksite Setup/Engineering Controls/ Decontamination cont'd	**5**

1:45 - 3:30	Class I - III Work Practices
	• Supervisory Techniques: Equipment Used for Removal of Friable Insulation Materials
	• Supervisory Techniques: Air Sampling
	  ◦ Filters
	  ◦ Pump Calibration
	  ◦ Analyzing Airborne Fibers
	  ◦ Air Sampling During and After the Asbestos Abatement Project
	  ◦ Recordkeeping: Sample Log Form
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DAY FOUR

7:00 - 7:30 a.m.	Day Three in Review	

7:30 - 8:30	Lockdown & Sprayback/Cleanup & Disposal
	• Supervisory Techniques:
	  ◦ "3-Phase" Cleaning
	  ◦ Visual Inspection
	  ◦ Recordkeeping: Lockdown Sequence
	  ◦ Recordkeeping: Air Sampling After Final Cleanup
		6

8:30 - 9:45	Personal Hygiene and Other Safety and Health Considerations	**7**
9:45 - 11:00	Glovebag Principles & Procedures/Worksite Preparation (Slides Show & Demonstration)	

DAY FOUR	TOPIC	TAB
11:00 - 11:30	**Lunch**	
11:30 - 2:30 (w/break)	Asbestos Abatement Methods/Cleanup & Disposal Procedures (PPE Practice Dress-out And Hands-on Workshop/Evaluation)	
2:30 - 3:30	Course Review	

DAY FIVE

7:00 a.m. - 8:30 a.m.	Final Exam; Class Evaluation
8:30 - 9:45 (w/break)	Asbestos Abatement (PPE Hands-on Evaluation)
9:45 - 11:00	Asbestos Abatement Methods/Cleanup & Disposal Procedures (Hands-on Workshop/Evaluation)
11:00 - 11:30	**Lunch**
11:30 - 3:00 (w/break)	Asbestos Abatement Methods/Cleanup & Disposal Procedures (Hands-on Workshop/Evaluation)
3:15 - 3:30	Class Closing

Fit-testing Hands-on

PPE Dress-out Hands-on Evaluation

ASBESTOS WORKER

Class Agenda

DAY ONE	TOPIC	TAB
7:00 - 7:30 a.m.	**Welcome and Introduction**	
7:30 - 8:30	Background Information: History, Physical Characteristics, and Uses of Asbestos	**1**
8:30 - 9:45 (w/break)	Health Effects of Exposure and Medical Monitoring	**2**
9:45 - 11:00	Asbestos Regulations ● State Regulations ● Federal OSHA Standards ● Federal EPA Regulations: NESHAP, AHERA, ASHARA	**3**
11:00 - 11:30	**Lunch**	
11:30 - 12:15	Asbestos Regulations cont'd	
12:15 - 1:30 (w/break)	Respiratory Protection and PPE ● Respirators – Principles and Types ● Caring for Your Respirator ● Other Safety Equipment	**4**
1:30 - 3:30	Respirator Fit Testing & PPE (Hands-on Workshop)	

DAY TWO		
7:00 - 10:00 a.m. (w/break)	Respirator Fit Testing & PPE cont'd (Hands-on Workshop)	
10:30 - 11:00	Control Methods/Worksite Preparation/ Setup/Decontamination Unit	**5**
11:00 - 11:30	**Lunch**	

DAY TWO	TOPIC	TAB
11:30 - 1:45 (w/break)	Work Practices/Engineering Controls/ Air Monitoring	**5**
1:45 - 3:30	Cleanup & Disposal/Lockdown & Sprayback/Clearance Procedures and Aggressive Sampling	**6**

DAY THREE

7:00 - 8:00 a.m.	Personal Hygiene and Other Safety and Health Considerations	**7**
8:00 - 10:00 (w/break)	Glovebag & Plasticizing Principles & Procedures – Slides and Demonstrations	
10:00 - 11:00 (w/break)	Asbestos Abatement Methods/Cleanup & Disposal Procedures (Hands-on Workshop)	
11:00 - 11:30	**Lunch**	
11:30 - 2:30 (w/break)	Asbestos Abatement Methods/Cleanup & Disposal Procedures (Hands-on Workshop)	
2:30 - 3:30	Course Review	

DAY FOUR

7:00 - 8:00 a.m.	**Final Exam (Written/Verbal)**	
8:00 - 9:45	**PPE Hands-on Competency Evaluation**	
9:45 - 11:00 (w/break)	Asbestos Abatement Methods/Cleanup & Disposal Procedures (Hands-on Workshop) cont'd	
11:00 - 11:30	**Lunch**	
11:30 - 3:00 (w/break)	Asbestos Abatement Methods/Cleanup & Disposal Procedures (Hands-on Workshop)	
3:15 - 3:30	**Course Evaluation and Close**	

IDENTIFYING ASBESTOS 1

In this chapter you will learn:

What asbestos is.
That asbestos can be dangerous.
When asbestos is dangerous.
How asbestos gets in the air.
Where you may find asbestos.
How asbestos is identified.
About the different kinds of asbestos fibers.

Recognizing Asbestos...

Will: The asbestos is behind these wall tiles. Let's tear out the tiles before we set up. It will save us some time, and we're behind schedule.

Chris: What's in the tiles?

Will: It's just tile. There's no asbestos in that.

Chris: How do you know?

Will: It doesn't look like it has asbestos in it. And besides, the owner of the building said the asbestos was behind the tiles.

Chris: How does he know where all the asbestos is?

Will: Listen Chris, he owns the building. He should know where all the asbestos is, right? Besides, I know what asbestos looks like. There's nothing in these tiles that can hurt you. Come on, we have a lot of work to do today. Grab a hammer and let's get going.

Chris: Well, ... OK.

Discussion Questions

(Choose 1 or 2 of the following questions to discuss.)

1. How can you tell if something has asbestos in it?
2. How can Will and Chris find out where the asbestos is in the building?
3. Why do you think Will wanted to tear the tiles out before setting up?
4. Why do you think Chris went along with Will?
5. What could Chris have done to find out about the tiles?
6. How could Chris have gotten the information without getting Will angry? (Without risking getting fired or disciplined?)

What is Asbestos?

Asbestos is a mineral. It is a natural rock mined from the ground in places like Vermont, Canada, and South Africa. Asbestos is not a technology-made fiber. (Fiberglass is a technology-made fiber.) Asbestos has been used since Roman times. Most recently, it has been used in building materials.

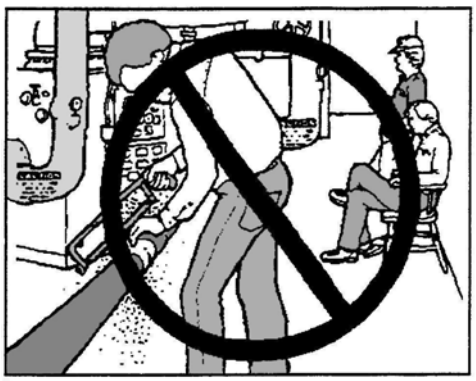
When asbestos is crushed, it does not make ordinary dust like other rocks. Asbestos breaks into tiny, sharp fibers that are too small to see. You cannot see, feel, or taste asbestos fibers.

When is Asbestos Dangerous?

Asbestos is dangerous when you breathe it. Asbestos fibers are so small they can easily get into your lungs. Asbestos can make you very sick years after you breathe it. Asbestos will not make you cough or sneeze or itch while you breathe it. But if enough asbestos gets into your lungs, it can kill you years later.

When asbestos gets in the air, you can breathe it. Sometimes plaster has asbestos in it. If the plaster stays on the wall, the asbestos will not hurt you. If you tear down the wall, the asbestos may get in the air. When asbestos is in the air, it is dangerous.

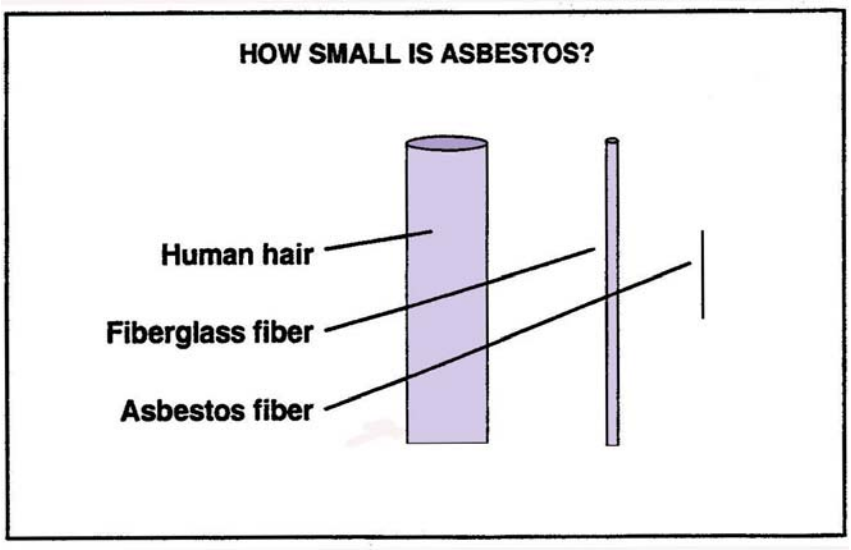
It is easy to get asbestos in the air. If you handle asbestos at all, it can become airborne. If you:



- ✓ saw
- ✓ drill
- ✓ nail
- ✓ cut
- ✓ sand
- ✓ or tear

asbestos, it may become airborne. Once asbestos is in the air, it can get in your lungs and make you sick.

Asbestos fibers are so light, they go wherever air goes. If asbestos is in the air in a boiler room, it can travel through the building. It can go through air ducts, under doors, and down halls and stairs. Asbestos is so light it can remain airborne for days. If you step in asbestos dust on the floor, you will push it back into the air.



How Much Asbestos is in the Air?

There are ways to measure how much asbestos is in the air. Air pumps can be used to measure asbestos. Air pumps pull the air through a small filter. The asbestos fibers stick to this filter. The fibers are counted with the use of a microscope. The amount of air that passes through the pump is also

measured. The amount of air is measured in cubic centimeters. A cubic centimeter is about the size of a sugar cube. **Asbestos is measured in fibers per cubic centimeter (f/cc) of air.** This is called **air sampling.** Even though you cannot see asbestos in the air, it can be measured. Remember, asbestos is dangerous when it is in the air.

If asbestos is so dangerous, why is there so much of it?

Asbestos is a very good fire, heat, and sound insulator. It is also very strong. Pound for pound, asbestos is stronger than steel. For example, asbestos is in brake shoes, which need to be strong and resist heat.

Asbestos is in more than 3,000 different products. It is in many building materials. A lot of asbestos is in old buildings. New buildings built in the 1980's don't have as much asbestos in them.

SOME ASBESTOS-CONTAINING MATERIALS (ACM)

acoustical (sound) plaster	mastic
adhesive backing for floor coverings	paper products
acoustical (sound) tiles	paints and coatings
boiler insulation	pipe gaskets
caulking, putties	pipe insulation
ceiling insulation	plaster/stucco
chemical tanks	roofing felts
decorative plaster	roofing asphalt
dropped ceiling tiles	siding
duct insulation	spackling
electrical insulation	**Transite** countertops and lab hoods
fire blankets	**Transite** (cement) sheets
fire curtains	**Transite** (cement) pipes
fire doors	valves/packing
fireproofing on beams	vinyl-asbestos floor tiles (VATs)

Friable (crumbly) Asbestos

Asbestos that can be crumbled in your hand is called "friable" (FRYable) asbestos. A friable (crumbly) piece of asbestos is more dangerous than a non-friable piece of asbestos. The fibers are more likely to get in the air – **and into your lungs.**

An example of friable asbestos is sprayed-on ceiling insulation. It is a surfacing material. The insulation may fall off the ceiling and get in the air without even being touched. Water damage, vibration, or even air blowing across the ceiling can cause fibers to be released into the air. Other examples of friable asbestos are pipe, boiler, and duct insulation.

FRIABLE (CRUMBLY) ASBESTOS

Non-friable Asbestos

An example of non-friable asbestos is vinyl-asbestos floor tile (VAT). If it is in good condition, the asbestos fibers will probably stay in the tiles. But if you saw, drill, strip, or sand the tile, asbestos may become friable and get into the air. Floor buffers can scrape the tile surface and release fibers into the air.

There are two categories of non-friable asbestos. Category I Non-friable asbestos includes roofings, flooring, packings, and gaskets. Category II Non-friable asbestos includes all other non-friable asbestos materials.

Regulated Asbestos Containing Material (RACM)

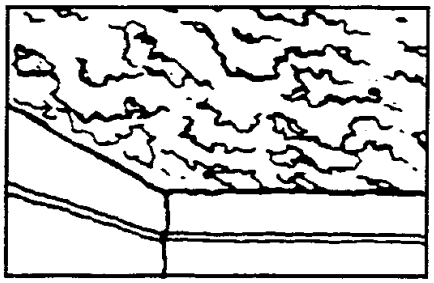
This term is used for the materials which are covered by regulations. This list of materials now includes some non-friable materials that were not regulated before. RACMs include:

- Friable asbestos containing materials (ACMs)
- Category I non-friable ACMs that have become friable or will be sanded, ground, cut, or abraded
- Category II non-friable ACMs that have become friable or have a high probability of becoming friable during demolition or renovation

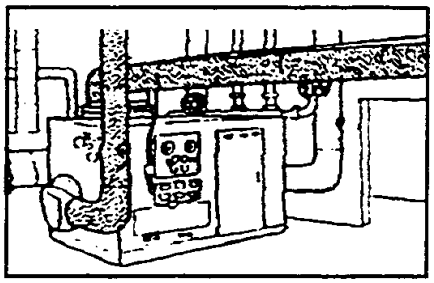
Asbestos is common in boiler rooms, on ceilings or above ceilings, and wherever pipes are found. You are likely to find asbestos in:

1. **Sprayed-on ceiling insulation**
2. **Pipe and boiler insulation**
3. **Duct insulation**
4. **Floor and ceiling tiles**

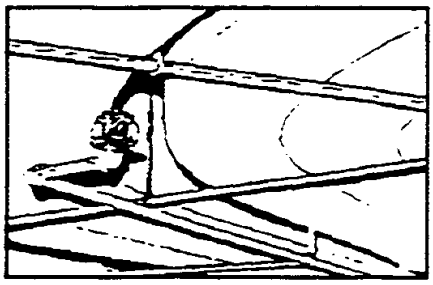
1. Sprayed-on asbestos insulation is usually fluffy material sprayed onto ceilings or beams. Because it covers a surface, sprayed-on insulation is called a "surfacing material." Sometimes you can see the insulation from the floor. Sometimes it is covered by ceiling tiles.



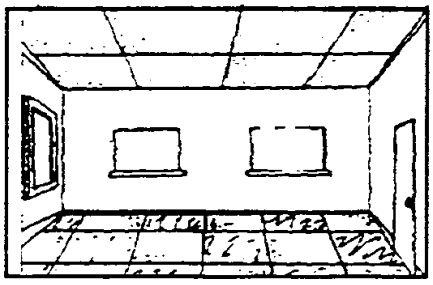
2. Asbestos pipe and boiler insulation may be covered with paper, cloth, or metal. The insulation may be cardboard-like pipe wrap or cement on pipe elbows. It may also be troweled-on insulation on boilers or boiler wrap.



3. Asbestos duct insulation is usually a thin layer of insulation. It is usually painted to match the room. It may be covered with paper, cloth, or metal. When asbestos is put on furnace pipes, boilers, ducts, or tanks it is called **t**hermal **s**ystem **i**nsulation (TSI).



4. Asbestos floor and ceiling tile look exactly like non-asbestos tile. Asbestos floor tile is usually **v**inyl **a**sbestos **t**ile (VAT). Asbestos floor tile is most often 9 inches square. Asbestos ceiling tile is used for sound insulation or for dropped ceilings.

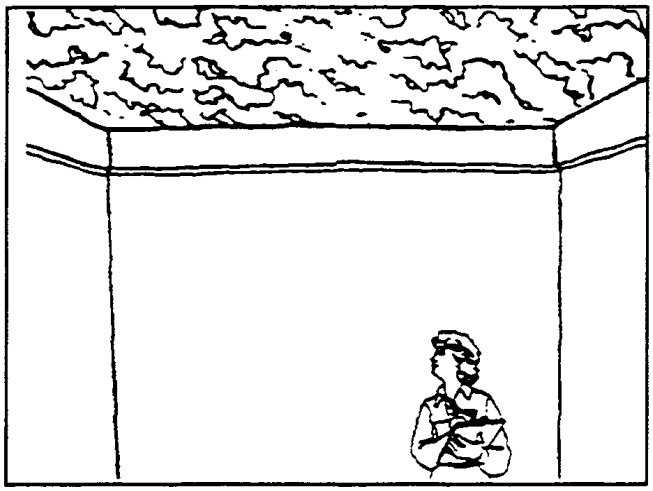


Identifying Asbestos

You can't tell if a product contains asbestos just by looking at it.

If your job is removing asbestos, your supervisor should tell you where the asbestos is when you get on the job. Some maintenance workers also handle asbestos. They may not know where all the asbestos is in their building. If you think something might be asbestos, assume that it is asbestos and treat it as such. Then ask your supervisor to find out for sure by looking at the lab report.

If you work in a school, you can look at your school's Management Plan. The Plan has the lab reports in it. They tell you whether or not the material is asbestos.



IS IT ASBESTOS?

Many things look the same, whether they have asbestos in them or not. Ceiling tiles made by different companies are made to look the same so they can be replaced. A ceiling tile with 10% asbestos may look exactly the same as a ceiling tile with 30% asbestos.

Sometimes asbestos looks white and fluffy. Sometimes it looks like brown mud. Sometimes it is covered with a paper jacket. The jacket may be painted any color.

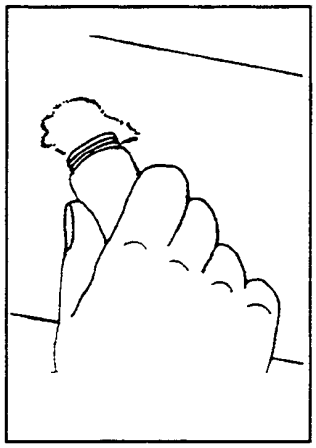
Some people say they can tell if something is asbestos just by looking at it. This is not true. No one can tell for sure if something is asbestos by looking, feeling, or smelling it. **The only way to tell for sure is to send a piece of material (bulk sample) to a lab and have it looked at under a microscope.**

This is the only detection way allowed by law. At the lab, a trained analyst looks at the sample under a microscope.

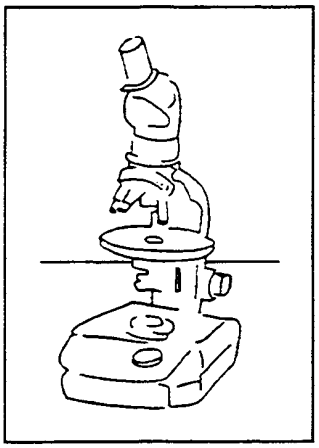
A few building materials have a standard look. Some contain asbestos, some don't. Papery pipe covering almost always has asbestos in it. Fiberglass, black polyurethane foam, and cork rarely ever contain asbestos.

As you can see, asbestos can be in many building materials. You need to work carefully around insulation and other building materials that might be asbestos. Remember that not everything has asbestos in it. Glass, gypsum board, fiberglass, polyurethane foam, cork, and ceramic tiles do not have asbestos in them.

What is Sent to a Lab?



BULK SAMPLE



POLARIZED LIGHT MICROSCOPE

To tell whether something is asbestos, a trained asbestos inspector takes **a sample of the material.** This is called a **bulk sample.** The inspector seals up the hole where the sample was taken. The inspector sends the piece of material to a lab. A sample taken from a school must go to an approved lab. The lab grinds up the **bulk sample** and stains it with dye. The lab then looks at it under a special microscope. It is called a **Polarized Light Microscope (PLM).** The lab sends back a report based on the PLM readings.

An Example

A building owner sent a piece of pipe insulation to a lab. Technicians at the lab analyzed the sample for asbestos content with a PLM. The lab found that the pipe insulation had asbestos in it and sent the building owner the following report. **According to the report, what percent of the insulation was asbestos?**

Received: 5/15/94
SAMPLE ID: AH-023

ABC ANALYTICAL LAB, INC. REPORT

NAME: Asbestos Bulk Sample Analysis

DATE ANALYZED: 5/16/94 ANALYST: Sletten VERIFIED BY: KMD

Fiber Type	Result	Other Materials	Result
CHRYSOTILE	Trace	CELLULOSE FIBER	Trace
AMOSITE	30-35%	FIBROUS GLASS	40-50%
CROCIDOLITE	0%	NANF	10-15%
TREMOLITE	0%		

Definitions:

NANF = Non-Asbestos, Non-Fibrous
Trace = Trace Amounts Noted

BULK SAMPLE REPORT FROM LAB

According to the lab report, the pipe insulation was 30 to 35% amosite asbestos. It also had a trace of chrysotile asbestos in it. It was 40 to 50% fiberglass.

Are There Different Kinds of Asbestos?

There are six kinds of asbestos fibers. They are all dangerous. The three most common kinds of asbestos fibers are:

- **Chrysotile (CRY-so-tile)**
- **Amosite (AM-o-site)**
- **Crocidolite (crow-SID-o-lite)**

Chrysotile asbestos counts for 95% of all asbestos in buildings.
Amosite is less than 5% of all asbestos found in buildings.
Crocidolite is less than 5% of all asbestos found in building materials.

Amosite does not soak up water easily. (Asbestos must be wet before you handle it.) Wetting asbestos helps to keep the fibers out of the air. Therefore, amosite is harder to work with. There are three other kinds of asbestos fibers that are **rarely** used in buildings:

- Anthophyllite (an-THAW-fill-ite)
- Tremolite (TREH-mo-lite)
- Actinolite (ack-TIN-o-lite)

All asbestos fibers are dangerous. Some people say that some kinds of asbestos fibers are less dangerous. Many people (including the government) disagree. You must consider all asbestos to be dangerous.

Protecting Yourself

Asbestos is dangerous if you breathe it. But you can protect yourself and those around you from breathing asbestos fibers. To work safely with asbestos, you have to keep it out of the air. There are lots of good ways to do this. You will learn about them in this class.

You also have to **take asbestos out of the air with special filters.** Most important, you have to filter the air that you breathe through a respirator - a mask that filters the air. You can also wear a respirator that pumps in clean air from outside the work room. You **must** wear a disposable

suit or coveralls (special laundering) when you work. You **must not** take asbestos home with you on your clothes.

The air that leaves the work room also has to be filtered. This protects people outside of the work area.

You cannot tell when asbestos is in the air or is hurting your lungs. **But you can use your knowledge to work more safely and protect yourself.**

It is the responsibility of the building owner to identify any ACMs in their building prior to work which may disturb it. The owner must notify workers of the location of any ACMs before they begin work.

Discussion Questions

1. Is asbestos dangerous if it gets on your clothes ?
2. Sometimes air ducts are insulated with asbestos on the inside. Why is this so bad?
3. Is asbestos floor tile friable? Is this always true?
4. You can't tell whether a product contains asbestos by just looking at it. Why does this make asbestos more dangerous than other workplace problems?
5. Why is it harder to work safely with amosite asbestos than with other kinds of asbestos?

For More Information

List of Asbestos-Containing Materials, Appendix A to EPA, "Guidance For Controlling Asbestos-Containing Materials in Buildings," (the "Purple Book") EPA Publication No. EPA 560/5-85-024.

EPA, "Managing Asbestos in Place" (the "Green Book"), EPA Publication No. 20T-2003.

OSHA Asbestos Standard, 29 CFR 1926.1101 , Appendix H, "Substance Technical Information for Asbestos."

Georgia Tech Research Institute, "Bulk Sampling," Section I in "Model EPA Curriculum for Training Building Inspectors," available from National Technical Information Services at (703) 487-4560.

IDENTIFYING ASBESTOS
Key Facts

Asbestos is a mineral that breaks into fibers that can become airborne.

Asbestos is dangerous when it is in the air and you breathe it.
It is very easy to get asbestos in the air.
Wherever air goes, asbestos can go.

Asbestos can kill you, but you can protect yourself. To work safely with asbestos, you have to:
Keep it out of the air.
Filter the air with special filters.
Protect yourself with special respirators and clothing.

Asbestos is in more than 3,000 different products. In buildings, you will probably find asbestos in:
- ⁕ Sprayed-on ceiling insulation
- ⁕ Pipe and boiler insulation
- ⁕ Duct insulation
- ⁕ Floor and ceiling tiles

Friable (crumbly) asbestos is more dangerous than non-friable (hard) asbestos. Damaged non-friable asbestos is also dangerous.

You cannot tell if something contains asbestos just by looking at it. A lab can test a piece of material, called a **bulk sample**. The lab looks at the bulk sample under a **Polarized Light Microscope (PLM).**

If you do not know whether something contains asbestos, assume that it is asbestos until a bulk sample proves it is not.

There are three common types of asbestos fibers:
- ⁕ Chrysotile (CRY-so-tile) (95% of asbestos in buildings)
- ⁕ Amosite (AM-o-site) (hard to wet)
- ⁕ Crocidolite (crow-SID-o-lite)

TRAINING FACT SHEET

(course review)

There are a lot of facts that you need to know about asbestos. **This fact sheet has been made to help you. It has information you must remember. All of the information will be covered in the class.** Read this fact sheet over every day. These facts may not make sense when you first start reading them. It will get easier. If you read this every day, it will help you remember the information.

A. Government Agencies involved with asbestos:

There are three federal government agencies that deal with asbestos. You will learn about these agencies throughout this training. Here is a list of the agencies and a brief description of each.

1. Environmental Protection Agency (EPA)

A federal government agency that protects against pollution. The EPA makes and enforces regulations to protect the community and the environment from pollution. The EPA regulations define the different types of ACM and how to protect the community and environment.

AHERA - Asbestos Hazard Emergency Response Act The EPA's "asbestos in schools" regulation.

ASHARA - Asbestos School Hazard Abatement Reauthorization Act The EPA regulation that updates AHERA.

NESHAP - National Emission Standards for Hazardous Air Pollutants The EPA regulation that covers asbestos as an air pollution problem.

2. Occupational Safety and Health Administration (OSHA)

A federal government agency that covers worker safety and health. OSHA makes and enforces regulations (standards) to protect workers. The OSHA regulations define the different types of asbestos work, how you are to be protected while you work, and how you are to work safely. OSHA has regulations about: asbestos, chemical safety, electrical safety, ladders, respirators, scaffolds, fall protection, confined spaces, and many other workplace hazards.

3. National Institute for Occupational Safety and Health (NIOSH)

A federal government agency that researches worker safety and health, and reports its findings to the Occupational Safety and Health Administration (OSHA). NIOSH makes recommendations to OSHA for Health and Safety standards. NIOSH also approves respirators.

4. State governments

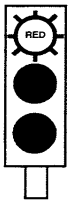
Many individual state governments have their own set of asbestos regulations. These regulations must be at least as strict as the federal regulations.

B. Measurement of Asbestos

Asbestos is measured in fibers per cubic centimeter (f/cc) of air. A cubic centimeter is about the size of a sugar cube. The air is checked for asbestos fibers through air sampling methods.

OSHA sets limits on the amount of asbestos fibers you can be exposed to while you work. There are two limits that you will need to know. They are the Permissible Exposure Limit **(PEL = 0.1 f/cc)**, and the Excursion Limit **(EL = 1.0 f/cc)**. These limits are found in the OSHA Asbestos Standard.

Permissible Exposure Limit (PEL) = 0.1 f/cc



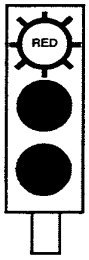
The **Permissible Exposure Limit** is the number (0.1 f/cc) of fibers in the air over an **8-hour time** weighted average. The PEL is the highest number of fibers in the air (allowed by law) for a worker to be exposed to.

The Permissible Exposure Limit is like a **red light** -it means **stop.** When you are working in an area that reaches the PEL, the OSHA standard states that you must stop until you have:

- Training
- Respirators
- Protective Suits
- Medical exam
- Contained the work area
- Negative air pressure

The OSHA standard states that you must get a medical exam if you wear a negative-pressure respirator or are exposed at or above the PEL for 30 days or more in a year.

Excursion Limit (EL) = 1.0 f/cc



The Excursion Limit is the average number (1.0 f/cc) of fibers in the air over a **30-minute** period of time. It is the highest number of fibers a worker can be exposed to in any **30-minute time period.**

It is like a red light-it means stop. The Excursion Limit protects you from large amounts of asbestos exposure in a short time period.

When you are working in an area that reaches the Excursion Limit the OSHA standard states that you must stop all work and take immediate steps to limit the amount of asbestos dust in the air:

1. Use more amended water.
2. Bag up the asbestos waste more quickly.

C. Respirators

Respirators are used to protect you from breathing asbestos fibers. You need to remember three terms to use the information about respirators. It is important to learn these terms so that you know whether you have the right respirator for your asbestos work. The terms are:

1. **Maximum Use Concentration (MUC)** = the largest amount of asbestos fibers that a respirator can handle, according to the OSHA law.

2. **Protection Factor (PF)** = the degree of protection a respirator gives you compared to wearing no respirator at all.

3. **Permissible Exposure Limit (PEL)** = the amount of asbestos where respirators become required. **The PEL for asbestos is 0.1 f/cc.**

These three terms combine to give you a **formula** that you can use:

Maximum Use Concentration = Protection Factor x
Permissible Exposure Limit or **MUC = PF x PEL**

Example on how to use this formula:

A half-mask, air-purifying respirator has a Protection Factor of 10. For every 10 fibers outside the respirator, 1 fiber can leak in. What is the MUC for this respirator?

MUC = PF x PEL **so** MUC = 10 x 0.1 f/cc
MUC = 1 f/cc

The Maximum Use Concentration is 1 fibers/cc, so:

1. **Below 1 f/cc** in the air, a half-mask, air-purifying respirator is **legal.**
2. **Above 1 f/cc** the respirator is **not allowed**. You need at least a full-face, air-purifying respirator.

D. Classification of Asbestos Work

OSHA classifies asbestos work into one of four categories. Each classification has a specific set of requirements and work practices. The system is based on two factors:

1. what kind of asbestos product you are working with; and
2. the amount of asbestos you may disturb.

The four classes are defined as follows:

Class I asbestos work is when you remove high-risk ACM. High-risk ACM is friable asbestos material. It gets into the air very easily. High-risk ACM is thermal system insulation and sprayed or troweled on surfacing material. Class I work is "full-scale asbestos abatement." It is the most hazardous.

Class II asbestos work is when you remove ACM that is not high-risk. Some examples of Class II materials include wallboard, floor tile and sheeting, ceiling tile, roofing and siding shingles, and construction

mastics. These materials are less friable, or less likely to become friable when removed. There are fewer requirements when working with them. They are less dangerous because less asbestos gets into the air.

Class III asbestos work is repair and maintenance operations where ACM is likely to be disturbed. These operations should involve no more than a single glovebag worth of ACM. These are very small jobs.

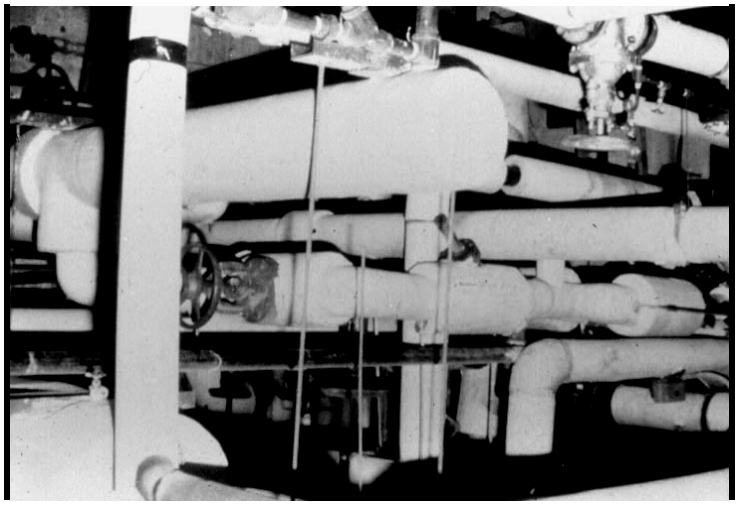
Class IV asbestos work is maintenance and custodial activities in which you come into contact with ACM. Clean up of waste and debris containing ACM is also considered a Class IV operation.

E. Exposure Assessment

Your employer must identify the hazards on the job. Your employer must find out how much asbestos gets into the air while you work. This is called an exposure assessment. An exposure assessment finds out how much asbestos you will be exposed to while you work.

F. Negative Exposure Assessment (NEA)

A negative exposure assessment is when your employer can prove that the asbestos in the air will remain below the PEL and EL. A negative exposure assessment states that you are expected to be exposed to asbestos below the PEL and EL. If the asbestos job has a NEA, then the requirements, procedures, and guidelines for the work may change.



How would you find out if these pipe coverings contain asbestos?

CONTRACTORS/SUPERVISORS

BACKGROUND: ASBESTOS SAMPLING AND ANALYTICAL METHODS

Sampling and Analysis

Sampling techniques are the first phase in procedures used to collect data representative of the environment. It is something like tasting (an analytical method) a piece of pie to determine what the entire pie tastes like. If you only taste (analyze) the pie's crust (sample), then your "sample" will not be representative of the entire pie.

Analytical methods are used to determine what is in the sample. Returning to our pie, a wedge is sliced (sample) is placed on your plate. Using the analytical method of touch, you can determine the size and shape of the sample (slice of pie). Knowing the size of the sample will now enable you to calculate the size and shape of the entire pie.

What else can you learn from the analytical method - touch? One thing touching the pie will tell us is whether or not it is a cream pie. But you still do not know all you need to know about the pie.

You still do not know what the pie tastes like. Well, I will tell you. It is lemon meringue. How do I know this? Simple, I tested (tasted and touched) your slice of pie (sample) when you weren't looking!

This process of sampling and testing applies to asbestos as well. There are many different methods to perform a specific task with each method revealing different bits of information. A person knowledgeable of and trained in these methods selects the appropriate ones to obtain the desired information

Bulk Sampling[1]

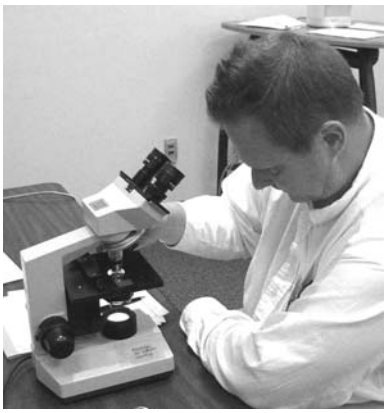
Bulk sampling is the technique used to collect samples of suspect materials such as fireproofing, pipe and boiler insulation, and acoustical

[1] Air and Clearance sampling and their analytic methods are discussed in later chapters.

spray. This sampling is usually conducted during the building inspection/ hazard assessment and it provides data for decisions on control measures. If bulk sampling data is not available to the contractor during the walkthrough survey, then an accredited inspector should be brought in to collect some bulk samples at that time.

Bulk Sampling Kit
$239

A small sample of suspected material is carefully collected and placed in a container (35 mm canisters work well – and many accredited labs offer "packages" of supplies at low prices which can include, among other items, small glass bottles w/caps or a device not unlike the old auto spark plug wrenches to collect samples). Anyone taking bulk samples in a school, industrial facility, or public or commercial building must be accredited according to U.S. EPA regulations and should always wear a cartridge respirator and protective clothing.



Bulk samples are analyzed by an accredited laboratory using **Polarized Light Microscopy (PLM)** to determine the presence, type, and percentage of asbestos in the sample. Bulk samples can also be analyzed by electron microscopy which might be useful for analysis of floor tile or other products where asbestos may have been processed into very small and fine fibers.

Settled Dust

Sometimes it is important to find out whether the settled dust within a facility contains asbestos. During a building inspection/survey when investigating for the presence of **ACM (asbestos-containing material)**, an owner may request that the inspector determine whether asbestos fibers are being released in the building environment. In the past, an air sample might have been collected to determine whether airborne asbestos fibers are present. However, the EPA does not recommend this practice of solely using air sampling for this purpose as it tends to provide only a "snapshot" of building conditions. Instead, EPA writes that a well-designed air sampling program used in conjunction with comprehensive physical and visual

inspections as a part of an O & M (Operations & Maintenance) Program may provide useful information. An alternative to the use of air sampling for contents of settled dust is the collecting samples of the dust.

Sampling settled dust can be accomplished in many ways. Dust can be collected by **scraping an area** (with a credit card, for example) and placing the material in a small container for analysis as a "bulk" sample by polarized light or electron microscopy. Another way of doing it by **"micro-vacuuming"** an area with a filter in a cassette which is attached to a sampling pump. The filter can be analyzed by polarized light microscopy, or preferably, by electron microscopy. Other techniques for dust sample collection include **wipe sampling** (where a filter or other material is used to wipe an area) or **tape sampling** (where cellophane or similar tape is used to collect the dust).

It is important to note that most settled dust sampling will typically provide only qualitative results and that any quantitative results must be interpreted with caution.

Dust samples should only be used to determine the presence or absence of asbestos fibers in accumulated dust and not as a tool to determine the amount of asbestos fibers being released from a particular material or the likelihood that these fibers will become airborne again.

The absence of asbestos fibers in settled dust does not necessarily mean asbestos fibers are not being released, just that none were present (or detected) in that particular accumulation of dust.

Air Sampling Before Abatement Begins

Area air sampling conducted before abatement activities begin to estimate the existing airborne fiber concentrations inside and outside the building is called **prevalent level sampling**. This type of sampling is also referred to as **pre-abatement** or **background sampling**. Results can be used as control data for comparing sample concentrations detected during the abatement project. Prevalent level sampling provides good data for documentation purposes. It is particularly useful when an abatement project is conducted in a portion of a building, with other areas of the building remaining occupied. Airborne fiber levels monitored in these occupied areas during the abatement project should never exceed the indicated prevalent

level in these areas before the project began.

Because low airborne fiber concentrations are typically found prior to abatement activities, a large volume of air should be sampled to obtain a low **detection limit**. The volume of air measured to obtain a 0.01 f/cc detection limit should range between 3,000 - 4,000 liters, depending on the filter size and counting method used. Samples can be collected at a flow rate typically in the range of 2 - 10 liters per minute (a typical personal sampling pump has a flow rate up to 5 lpm).

> Detection Limit is the lowest value that can be reliably reported for the sampling and analytical methods used.

Prevalent level samples should be collected throughout the building as well as the areas where abatement will take place. As a rule of thumb, one sample should be taken for every 50,000 cubic feet (5,000 ft^2 with 10' ceilings) of building space (minimum of 3 samples per building). At least two (2) samples should be collected from outside the building. Because the results of prevalent level sampling are used as **baseline data**, the same sampling and analytical techniques should be used for pre-abatement samples as well as subsequent samples (i.e., indoor/outdoor removal project, clearance samples, etc.). Since most samples taken during an abatement project are analyzed by **phase contrast microscopy (PCM)**, most prevalent level air samples should be analyzed by PCM as well. Occasionally, the building owner or manager will want more absolute data for baseline purposes. In this case, additional prevalent level samples should be collected and analyzed by **Transmission Electron Microscopy (TEM)**. One should not attempt to compare prevalent level samples analyzed by TEM with abatement samples analyzed by PCM as no sound conversion exists between these two analytical methods.

ASBESTOS DISEASES 2

PART 1

In Part 1 you will learn:

About the diseases caused by asbestos.
How asbestos gets into your body.
When asbestos is dangerous.
How much asbestos can make you sick.
How long it takes you to get sick from asbestos.
How your respiratory (breathing) system works.
The connections between asbestos, smoking, and disease.

Asbestos Diseases ...

Pat: One of the waste bags broke. Help me clean up the asbestos that spilled on the floor.

Jesse: OK, let's get our suits and respirators on.

Pat: Don't worry about that. Let's just sweep it up real quick.

Jesse: We shouldn't handle it without some protection. It's dangerous.

Pat: Crossing the street is dangerous, too! Come on. That little bit of asbestos isn't going to hurt you. Let's get it done fast so I can take a cigarette break.

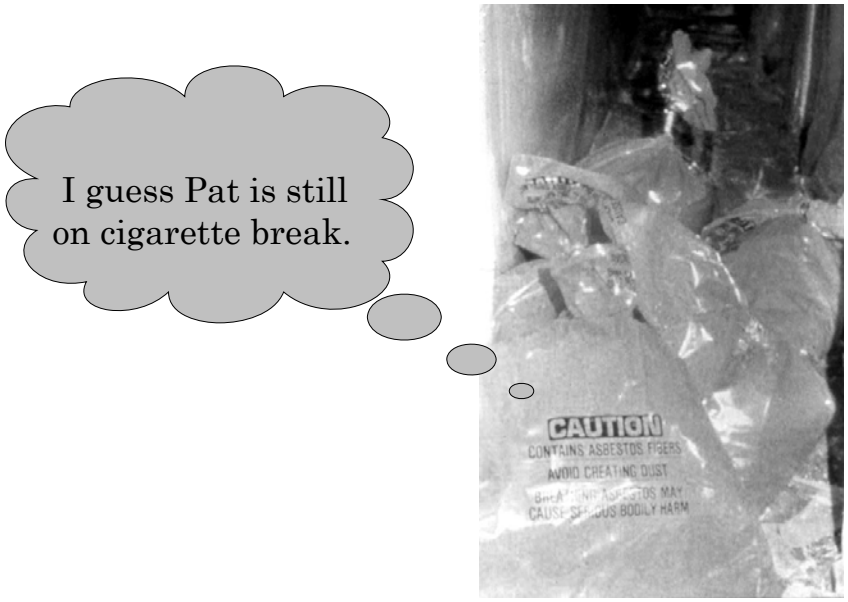
Discussion Questions

(Choose I or 2 of the following questions to discuss.)

I. Do you agree or disagree with the following statements ? Why or why not?

If you only breathe asbestos at levels below the legal limit you cannot get an asbestos disease. **(Yes/No)** _____
Jesse worries too much. **(Yes/No)** _____
Jesse is a better worker than Pat. **(Yes/No)** _____
If you worry about every bit of asbestos, you will never get any work done. **(Yes/No)** _____
Pat is going to get cancer from smoking anyway, so it doesn't matter how careful Pat is with asbestos. **(Yes/No)** _____

2. Who would you rather work with, Jesse or Pat?
3. Do you think Jesse decided to help Pat sweep up without a suit and respirator? **Why or why not?**
4. What could Jesse say or do to get Pat to be more careful?



Breathe

Oxygen lashes
His nostrils
As the black machine
Heaves with the strain.
Stoplight colors flash
As pressure slopes down
Then climbs.

Frail as a dried flower, his steps
Though he only goes to another room.
Mount Everest, he climbs.

A rope of plastic tube
Curves and hangs
As I push this machine
To his chair.

His breath as thick
As stagnant black air.

Breathe my dear father,
Breathe.

Virginia C. Jones

This poem was written about a man who was exposed to asbestos as a seaman in the Navy in World War II. He died of mesothelioma in 1976.

ASBESTOS DISEASES

Asbestos can kill you. When you work with asbestos, you must work carefully. You are in this class to learn how to protect yourself and others from asbestos fibers. Asbestos exposure means breathing or swallowing asbestos fibers. If you are in an area where asbestos is in the air and you are not protected, then you are exposed. **Asbestos exposure can cause:**

- **Asbestosis -** "white lung" – a disease that causes scars on the lungs;
- **Lung cancer -** cancer of the lungs;
- **Mesothelioma -** cancer of the lining of the lungs or of the belly; or
- **Other cancers -** such as cancers of the digestive system.

How do we know that asbestos can make you sick?

We know that asbestos causes asbestosis, mesothelioma, lung cancer, and other cancers because of many studies. One of the most important studies looked at the death certificates of **union insulation workers** who worked with asbestos. All the men had worked with dangerous amounts of asbestos for at least 20 years.

These workers did not know how dangerous their work with asbestos was. **No one told them** that they needed to keep asbestos out of the air. **No one told them** that they had to protect themselves with respirators and disposable suits. **There were no laws** to protect them. **Many of these workers died from asbestos diseases.**

Working with asbestos is a big responsibility

You are in this asbestos class for four days. You will learn that asbestos is dangerous. Asbestos causes diseases that kill. You will learn when asbestos is most dangerous and how to keep the danger level as low as possible. You will learn how to protect yourself and others as you work with asbestos. Use the information from this class. Demand and use the right equipment and protective gear. You can then help reduce the risk of asbestos disease to yourself by up to 90%. (preamble to the OSHA Standards, 29 CFR 1910 and 1926)

When is asbestos dangerous?

Asbestos is dangerous when it is in the air. **When asbestos is in the air, you cannot see it but you breathe it.** Asbestos is dangerous when it gets into your body. Asbestos gets in your body when you breathe or swallow it. Asbestos enters your body through your nose and mouth. Remember that asbestos fibers are so small you can't see them. You cannot see, feel, or taste asbestos. Asbestos will not make you cough or sneeze. It will not make your throat or skin itch. Asbestos does not let you know it is there.

How much asbestos is dangerous?

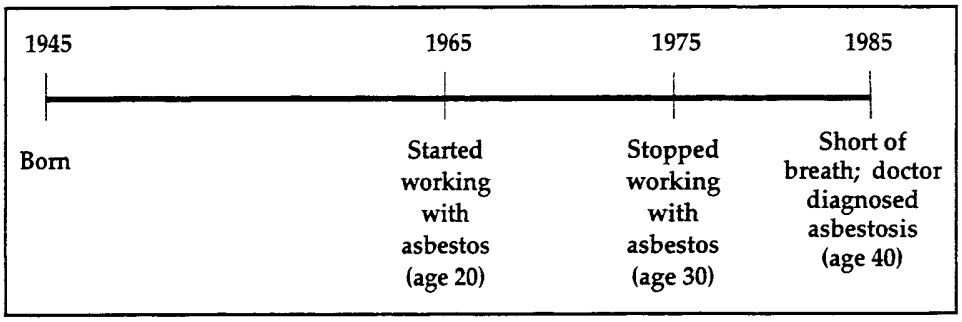
The more asbestos you are exposed to, the more likely you are to get an asbestos-related disease. All of the asbestos diseases except one are **dose-related. Dose-related means the more asbestos you breathe, the more likely you are to get sick. The bigger the dose of asbestos, the more likely you are to get an asbestos-related disease.** You may not get sick until years after you breathe the asbestos.

The more asbestos you breathe, the more likely you are to get asbestosis. The more asbestos you breathe, the more likely you are to get lung cancer. The more asbestos you are exposed to, the more likely you are to get a digestive system cancer. **Asbestosis, lung cancer, and digestive system cancers are dose-related.**

The one asbestos disease that is different is mesothelioma. Very small amounts of asbestos can cause mesothelioma. Asbestos workers' families have gotten mesothelioma from the dust the workers brought home on their clothes. Like other things that cause cancer, **there is no amount of asbestos that has been proven to be safe.**

How long does it take to get sick from asbestos?

All of the asbestos diseases have a **latency period.** The latency period is the gap between the time you are exposed to asbestos and the time you start to feel sick. **The latency period for asbestos diseases is between ten and forty years.** Even if you only worked with asbestos for a year and then stopped, you still might get sick ten to forty years later.



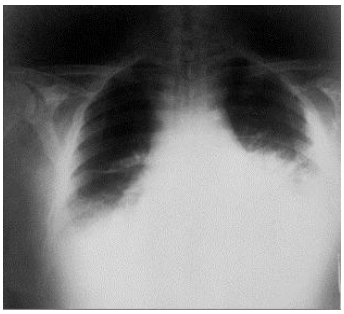
SAMPLE LATENCY PERIOD

If you breathe tear gas, it will make you feel ill right away. It will make your eyes water and throat hurt as soon as you are exposed to it. **If you breathe asbestos, you probably won't even know you are breathing it.** Asbestos does not irritate you while you are being exposed to it. It gives no warning.

You may not feel sick during the latency period of ten to forty years. If you get an asbestos-related disease, you will begin to feel sick **after** the latency period.

Not everyone who is exposed to asbestos gets an asbestos-related disease, but anyone who is exposed to asbestos has a higher risk of getting an asbestos disease. All of the asbestos diseases are difficult to treat. Most are impossible to cure.

Once you get sick, doctors may not be able to stop your disease from getting worse. Except for colon cancer, asbestos diseases - asbestosis, lung cancer, mesothelioma (a cancer) - are very difficult or impossible to treat. The only cure for most asbestos diseases is to prevent them. The best way to avoid getting sick is to not breathe asbestos fibers.



Lung tissue seems to disappear in the x-ray.

When you breathe in asbestos, a few fibers are caught in your throat before they get to your lungs. But many fibers dig into your lungs, and stay there for the rest of your life. It is important to stop these fibers from ever entering your lungs. You can keep many of the fibers out of your lungs by using safer work methods and using personal protection.

They can drain you and your loved ones emotionally and financially for a long time. **The best thing you can do is to prevent them.** When you work safely with asbestos, you help to prevent asbestos related diseases.

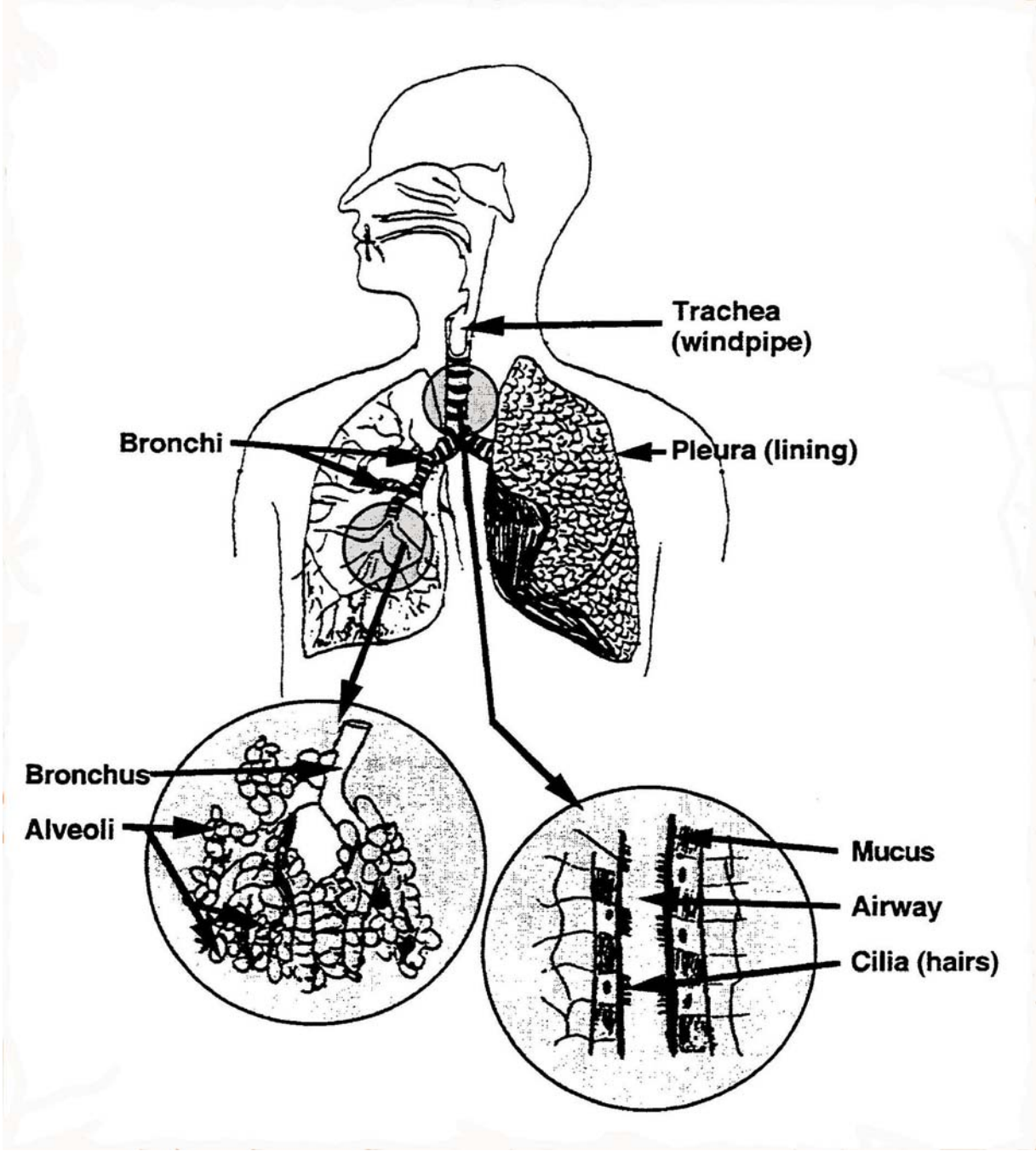
How Your Lungs Work

To understand how asbestos makes you sick, you need to know how your respiratory (breathing) system works.

Your respiratory system brings oxygen (a gas in the air) into your body. You cannot live without oxygen for more than a couple of minutes. When you breathe in, air goes into your lungs. Your lungs are like a giant sponge with a huge surface area for taking in oxygen. **Your lungs take oxygen out of the air into your blood, and get rid of carbon dioxide** (a waste gas in your blood). Then your heart pumps the oxygen-rich blood through your body. Every cell in your body needs the oxygen that comes through your lungs.

Take a deep breath. When you breathe in, air goes through your nose and mouth into your windpipe. The windpipe divides into smaller and smaller tubes and finally ends in tiny sacs called **alveoli (al-VE-o-lie).** In the alveoli, oxygen from the air goes into your blood, and carbon dioxide from your blood goes through your lungs and out of your body when you breathe out. **The alveoli are like the leaves on a tree. In the alveoli, oxygen passes into the blood and carbon dioxide waste goes out. The walls of your alveoli have to be very thin so that oxygen and carbon dioxide can move through them.** When you breathe, your chest moves in and out. It widens or expands when you breathe in, so that more air can come into your lungs.

When you breathe out your chest narrows or contracts, as your lungs push out the carbon dioxide. **There is a two-layered lining called the pleura. It lines your lungs and your rib cage.** This lining lubricates your chest. It reduces the friction caused by breathing. All of the parts of your respiratory system work together so that you can breathe and live.


Trachea
(windpipe)
Bronchi
Pleura (lining)
Bronchus
Alveoli
Mucus
Airway
Cilia (hairs)

Your Body's Defenses Against Asbestos

Your breathing system has some good defenses against breathing in dusts that can hurt you. But the small asbestos fibers can pass through your body's natural defenses and make you sick years later. **Here are some of your body's defenses against asbestos:**

nose - dust gets stuck in hairs and mucus in your nose. **You sneeze to get rid of it.** You can blow out the large asbestos fibers. The smaller fibers travel on to your throat.

throat - smaller dust also gets stuck in hairs and mucus in your throat. **You cough to get rid of it.** The smaller fibers travel down your windpipe.

windpipe - the cells in your windpipe are covered with tiny hairs called **cilia** (SILLY -uh). These tiny hairs quickly beat back and forth. There are other cells in your windpipe that make mucus, a sticky gum-like substance. Some of the asbestos fibers stick to the mucus. The cilia wave back and forth, slowly pushing dust and mucus up your throat. **Then you cough up the mucus and get rid of some of the asbestos fibers. Cigarette smoke paralyzes the cilia. It destroys one of your body's important defenses against asbestos.**

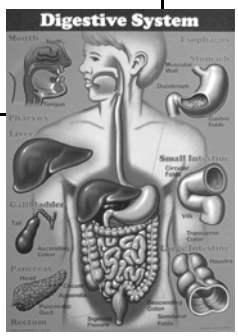
You swallow about a quart of this mucus a day. If the mucus you swallow has asbestos fibers in it, then the fibers lodge in your digestive system. This greatly increases your chance of developing an asbestos-related disease.

Some of the smaller asbestos fibers travel into the branches of your breathing system. They then lodge in your lungs or the lining of your lungs. They may even enter your blood stream.

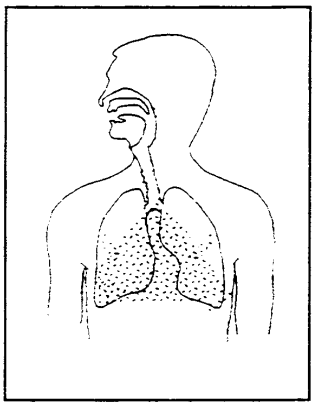
white blood cells and scar formation - this part of your immune system **tries to eat up asbestos, just like it would eat up a germ.** But the asbestos fiber kills the white blood cells. The dead cells wrap around the asbestos fiber and your body forms a scar. This scar tissue on your alveoli (air sacs) is called **fibrosis.** The scarring thickens the walls of the alveoli and makes it difficult for oxygen to reach the blood. **This scarring is called asbestosis.**

Diseases Caused by Asbestos

Disease	Signs & Symptoms	Treatment of Symptoms
Asbestosis	Severely short of breath Dry cough Feeling very tired Clubbed fingers	Treatment, but no cure. Stop working with asbestos. Stop smoking Get flu shots. Treat all chest colds quickly with antibiotics.
Lung cancer	Short of breath Constant cough Feeling tired and weak Deep chest pain Cough up blood Weight loss	Surgery, radiation and chemotherapy. 9-13% live for 5+ years Poor cure rate. **Smoking multiplies your chances of getting lung cancer. Stop smoking!**
Mesothelioma	**Pleural Mesothelioma** Short of breath Dull chest pain under ribs Swelling in chest **Peritoneal Mesothelioma** Swollen stomach Belly pain Weight loss	No treatment, some medical procedures for pain reduction. Most people die within 6 months to 2 years after it is discovered.(A few people have died 5 years **after their mesothelioma was discovered.)**
Digestive system cancer	Change in bowel patterns Blood in bowel movement Feeling tired Weight loss	Surgery, radiation and chemotherapy. Chances of living are **good** if colon cancer found early. 80% to 90% live for 5+ years.



Asbestosis



ASBESTOSIS

Asbestosis (as-bes- TO-sis) is a scarring of the lungs that can weaken and destroy your lungs ("white lung"). Asbestosis is **not** a cancer. It is a progressive disease. This means that scars keep forming in your lungs even after your exposure to asbestos ends.

Asbestosis is only caused by exposure to asbestos. This is why asbestosis is called a "marker disease." If someone has asbestosis, you know that they have been exposed to asbestos.

When you breathe in asbestos fibers, they go deep into your lungs. Asbestos fibers are thin, sharp and jagged. They dig into your lungs like tiny needles. **Your body forms scars around the fibers**. The scarred lungs cannot get oxygen into your blood any more. The scarred areas of your lungs become useless. You have to breathe more often to get the oxygen you need. You become short of breath.

When you have asbestosis, your heart (your body's pump) has to work much harder to get blood with enough oxygen to all your body cells. Many people with asbestosis die from heart attacks or heart failure because their heart is overworked. Other people with asbestosis die of pneumonia, other infections, and respiratory failure, because asbestosis weakens them.

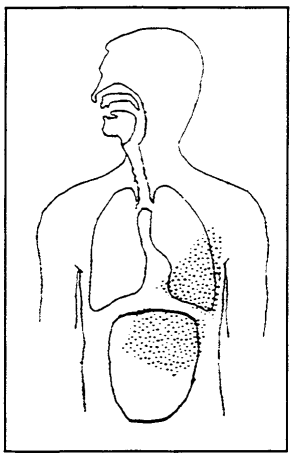
Asbestosis is dose-related. The more asbestos you breathe, the more likely you are to get asbestosis. The more asbestos you breathe, the more severe the asbestosis will be.

Asbestos causes cancer. What is cancer?

Several cancers are linked to asbestos exposure. Cancer is a name used for a large group of diseases which affect many different parts of the body.

All cancers are made up of cells which are not normal. These abnormal cancer cells grow rapidly and out of control. They either remain in one area of the body and form a tumor or they spread to other areas of the body.

Mesothelioma



MESOTHELIOMA

Mesothelioma (mes-o-the-lee-O-ma) is a rare but deadly cancer. It is estimated that less than 2% of asbestos worker deaths are caused by mesothelioma. Mesothelioma is a difficult disease to identify or diagnose. It is often not identified and is mislabeled. It is difficult to know how rare this disease really is.

There are two major kinds of mesothelioma. **Pleural mesothelioma** is a cancer that attacks the 2-layered pleural lining of the chest. **Peritoneal mesothelioma** is a cancer that attacks the lining of the stomach or abdomen. Mesothelioma may also be found in the reproductive organs.

Mesothelioma is only caused by asbestos. It is also considered a "marker disease." Mesothelioma has been directly linked to asbestos exposure in **at least 96%** of the documented cases. There is no cure for mesothelioma. It kills most people 6 months to 2 years after it is detected. There are a few people who have lived more than 5 years after their mesothelioma was discovered.

Mesothelioma has the longest latency period of all the asbestos diseases. The latency period for mesothelioma is between 30-40 years. Children are the exception to the long latency period rule. The latency period for a child is much shorter because a child's body grows at a rapid pace.

Mesothelioma is different from other asbestos diseases. **It may only take a very small amount of asbestos to give you mesothelioma.** Mesothelioma has killed asbestos workers' wives, children, and even pet dogs. This is why you must not take asbestos home with you on your clothes. We say that mesothelioma is **not dose-related** because low levels of asbestos exposure can cause this disease.

There is no amount of asbestos that has been proven to be safe.

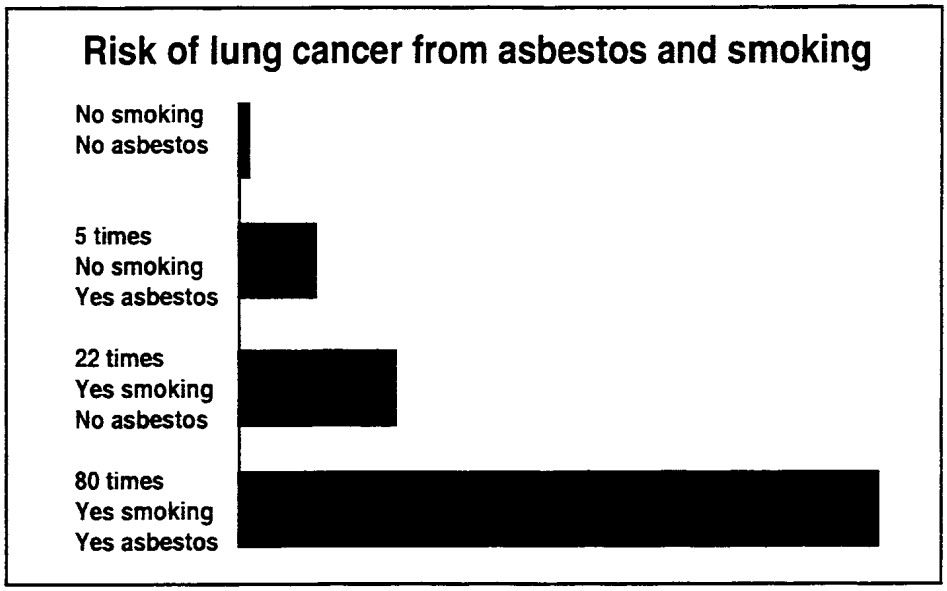
If you are a smoker, get help to quit.

Nicotine addiction and the pleasures of smoking make smoking a very difficult habit to break. How difficult a habit (or addiction) is to break can be measured. It is measured by the percent of relapse. Relapse means that you tried to stop using the substance, but started using it again. Let's say you stopped smoking for 30 days. Then on day 31, you picked up a cigarette and by day 40, you were smoking a pack a day again. You just had a relapse.

About 70% of smokers who quit relapse in the first three months. The rate of relapse is about the same for those who are addicted to heroin and those who have the disease of alcoholism.

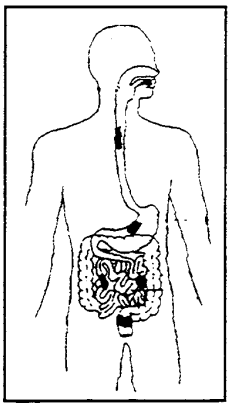
There is hope - surveys show that most people who keep trying to quit finally succeed. There are many programs that can help you stop smoking. Your local chapter of the American Lung Association can give you a list of where you can go to get help. Please get help.

In addition to feeling better, breathing easier and smelling better, quitting smoking has many other advantages. Persons who quit smoking before the age of 50 have one-half the risk of dying in the next 15 years compared to continued smokers. **After 10 years of not smoking, the risk of lung cancer is reduced by 30 to 50% compared to continuing smokers.**



Quitting smoking reduces the risk of many other cancers, including laryngeal, oral, pancreatic, bladder, and cervical cancer. The Surgeon General's report on "The Health Benefits of Smoking Cessation" has over 600 pages of material on the benefits of quitting smoking.

Other Cancers



DIGESTIVE SYSTEM CANCER

Many other cancers are more often found in asbestos workers than in people who don't work with asbestos. These cancers include: cancers of the digestive system-that is, cancer in the mouth, the esophagus (the tube from your mouth to your stomach), the stomach, and the lower intestine (colon and rectum), kidneys, pancreas, and reproductive organs.

A doctor may be able to successfully treat colon and rectum cancer **if the doctor finds it early.** Digestive system cancers are **dose - related.**

Other Diseases

Pleural plaques are found in asbestos workers. They are lesions that grow slowly. They are made of fibrous tissue that can harden. They are found in the lining of the lungs. You may not even know you have pleural plaques until you get an x-ray. If you have these plaques, your risk of lung cancer doubles. You may also develop pleural asbestosis, which is a scarring of the lining of the lungs.

Pleural plaques are not caused by smoking. **Pleural plaques that are found in both the right and left sides of the respiratory system are caused by asbestos exposure and talc exposure only.**

If you protect yourself and keep asbestos out of the air, you lower your odds of getting sick.

Who gets sick from asbestos exposure?

A lot of research has been done to find out who gets sick from asbestos fibers. In June 1990, many new medical study results were presented at the "Third Wave of Asbestos Disease-Asbestos in Place" conference held by Dr. Irving J. Selikoff. Six of those studies are listed on this chart. **School custodians and even school teachers can get asbestos - related diseases.**

Chart Summary of Third Wave Asbestos Studies

Study	No. in Study	Years on Job	Findings
Wives and children of Union Rubber Asbestos Factory workers, Patterson, NJ by Dr. L. Joubert, American Cancer Society	878	N/A	115 died, cancer rate 2 times higher than expected
NYC Firefighters by Drs. Landrigan and Markowit, Mount Sinai School of Medicine, NY	8,500	20+	15-20% had abnormal X-rays
Sheet Metal Workers (nationwide) by Dr. L. Welch, George Washington Univ. Washington, DC	490	30+ 20 or less	50% had abnormal X-rays 40% had abnormal X-rays
School Maintenance Workers by Dr. H. Anderson, WI Division of Health	457	30	40% had abnormal X-rays
Boston School Custodians by Dr. L. C. Oliver, Harvard Medical School	120	20+	33% had pleural plaques
NYC School Custodians by Dr. S. Levin, Mount Sinai, NY.	660	35+	39% had abnormal X-rays

ASBESTOS DISEASES

Key Facts

Asbestos can kill you or make you sick - unless you protect yourself. Asbestos is silent and deadly. You do not know it is there. You cannot see, hear, feel, taste, smell, or touch the small asbestos fibers that enter your body. When asbestos is in the air, it gets into your body when you breathe and when you swallow.

Asbestos causes four types of disease:

1. Asbestosis, "white lung" - scarring of lungs which makes it hard to breathe.
2. Mesothelioma, the "marker disease" - a cancer of the lining of the lungs or the lining of the belly. It is rare but it always kills. It is not dose-related.
3. Lung Cancer (also caused by smoking) is the biggest killer of all the asbestos diseases. Asbestos workers who smoke are 80 times more likely to get lung cancer then the general public.
4. Other Cancers - cancers of the stomach or colon.

Dose-related
The more asbestos fibers you breathe or swallow, the more likely you are to get sick. This is called a dose relationship. The higher the amount of asbestos, the greater your chances of getting an asbestos disease. Most asbestos-related diseases are dose-related. Mesothelioma is the exception.

Latency period
All of the asbestos diseases have a latency period. The latency period is the time gap between when you take the asbestos into your body and when you become sick. For asbestos diseases, the latency period is between 10 and 40 years long.

Discussion Questions

1. Why is it important to know about the health hazards of asbestos?
2. When is asbestos dangerous?
3. Is there a safe level of asbestos exposure?
4. How do we know that asbestos causes diseases that can kill?

For more information

"Breath Taken," Center for Visual Arts in the Public, Inc., Boston, MA,1991.

National Cancer Institute, Office of Cancer Communications, "Mesothelioma Research Report."

National Research Council, Asbestiform Fibers: Nonoccupational Health Risks, National Academy Press, 1984.

NI0SH-OSHA Asbestos Work Group, "Workplace Exposure to Asbestos," DHHS (NIOSH) Publication No.81-103.

OSHA Asbestos standard, 29 CFR 1926.1101. Appendix I, "Medical Surveillance Guidelines."

Peters, George A., and Barbara J. Peters, Sourcebook on Asbestos Diseases, Garland STPM Press, 1980.

Peters, George A., and Barbara J. Peters, Asbestos Disease Update, Garland Publishing, 1989.

U.S. Department of Health and Human Services, "The Health Benefits of Smoking Cessation-A Report of the Surgeon General," 1990.

Workplace Health Fund, "The Third Wave of Asbestos Disease: Asbestos in - Place," Washington, DC, 1990.

Asbestos Diseases Exercise

This is not a test. It is an exercise. Use it to see for yourself how well you understand the material in the chapter.

1. How do asbestos fibers enter your body?

2. What is a latency period?

3. What does dose-related mean?

4. What are the diseases that asbestos causes?

5. How do asbestos exposure and smoking cigarettes mix?

2

ASBESTOS DISEASES
PART 2: MEDICAL EXAMS

In Part 2 you will learn:

What happens during a medical exam.
Why you need a medical exam.
When to have a medical exam.
About the medical records your employer has keep.

Medical exams

Billy: Do you want to ride with me to the Medical Center to get your asbestos check-up?

Lee: No, I'm not going to get a check-up.

Billy: Why not? You need to get checked to make sure you don't have an asbestos disease.

Lee: I feel fine. Besides, if I am sick, I don't want to know it. I mean, you've got to die from something, right?

Billy: Some cancers can be treated if they find them early enough.

Lee: Yeah. But even if it can be treated, I'd lose my job. I've got a family and a mortgage on the house. What do you think would happen to them if I lost my job?

Billy: What would happen to them if you die?

Discussion Questions

(Choose one or two of the following questions to discuss).

1. Why doesn't Lee want to get a check - up?
2. Do you think Lee would really lose the job if the doctor found an asbestos disease, or is that just an excuse?
3. If Lee doesn't get a check-up and then gets sick later, do you think Lee will be able to get Workers' Compensation?
4. If you were Lee's family, what would you want Lee to do?
5. If you were Lee's employer, what could you do to make Lee less afraid of losing the job?

MEDICAL EXAMS

If you work with asbestos, you must have a special kind of medical exam called **medical surveillance**. You have to have a medical exam before you start working with asbestos and then **once a year.** The doctor who gives you medical surveillance is a doctor whose specialty is **occupational diseases**. Occupational diseases are caused by your occupation or job. Asbestos causes occupational disease. Medical exams are required by law.

You must have a **baseline** exam before you start to work. The baseline exam documents your health before you do asbestos work. It is the first medical exam that you get with the job. It is a long and complete exam that usually takes 2-3 hours. You may need the records of this exam for legal purposes if you get an asbestos disease.

Each year after that, you will have a medical exam that is shorter than the baseline exam. The doctor looks for any changes in your health since your first exam. With the yearly exam, a disease can be found early. **The earlier an asbestos disease is found, the better your chances for treatment.** Be sure to get these exams. They can save your life. By law, your employer must pay for all of these exams.

When must workers have medical exams?

The OSHA asbestos regulation says your employer must provide medical exams whenever:

1. **You are issued a negative-pressure respirator.** You will learn about negative-pressure respirators in another section. You must be medically cleared by a doctor before you can wear a respirator. This is to make sure that your heart and lungs can handle the strain of wearing a respirator.

2. **You work on a Class I, ll, or Ill asbestos job below** the Permissible Exposure Limit (0.1 f/cc over an 8-hour period) for 30 days or more per year.

3. **You work on an asbestos job where the amount of asbestos in the air reaches or exceeds the Permissible Exposure Limit or Excursion Limit** (1.0 f/cc over a 30 minute period).

Required Parts of Medical Exams:

DOCTOR TAKING WORK HISTORY

1. Work History Questionnaire

The doctor must know if you've ever worked with materials that might have damaged your lungs. These include coal dust, cotton fibers, silica, or asbestos. The questionnaire is a long one - about 9-12 pages. It asks you about your smoking habits and about any lung diseases you have had.

The questionnaire is required by OSHA. **The doctor must use the official questionnaire from Appendix D of the OSHA Asbestos Standard.** The doctor may not use a questionnaire that the employer writes.

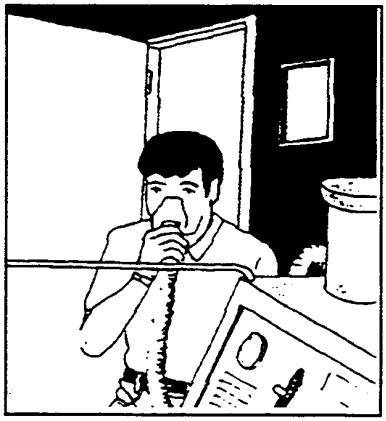
General Physical Exam

2. General Physical Exam

The doctor must give you a physical exam to see if your lungs, heart, and stomach are normal and in good shape. The first physical exam is called a baseline exam. **In your baseline exam, the doctor will document your health and state how healthy you are before you work with asbestos.** It is also to make sure that you don't have any medical problems that asbestos would make worse. After checking your lungs and heart, the doctor will tell you if you can wear a respirator (a mask that protects you from asbestos), and if you can work with asbestos.

You will also need to have a yearly exam. In the yearly exam, the doctor looks for any signs (symptoms) of asbestosis, lung cancer, or other asbestos diseases. For example, the doctor will listen for "rales" or crackling sounds in your lungs, which may be a sign that you have asbestosis.

3. Pulmonary Function Test

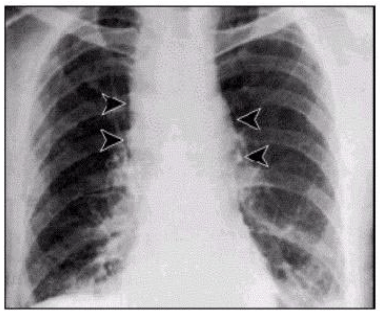


PULMONARY FUNCTION TEST

A Pulmonary Function Test (PFT) is a special breathing test. A PFT makes sure that your lungs are not damaged before you begin work. It is used as a comparison for later tests. You blow in and out of a tube using your mouth. Your nose is held tight so you cannot breathe from it. All the air that your lungs take in and push out is measured. A meter reads how much air your lungs can hold and how much air you can blow out in one second. This test often gives the first clue that your lungs are being hurt by asbestos. Smokers may also have a poor pulmonary function test result. Your pulmonary function test may also be poor if you have a bad cold.

Recommended Parts of the Medical Exam

1. Chest x-ray



The doctor might take a chest X-ray to make sure that your lungs are not damaged before you begin to work. It is compared to future x-rays to find any changes that take place in your lungs as you work with asbestos over the years. The need for a chest x-ray is your doctor's decision. It is usually a part of the baseline exam.

The x-ray must be checked by a doctor with experience in reading X-rays of work-related lung diseases. Doctors who are trained and certified to read X-rays for asbestos workers are called **"B readers."**

In general, you should have a chest x-ray every 5 years (more often if you're older and/or have worked with asbestos for many years, less often if your doctor says). **You do not need to have a chest x-ray every year.** The table below is a recommended (not required) schedule. Your doctor will determine when you need to have an x-ray.

RECOMMENDED SCHEDULE FOR CHEST X-RAYS

YEARS SINCE FIRST WORKED WITH ASBESTOS	AGE NOW 18-35	AGE NOW 36-45	AGE NOW OVER 45
0 - TO 10 YRS	EVERY 5 YRS	EVERY 5 YRS	EVERY 5 YRS
MORE THAN 10 YRS	EVERY 5 YRS	EVERY 2 YRS	ONCE A YEAR

2. EKG (electrocardiogram)

The doctor may take an EKG to make sure that your heart is working well. It measures the electrical workings of your heart. If you are 40 years old or over, this test should be included in your exam.

3. Sputum cytology

This is a special test to find abnormal cells that warn of cancer. You cough up some mucus into a cup and it is examined.

4. Hemoccult slide

This test checks for blood in your digestive system by examining your stool for hidden blood.

Why are medical exams required?

Yearly medical exams are the quickest way to tell if asbestos is making you sick. **The exams are for finding asbestos diseases early.** It's important to find these diseases as early as possible.

Medical exams are used as evidence for workers' compensation. Workers' compensation is a no-fault insurance system. You must prove that you got your disease or injury on the job. You will then be financially compensated, to some extent, for your disability. Medical exams also help doctors research asbestos diseases, so they can prevent them in the future.

The first exam shows a baseline - how healthy you were when you started work. **Yearly exams can catch a problem when it first starts.** The yearly exam is a little shorter than the first one. It must include the following:

1. **A short (3-page) questionnaire every year.** This is also an official OSHA questionnaire. It asks about your work experience, smoking habits, and lung diseases over the last year.
2. **A general physical exam** each year, just like the first year.
3. **Pulmonary Function Tests** (PFTs) each year, just like the first year.

Many lives have been saved by these tests. Employers are required by the OSHA law to provide these tests for their workers. The tests are not to punish you for getting sick on the job. They are to keep you from getting sicker if asbestos begins to make you sick. The earlier most asbestos diseases are found, the better your chances for treatment. Medical exams are also very important if you ever have to file for workers' compensation or disability.

Your Medical Exam Results

After these medical exams, the doctor writes a report and gives a copy to your employer. The doctor tells your employer whether you have any medical problems that would make it more dangerous for you to work with asbestos. The doctor writes down any medical limitations on your work. The doctor might say that you have to wear a **powered air-purifying respirator (PAPR)** instead of a negative pressure respirator.

Your employer pays for the doctor. The law requires the employer to inform the doctor of the **required** and recommended tests for the medical exam. A urine test should not be requested. It is not a part of this exam. The employer must also inform the doctor not to report any finding that does not prevent you from working with asbestos. You are the doctor's patient. **By law, the doctor must not tell your employer anything about your health, unless it will keep you from doing asbestos work. Your employer must give you a copy of the doctor's report within 30 days after getting it from the doctor.**

Records

Your employer must keep your medical records for at least 30 years after you leave the job. If your employer goes out of business, your employer has to give your medical records to the person who takes over the business. If the business folds, the records are to be sent to the Director of the National Institute for Occupational Safety and Health (NIOSH). You cannot count on your employer to be in business when you need your medical records.

Even in the best business offices, records can get lost or ruined. The longer the records have to be kept, the more chances that they get lost or misplaced. You have the right to get copies of your medical records from the doctor. You and your family are the people who will care the most about your health. You may need the information from your medical records 20-30 years from now. **YOU SHOULD GET COPIES OF ALL YOUR MEDICAL RECORDS AND KEEP THEM IN A SAFE PLACE.** A safe deposit box is a good place to keep them. Thirty years from now, you may need these records, and they need to be in a place where you can find them.

Beyond Medical Exams

There are some things you can do to lower your risk of getting cancer from working with asbestos:

1. **Always remember how dangerous asbestos can be.** The law requires your employer to give you the right equipment and protective gear you need to do the work safely. A good abatement job protects you and everyone around. Keep asbestos out of the air. Demand the right equipment. Work safely. Protect yourself with the right respirator and disposable suit.

2. **Quit smoking.** There are many places you can go for help to quit smoking. Encourage your family, friends, and co-workers to quit smoking.

3. **Inform any doctor you visit that you have worked with asbestos.** Tell the doctor the year when you started working with asbestos. Tell the doctor how long you worked with it. Asbestos diseases have a latency period of ten to forty years. Tell the doctor about all the diseases that asbestos causes and ask the doctor to look for those diseases.

4. **Even after you stop working with asbestos, you should have a yearly physical** with a rectal exam. This is even more important if you worked with asbestos ten years ago or more.

5. **You have the right to know what hazards you are working with** and what hazards and pollutants are in your community. Work with your coworkers, union, and community to lower these hazards.

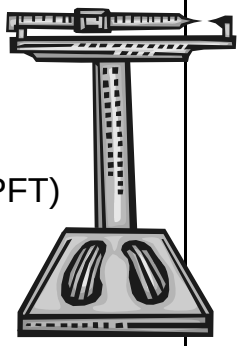
MEDICAL EXAMS

Key Facts

Asbestos workers must have medical surveillance, a special kind of doctor's check-up:

1. before they start work, and
2. once a year after that.

Medical exams are the quickest way to tell if asbestos is making you sick.



A medical exam includes:

- ✎ First exam
- ✎ Long questionnaire
- ✎ General physical (lungs, heart, stomach)
- ✎ Lung tests (Pulmonary Function Tests (PFT)

Every year

- ✎ Short questionnaire
- ✎ General physical (lungs, heart, stomach)
- ✎ Lung tests (Pulmonary Function Tests (PFT)

Your employer must give you a copy of the doctor's written opinion within 30 days after she or he gets it.

Your employer must keep your medical records for at least 30 years after your last day on the job.

Discussion Questions

1. What good is medical surveillance ?
2. Why is it important to find asbestos diseases early?
3. Why is it important to have an asbestos medical exam before doing any asbestos abatement?
4. When are medical exams required by OSHA ?
5. List the required parts of an asbestos medical exam.
6. What is the baseline exam?
7. How long must the employer keep the medical records?
8. Why keep copies of your medical records?
9. What do I do when I am no longer working with asbestos and do not get yearly medical surveillance?

For More Information

OSHA Asbestos Standard, 29 CFR 1926.1101, paragraph (m)(2), "Medical Examinations and Consultations."

OSHA Asbestos Standard, 29 CFR 1926.1101, Appendix I, "Medical Surveillance Guidelines."

Stop smoking information:

Call your local chapter of the American Lung Association.
Call your local chapter of the American Cancer Society.
Look in the yellow pages under "Smoking."

CONTRACTORS/SUPERVISORS

The Importance of Medical Surveillance

It is important for all asbestos abatement supervisors/contractors to establish an ongoing medical surveillance program for several reasons. The three areas of major concern are:

- ➢ the safety and health of all workers;
- ➢ regulatory requirements; and
- ➢ other legal liability.

Through implementation of an effective medical surveillance program, an abatement supervisor/contractor will be able to –

- ➢ verify every employee's medical status at a particular time;
- ➢ comply with OSHA standards on medical surveillance of workers exposed to asbestos; and
- ➢ reduce the possibility of other liability risks.

Who needs Medical Surveillance?

Because of the increased public awareness concerning the health hazards associated with exposure to airborne asbestos an because of various regulatory requirements, employers and building owners find themselves in situations where they must provide for regular and periodic medical surveillance for their employees. For these employees, a medical surveillance program is used for determining their **baseline health status** (health status before beginning work), **monitoring their health** for the duration of their employment/project, and **providing documentation of their health status**, along with their **work history** upon completion of their employment/project. In addition to the medical reports, the employer must request that the **physician provide a statement indicating whether or not an employee is capable of wearing a respirator**. This statement should **make reference to any lung restrictions** that would prevent respirator usage as well as any limitations associated with their use.

Clarification of Termination of Employment Examination

Within **thirty (30) calendar days before or after** the termination of an employee covered by the **OSHA General Industry Standard for Asbestos** (but not the Asbestos Abatement Construction Standard), OSHA requires each employee exposed to asbestos receive a medial examination. This examination must include the same items as the annual exam.

Summary

An effective medial surveillance program is essential for employers to ensure the safety and health of their employees and also reduce their liability potential for claims pertaining to asbestos exposure. It is also important to have a firm understanding of when OSHA requires medial surveillance programs for employees when they are –

1. **Issued a negative-pressure respirator.**
   They must be medically cleared by a doctor before they can wear a respirator. This is to make sure that each employee's heart and lungs can handle the strain of wearing a respirator.

2. **Working on a Class I, II, or III asbestos job below** the Permissible Exposure Limit (0.1 f/cc over an 8-hour period) for 30 days or more per year.

3. **They work on an asbestos job where the amount of asbestos in the air reaches or exceeds the Permissible Exposure Limit or Excursion Limit** (1.0 f/cc over a 30 minute period).

Finally, it is important for supervisor/contractor to understand the reasons for the specific steps and tests that make up initial, annual, and termination medical exams.

OSHA Regulations (Standards - 29 CFR)
1926.1101 Asbestos Appendix D
Medical Questionnaire – Mandatory

This mandatory appendix contains the medical questionnaires that must be administered to all employees who are exposed to asbestos above the permissible exposure limit, and who will therefore be included in their employer's medical surveillance program. **Part 1** of the appendix contains the **Initial Medical Questionnaire,** which must be obtained for all new hires who will be covered by the medical surveillance requirements. **Part 2** includes the abbreviated Periodical Medical Questionnaire, which must be administered to all employees who are provided periodic medical examinations under the medical surveillance provisions of the standard.

Part 1
INITIAL MEDICAL QUESTIONNAIRE

1. NAME _____
2. SOCIAL SECURITY NUMBER # _____
3. CLOCK NUMBER _____
4. PRESENT OCCUPATION _____
5. PLANT _____
6. ADDRESS _____
7.(Zip Code) _____
8. TELEPHONE NUMBER _____
9. INTERVIEWER _____
10. DATE _____
11. Date of Birth _____
    Month Day Year
12. Place of Birth _____
13. Sex 1. Male ___ 2. Female ___
14. What is your marital status? 1. Single ___ 2. Married ___ 3. Widowed ___
    4. Separated/Divorced ____
15. Race 1. White ___ 4. Hispanic ___
    2. Black ___ 5. Indian ___
    3. Asian ___ 6. Other ___
16. What is the highest grade completed in school? _____
    (For example 12 years is completion of high school)

OCCUPATIONAL HISTORY

17A. Have you ever worked full time (30 hours per week or more) for 6 months or more? 1. Yes ___ 2. No ___

IF YES TO 17A:

B. Have you ever worked for a year or more in any dusty job? 1. Yes ___ 2. No ___ 3. Does Not Apply ___

Specify job/industry _____ Total Years Worked _____

Was dust exposure: 1. Mild ____ 2. Moderate ____ 3. Severe ____

C. Have you ever been exposed to gas or chemical fumes in your work? 1. Yes ___ 2. No ___
Specify job/industry _____ Total Years Worked ___
Was exposure : 1. Mild ____ 2. Moderate ____ 3. Severe ____

D. What has been your usual occupation or job -- the one you have worked at the longest?

1. Job occupation _____
2. Number of years employed in this occupation _____
3. Position/job title _____
4. Business, field or industry _____

(Record on lines the years in which you have worked in any of these industries, e.g. 1960-1969)

Have you ever worked:	YES	NO
E. In a mine?	_____	_____
F. In a quarry?	_____	_____
G. In a foundry?	_____	_____
H. In a pottery?	_____	_____
I. In a cotton, flax or hemp mill?	_____	_____
J. With asbestos?	_____	_____

18. PAST MEDICAL HISTORY

	YES	NO
A. Do you consider yourself to be in good health?	_____	_____
If "NO" state reason _____		
B. Have you any defect of vision?	_____	_____
If "YES" state nature of defect _____		
C. Have you any hearing defect?	_____	_____
If "YES" state nature of defect _____		

D. Are you suffering from or have you ever suffered from	YES	NO
a. Epilepsy (or fits, seizures, convulsions)?	_____	_____
b. Rheumatic fever?	_____	_____
c. Kidney disease?	_____	_____
d. Bladder disease?	_____	_____
e. Diabetes?	_____	_____
f. Jaundice?	_____	_____

19. CHEST COLDS AND CHEST ILLNESSES

19A. If you get a cold, does it "usually" go to your chest?
(Usually means more than ½ the time) 1. Yes ___ 2. No ___ 3. Don't get colds__

20A. During the past 3 years, have you had any chest illnesses that have kept you off work, indoors at home, or in bed? 1. Yes ___ 2. No ___

IF YES TO 20A:

B. Did you produce phlegm with any of these chest illnesses?
1. Yes ___ 2. No ___ 3. Does Not Apply ___

C. In the last 3 years, how many such illnesses with (increased) phlegm did you have which lasted a week or more?
Number of illnesses ___ No such illnesses ___

21. Did you have any lung trouble before the age of 16? 1. Yes ___ 2. No ___

22. Have you ever had any of the following?
    1A. Attacks of bronchitis? 1. Yes ___ 2. No ___
    IF YES TO 1A:
    B. Was it confirmed by a doctor? 1. Yes ___ 2. No ___ 3. Does Not Apply __
    C. At what age was your first attack? Age in Years ___ Does Not Apply ___
    2A. Pneumonia (include bronchopneumonia)? 1. Yes ___ 2. No ___
    IF YES TO 2A:
    B. Was it confirmed by a doctor? 1. Yes ___ 2. No ___3. Does Not Apply ___
    C. At what age did you first have it? Age in Years ___ Does Not Apply ___
    3A. Hay Fever? 1. Yes ___ 2. No ___
    IF YES TO 3A:
    B. Was it confirmed by a doctor? 1. Yes ___ 2. No ___ 3. Does Not Apply ___
    C. At what age did it start? Age in Years ___ Does Not Apply ___
23A. Have you ever had chronic bronchitis? 1. Yes ___ 2. No ___
    IF YES TO 23A:
    B. Do you still have it? 1. Yes ___ 2. No ___3. Does Not Apply ___
    C. Was it confirmed by a doctor? 1. Yes ___ 2. No ___3. Does Not Apply ___
    D. At what age did it start? Age in Years ___Does Not Apply ___
24A. Have you ever had emphysema? 1. Yes ___ 2. No ___
    IF YES TO 24A:
    B. Do you still have it? 1. Yes ___ 2. No ___3. Does Not Apply ___
    C. Was it confirmed by a doctor? 1. Yes ___ 2. No ___3. Does Not Apply ___
    D. At what age did it start? Age in Years ___ Does Not Apply ___
25A. Have you ever had asthma? 1. Yes ___ 2. No ___
    IF YES TO 25A:
    B. Do you still have it? 1. Yes ___ 2. No ___3. Does Not Apply ___
    C. Was it confirmed by a doctor? 1. Yes ___ 2. No ___3. Does Not Apply ___
    D. At what age did it start? Age in Years ___ Does Not Apply ___
    E. If you no longer have it, at what age did it stop? Age stopped ___Does Not Apply ___
26. Have you ever had:
    A. Any other chest illness? 1. Yes ___ 2. No ___
    If yes, please specify _____
    B. Any chest operations? 1. Yes ___ 2. No ___
    If yes, please specify _____
    C. Any chest injuries? 1. Yes ___ 2. No ___
    If yes, please specify _____
27A. Has a doctor ever told you that you had heart trouble? 1. Yes ___ 2. No ___
    IF YES TO 27A:
    B. Have you ever had treatment for heart trouble in the past10 years?
        1. Yes ___ 2. No ___3. Does Not Apply ___
28A. Has a doctor told you that you had high blood pressure? 1. Yes ___ 2. No ___
    IF YES TO 28A:
    B. Have you had any treatment for high blood pressure (hypertension) in the past 10 years?
        1. Yes ___ 2. No ___3. Does Not Apply ___
29. When did you last have your chest X-rayed? (Year) ___ ___ ___ ___
30. Where did you last have your chest X-rayed (if known)?
    _____
    What was the outcome? _____

FAMILY HISTORY

31. Were either of your natural parents ever told by a doctor that they had a chronic lung condition such as:

	FATHER 1. Yes 2. No 3. Don't know	MOTHER 1. Yes 2. No 3. Don't know
A. Chronic Bronchitis?	___ ___ ___	___ ___ ___
B. Emphysema?	___ ___ ___	___ ___ ___
C. Asthma?	___ ___ ___	___ ___ ___
D. Lung cancer?	___ ___ ___	___ ___ ___
E. Other chest conditions?	___ ___ ___	___ ___ ___
F. Is parent currently alive?	___ ___ ___	___ ___ ___
G. Please Specify	___ Age if Living ___ Age at Death __ ___ Don't Know ___	___ Age if Living ___ Age at Death ___ Don't Know

H. Please specify cause of death: Father_____Mother _____

COUGH

32A. Do you usually have a cough? (Count a cough with first smoke or on first going outof doors. Exclude clearing of throat.)
(If no, skip to question 32C.) 1. Yes ___ 2. No ___

B. Do you usually cough as much as 4 to 6 times a day 4 or more days out of the week? 1. Yes ___ 2. No ___

C. Do you usually cough at all on getting up or first thing in the morning? 1. Yes ___ 2. No ___

D. Do you usually cough at all during the rest of the day or at night? 1. Yes ___ 2. No ___

IF YES TO ANY OF ABOVE (32A, B, C, OR D,), ANSWER THE FOLLOWING.
IF NO TO ALL, CHECK "DOES NOT APPLY" AND SKIP TO NEXT PAGE

E. Do you usually cough like this on most days for 3 consecutive months or more during the year? 1. Yes ___ 2. No ___3. Does not apply ___

F. For how many years have you had the cough?
Number of years ___ Does not apply ___

33A. Do you usually bring up phlegm from your chest?
(Count phlegm with the first smoke or on first going out of doors. Exclude phlegm from the nose. Count swallowed phlegm.)
(If no, skip to 33C) 1. Yes ___ 2. No ___

B. Do you usually bring up phlegm like this as much as twice a day 4 or more days out of the week? 1. Yes ___ 2. No ___

C. Do you usually bring up phlegm at all on getting up or first thing in the morning? 1. Yes ___ 2. No ___

D. Do you usually bring up phlegm at all on during the rest of the day or at night? 1. Yes ___ 2. No ___

IF YES TO ANY OF THE ABOVE (33A, B, C, OR D), ANSWER THE FOLLOWING:
IF NO TO ALL, CHECK "DOES NOT APPLY" AND SKIP TO 34A

E. Do you bring up phlegm like this on most days for 3 consecutive months or more during the year? 1. Yes ___ 2. No ___3. Does not apply ___

F. For how many years have you had trouble with phlegm?
Number of years ___ Does not apply ___

EPISODES OF COUGH AND PHLEGM

34A. Have you had periods or episodes of (increased*) cough and phlegm lasting for 3 weeks or more each year?
* (For persons who usually have cough and/or phlegm) 1. Yes ___ 2. No ___

IF YES TO 34A

B. For how long have you had at least 1 such episode per year?
Number of years ___Does not apply ___

WHEEZING

35A. Does your chest ever sound wheezy or whistling

1. When you have a cold? 1. Yes ___ 2. No ___
2. Occasionally apart from colds? 1. Yes ___ 2. No ___
3. Most days or nights? 1. Yes ___ 2. No ___

IF YES TO 1, 2, or 3 in 35A

B. For how many years has this been present? Number of years ___Does not apply ___

36A. Have you ever had an attack of wheezing that has made you feel short of breath? 1. Yes ___ 2. No ___

IF YES TO 36A

B. How old were you when you had your first such attack? Age in years ___Does not apply ___

C. Have you had 2 or more such episodes? 1. Yes ___ 2. No ___3. Does not apply ___

D. Have you ever required medicine or treatment for the(se) attack(s)? 1. Yes ___ 2. No ___3. Does not apply ___

BREATHLESSNESS

37. If disabled from walking by any condition other than heart or lung disease, please describe and proceed to question 39A. Nature of condition(s) _____
_____

38A. Are you troubled by shortness of breath when hurrying on the level or walking up a slight hill? 1. Yes ___ 2. No ___

IF YES TO 38A

B. Do you have to walk slower than people of your age on the level because of breathlessness? 1. Yes ___ 2. No ___3. Does not apply ___

C. Do you ever have to stop for breath when walking at your own pace on the level? 1. Yes ___ 2. No ___3. Does not apply ___

D. Do you ever have to stop for breath after walking about 100 yards (or after a few minutes) on the level? 1. Yes ___ 2. No ___3. Does not apply ___

E. Are you too breathless to leave the house or breathless on dressing or climbing one flight of stairs? 1. Yes ___ 2. No ___3. Does not apply ___

TOBACCO SMOKING

39A. Have you ever smoked cigarettes? (No means less than 20 packs of cigarettes or 12 oz. of tobacco in a lifetime or less than 1 cigarette a day for 1 year.) 1. Yes ___ 2. No ___

IF YES TO 39A

B. Do you now smoke cigarettes (as of one month ago) 1. Yes ___ 2. No ___3. Does not apply ___

C. How old were you when you first started regular cigarette smoking?
Age in years ___Does not apply ___
D. If you have stopped smoking cigarettes completely, how old were you when you stopped? Age stopped ___ Check if still smoking ___ Does not apply ___
E. How many cigarettes do you smoke per day now?
Cigarettes per day ___Does not apply ___
F. On the average of the entire time you smoked, how many cigarettes did you smoke per day?
Cigarettes per day ___ Does not apply ___
G. Do or did you inhale the cigarette smoke?
1. Does not apply ___ 2. Not at all ___ 3. Slightly ___ 4. Moderately ___ 5. Deeply ___
40A. Have you ever smoked a pipe regularly?
(Yes means more than 12 oz. of tobacco in a lifetime.) 1. Yes ___ 2. No ___
IF YES TO 40A:

FOR PERSONS WHO HAVE EVER SMOKED A PIPE
B. 1. How old were you when you started to smoke a pipe regularly? Age ___
2. If you have stopped smoking a pipe completely, how old were you when you stopped?
Age stopped ___Check if still smoking pipe ___Does not apply ___
C. On the average over the entire time you smoked a pipe, how much pipe tobacco did you smoke per week? ___ oz. per week
(a standard pouch of tobacco contains 1 1/2 oz.) ___ Does not apply
D. How much pipe tobacco are you smoking now?
oz. per week ___Not currently smoking a pipe ___
E. Do you or did you inhale the pipe smoke?
1. Never smoked ___2. Not at all ___3. Slightly ___4. Moderately ___5. Deeply ___
41A. Have you ever smoked cigars regularly? 1. Yes ___ 2. No ___
(Yes means more than 1 cigar a week for a year)

IF YES TO 41A
FOR PERSONS WHO HAVE EVER SMOKED A CIGARS
B. 1. How old were you when you started smoking cigars regularly? Age ____
2. If you have stopped smoking cigars completely, how old were you when you stopped. Age stopped ___
Check if still smoking cigars ___ Does not apply ___
C. On the average over the entire time you smoked cigars, how many cigars did you smoke per week? Cigars per week___ Does not apply ____
D. How many cigars are you smoking per week now?
Cigars per week Check if not smoking cigars currently ___
E. Do or did you inhale the cigar smoke?
1. Never smoked ___2. Not at all ___3. Slightly ___4. Moderately ___5. Deeply ___

Signature _____ **Date** _____

Part 2
PERIODIC MEDICAL QUESTIONNAIRE

1. NAME _____
2. SOCIAL SECURITY # ___ ___ ___ ___ ___ ___ ___ ___ ___
3. CLOCK NUMBER ___ ___ ___ ___ ___ ___ ___
4. PRESENT OCCUPATION_____
5. PLANT _____
6. ADDRESS _____
7. (Zip Code) _____
8. TELEPHONE NUMBER _____
9. INTERVIEWER _____
10. DATE _____ ___ ___ ___ ___ ___ ___
11. What is your marital status?
    1. Single ___ ___2. Married ___3. Widowed ___4. Separated/Divorced

12. OCCUPATIONAL HISTORY

12A. In the past year, did you work full time (30 hours per week or more) for 6 months or more? 1. Yes ___ 2. No ___

IF YES TO 12A:

12B. In the past year, did you work in a dusty job? 1. Yes ___ 2. No ___ 3. Does not Apply ___

12C. Was dust exposure: 1. Mild ___ 2. Moderate ___ 3. Severe ___

12D. In the past year, were you exposed to gas or chemical fumes in your work? 1. Yes ___ 2. No ____

12E. Was exposure: 1. Mild ___ 2. Moderate ___ 3. Severe ___

12F. In the past year, what was your:

1. Job/occupation? _____
2. Position/job title? _____

13. RECENT MEDICAL HISTORY

13A. Do you consider yourself to be in good health? Yes ___ No ___

If NO, state reason _____

13B. In the past year, have you developed:

	Yes	No
Epilepsy?	___	___
Rheumatic fever?	___	___
Kidney disease ?	___	___
Bladder disease?	___	___
Diabetes?	___	___
Jaundice?	___	___
Cancer?	___	___

14. CHEST COLDS AND CHEST ILLNESSES

14A. If you get a cold, does it "usually" go to your chest? (usually means more than 1/2 the time) 1. Yes ___ 2. No ___3. Don't get colds ___

15A. During the past year, have you had any chest illnesses that have kept you off work, indoors at home, or in bed? 1. Yes ___ 2. No ___ 3. Does Not Apply

IF YES TO 15A:

15B. Did you produce phlegm with any of these chest illnesses? 1. Yes ___ 2. No ___ 3. Does Not Apply ___

15C. In the past year, how many such illnesses with (increased) phlegm did you have which lasted a week or more? Number of illnesses _____ No such illnesses ___

16. RESPIRATORY SYSTEM

In the past year have you had:

	Yes	or	No	Further Comment on Positive Answers
Asthma	_____		____	_____
Bronchitis	_____		____	_____
Hay Fever	_____		____	_____
Other Allergies	_____		____	_____
Pneumonia	_____		____	_____
Tuberculosis	_____		____	_____
Chest Surgery	_____		____	_____
Other Lung Problems	_____		____	_____
Heart Disease	_____		____	_____

Do you have:	Yes	or	No	Further Comment on Positive Answers
Frequent colds	_____		____	_____
Chronic cough	_____		____	_____
Shortness of breath when walking or climbing one flight or stairs	_____		____	_____

Do you:

Wheeze _____ Cough up phlegm _____ Smoke cigarettes _____ Packs per day ____ How many years ___

Date _____ Signature ____ _____

[59 FR 40964, **Aug. 10, 1994**]

"B" Reader

LAWS & REGULATIONS 3

In this chapter you will learn about:

Regulations, and how they are enforced.
The difference between federal and state asbestos laws.
The laws that protect you on the job.
The laws that protect the environment on the job.

Laws and Regulations

There are lots of laws and regulations on the books. Laws and regulations give you many rights. They help to protect you and require your employer to protect you. **You can't fight for your rights unless you know what they are.** The law is one tool for a safer and healthier job.

Not everyone follows laws. Think about the speed limit. Lots of people drive above the speed limit and don't get caught. But if you get caught too many times, you can lose your driver's license. If employers are caught violating regulations, they can be fined.

Congress passes **laws**, and EPA and OSHA write and enforce **regulations** or **standards** based on those laws. These regulations tell your employer what specifically has to be done to make the workplace safer. OSHA and EPA can give your employer a fine for breaking their regulations. Regulations are just as strong as laws.

The Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) have regulations that cover asbestos work. EPA enforces regulations which protect the environment. Some of these regulations also protect workers. OSHA enforces regulations which protect workers on the job. OSHA is part of the Department of Labor.

Some states have their own asbestos regulations, which must be followed when you work in those states. State laws must be at least as protective as federal laws.

Environmental Protection Agency

There are a number of EPA asbestos regulations you need to know about. Your teacher must go over these regulations in detail. These notes are only to give you some background to understand the regulations.

Asbestos Hazard Emergency Response Act

In 1987, Congress passed a law that required EPA to develop rules about managing asbestos materials in schools. That law was called the "Asbestos Hazard Emergency Response Act," or **AHERA.**

Under AHERA, schools have to be inspected for asbestos. Schools with asbestos then must develop and follow a special Operations and Maintenance program for managing the asbestos. Anyone who deals with asbestos in schools - workers, supervisors, inspectors, and management planners - must go through special training and get accreditation. As of November, 1992, the "Asbestos School Hazard Abatement Reauthorization Act" **(ASHARA)** extended the training requirement to cover asbestos workers, supervisors, and inspectors in **public and commercial buildings** as well.

How AHERA affects your work:

1. It defines asbestos material as being more than 1% asbestos.
2. It lays out the five control methods: operations and maintenance, enclosure, encapsulation, repair, and removal.
3. It describes clearance air sampling at the end of the job with aggressive air sampling and a Transmission Electron Microscope.
4. It regulates training classes like this one and requires this training for all workers working with asbestos, not just school workers.

Asbestos School Hazard Abatement Act (ASHAA) Public Law 98-377

ASHAA, enacted by Congress in 1984, directed EPA to help schools carry out their asbestos hazard responsibilities. ASHARA required EPA to provide technical assistance to schools on how to identify and abate asbestos health hazards. ASHARA also required EPA to provide funds to state and local agencies. These funds were used for training people involved in asbestos inspections and abatement. They were also used for abating asbestos materials that posed a threat to the health and safety of school children or employees.

Asbestos School Hazard Abatement Reauthorization Act (ASHARA) Public Law 101-637

In 1990, Congress reauthorized ASHAA through ASHARA. In addition to providing more money for school abatement programs, ASHARA also made changes to both AHERA and the EPA's "Model Accreditation Plan."

Under the ASHARA revisions AHERA's training requirements now apply to all persons working with asbestos in public and commercial buildings, not just school buildings. This means that all asbestos inspectors, supervisors, and workers must have EPA-approved AHERA training. Public and commercial buildings are all buildings other than school buildings and apartment buildings with fewer than 10 living units. Single family homes are excluded from this rule.

ASHARA has also increased the number of hours required for asbestos worker and supervisor training to 32 and 40 respectively. The additional eight hours of training provides more hands-on training.

National Emission Standards for Hazardous Air Pollutants (NESHAP) 40 CFR Part 61, Subpart M

The National Emission Standards for Hazardous Air Pollutants is part of the Clean Air Act. NESHAP says that you have to keep asbestos out of the air. There should never be so much asbestos that you can see it in the air. NESHAP is the EPA's law that treats asbestos as a hazardous air pollutant.

How NESHAP affects your work:

1. It defines any job that is at least 160 square feet, 260 linear feet, or 35 cubic feet as a large job.

2. It requires that if the combined work area of a group of small jobs in one facility equals, or exceeds, the measurements for a large job, those jobs must be treated as a large job.

3. It says that **asbestos must be adequately wet** before it can be taken down and when it is sealed in an airtight container.

4. It is illegal to drop asbestos more than 50 feet during demolition or renovation work.

5. Your employer must notify EPA of the job 10 working days before it begins and notify EPA again if the start date changes.

6. **Waste bags must be labeled** with the location of the job. and the name of the waste generator.

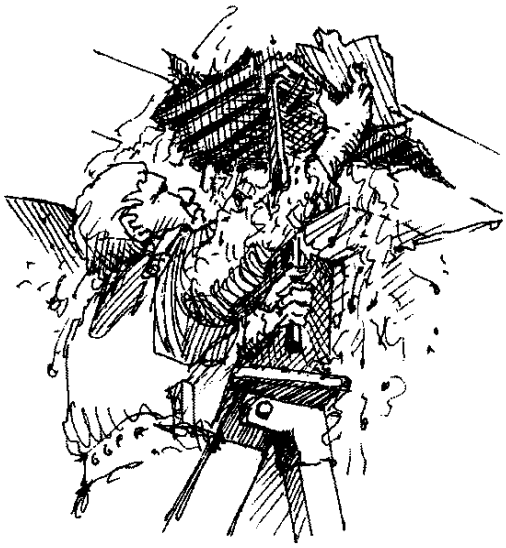
7. Buildings must be inspected for asbestos **prior to demolition or renovation work.**

Ban and Phase Out Rule
40 CFR 763.160 to 763.179

Beginning in 1990, the EPA began a 7-year phased ban on 94% of all asbestos products. The ban covered asbestos containing floor tiles, ceiling tiles, brake shoes, clutch facings, and most other uses of asbestos. The Ban was overturned by the 5th U.S. Circuit Court of Appeals. Only products that were discontinued before the overturning of the Ban are still banned and cannot be reintroduced.

Worker Protection Rule
40 CFR 763

Some state and local government workers are not protected by the Occupational Safety and Health Administration's rules. EPA's Worker Protection Rule gives these workers who conduct asbestos abatement the same protection as everyone else.



This in not the way you remove ceiling or attic asbestos insulation.

Occupational Safety and Health Administration

The Occupational Safety and Health Administration (OSHA) has regulations that cover your work. This is the most important thing for you to know: **You have the right to a safe and healthy workplace.** Your employer is required to keep your workplace safe. Only employers can be fined by OSHA. Workers cannot be fined by OSHA.

OSHA has two key regulations that cover the asbestos industry:

- **Construction Industry Asbestos Standard (29 CFR 1926.1101)**
- **Respiratory Standard (29 CFR 1910.134)**

Construction Industry Asbestos Standard
29 CFR 1926.1101

The OSHA Construction Industry Standard has regulations covering asbestos abatement. It covers most of the material in this class. The Standard sets the Permissible Exposure Limit (legal limit) of **0.1 f/cc** of asbestos in air and requires:

- work practices
- protective suits
- medical exams
- record-keeping
- air sampling
- negative air pressure
- respirators
- decons

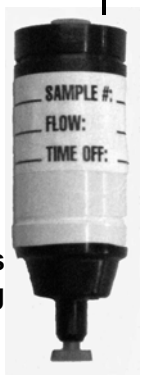
See the chart on the next page for more information on your rights under this standard.

The OSHA Respirator Standard
29 CFR 1910.134

The OSHA Respirator Standard covers **everyone who wears a respirator**. It doesn't just cover respirators for asbestos work. This is like a "Worker's Respirator Bill of Rights." Your employer must have a written respirator program.

A battery-powered tight-fitting Powered-air Purifying Respirator w/HEPA Filter

Little-known Rights in the OSHA Asbestos Regulations	
Section of 1926.1101	**Employee Right:**
(f)(1)(iii)	Your employer has to take 30-minute air samples on every shift from a cross-section of workers.
(f)(6)(i)	The employer must allow the workers or their designated representative to observe air sampling.
(h)(2)(ii)	If a doctor says that you may not work with asbestos, your employer has to offer you another job at the same pay, if there is one.
(h)(3)(ii)	You have the right to get a (PAPR) instead of another air-purifying respirator if you ask.
(i)(2)(i)	The employer shall ensure that laundering of contaminated clothing is done to prevent the release of asbestos.
(m)(4)(iii)	The doctor has to write a letter to your employer about the exam. Your employer has to send you a copy within 30 days after getting it.
1910.134 (g)(2)(ii)(B)	You have the right to change your respirator filters every time it gets hard to breathe. (The filters are clogged.)
1910.134 (g)(2)(ii)(4)	You have the right to wash your face and respirator when asbestos or the respirator irritates your face.



Asbestos Sampling Cassette

Other OSHA Rights

Right-to-Know (Hazard Communication Standard)
29 CFR 1910.1200 & 29 CFR 1926.59

OSHA says you have to be trained about the dangers of your work. One danger is chemicals. In this class, we mention methylene chloride (in spray glue) and ammonia (in spray poly). Your employer has to give you training about the chemicals you work with. This is part of the **Right-to-Know law.**

Your employer is also required under this law to make sure all containers holding hazardous substances are properly labeled. There must also be fact sheets about all the chemicals you work with. These fact sheets are called **Material Safety Data Sheets or MSDS.** In required training, you learn how to use the data sheets. MSDSs tell you about how the chemicals can harm your health. They also tell you how to protect yourself from the chemicals.

Non-discrimination

OSHA law says your employer may not fire you for fighting for your health and safety. Your employer may not discipline you or discriminate against you. This is called "11 C" protection. (It comes from section 11(c) of the OSH Act.)

Some people have been fired for fighting for their rights. However, if you win an 11 C case, you can get your job back, get back pay, and your employer can be fined. But 11 C cases often take a long time to settle. Even if you lose your case, you may still be able to get unemployment benefits.

It' s important to know your rights and fight for them. It's also important to do your job. It is illegal to fire someone because they are fighting for their rights. It is legal to fire someone because they didn't do their job. If you are fighting for a safer workplace, don't forget to do your job too.

State Laws

Some state laws protect you more than the federal laws. OSHA and EPA regulations do not say exactly how you are supposed to build a work room. They don't tell you how many layers of poly or tape you should use. Many state and even county or city laws do cover these details.

If your state has a law, your instructor will go over the state law in detail. It is important to know the state and local laws. The better you know the laws, the safer you can work.

Most state asbestos laws are licensing laws. Some states make you take a class and pass a test to work with asbestos. Some state laws also cover work practices, waste disposal, and other topics. Many states enforce federal laws for themselves. Your state may have its own OSHA or EPA law.

Many people think that a federal law always overrules a state law. Some people think that a state law always overrules a federal law. This is not true. **The law that holds is the one that protects you more.** Many state asbestos laws protect you more than the federal law.

Many states took the work practices recommended by the EPA and OSHA, and made them required. Many of these state laws are based on the OSHA standard. Many state laws are also based on EPA laws. Some state laws are developed by either the state department of health, department of labor, or environmental protection agency. You will get your license from the agency that is responsible for asbestos licensing in your state.

Excerpt of:

Colorado Department of Public Health and Environment – Air Pollution Control Division

APPLICATION FOR ASBESTOS ABATEMENT CERTIFICATION

PART II Type of Certificate Requested

_____Building Inspector	$122.50
_____Management Planner	$175.00
_____Worker	$122.50
_____Project Designer	$175.00
_____Supervisor	$175.00
_____Building Inspector/Management Planner	$175.00
_____Supervisor/Project Designer	$175.00

PART III This is an application for a:

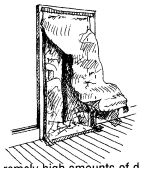
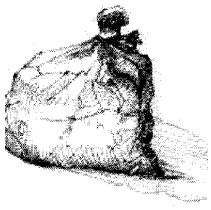
_____New Certificate (First time applicants)
_____Re-certification
_____Replacement Identification card/certification ($10.00 fee/1st time, $25.00 fee/after 1st

Fee Enclosed $ _____
Please make check payable to: **Colorado Department of Public Health and Environment (or CDPHE)**

PART IV Attachments

Attach **originals** of all training certificates. This includes AHERA training certificate and all subsequent AHERA refresher training certificates. Verifiable U.S. Government photo identification required at the time of application. Originals will be returned to you with Colorado certification.

Here are some areas where state laws protect you better than the federal law:

OSHA says ...	Some States say ...
You must wear clothing that covers your whole body. Workers may wear street clothes.	You must wear a disposable suit.
Half-mask air-purifying respirators are allowed up to 1.0 f/cc.	Half-mask air-purifying respirators are only allowed up to 0.1 f/cc.
Provides some direction about how to build a work room for each class of job.	There must be two layers of 4-mil poly on walls. There must be two layers of 6-mil poly on floors.
Must have plastic flapped doorways in the decon. 	That a 3-foot-long air lock between each decon room is recommended.
Recommends area air samples, but does not require them.	Must take six area samples per day.
Recommends how to clean the work room.	Must clean the work room with damp rags, then wait 24 hours. Then clean the work room again with damp rags and HEPA vacs. The workroom must then be inspected by the Department of Labor. The room is clean at .005 f/cc.
Must use sealed, labeled, leakproof containers. 	Bags must have a tag with the asbestos license number and the date the bag was sealed

Solving Problems on the Job

Many employers try to go by the book on an asbestos job. Contract specs are very specific, and the employer can lose money if they aren't followed. But what if you see something done wrong on a job? What if the negative air machine breaks, but your foreman tells you to keep on working? What if you ask for a PAPR instead of a full-face, air-purifying respirator and your boss tells you he's never heard of one? You may see something wrong, and you have to decide whether you're going to do anything about it. What can you do to solve these kinds of problems at work?

Talk to other workers first.

If your company or union has a health and safety committee, go to it first. Talk to other workers. You will get better results if your employer sees that it is a problem for everyone, not just a "personal problem."

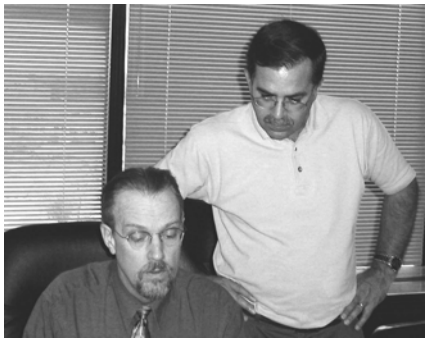
Collect Information and Records

When did the problem start? Did anyone try to do anything about it? Talk to the industrial hygienist on the job.

Get copies of your air samples. Get some more information from the people who trained you. Find out what part of the OSHA standard applies. The "For More Information" section at the end of each chapter in the manual lists the sections of the OSHA standards that apply.

Then take the problem to a supervisor.

You may want to go to the contractor right away, but you are much more likely to get results, and keep your job, if you start at the bottom. If you are not satisfied with the supervisor's answer, then take it up the management ladder.



If you go all the way to the top and you still don't think the work is being done right, then you might go outside the company for help.

If you ask OSHA or EPA to inspect the job, you should know what they can and can't do. They will try to come on the job. If the company has broken their rules, they can fine the company or they could shut the job down. Some fines are small. But a contractor can lose his or her asbestos license if fined by EPA or OSHA. You have to be specific and know what you are talking about if you call OSHA or EPA. You must specifically ask for your name to be kept secret if you do not want the company to know you have filed a complaint.

However, jobs are sometimes short. Inspectors can't always get there while the work is still going on. If there is a problem with the job that isn't covered by a regulation, then the agency can't fine the company. For example, heat stress is a big problem on asbestos jobs. OSHA does not have rules about heat. Calling the government is not a quick fix. You may get good results. But if you call the government, it should be one part of an overall strategy.

The number to call to report a life or death situation is **1-800-321-OSHA.** Do not call this joking around. This number is for emergency situations only and is available 24 hours a day. Remember to be specific when you call to report something-know exactly what you want to say. Be patient. Know the specific law being broken, if you can.

4

PERSONAL PROTECTIVE EQUIPMENT
PART 1: RESPIRATOR TYPES

In Part 1 you will learn:

What respirators are and how they work.
You must wear a respirator when you work with asbestos.
Respirators are not perfect.
Respirators have to fit.
What respirators are allowed on an asbestos job.
What respirators are not allowed on an asbestos job.
How to figure out if you have the right respirator for the job.

Respirators ...

Nick: I don't think these half-mask respirators will protect us enough for this job.

Bobby: But we were using half-masks last week. And when they tested for asbestos in the air, the level was real low.

Nick: Last week we were just removing floor tiles. Now we're scraping sprayed-on insulation off the ceiling. There's bound to be a lot more asbestos in the air now.

Bobby: I hate using the supplied-air respirators. I always trip over the hoses. These half-masks do the job just fine.

Nick: The half-masks will only protect you if there is a small amount of asbestos in the air. What are the air levels now?

Bobby: I don't know. We don't get to see the report until 4 or 5 days after they take the sample.

Discussion Questions

(Choose one or two of the following questions to discuss.)

1. How do you know what type of mask you need?
2. Do you think half-masks are good enough for this job? Why or why not?
3. Should Nick go ahead and use the half-mask?
4. Why doesn't this contractor post air-monitoring results sooner?
5. Does Bobby have a right to see the air sampling results from the job site?

What is a Respirator?

Your employer has to prepare the workplace to make it safe. Your employer also has to train you in safe work practices for doing asbestos work.

Asbestos is very hazardous. Making changes in the workplace and using safe work practices are not enough. You must wear protective clothing and respirators to protect yourself from asbestos.

You need to keep asbestos out of your lungs when you work with it. One way to do this is to keep asbestos out of the air. But no matter what you do, some asbestos will still be in the air. This is why you have to wear a respirator.

A respirator is a mask that filters the air in the work room or supplies clean air from outside the work room.

Some respirators have filters that filter out asbestos fibers from the air. Other respirators pump fresh air through a hose.

Paper nuisance dust masks are not respirators! They will not protect anyone from asbestos. **They are illegal on asbestos jobs.**

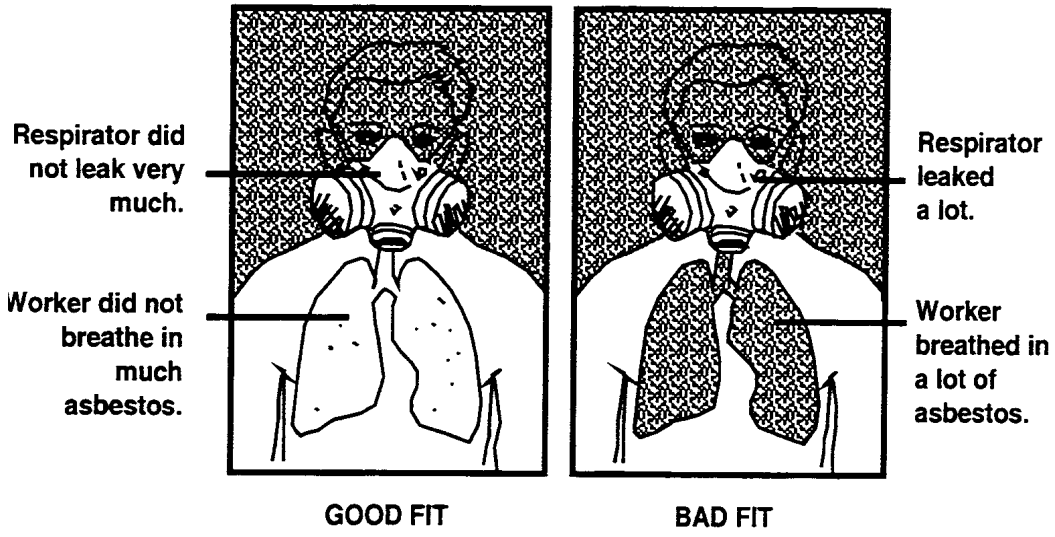
The Last Line of Defense

Respirators are your last line of defense. They are absolutely necessary to protect your lungs from asbestos disease. Workers don't like respirators. Respirators are uncomfortable, hot, and heavy. They block your sight, and they make it hard to breathe. It is important to remember you are protecting yourself from asbestos diseases by wearing them.

Respirators are also not a quick fix, though many people think they are. The OSHA law says that before they can wear a respirator, workers have to have a medical evaluation, a fitting session (called a fit test), and training. Respirators must be maintained and kept in good shape all the time. Employers have to pay for the medical evaluation, fit testing, training, and the respirators. Employers must also have a written respirator program. They must do regular inspections to be sure that respirators actually protect workers.

A Respirator is Only as Good as its Fit

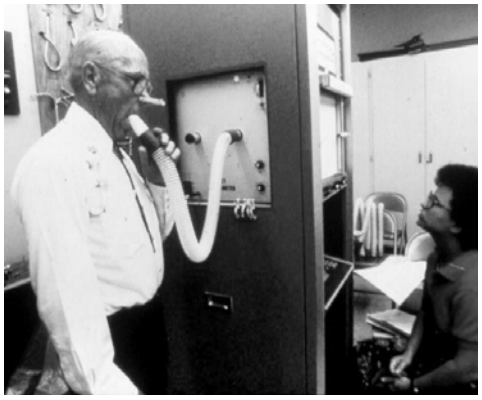
If you wear a respirator that doesn't fit, air and asbestos will leak in around the sides of the mask. Instead of being caught in the filters, asbestos will go into your lungs. This is why the law says you must have a fit test. The test tells you whether the respirator seals around your face. A respirator that does not fit looks the same as one that does. There is no way to tell if a respirator protects you or not just by looking at it.



Not Everyone Can Wear a Respirator

Some people cannot find a respirator to fit their face. If you have a beard, you can not wear a tight fitting respirator. If you have any hair on your face where the respirator seals, the respirator will not protect you. Even a large moustache can break the seal of your respirator.

If you have a broken nose you may not be able to wear a respirator. If you have missing teeth, large scars, a very narrow or broad face, or any face with an unusual shape, you may not be able to wear a respirator.



Checking lung capacity

If you feel very anxious, a little faint, or shaky when you first try a respirator on, you may not be able to wear a respirator. You may have a fear of confined spaces, claustrophobia.

Respirators also make it hard to breathe. You need to have a medical checkup to be sure that your lungs and heart are strong enough to take the strain of working with a respirator. You must have a medical evaluation before you can wear a respirator on the job.

Who Must Wear a Respirator?

Workers who come in contact with high-risk ACM (thermal system insulation, sprayed or troweled on surfacing material) are always required to wear respirators. Other types of ACM are not always considered as dangerous. In some cases respirator use is required, in others it is not. **Whenever you work with asbestos in the air that reaches the PEL, 0.1 fibers per cubic centimeter in an eight hour day (time weighted average), you must wear a respirator.**

Factors that affect the need for respirator protection include the type of ACM, abatement methods used, and the amount of airborne fibers. OSHA has put the different job tasks and types of asbestos material into four categories. They are Class I, ll, III, and IV. Class I creates the most amount of asbestos in the air.

The chart on the next page describes when respirators are required for each class of asbestos work.

RESPIRATORS MUST BE WORN WHEN:

Class I	Class II	Class III	Class IV
Always	you are exposed above the PEL/EL **or** wet methods are not used **or** there is no negative exposure assessment* **or** ACM is not removed in a substantially intact state	you are exposed above the PEL/EL **or** wet methods are not used **or** there is no negative exposure assessment* **or** when TSI or surfacing material is disturbed	you are exposed above the PEL/EL **or** working in an area where other employees are required to wear respirators

* A negative exposure assessment is a demonstration by the employer that employee exposure during an operation will be consistently below the PEL/EL.

No Respirator is Perfect

Every kind of respirator has its good and bad points. Every respirator leaks. Some respirators protect you more than others. Each respirator on the following pages has a Protection Factor (PF). This number tells you how much the respirator protects you.

There are five kinds of respirators allowed on asbestos jobs. Which respirator you wear depends on the amount of asbestos in the air. Your employer must test workers' breathing air every day. Then he decides what kind of respirator is needed, based on how much asbestos is in the air.

Protection Factors

How much asbestos can a respirator handle? Some respirators are better than others at keeping asbestos out of your lungs. A respirator's Protection Factor (PF) is a measure of how well it should protect you from asbestos. Remember, your respirator must fit right in order to get these Protection Factors.

Respirators Fall into Two Main Groups –

Air Purifying
Respirators use filter(s)
to clean the air

Supplied Air
Respirators supply clean air
through a hose

#1 Half-mask, Air-purifying Respirator

This is the simplest respirator you may use on an asbestos job. It is a half mask, air-purifying respirator. The bottom of the respirator facepiece (the wide part) goes under your chin. The top of the facepiece (the narrow part) goes over your nose.

It is the **least** protective respirator the law allows. The two filters catch the asbestos and filter it out of the air. **The filters are called HEPA filters (High Efficiency Particulate Air) or "100" s.** This is an air-purifying respirator. It filters, or purifies, the air that's in the room. You must not use it if there is not enough oxygen to breathe. It will not work unless the filters are made for asbestos. **HEPA filters are often magenta, purple, or red in color.** An asbestos respirator must have filters that say they protect against asbestos dust. **Filtering facepieces are not allowed on asbestos abatement jobs.**

When you breathe in, your lungs pull air through the filters. This takes a lot of effort. It is called a negative-pressure respirator. When you breathe in, it makes a suction, or negative pressure inside the mask. The facepiece has to fit perfectly on your nose, cheeks, and chin. If it does not form an airtight seal, air and asbestos will leak in around the edges of the mask. The fibers will not be filtered through the magenta filters. Negative-pressure respirators can leak. Remember, a respirator is only as good as its fit. The type of fit test you must have for this mask is called a qualitative fit test. You will learn about this fit test in Part 2 of this chapter. **Note that NIOSH recommends the use of this respirator up to 0.1 f/cc, or up to the PEL.**

#1
HALF-MASK AIR-PURIFYING RESPIRATOR
Protection Factor = 10

#2 Full-face, Air-purifying Respirator

This respirator is legal for five times as much asbestos as respirator #1. It is the same as respirator #1, except the top of the facepiece goes all the way around your face and across your forehead. It is a full-face air-purifying respirator.

Because it is also an air-purifying respirator, you must not use it if there is not enough oxygen to breathe. It is also a negative-pressure respirator. When you breathe in, it makes a suction or negative pressure inside the facepiece. The facepiece has to fit perfectly on your forehead, the sides of your face, and your chin. If it does not form an airtight seal, air and asbestos will leak in around the edges of the mask. It will not be filtered through the HEPA/100 filters. (**N** for not resistant to oil, **R** for resistant to oil; and **P** for oil proof.)

You must not wear a full-face respirator if you wear regular glasses. The side bars of the glasses break the seal of the mask. The mask will not fit tightly on your face. If you wear glasses, your employer has to pay for special glasses and a frame that holds your lenses in place inside the full face respirator.

You must have a special fit test called a quantitative fit test for a full-face respirator. If you have a quantitative fit test, the maximum use level of the full-face mask is 5 fibers per cubic centimeter. If you get a qualitative fit test on a full-face mask, your maximum use level will be only 1 fiber per cubic centimeter. This is the same maximum use level as the half-face, air - purifying respirator. You will learn more about these two types of fit tests in Part 2 of this chapter.

#2
FULL-FACE AIR-PURIFYING RESPIRATOR
Protection Factor = 50

#3 Powered Air-purifying Respirator (PAPR)

This respirator is legal for ten times as much asbestos as respirator #1. It looks like respirator #2, but it has an air pump. It has filters (or cartridges). The air pump and the filters are usually on a belt or on the facepiece. The pump pulls the air through the filters. It blows the air through a hose into the mask.

This respirator only filters the air that's already in the room. It is an air-purifying respirator. Because it has an air pump, this respirator is called a powered air-purifying respirator or PAPR. The OSHA asbestos law states that you have the right to get a PAPR whenever a negative pressure respirator is required on the job.

The air coming through the hose pushes air and asbestos away from the sides of the mask. This is a positive-pressure respirator. The air pump makes a positive pressure inside the mask. One good thing about a positive-pressure respirator is that if it leaks, it leaks out. Asbestos is not supposed to leak in.

Another good thing about a powered air-purifying respirator (PAPR) is that your lungs do not have to work so hard to pull the air through the filters. The air pump does some of the work. But if the batteries are low, this PAPR is no better than a full-face respirator without an air pump.

Another problem with a PAPR is that it only filters the dirty air in the room. It is just like any other air-purifying respirator. If the batteries in the air pump are run down, air and asbestos can leak in around the sides of the mask. This can also happen if the HEPA/100 filters are clogged with dust or if you are breathing very hard.

The air pump on a PAPR blows air at the same rate, no matter how hard you breathe. If you breathe in very hard, it makes a suction, or negative pressure inside the facepiece. The facepiece has to fit perfectly on your forehead, the sides of your face, and your chin. If it does not form an airtight seal, air and asbestos will leak in around the edges of the facepiece. This is called over-breathing the respirator.

#3
POWERED AIR-PURIFYING RESPIRATOR
Protection Factor = 1000

#4 Continuous-flow Supplied-air Respirator

This respirator is also legal for ten times as much asbestos as respirator #1. It looks a lot like respirator #2 and #3. But this respirator is very different from the other three. Fresh air comes in through a hose from outside of the room. It comes from an air tank or a purification unit and compressor. This is a supplied-air respirator or **a "Type C" respirator**. With a Type C respirator, you don't have to worry about whether the air in the room is safe to breathe.

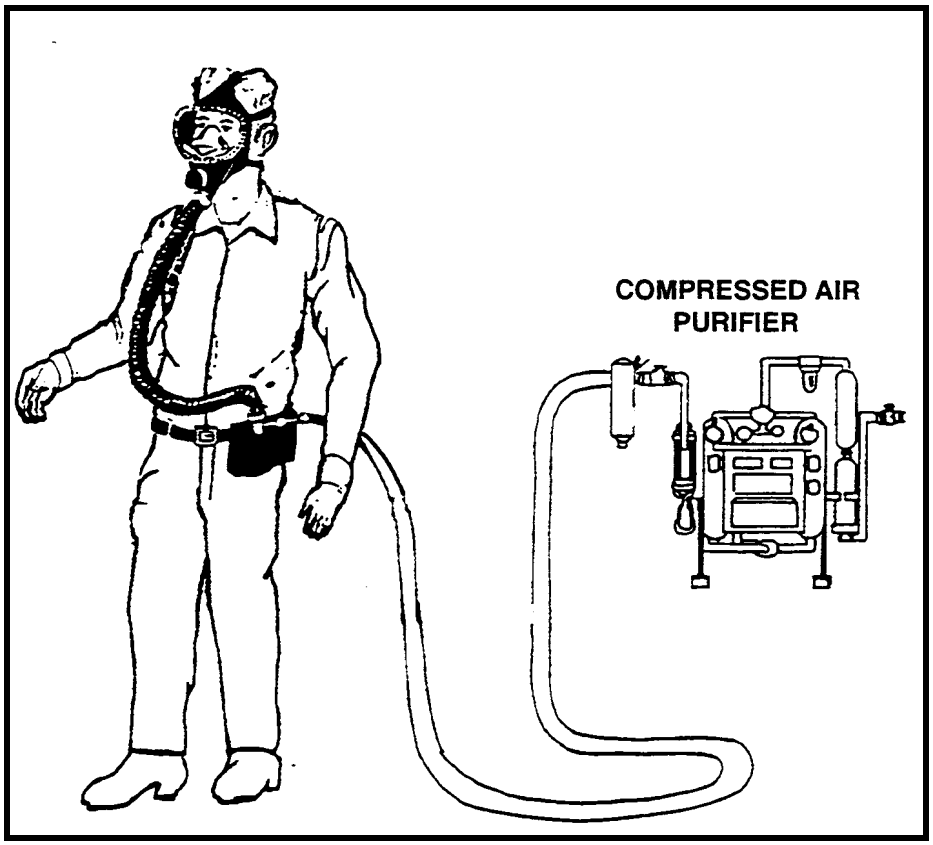
All Type C respirators are positive-pressure respirators. The air coming through the hose pushes asbestos fibers away from the mask. Another good thing about a supplied-air respirator is that your lungs do not have to work so hard to pull in air. The air is pumped in through the hose.

One problem with this respirator is that it pumps air at a constant rate. It is a continuous flow respirator. No matter how hard you breathe, the air

pump blows air at the same rate. So if you breathe in very hard, it makes a suction, or negative pressure inside the facepiece. The facepiece has to fit perfectly on your forehead, the sides of your face, and your chin. If it does not form an airtight seal, air and asbestos will leak in around the edges of the facepiece. If you breathe hard, you will pull air and asbestos in around the edges of the mask just like with an air-purifying respirator. **This is called over-breathing the respirator.**

Another problem with this respirator is that you can trip on the hose, or it can get caught on a scaffold. The respirator needs an extra HEPA/100 filter or a egress bottle of air (reserve air) in case the air supply is cut off.

#4
TYPE C CONTINUOUS-FLOW SUPPLIED-AIR RESPIRATOR
Protection Factor = 1000



5
Pressure-Demand Supplied-Air Respirator

This respirator looks exactly the same as respirator #4. But it is legal for one hundred times as much as respirator #1. Like respirator #4, fresh air comes in through a hose from outside of the room. It is also a supplied-air respirator or Type C respirator. **It is also a positive-pressure respirator.**

The only difference between this respirator and the last one is a tiny valve. It opens to give you more air when you breathe harder. **It is called a pressure-demand respirator.** When you breathe harder, more air comes through the hose. A pressure-demand respirator is the most protective. Most Type C respirators on asbestos jobs are the pressure-demand type.

Even if the facepiece does not fit perfectly (if it does not form an airtight seal), the pump forces air into the mask and pushes asbestos away from the edges of the facepiece.

One problem with this respirator is that you can trip on the hose, or it can get caught on a scaffold. The respirator needs an extra HEPA/100 filter or egress bottle of air (reserve air) in case the air supply is cut off. The bottle of air is called the back-up self-contained breathing apparatus (SCBA). You must wear this type of respirator if you are working in an area where exposure assessments indicate the exposure level is in excess of 1 f/cc as an 8-hour time weighted average and a negative exposure assessment has not been produced (or if you are in a permit-required confined space).

#5
TYPE C PRESSURE-DEMAND SUPPLIED-AIR RESPIRATOR
Protection Factor = 1,000

More About Type C respirators

Type C respirators are more complicated than air-purifying respirators. Fresh air goes into a compressor. **It is cleaned in an air-purifying panel. It is pumped into the respirator through a hose.** The air has to be clean, cool, and at low pressure so that it's comfortable to breathe.

The air you breathe in a Type C respirator is called **"Grade D Air" or breathable air.** (You do not breathe pure oxygen in a Type C respirator.) Grade D air is air that has chemicals filtered out and 20.8% - 21% oxygen. (Normal air has about 21% oxygen.) Grade D air has almost all of the carbon monoxide filtered out. Carbon monoxide is a dangerous gas which you can't smell.

Your employer may use a special rig which filters the air to Grade D quality. He may buy bottled air which the manufacturer or distributor certifies to be Grade D or "breathable." An ordinary compressor will pump dirty air into your mask, which can hurt you. If there is a compressor on the job, it must have these features:

- **A filter to take out odors and some chemicals.** The filters on the air purification panel must be cleaned and maintained.
- **A carbon monoxide (CO) alarm or a high-temperature alarm.** CO can come from compressors which work at high temperatures or from the outside air because of cars or trucks. A carbon monoxide alarm is better than a high-temperature alarm.
- **A trap to catch the water in the air.**

If a carbon monoxide alarm goes off, stop work immediately. Leave the work room as soon as possible. Supervisors should make sure all workers are out. They should make sure that all respirators are accounted for and are not in use.

There are low-pressure and high-pressure air systems. Although they are very similar, they differ in a few ways: the pressure of the compressed air, the way the system looks, and the way the air is delivered. On the next page is a chart summarizing the two systems.

You may have up to **300 feet of hose** on a Type C respirator depending on how much air pressure is in your lines and the type of system. Some Type-C systems may only allow 50 feet of hose. You must check the owner's manual or the NIOSH Certified Equipment List to see what your Type C system can handle. **It is illegal to have more than 300 feet of hose with any Type C respirator.** It is illegal to use a Type C system differently than how the

manufacturer specifies to use it. Make sure that the airline connectors do not interchange with compressed-air tool airlines.

You Need Training in How to Use a Type C Respirator

Special training must be given to each worker who is using a Type C respirator. The training should be specific to the exact type of respirator that is issued. Each supplied-air respirator has emergency escape gear. The escape gear provides the air you breathe while you are getting out of the work area. It will either be a small tank of air that hooks to your belt or a filter that is on the respirator. When you use a filter to escape, your respirator only protects you as much as a negative pressure respirator.

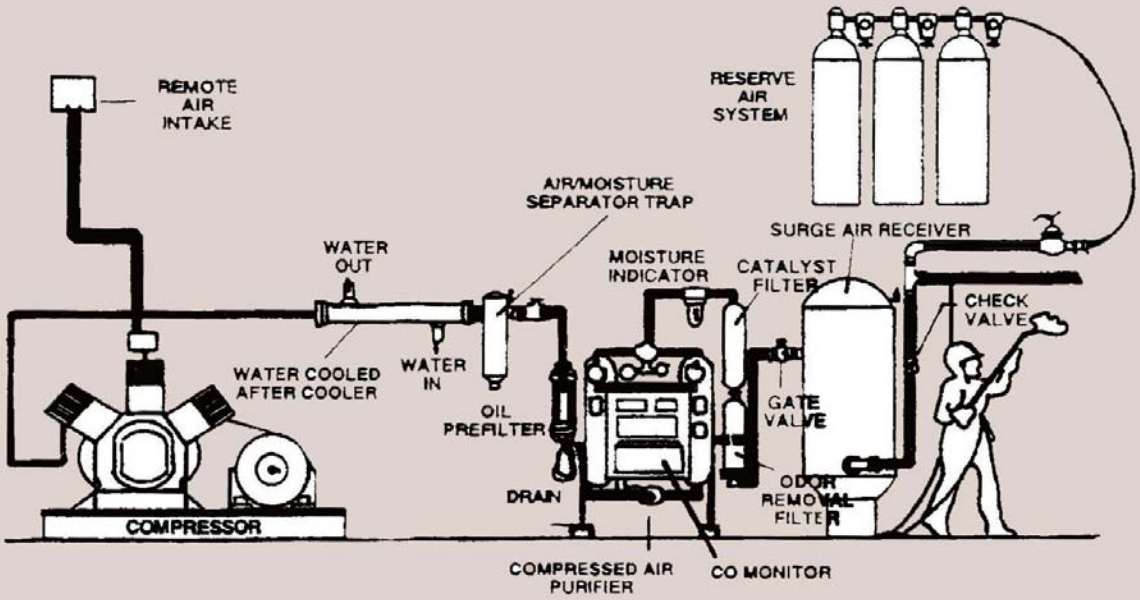
You must know how to use your escape gear. Remember, if the air you are breathing is supplied, anything can happen to that supply. When the source of your air is gone, you may panic. It is very important to practice how to use your escape gear. Practice each day you wear it. Then you will remember how to use your escape air when you need it.

A Trained Supervisor Should Watch the System

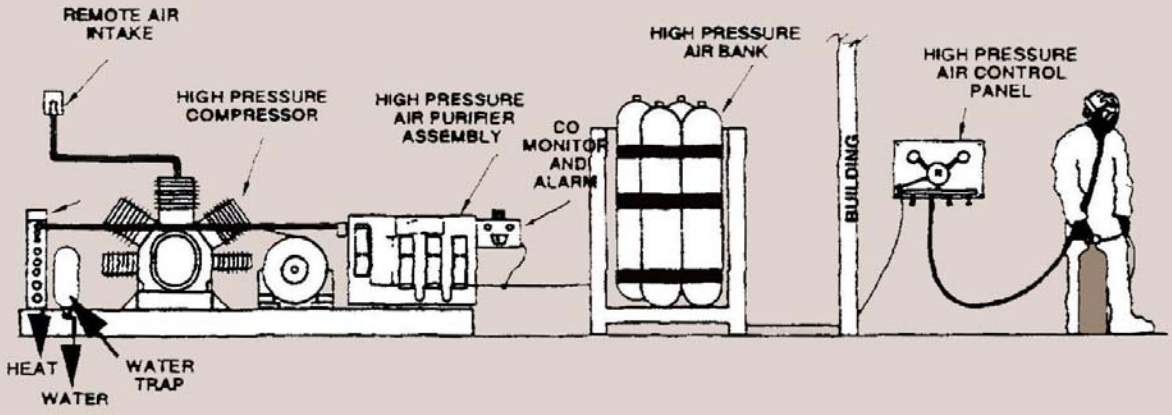
Type C respirator systems protect workers the most. They are also the most complicated respirator systems. There are individual respirators, many long hoses, manifolds, compressors, and alarms.

A supervisor or foreman should be responsible for checking to make sure that the entire Type C system is operating correctly. This person must know the Type C system that is being used. This person must consistently monitor the system, and be alert to the alarms.

This monitoring can save lives by making sure that workers are being supplied breathable air. If you are given a Type C respirator, make sure that you and the foreman really know how the system works. Don't let an amateur be responsible for monitoring the system. Non-breathable air can kill workers immediately.



TYPICAL LOW PRESSURE BREATHING AIR SYSTEM



TYPICAL HIGH PRESSURE BREATHING AIR SYSTEM

How Do You Know It's The Right Respirator?

When you see your air sampling results, how can you tell which respirator will protect you enough? You need to know the respirator's limit or **Maximum Use Concentration (MUC).** This is how much asbestos the respirator can protect you from.

To figure out the Maximum Use Concentration for a respirator, **take the legal limit (the PEL = 0.1 f/cc) and multiply it by the Protection Factor.** The Protection Factor (PF) tells you how many fibers leak in, compared to the number of fibers outside. You need to keep the number of fibers inside below 0.1 f/cc (the legal limit).

0.1 f/cc (PEL) x Protection Factor (PF) = Maximum Use Concentration
0.1 x PF = MUC

A half-mask, APR has a Protection Factor of 10.
0.1 x 10 = 1 f/cc
The Maximum Use Concentration is 1 f/cc.

A full-face, APR has a Protection Factor of 50.
0.1 x 50 = 5 f/cc
The Maximum Use Concentration is 5 f/cc.

A PAPR has a Protection Factor of 1000.
0.1 x 1,000 = 100 f/cc
The Maximum Use Concentration is 100 f/cc.

A continuous flow SAR has a Protection Factor of 1,000.
0.1 x 1,000 = 100 f/cc
The Maximum Use Concentration is 100 f/cc.

A pressure-demand SAR has a Protection Factor of 1,000
0.1 x 1,000 = 100 f/cc
The Maximum Use Concentration is 100 f/cc.

A pressure-demand SCBA has a Protection Factor of 10,000
0.1 x 10,000 = 1,000 f/cc
The Maximum Use Concentration is 1,000 f/cc.

How Does NIOSH Determine Its Maximum Use Level?

Use a new equation. Substitute CL for PEL
CL x PF = MUL
For a half-mask, air-purifying respirator 0.01 x 10 = 0.1 f/cc

What Does This Mean?

CL stands for Clearance Level. 0.01 f/cc is a Clearance Level used in the AHERA rule. When the abatement job is complete, air samples are taken. The area is clean when the Clearance Level is reached. The Clearance Level is an acceptable level of exposure. The area can then be opened for the public to use.

NIOSH says that the acceptable level of asbestos exposure for workers should be the same as for the general public. When you use a respirator at the NIOSH recommended MUL, you breathe in one asbestos fiber for each 100 cubic centimeters of air that you breathe.

RESPIRATOR TYPES

Key Facts

- ➢ You must wear a respirator when you work with asbestos.
- ➢ You must have a doctor's permission before you can wear a respirator on the job.
- ➢ Not everyone can wear a respirator.
- ➢ Unless respirators fit perfectly, they won't protect you.
- ➢ Paper nuisance dust masks are illegal for asbestos work.

Positive pressure (a motor pushes air into the mask and pushes fibers away from the edges of the mask) **is better than negative pressure** (your lungs do all the work to move the air)

Full-face is better than **half-mask.**

Powered Air-Purifying (PAPR) (a motor does some of the work) **is better than non-powered negative pressure** (your lungs do all the work).

Tight-fitting (an airtight seal) **is better than loose-fitting** (no seal).

Supplied-air (pumps in clean air from outside the room) **is better than air-purifying** (filters the air in the room).

Pressure-demand (the motor pumps more air when you breathe harder) **is better than continuous-flow** (a motor always pumps air at the same rate).

- ➢ Your employer must give you a PAPR instead of a negative pressure respirator if you want one.

- ➢ Your employer chooses your respirator by looking at the air samples.

- ➢ Supplied-air respirators use Grade D air.

For More Information

OSHA Asbestos Standard, 29 CFR 1926.1101, Section h, "Respiratory Protection."

American Lung Association, "What You Should Know About On- The-Job Respiratory Protection," ALA Item No.0683.

Georgia Tech Research Institute, Chapter VIll, "Establishing a Type C Supplied-Air System," in "Model Curriculum for Training Asbestos Abatement Contractors and Supervisors," available from National Technical Information Services, (703) 487-4650.

EPA/NIOSH, " A Guide to Respiratory Protection for the Asbestos Abatement Industry," Publication No. EPA-560-0PTS-86-001.3.

NIOSH, "Respiratory Protection, A Guide for the Employee," (NIOSH) Publication No.78-1 93B.

NIOSH, "Guide to Industrial Respiratory Protection," DHHS (NIOSH) Publication No. 87 -116.

5 point head strap
for full-face APR

6 point head strap for
a full-face APR

SCBA ▲ SAR ▼

4

PERSONAL PROTECTIVE EQUIPMENT PART 2: CARING FOR YOUR RESPIRATOR

In Part 2 you will learn:

What your employer has to do before giving you a respirator.
How to make sure your respirator fits.
How to take care of your respirator.
How to:

- clean,
- inspect,
- maintain, and
- store your respirator.

A Respirator Program

When OSHA inspects a job for health problems, more than one-third of the problems they find are in the company's respirator program. The law says your employer has to have a very strong respirator program. You can think of this as the "workers' respirator bill of rights."

What Your Employer Has To Do

Before your employer hands you a respirator, he or she has to do a lot of things. The employer has to find out if you can wear a respirator. Who will pick the respirators? Who will maintain them? These things have to be written down in a respirator program. What your employer must do could be called the "Respirator Bill of Rights."

The Respirator Bill of Rights

1. **Your employer must assign one person to be in charge of the respirator program.**
   Find out who this person is. He or she can help you if you have a problem with your respirator.

2. **Your employer must have written procedures for choosing and using respirators. Your employer must develop a new plan for each work site.**
   Get a copy of this program from the person in charge of the program.

3. **Your employer must check the whole respirator program regularly.**
   Is it as good in reality as it is on paper?

4. **Your employer must offer medical exams to everyone who wears a respirator.**
   No one is allowed to wear a respirator without a medical evaluation.

5. **Your employer must give you training about respirators.**
   Before you put on a respirator, you have to be trained. You need training on each respirator you work with. You have to learn about all the parts of your respirator. You have to learn how your respirator works. You need to know what a respirator can do for you. You need to know what a respirator can't do for you. You have to be trained in how to clean, inspect, and store your respirator.

6. **Your employer must use approved respirators.** Respirators must be tested and approved by the National Institute for Occupational Safety and Health (NIOSH). **Make sure your filters are marked either HEPA, N100, R100 or P100 when you are working with Asbestos.** If there is any possibility of exposure to oil in the air, then use P100.

APPROVAL STICKERS

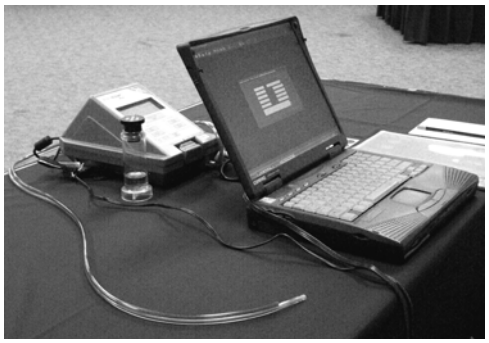
7. **Your employer must choose a respirator based on the hazard.**
A gas filter won't protect you from a dust. A dust filter won't protect you from a gas. A filter respirator won't protect if there isn't enough oxygen in the air.

8. **Your employer must be sure your respirator fits you.** When you first get a respirator, and every year after that, the fit must be tested. Remember that a respirator is only as good as its fit. The fit tests are called a qualitative fit test or a quantitative fit test. The tests take from minutes to an hour.


Irritant Smoke QLFT

In a qualitative fit test, Bitrex, irritating smoke, banana oil, or saccharine are used. The tester blows irritating smoke around the edges of the respirator. When Bitrex, banana oil, or saccharine are used, you stand with your head in a hood while one of the agents is misted in front of your respirator. If the material leaks into the mask, you will smell it or taste it. If you can smell or taste the test material, the mask does not fit well enough to keep asbestos out of your lungs. **A qualitative fit test** tests the quality of the respirator's seal. You use your senses in the qualitative fit test.

In a quantitative fit test, you wear a respirator with a probe inserted into it. The respirator is hooked to a machine by tygon


QNFT machine and computer

tubing. The machine produces an alcohol mist. The machine measures how much mist leaks in compared to how much mist is outside the machine.

In both tests you will be asked to move your head around, bend at the waist, and talk. This makes the test more realistic. You will have one of these fit tests simulated during an EPA-approved Asbestos Worker Training Class. You must have a fit test on every respirator that is given to you for protection. You must have another fit test every year. You must also have a fit test if the shape of your face changes. This could happen if you ...

- gain or lose more than 10 pounds
- lose teeth or get new dentures
- have surgery on your face
- break your nose
- get pregnant

9. **Your employer must check respirators and fix them.**
   If there is anything wrong with your respirator, your employer has to fix it before you can wear it. Your employer has to check the respirators to make sure they are in perfect shape. Your employer has to have trained people fix your respirator.

10. **Your employer must give you a safe place to store your respirator.**
    Your employer has to give you a clean, dry place to keep your respirator.

What You Have To Do

After your employer gives you the respirator, you have to use it safely. Do you have the right one? Did you get a fit test on your respirator? Does the respirator work? Is it clean?

You are the one who cares the most about whether your respirator works. If it is not in perfect shape, you could breathe asbestos. Learn how to use your respirator and take care of it.

1. **Do you have the right respirator?**
   Does your respirator fit you? You must get a fit test for your respirator.

   Do you have an approved respirator? Look for the NIOSH seals on your respirator box and on the filters. Make sure you see N100, R100 or P100 on your filters.

   You need to have the right respirator for the job. Look at the air samples. Figure out which respirator you need. Is your respirator good enough? If you can, get a better respirator. **By OSHA law, you can ask for a Powered Air-Purifying Respirator (PAPR) and your employer must give you one unless it is not protective enough for the work area.** You would then get a supplied-air respirator.

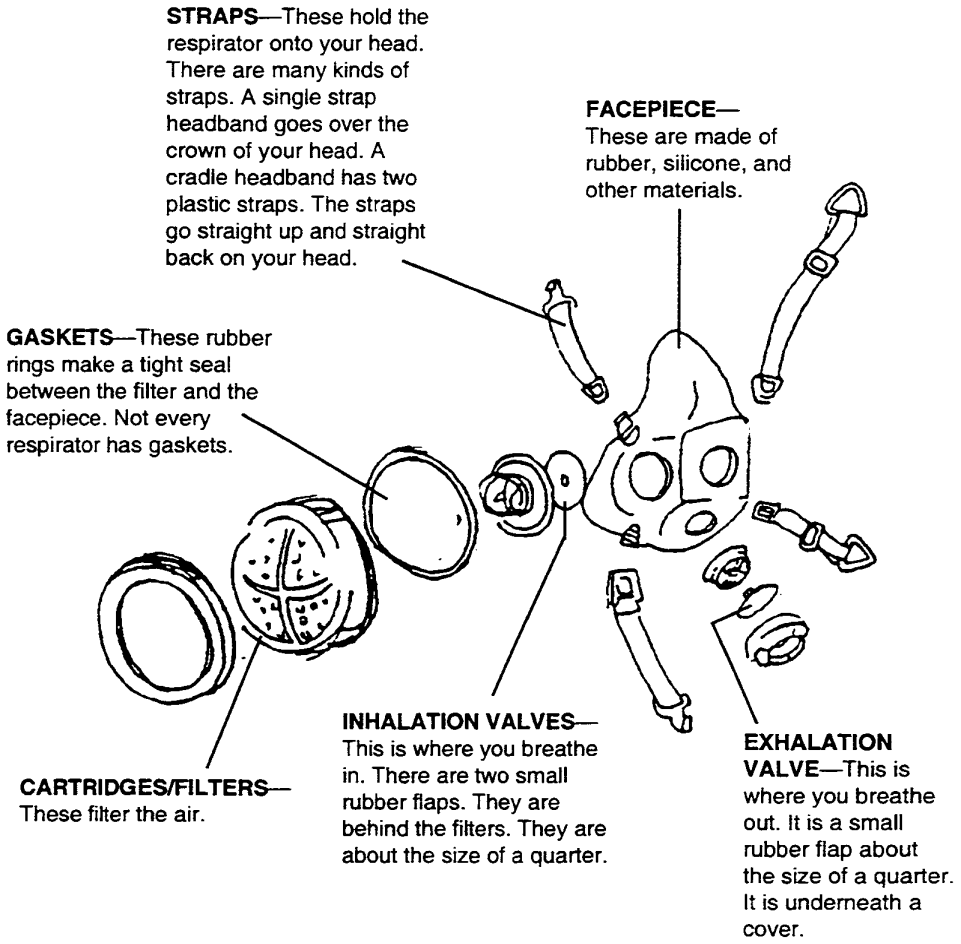
   Even if you have an approved respirator, it might not protect you enough from the amount of asbestos in the air. Respirator Protection Factors come from tests in labs. The respirator maker tests an average-size person. The tests are done in a clean, cool lab. Only new respirators are used. But you don't work in a lab. You may not have an average face. You sweat when you work. The respirator may slide on your face. Maybe your respirator isn't as perfect as when it was new. There are many reasons why the respirator may not work as well for you as it did in the lab. Respirators may not protect you as well as they are supposed to. If you can, get a better respirator than the law requires.

2. **Know how to use your respirator.**
   If you don't know how to use your respirator, it will not protect you. If you don't have a clean shaven face, a tight fitting respirator will not protect you. If you don't maintain the respirator, it will not protect you. Get training on the respirator you use. Inspect your respirator. Are all the parts where they belong? Always inspect your respirator before you put it on.

3. **Inspect your respirator every time you use it.**
   A respirator can't help you unless it's in perfect shape. You need to inspect your respirator before you put it on. Make sure all the

parts are there. Make sure all the parts are in good shape. Make sure all the parts are in the right place. **If you find anything wrong with your respirator, do not wear it until it is fixed.**

THE PARTS OF A RESPIRATOR



A PAPR (powered air-purifying respirator) has all of these parts and some more:

hose - If the fan is on your belt, this carries air up to your face.
cord - If the fan is on your facepiece, this carries electricity up to the fan.
battery - Every PAPR has a battery to run the fan.

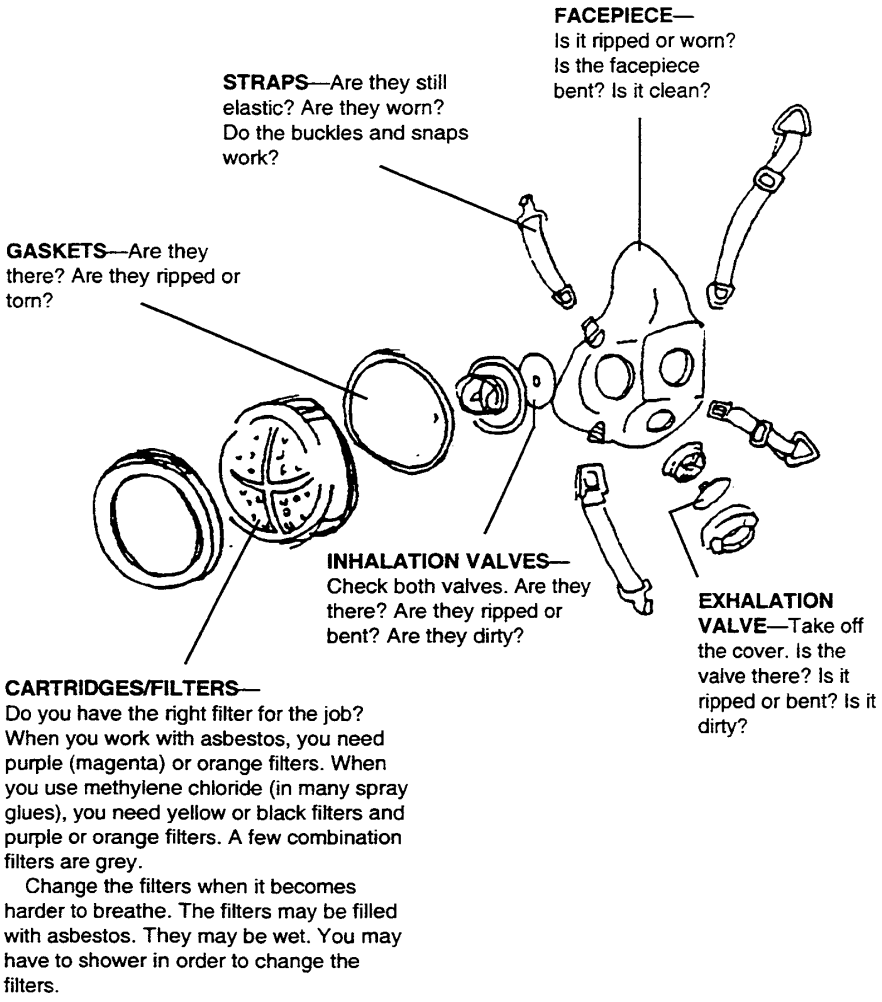
A Type C respirator also has all of the same parts and some different ones:

air regulator - This valve controls how much air comes into the mask. There are continuous flow valves and pressure-demand valves. A pressure-demand valve is better than a continuous flow valve.

escape cartridge - Many Type C respirators have a HEPA filter which is used if air stops coming through the hose. The filter cleans the air while you leave the work area.

escape air bottle - Many Type C respirators have a small bottle of air. If air stops coming through the hose, you can breathe air out of the bottle.

HOW TO INSPECT YOUR RESPIRATOR



If you wear a PAPR, you need to check all of the above and more:

hose - Is it bent or cut?
battery - Is it charged?
flow - Use a tube called a flow meter to see how much air the fan is blowing.

If you wear a Type C respirator, you need to check all of the above and more:

escape cartridge - Is there a HEPA filter? Is it clean?
escape air bottle - Is the bottle full?

Repairs
Respirator parts have to come from the same manufacturer that made the respirator. In other words, you may not use MSA brand filters on a 3M brand respirator. You may not use North brand valves on an AO brand respirator. No one should fix your respirator unless he or she knows how to fix it.

4. **Putting on a respirator**.
When you put on a respirator for the first time, put the mask up to your face first. Smile and frown and move your face around. Be sure the edges of the mask fit your face. Next, fasten the bottom strap (the one that goes around the back of your neck). Tighten the bottom strap. Pull the top strap over your head. Tighten the top strap. Pull both sides at the same time. The straps need to hold the respirator on your face. Do not make them too tight. The mask will dig into your skin and it will not be comfortable. Then do the two seal (fit) checks.

5. **Do user seal (fit) checks every time you put a respirator on.**
Fit tests every year make sure that you have the right respirator. You also have to check the fit (seal) yourself every time you put a respirator on. The user seal checks you do yourself are called a negative-pressure user seal check and a positive-pressure seal check. You must do both of these seal checks every time you put on the respirator. Do the two user seal checks every time you go into an area where there's asbestos in the air. You can only do

these checks on a tight-fitting respirator. (A tight-fitting respirator makes an air-tight seal around you face.)

The **negative-pressure user seal check.** Cover the two filters or the air hose with your hands and suck in gently. Hold for a count of ten. You will feel the respirator pull against your face. You can feel the area of the seal tightening to your face. If there is a leak, air will rush in through the leak instead of pulling the mask against your face. You will feel air move against your cheeks. It may feel like a feather brushing across your face. The air will move toward your mouth. You may hear the air flow. If someone is watching you, they should see the respirator suck in a little at your nose.

The **positive-pressure user seal check**. Take the cover off the valve on your chin. Cover the rubber flap with one hand and puff out gently. You should feel the force of your breath balloon the respirator out a tiny bit. This is like the feeling you get when you first blow up a balloon. You have to blow harder to get over the resistance of the balloon. As the mask moves out, you will feel the seal of the respirator tighten on your face. If there is a leak in the mask, air will rush out of the leak instead of making the mask balloon out. If there is a leak, you will feel air rush out against your cheeks. You will not feel the seal tightening to your face. Don't blow too hard, or you can blow out your intake valves and break a good seal.

6. **Keep your respirator clean.** Though respirators are never comfortable, they can become very uncomfortable if you do not clean and disinfect them regularly. It is very easy to clean your respirator, and you must clean it every time you use it.

Take off the filters and wash the respirator in warm water with a mild soap. The water temperature should not be more than 110°F. You may want to use a mild disinfectant. Wash the inside and outside of the facepiece with a soft bristle brush or a clean rag. Rinse the respirator in clean water and let it dry in the air.

7. **Store your respirator in a safe place.**
Don't hang your respirator by its straps to dry. This can stretch out the straps. Keep your respirator in a clean, dry place. It is easy to damage a respirator or get asbestos on it.

CARING FOR YOUR RESPIRATOR

Key Facts

A respirator will not protect you unless it fits.

You must have a fit test before you can wear a negative-pressure respirator at work.

- **Qualitative fit-testing** uses your sense of smell. It doesn't use machines.
- **Quantitative fit-testing** uses a machine. It measures how much air leaks around the edges of your respirator.

You must have another fit test every 12 months.

You must inspect your respirator before you put it on.

You must do seal checks every time you enter an area with asbestos in it.

- Negative pressure user seal check: suck in, cover the filters.
- Positive pressure user seal check: blow out, cover the valve on your chin.

Clean your respirator with soap and water every time you wear it.

Store your respirator in a clean, safe place.

Use HEPA/100 filters for asbestos. Use black filters for organic vapors like methylene chloride. Use a “combo” filter to protect against multiple atmospheric hazards.

Discussion Questions

1. The law gives you the right to go through decontamination and wash your face if asbestos or your respirator irritates it. Why do you have this right?

2. When you first pick up your respirator, what are you going to do?

3. How often do you need a fit test?

4. Why is it important to learn how to do the positive-pressure and negative-pressure seal (fit) checks?

For More Information

OSHA Asbestos Standard, 29 CFR 1926.1101, section (h).

OSHA Respirator Standard, 29 CFR 1910.134.

American Lung Association, "What You Should Know About On-The-Job Respiratory Protection," ALA Item No.0683.

NIOSH, "Respiratory Protection, A Guide for the Employee," DHHS (NIOSH) Publication No.78-193B.

EPA/NIOSH, " A Guide to Respiratory Protection for the Asbestos Abatement Industry," Publication No. EPA-560-0PTS-86-001.

Respirator Exercise

This is not a test. It is an exercise. Use it to see for yourself how well you understand the material in this section of the chapter.

1. What is the difference between a negative-pressure respirator and a positive-pressure respirator?

2. Which one protects you more? Why?

3. If you are working on an abatement project and air samples show 2.5 fibers/cc, which respirator do you have to wear?

4. Can you request a respirator that will protect you more? If so, what type?

5. What is the difference between a qualitative fit test and a quantitative fit test?

6. Some people have a harder time getting a good fit on a respirator. Who are they? Why do they have a hard time?

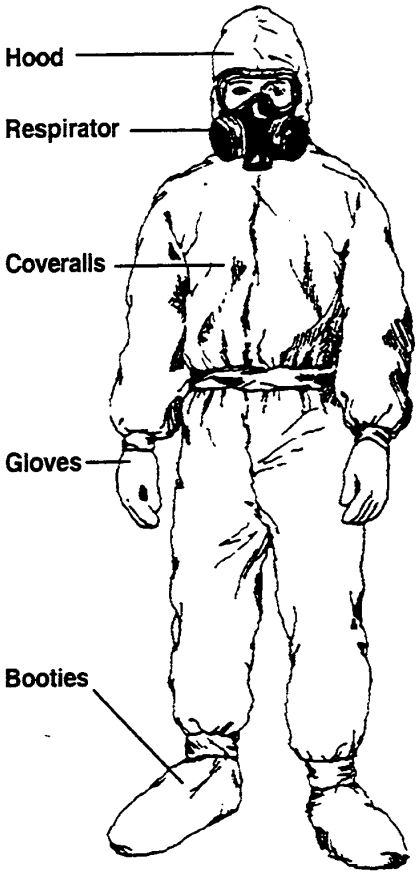
4

PERSONAL PROTECTIVE EQUIPMENT PART 3: OTHER SAFETY EQUIPMENT

In Part 3 you will learn:

About disposable suits.
About hard hats, boots, and other equipment.

Protective Clothing and Other Safety Equipment



A respirator is the most important piece of equipment for protecting you from asbestos. You also have to wear protective clothing.

Asbestos workers should always wear disposable suits. The suit includes coveralls, booties, and a hood. Sometimes suits are made in one piece, sometimes in two or three. They are usually made of a spun poly material called Tyvek™ or KleenGuard™. Suits come in several sizes. You can shorten a one-piece suit by putting duct tape around the waist, wrists, and ankles. Everyone in the work room must wear a suit. You should also wear gloves to keep asbestos off your hands.

Footwear

Booties are very slippery, especially on the wet plastic in asbestos work rooms. You may wear canvas or rubber shoes outside the booties. You may wear boots or steel-toed safety

Plastic booties are slippery.

shoes. These keep you from slipping or being hurt by falling objects.

You can't take these shoes off the job unless they are clean. Sometimes you can clean all the asbestos off them. (Leather and fabric shoes can not be cleaned; rubber shoes without seams can be cleaned.) If you can't clean them, you have to throw them out or tie them up in a bag. Your employer can take them from job to job in a sealed plastic bag with a warning label on it.

Tyvek Suit

You should not wear street clothes on an asbestos job. If for some reason you have to wear street clothes, seal them in a plastic bag with a warning label. Do not take them home.

If you use any non-disposable clothing or equipment (such as work boots or a hard hat) on an asbestos job, you must clean it. Do not take it off the job unless it is clean. Your employer can take it from job to job in a sealed, labeled plastic bag.

It is possible to wash clothing with asbestos on it. But disposable suits are much better. If you work in cold weather, you will probably wear long underwear. It should not leave the job. The person who washes the long underwear must be trained about the dangers of asbestos.

If you take asbestos home on your skin or street clothes, dust can come off in your home. Your family could get asbestosis, mesothelioma, or other asbestos diseases if they breathe or swallow asbestos. It is very important to wear a suit and not take your work clothes home.

Goggles, Gloves, and Hard Hats

You need to wear goggles or a full face respirator if you do work overhead. You need to wear latex, cotton, or leather gloves if you work with sharp metal lath or around hot pipes. You need to wear steel-toed safety boots and hard hats if building materials might fall. You must wear rubber gloves, rubber safety boots, and hard hats if you work around live electrical wires.

For example, hard hats are made to protect you if something falls straight down on your head. But they will not protect you if something hits you from the side. OSHA has rules about protective equipment like hard hats, goggles, hearing loss protection, and boots. **Many of the rules for respirators also apply to other equipment.** For example, goggles will not protect you unless they are in perfect shape. They have to be cleaned, stored, and maintained.

OTHER PROTECTIVE EQUIPMENT

Key Facts

You must wear protective clothing on an asbestos job.

Asbestos work is just as dangerous as other demolition work.

You may need to wear a hard hat, goggles, or steel-toed boots outside your disposable suit.

You must wear rubber gloves and boots if you are working around live electrical wires.

You need training in how to use safety equipment.

Leave unclean safety equipment on the job site.

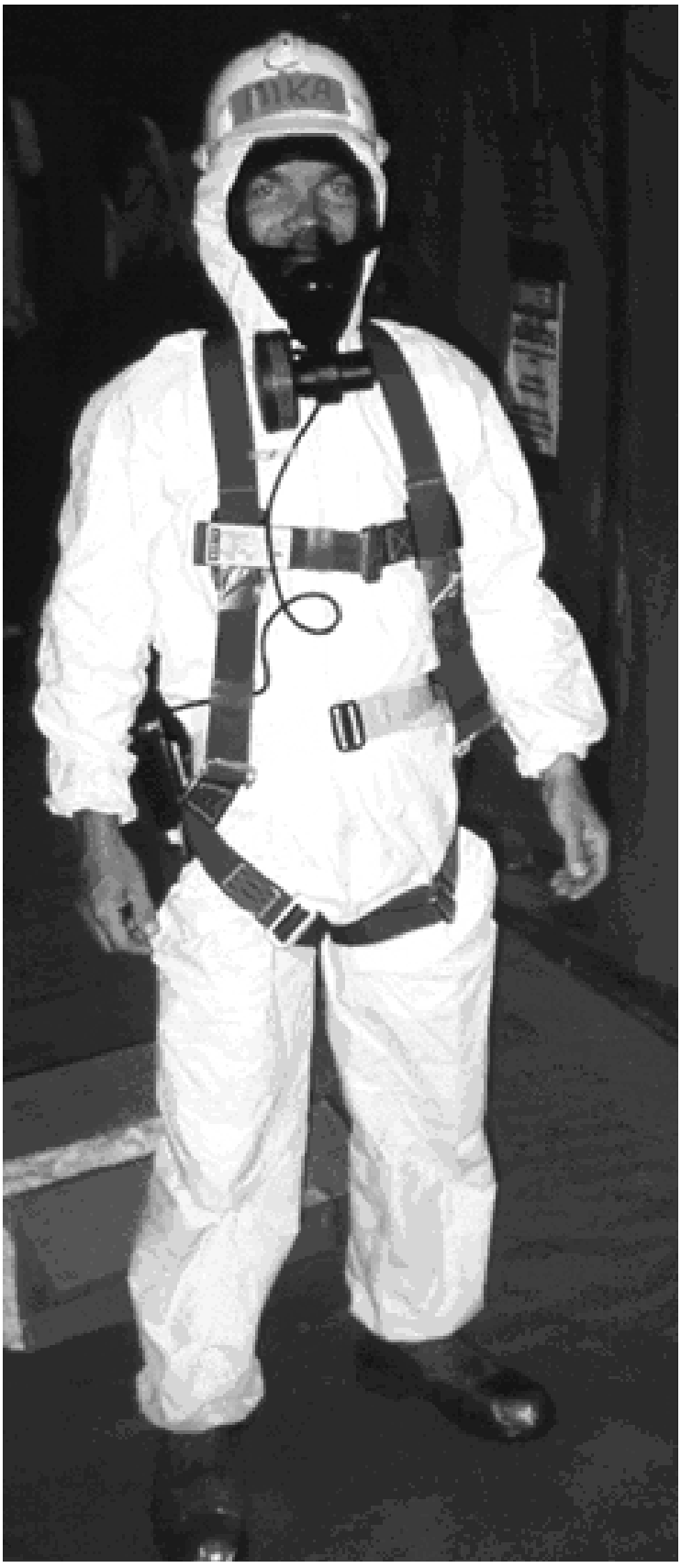
Don't bring asbestos home. Leave work clothes at work!

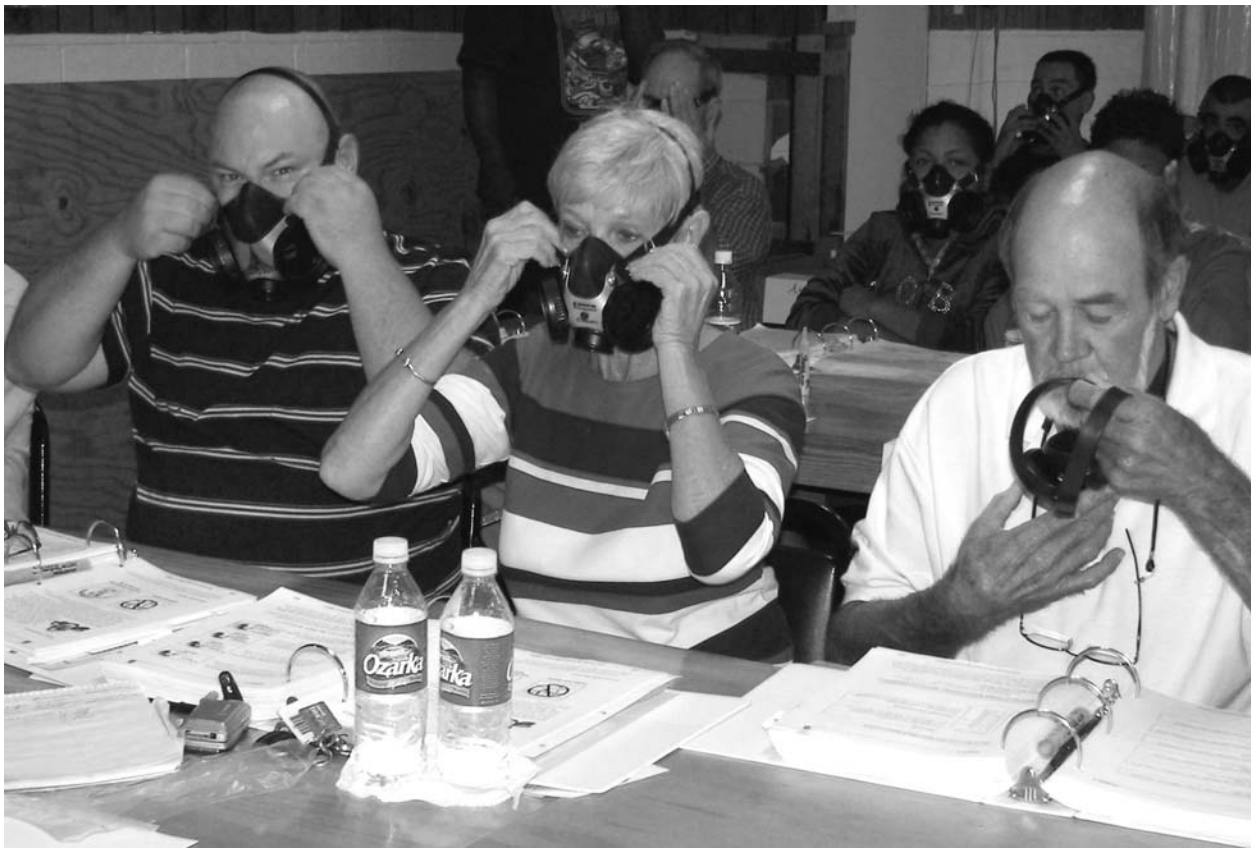
For More Information

OSHA Personal Protective Equipment Standards, 1910.132, 1910.133, 1910.135, and 1910.136.

OSHA, "Personal Protective Equipment," Publication No. OSHA 3077.


Tyvek

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Notes and Scribbles

CONTRACTORS/SUPERVISORS

PERSONAL PROTECTIVE EQUIPMENT

- ☐ **RESPIRATORY PROTECTION PROGRAM**
- ☐ **PROTECTION FACTOR**
- ☐ **COVERALL FORMULA**

RESPIRATORY PROTECTION PROGRAM

OSHA requires, through its Asbestos and Respiratory standards, a comprehensive respiratory protection program to ensure proper employee protection.

From 1926.1101 –

1926.1101(h)(2) Respirator Program.
1926.1101(h)(2)(i)
The employer must implement a respiratory protection program in accordance with **29 CFR 1910.134 (b)** through **(d)** (except **(d)(1)(iii)**), and **(f)** through (m).
1926.1101(h)(2)(ii)
No employee shall be assigned to asbestos work that requires respirator use if, based on their most recent medical examination, the examining physician determines that the employee will be unable to function normally while using a respirator, or that the safety or health of the employee or other employees will be impaired by the employee's respirator use. Such employees must be assigned to another job or given the opportunity to transfer to a different position that they can perform. If such a transfer position is available, it must be with the same employer, in the same geographical area, and with the same seniority, status, rate of pay, and other job benefits the employee had just prior to such transfer.

From 1910.134 –

1910.134(c) Respiratory Protection Program.

This paragraph requires the employer to develop and implement a written respiratory protection program with required worksite-specific procedures and elements for required respirator use. The program must be administered by a suitably trained program administrator. In addition, certain program elements may be required for voluntary use to prevent potential hazards associated with the use of the respirator. The *Small Entity Compliance Guide* contains criteria for the selection of a program administrator and a sample program that meets the requirements of this paragraph. Copies of the *Small Entity Compliance Guide* will be available on or about April 8, 1998 from the Occupational Safety and Health Administration's Office of Publications, Room N 3101, 200 Constitution Avenue, NW, Washington, DC, 20210 (202-219-4667).

1910.134(c)(1)

In any workplace where respirators are necessary to protect the health of the employee or whenever respirators are required by the employer, the employer shall establish and implement a written respiratory protection program with worksite-specific procedures. The program shall be updated as necessary to reflect those changes in workplace conditions that affect respirator use. The employer shall include in the program the following provisions of this section, as applicable:

1910.134(c)(1)(i)

Procedures for selecting respirators for use in the workplace;

1910.134(c)(1)(ii)

Medical evaluations of employees required to use respirators;

1910.134(c)(1)(iii)

Fit testing procedures for tight-fitting respirators;

1910.134(c)(1)(iv)

Procedures for proper use of respirators in routine and reasonably foreseeable emergency situations;

1910.134(c)(1)(v)

Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and otherwise maintaining respirators;

1910.134(c)(1)(vi)

Procedures to ensure adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators;

1910.134(c)(1)(vii)

Training of employees in the respiratory hazards to which they are potentially exposed during routine and emergency situations;

1910.134(c)(1)(viii)
Training of employees in the proper use of respirators, including putting on and removing them, any limitations on their use, and their maintenance; and
1910.134(c)(1)(ix)
Procedures for regularly evaluating the effectiveness of the program.
1910.134(c)(1)(2)
Where respirator use is not required:
1910.134(c)(2)(i)
An employer may provide respirators at the request of employees or permit employees to use their own respirators, if the employer determines that such respirator use will not in itself create a hazard. If the employer determines that any voluntary respirator use is permissible, the employer shall provide the respirator users with the information contained in Appendix D to this section ("Information for Employees Using Respirators When Not Required Under the Standard"); and
1910.134(c)(2)(ii)
In addition, the employer must establish and implement those elements of a written respiratory protection program necessary to ensure that any employee using a respirator voluntarily is medically able to use that respirator, and that the respirator is cleaned, stored, and maintained so that its use does not present a health hazard to the user. Exception: Employers are not required to include in a written respiratory protection program those employees whose only use of respirators involves the voluntary use of filtering facepieces (dust masks).
1910.134(c)(3)
The employer shall designate a program administrator who is qualified by appropriate training or experience that is commensurate with the complexity of the program to administer or oversee the respiratory protection program and conduct the required evaluations of program effectiveness.
1910.134(c)(4)
The employer shall provide respirators, training, and medical evaluations at no cost to the employee.

As a contractor and/or supervisor, you fit test an employee only after the employee has passed a respiratory medical evaluation, has been trained about the respiratory hazards on the job, and the proper use, limitations, and care (cleaning, sanitizing, and storing) of respirators.

RESPIRATOR PROGRAM CHECKLIST

In general, the respirator program should be evaluated at least annually with adjustments, as appropriate, made to reflect the evaluation results. Program function can be separated into **administration** and **operation**.

A. Program Administration

	Yes	No
1. There a written policy which acknowledges employer responsibility for providing a safe and healthful work-place and assigns program responsibility, accountability, and authority?	☐	☐
2. Is program responsibility vested in one individual who is trained, knowledgeable, and experienced and who can coordinate all aspects of the program at the job site?	☐	☐
3. Can feasible engineering controls or work practices eliminate the need for respirators?	☐	☐
4. Are there written procedures/statements covering the various aspects of the respirator program, including:	☐	☐
a. designation of an administrator;	☐	☐
b. purchase of NIOSH-approved equipment;	☐	☐
c. medical evaluation;	☐	☐
d. training;	☐	☐
e. respirator selection;	☐	☐
f. inspection;	☐	☐
g. fitting;	☐	☐
h. fit testing;		
A. QLFT	☐	☐
i. Banana Oil (isoamyl acetate)	☐	☐
ii. Bitrex (denatonium benzoate)	☐	☐
iii. Irritant Smoke (stannic chloride)	☐	☐
iv. Saccharin Solution		
B. QNFT	☐	☐
i. issuance of equipment;		
j. maintenance, storage, and repair;	☐	☐

	Yes	No
j. ___ use under special conditions; and	☐	☐
k. ___ work area under observation(?).	☐	☐

B. Program Operation

1. Respiratory protective equipment and assignment –

	Yes	No
a. Work are conditions and employee exposures are properly surveyed (characterized).	☐	☐
b. Respirators are selected on the basis of hazards to which the employee(s) will be exposed.	☐	☐
c. Respirator selections are made by workers knowledge-able about proper selection procedures.	☐	☐
d. Only NIOSH-approved respirators and matching parts are used and they match the chemical(s) and concentration(s) in the air.	☐	☐
e. Medical evaluations of all prospective wearers have completed.	☐	☐
f. Where practical, respirators have been issued to the wearers for their exclusive use and Fit Test and related documentation is on file.	☐	☐

2. Respirator Fitting –

a. Users are given the opportunity to try on several respirators (size, model, and brand) to determine whether the respirator they will subsequently be wearing is the best fitting one.	☐	☐
b. Before being fit tested, the wearer shall have the respirator fitted on his or her face for at least 5 minutes.	☐	☐

	Yes	No
c. If re-tested (fitted), there shall be a minimum of 20 minutes between the completion of the previous fit test and the start of the new one.	☐	☐
d. Glasses, corrective lenses, are worn correctly.	☐	☐
e. There isn't facial hair prohibiting a proper fit.	☐	☐
f. Are both seal checks (-, +) done properly by the wearer.	☐	☐

2. Respirator Use –

a. Respirators are worn correctly (straps & harness).	☐	☐
b. Workers maintain the seal while in the regulated area.	☐	☐

3. Maintenance of Respiratory Protective Equipment –

a. Cleaning and Disinfecting

i. Respirators are cleaned and disinfected (sanitized) after each use.	☐	☐
ii. Proper cleaning and sanitizing methods are utilized.	☐	☐

b. Storage

i. Respirators are stored in a manner that will protect them from dust, sunlight, heat, excessive cold or moisture, or damaging chemicals.	☐	☐
ii. Respirators are stored properly (not hanging by a strap) in a storage area so as to prevent them from stretching and/or deforming.	☐	☐

	Yes	No
iii. Storage in lockers and tool boxes is permitted only if the respirator(s) is in a carrying cases or carton.	☐	☐

c. Inspection

i. Respirators are inspected before and after each use and cleaning by the wearer and/or a qualified person.	☐	☐
ii. Is respiratory protective equipment designated as 'emergency use" inspected at least monthly in addition to after each use.	☐	☐
iii. A record is kept of the inspection of "emergency use" respiratory protective equipment.	☐	☐

d. Repair

Manufacturers' replacement parts are on-site for each brand, model, and size of respirator issued.	☐	☐

e. Special Use Conditions

i. There are established IDLH procedures.	☐	☐
ii. There are established procedures for PRCS entry.	☐	☐
iii. Training is required for workers and supervisors performing work related to or in PRCSs and/or IDLH atmospheres.	☐	☐

f. Training

Competency-based training and evaluation for all those using respiratory protective equipment in respirator selection, inspection, use, cleaning, and storage is required. (Documentation on file on site)	☐	☐

■■■

PROTECTION FACTOR

PROTECTION FACTOR ..... PF – The degree of protection of a respirator. The Protection Factor is determined in a laboratory setting.

Protection Factor is about comparing particles (contaminants?) in the air outside the respirator facepiece to particles inside the respirator worn by a worker. If written as a formula, it would be:

$$\mathbf{PF = \frac{Concentration\ Outside\ the\ Facepiece}{Concentration\ Inside\ the\ Facepiece}}$$

or

$$\mathbf{PF = C_O\ divided\ by\ C_I}$$

The actual level of protection depends greatly on the fit of the facepiece to the wearer's face. The protection changes depending on the worker's activities and even shaving habits. When a worker laughs, talks, or coughs inside a respirator, the protection factor will decrease since the facepiece will not "fit" during these "movements".

Each brand of respirator type and model tested and certified by NIOSH is issued a protection factor, with the half-face respirator being the least protective (PF = 10) and the SCBA being the most protective (PF = 10,000). The full-face respirator weighs in at PF = 50 while the full-face, tight-fitting PAPR's PF = 1000 (a change in 2006).

COVERALL FORMULA

A common problem on asbestos abatement projects is a failure by contractors to purchase enough disposable coveralls for the project. Each worker must use a new coverall (and foot and head covering if not attached) each time he or she enters the work/regulated area. Assuming two (2) breaks and a lunch period, four coveralls will be needed each day by each worker. Additional coveralls are usually needed for authorized visitors and to replace some that are torn to the point of being unusable. As a rule of thumb, the contractor may estimate the number of suits needed on a project by the following formula:

5 x # of workers x project duration in days = # of coveralls needed

For example, a project lasting 48 days using a crew of eight (8) workers and one supervisor will need the following number of coveralls (estimated):

5 coveralls x 9 workers x 48 days = 2,160 coveralls

Accordingly, the contractor should order ninety (90) cases (24/case) of coveralls for the project. When purchasing coveralls, large and extra large sizes should be purchased.

CONTROL METHODS, SETUP & REMOVAL 5

In the Control Methods section you will learn:

How asbestos can be controlled.
About the kind of asbestos work you may do.

In the Setup section you will learn:

How to keep asbestos out of the air.
About wearing a respirator and disposable suit.
What an asbestos job looks like.
How to clean the work room.
How to set up the work room.

In the Removal section you will learn:

How to enter the work room.
How to take asbestos off ceilings, walls, and pipes.
How to keep asbestos out of the air.
How to bag asbestos waste.
How to exit the work room.
How your employer measures asbestos in the air
How to work with Class I &II asbestos.
How to remove asbestos from pipes.
How to use a mini-enclosure and a glovebag.
About Class III asbestos work.

Control Methods

When asbestos materials are found in a building, the owner of the building must make a decision about what to do with them. The danger from asbestos materials depends on how likely they are to release fibers into the air. Products which are in good shape and are unlikely to be damaged by accident are not a problem. These products can stay in the building and might not be removed until the building is renovated or demolished.

Products which are in bad shape need to be taken care of to prevent fibers from getting into the building air. There are a number of different ways to do this. These are called "control methods." They are:

1. **Encapsulation;**
2. **Enclosure;**
3. **Repair;**
4. **Removal; and**
5. **Operations and Maintenance Program.**

These Control Methods are sometimes used together on one project. For example, a job may involve the removal of 100 feet of pipe covering and repair of an additional 1000 feet or encapsulating most of the ceiling material in a building, but removing of the material which is in areas where the hallway is low.

Usually, asbestos workers will not decide which method to use. That decision is made by the building owner and a consultant. It is then included in the job specifications (specs) for the project.

1. Encapsulation

Encapsulation is the spraying of a paint-like coating over the material. The coating is put on using a low-pressure spray system. When material is encapsulated, the coating prevents release of fibers into the air. The coating can also prevent some damage to the material from contact.

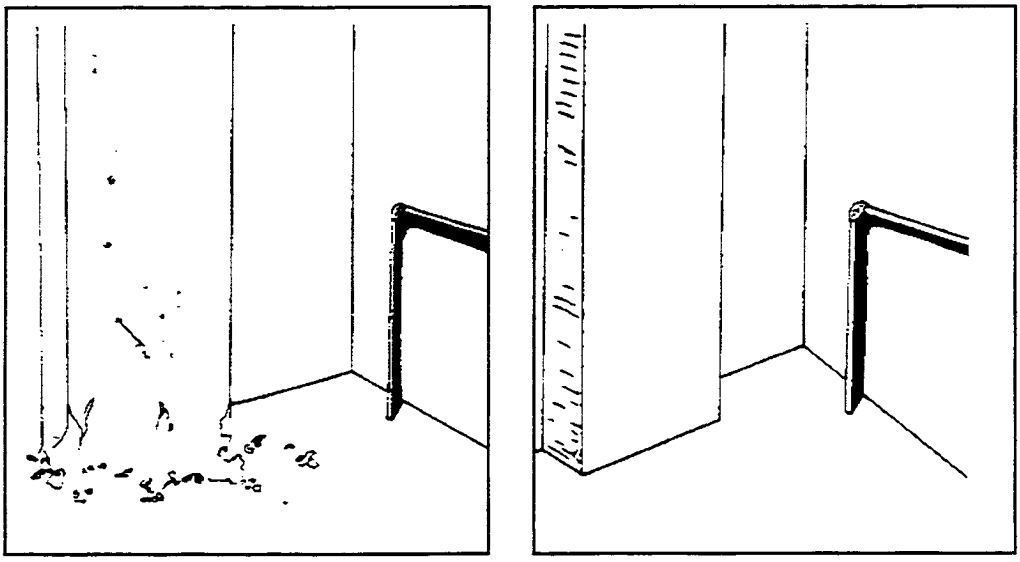
When you work on an encapsulation job you can still be exposed to asbestos fibers. In fact, when the spray of encapsulant hits the material, a small amount of dust is sometimes blown into the air. The material cannot be wetted first, because the encapsulant will not stick. Because of this, an encapsulation job is set up just like a removal job. Workers will also wear respirators and protective clothing while doing encapsulation.

Two kinds of encapsulants are used. One kind is called a **bridging encapsulant.** This kind covers the material with a "tough skin" on the outside. The other kind is called a **penetrating encapsulant**. This kind soaks into the material and binds the material together. The material then becomes hard, like a plaster cast.

When doing encapsulation, workers usually make two passes at the material with the sprayer. This is done to make sure that the asbestos is completely covered. The encapsulant takes some time to dry. Materials contaminated with dust during the job are disposed of as asbestos. This includes plastic barriers, suits, and other items.

2. Enclosure

Enclosure means building an air-tight barrier around the asbestos material. The enclosure is built with non-asbestos building materials. Examples are sheet rock, wood with spline joints, caulked sheet metal, and other materials. **If the barrier is not air-tight, it is not considered an enclosure.** For example, putting in a drop ceiling to control asbestos fireproofing material is not an enclosure.



ENCLOSURE

An enclosure job also requires that a containment be built. Building the enclosure often requires disturbing the material. Workers will also have to wear respirators and protective clothing. If drills or nail guns are used to attach the enclosure, asbestos dust can be released.

Another type of enclosure is sometimes referred to as **encasement.** Encasement means spraying a closed-cell foam directly on an asbestos material or onto a lattice hung below the material. Another example would be to pour concrete onto a dirt floor in a crawl space.

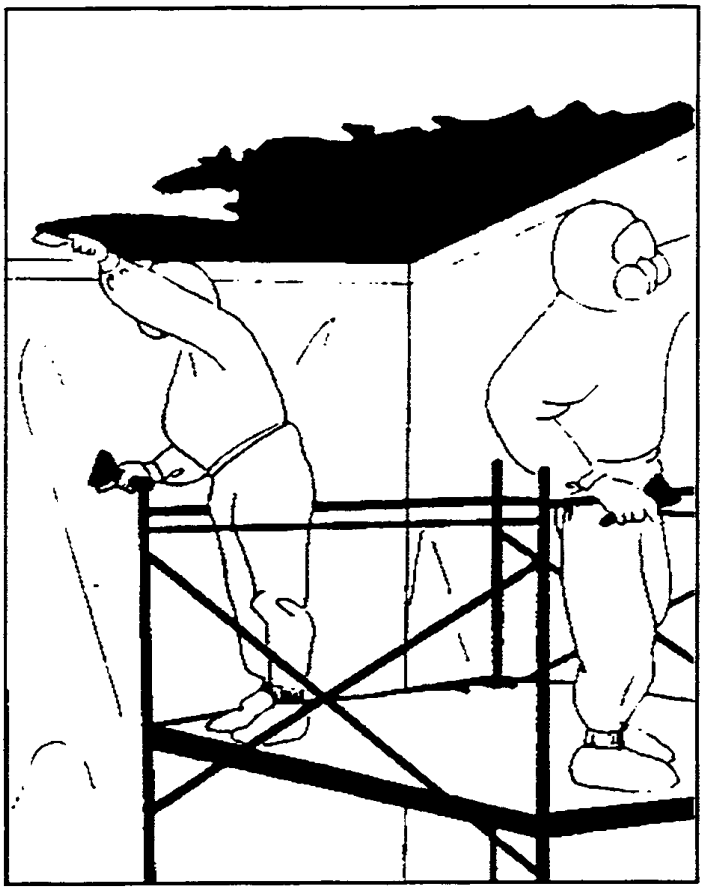
During an enclosure job, disturb the material as little as possible. It is best to use power tools such as drills only if they are attached to a HEPA vacuum. Items from the work area (like plastic sheeting and suits) that get dust on them have to be disposed of as asbestos waste. Other things like power tools must be cleaned before they leave the containment.

3. Repair

Repair is a control method which can be used if there are small amounts of damage to asbestos materials. For example, asbestos pipe insulation might have a canvas covering which is torn. The tear exposes the asbestos fibers and they can be released into the air. By simply wrapping new canvas around the tear and repainting with mastic, the area is repaired.

4. Removal

Removal is the method used most to control fiber release from asbestos materials in buildings. Removal means taking the asbestos off of whatever it is on. It is then bagged and sealed and taken to an asbestos landfill. A removal job must not only remove the material that can be easily seen. Workers will also be doing lots of cleaning. This is because when asbestos is scraped, pulled, or ripped off surfaces or mechanical systems, many fibers are released. These must be cleaned up as a part of the removal job.



REMOVAL

On a removal job you can be exposed to a lot of asbestos dust. This is why strong rules have been made for these jobs. If removal jobs are not done right, workers can be exposed to asbestos. Additionally, a poor removal job can leave more asbestos fibers in the building air than there were before.

5. Operations and Maintenance

An Operations and Maintenance program is a control method used for managing asbestos while it remains in a building. An O&M program should be done in any building which has asbestos building materials in it. The program has a number of different parts. They are listed below.

A. A list or inventory of all asbestos materials in the building is made. The inventory should include details about the kinds of materials, their location, and their condition.

B. Asbestos materials in the building should be labeled with stickers to alert workers that they contain asbestos.

C. Asbestos materials should be inspected on a regular basis (for instance every six months) to see if they stay in good shape.

D. Training is done for maintenance employees so that they can handle small amounts of asbestos that might be disturbed during their work.

E. Work procedures are developed for maintenance work. For example: how to safely remove and dispose of a small amount of pipe insulation so that a leaking pipe valve can be repaired.

F. Proper equipment is provided to maintenance workers so that they can do the work safely.

G. Procedures are developed for dealing with accidental damage to asbestos materials (fiber release episodes).

The point of the Operations and Maintenance program is to prevent the asbestos materials from releasing fibers into the building. This protects maintenance and service workers, outside contractors (plumbers, electricians, etc.), and other people in the building. All of the parts of the program are important. If some parts are done but others are not, the program won't be successful. An effective O&M program also requires that the building owner have a knowledgeable person on staff to deal with asbestos. The building engineer or someone else should be trained to know about asbestos hazards and how to run the owner's program.

CONTROL METHODS

Key Facts

Asbestos in buildings can be controlled in a number of different ways. The different ways are:

- ➢ Encapsulation;
- ➢ Enclosure;
- ➢ Repair;
- ➢ Removal; and
- ➢ Operations and Maintenance Program.

Encapsulation means spraying a paint-like coating over the material. This binds the material together.

Enclosure means building an airtight barrier around the asbestos material.

Repair means fixing small areas of damaged asbestos material.

Removal means taking the asbestos material off of whatever it is on, cleaning the material up, and properly disposing of it.

An **Operations and Maintenance Program** (O&M) is a written program. It is needed when asbestos will remain in a building. The program states what training a worker must have. In order to work with asbestos, workers should receive a two-day operations and maintenance training. The written O&M program includes:

- ➢ Where asbestos is found. Many asbestos materials should be labeled.
- ➢ Worker training requirements.
- ➢ Ways to work with asbestos safely. This includes equipment, worker protection, and medical exams.
- ➢ Permits which are required before beginning work.
- ➢ How to check the condition of asbestos materials and record any changes.

Discussion Questions

1. What kind of material do you think would not be good to encapsulate?
2. Can you see a situation in which more than one control method might be used in an area?

For More Information

Guidance for Controlling Asbestos Containing Materials in Buildings ("The Purple Book"), U.S. Environmental Protection Agency, June 1985.

Managing Asbestos In Place, A Building Owner's Guide to Operations and Maintenance Programs for Asbestos-Containing Materials, U.S. Environmental Protection Agency, July, 1990.

.....

Notes and Scribbles

SETUP

Setup ...

Carlos: We need to set up this room for removal. Let's put on our suits and respirators and start wiping the walls and floors.

Tom: I don't need a suit and respirator. It's too hot in here.

Carlos: But there's asbestos in this room. You really need to protect yourself.

Tom: All the asbestos is in the ceiling. We're not going to disturb it. A respirator and suit in this heat will just slow me down. The supervisor told me that my last setup was too slow.

Carlos: I know it's really hot in here, but you need to protect yourself so you don't get sick in a few years.

Tom: I don't want to get in trouble for working too slow. This is the first work I've had in 3 months. I need this job.

Discussion Questions

1. Do you agree or disagree with the following? Why or why not?

   - ➢ Tom and Carlos don't really need to wear a suit and respirator if they are just setting up. **(Yes/No)** _____
   - ➢ It's none of Carlos' business if Tom doesn't want to wear a suit and respirator. **(Yes/No)** _____
   - ➢ The foreman should put in a fan or air conditioner to cool the room during setup. **(Yes/No)** _____
   - ➢ It would be better for Tom to work without a respirator than to risk losing his job. **(Yes/No)** _____
   - ➢ If Tom explained things to the foreman, Tom wouldn't get in trouble with him. **(Yes/No)** _____

2. Why is Tom in such a hurry?
3. What could Carlos do to convince Tom to wear his respirator and suit?
4. What could the foreman do to make it easier for Tom to wear his respirator and suit?

KEEP ASBESTOS OUT OF THE AIR

Four basic rules for working with asbestos --

1. Keep the asbestos wet
2. Contain the work area
3. Filter the air
4. Use negative air pressure

No matter how good your respirator is, some asbestos will leak in. So one of the best ways to keep asbestos out of your lungs is to **keep it out of the air.** There are many ways to keep asbestos out of the air. These are called **work practices (or work methods) and engineering controls.**

There are four basic rules for working with asbestos. Follow these rules on all asbestos jobs, whether they are small or large. These rules must be followed from the time you start setting up for an asbestos job to the time you finish one.

1. Keep the Asbestos Wet

When you work on asbestos, you must keep it wet. Dry, fluffy asbestos can send up a cloud of fibers you can't even see. The fibers are so light they can float in the air for days.

When the asbestos is wet, the fibers stick together. When you spray water into the air, asbestos fibers are trapped by the drops of water. The fibers are pulled down to the ground, out of the air. To make the water soak into the asbestos faster, always add a chemical called **surfactant.** Surfactant makes the water wetter. Water with surfactant in it is called **amended water**.

Get the asbestos wet before you cut it or even touch it. Do this when you are working on a large job or a small one. Do this when you are setting up, removing asbestos, throwing it out, or cleaning up. Wetting asbestos with amended water can reduce asbestos in the air by as much as 90%.

2. Contain the Work Area

Cover the walls and floor of the work room with plastic. Use polyethylene sheet plastic. On the job it is usually called poly (pronounced "polly"). Putting up poly does three things:

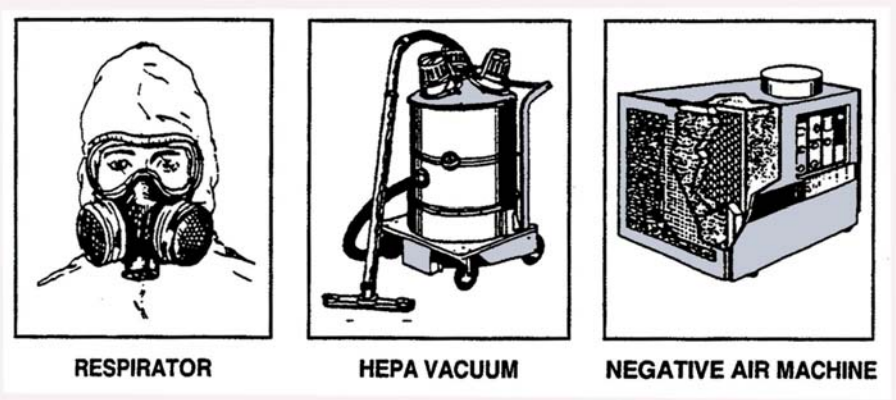
1. It protects the walls and floor from water and asbestos.
2. It keeps asbestos from spreading outside the work area.
3. It keeps everyone but workers away from the asbestos.

The plastic must be nearly air-tight. Put up plastic on large jobs and small jobs. When working on a whole room, use a full containment. When working on a small section of pipe, use a mini-enclosure or a glove bag.

3. Filter the Air

Any air that has asbestos in it must be filtered. You must use a filter that is so fine it can catch the asbestos in the air. It is called a High Efficiency Particulate Air filter (HEPA filter). A HEPA filter takes out 99.97% of all particles .3 microns or larger. (A micron is very small. More than 25,000 microns fit in one inch.) **Air that goes through a HEPA filter is safe to breathe.**

Respirators, vacuum cleaners, and negative air machines (see the next page) **all must have HEPA filters in them** so that the air will be safe to breathe.

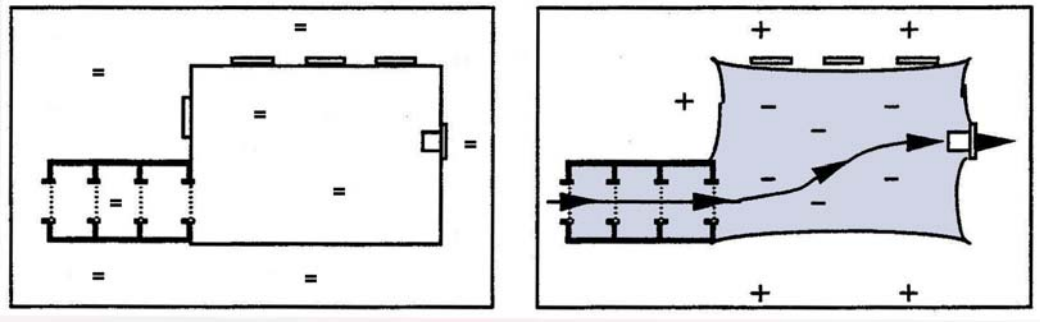


Never use an ordinary shop vacuum for asbestos work. The vacuum has a paper filter that will not trap asbestos. You will blow asbestos into the air. You must use a vacuum with HEPA filters (a HEPA vac) when you work with asbestos.

4. Use Negative Air Pressure

Put a heavy-duty fan with HEP A filters at one end of the work room. This is called a negative air machine. The fan pulls dirty air into the negative air machine. The HEPA filters catch the asbestos. All the air that leaves the room is clean.

The negative air machine also pulls clean air in from across the work room. It makes the work room a little cooler. The negative air machine makes the air pressure inside the room lower than the air pressure outside the room. Inside the room, there is negative air pressure. Asbestos can't leak out of the room, it can only leak in.



Use negative air pressure on both large and small jobs. On a large job, use a negative air machine for negative air pressure. On a small job, use a vacuum with HEPA filters (a HEPA vac) for negative air pressure.

After you follow these four basic rules, there will still be asbestos in the air. You should wear a respirator and a disposable suit every time you work with asbestos.

KEEPING ASBESTOS OUT OF THE AIR

Key Facts

One way to keep asbestos out of your lungs is to keep it out of the air.

Four basic rules for keeping asbestos out of the air --

1. **Contain the work area with plastic (poly).**
   The plastic can be as large as a work room or as small as a glove bag.

2. **Use negative air pressure.**
   Use a negative air machine to clean the air.

3. **Keep the asbestos wet.**
   Wet down the asbestos material before you handle it. To make the water soak into the asbestos faster, add a chemical called surfactant. Water with surfactant in it is called amended water.

4. **Filter the air with High Efficiency Particulate Air (HEPA) filters.**
   - ✧ Use a respirator with HEPA filters.
   - ✧ Use a HEPA vacuum ➛ ➛ ➛ ➛ ➛ ➛ ➛
   - ✧ Use a negative air machine with HEPA filters to clean the air that leaves the room.

Discussion Questions

1. Why not try to spread asbestos fibers around and lower the concentration in the air?
2. Why won't fibers leak out if there is a negative air machine set up?
3. How does surfactant cause water to soak the asbestos?

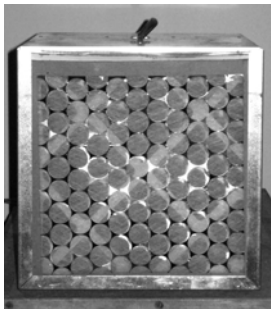
For More Information

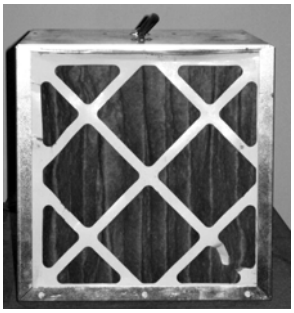
OSHA Asbestos Standard, 29 CFR 1926.1101, Section G, "Methods of Compliance."

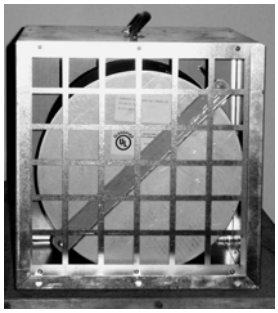
OSHA Asbestos Standard, 29 CFR 1926.1101, Appendix F, "Work Practices and Engineering Controls for Major Asbestos Removal...."

OSHA Asbestos Standard, 29 CFR 1926.1101, Appendix G, "Work Practices and Engineering Controls for Small-Scale, Short Duration Asbestos Renovation...."

Negative Air Machine – Intake View


First pre-filter


Second pre-filter


HEPA filter

SETUP - OVERVIEW

By now, you know that protecting your lungs with respirators and wearing suits is very important. You also know about some ways to keep asbestos out of the air. One way to do this is to cover the walls and floor with **sheet plastic (poly).** This keeps the asbestos in the work room. It keeps it out of the rest of the building.

For the rest of this class, you will apply the rules you have learned to a large asbestos removal job. Keep the asbestos wet, contain the work area, filter the air, and use negative air pressure.

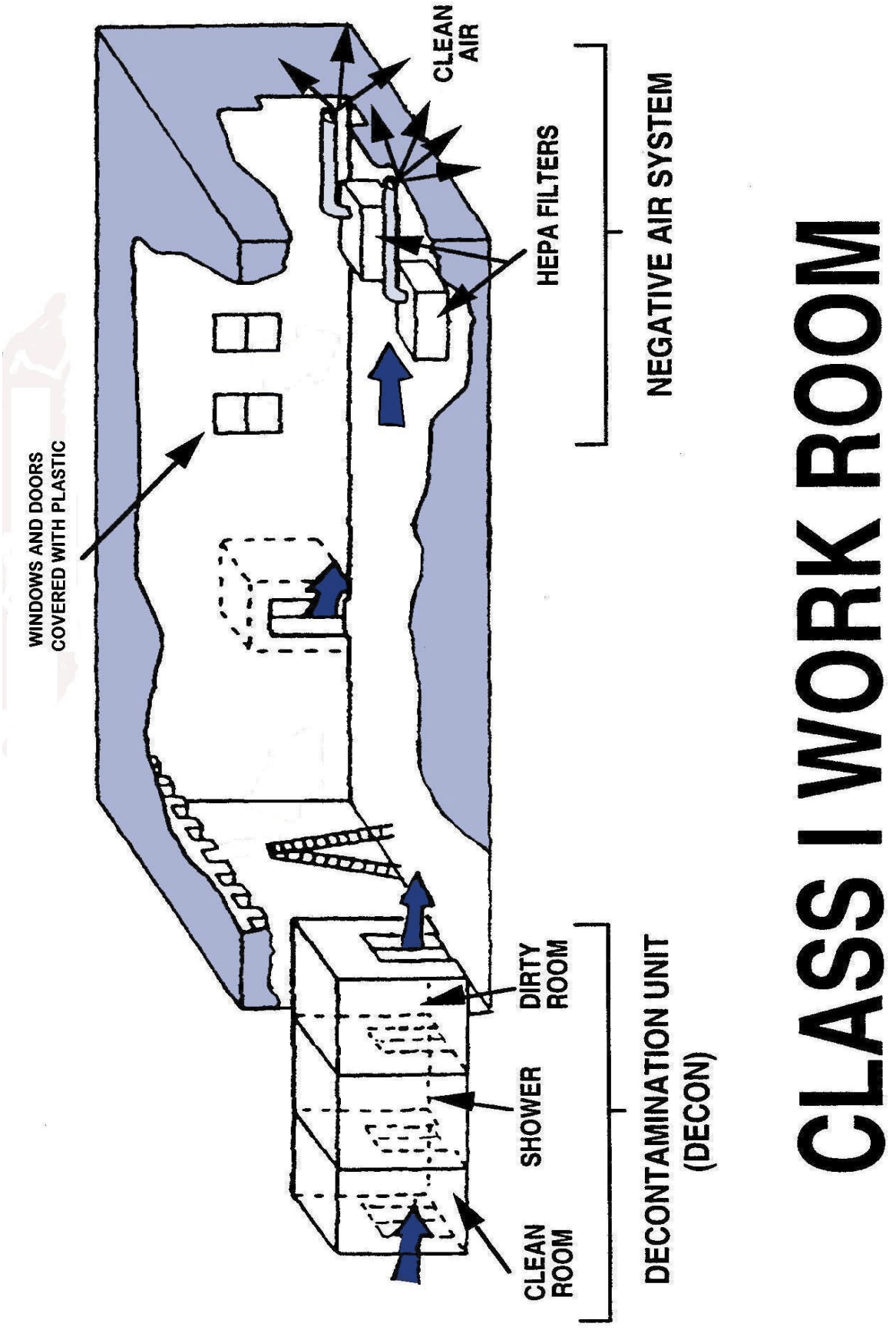
When you take asbestos off a whole ceiling, build a **full containment**. Do this when you take asbestos off a whole run of pipes, or air ducts, or a whole wall or floor. Cover the walls and floor with sheets of plastic (poly). Seal off all the exits except one. Build a **shower unit** (decontamination unit or decon) there. Set up a **negative air machine** at the other end of the room.

Most of this manual is based on what OSHA law says you have to do. In the first part of the class, you learned what kind of respirators **must** be used. You learned that asbestos **must** be wet. This section of the manual is not based on a law. OSHA law does not say how many layers of poly (sheet plastic) **must** be used. It does not tell you how many negative air machines **must** be used. (Some state laws do tell you how many layers of poly, etc., you must use.) This manual describes **"state-of-the-art"** work practices. State-of -the-art work practices are the work practices considered to be the best. OSHA law does not say you have to put **two** layers of poly on the floors. But so many companies do this that you will find it on most jobs. It has become "standard operating procedure."

Some things on your job may be different from what you learn in this section of the manual. Many states have regulations that are more strict than OSHA regulations. You must follow state regulations **in addition to** OSHA regulations.

Class I Setup

Experienced asbestos companies know that a good setup is at least 40% of an asbestos job. When working with thermal system insulation or surfacing materials (Class I), you have to cover the room with sheet plastic. You have to turn off the ventilation system. Class I asbestos work requires more preparation than any of the other classes. You have to clean and protect the


CLASS I WORK ROOM
WINDOWS AND DOORS COVERED WITH PLASTIC
CLEAN AIR
HEPA FILTERS
NEGATIVE AIR SYSTEM
DIRTY ROOM
SHOWER
CLEAN ROOM
DECONTAMINATION UNIT (DECON)

room. You have to bring in extension cords. Good setup makes the rest of your job much easier. It also prevents many safety problems.

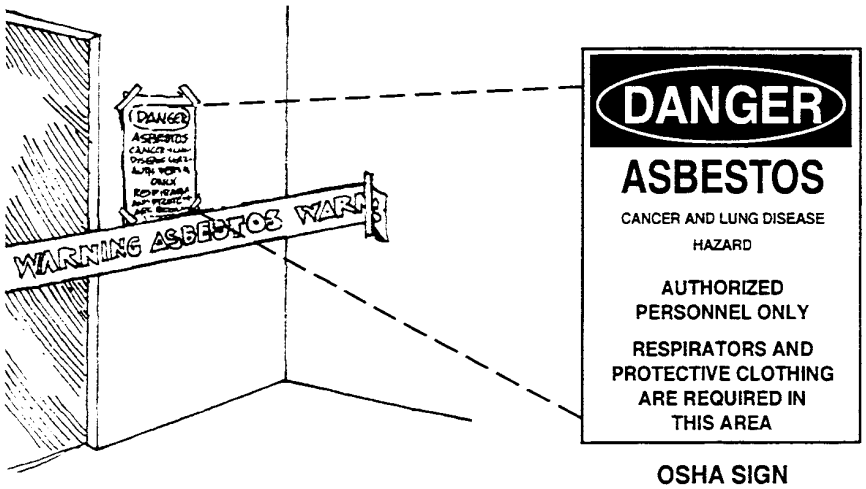
The building owner will probably hire someone to write up contract specifications (specs). The specs should tell you how many layers of poly to use. They should tell you how to set up the work room. Setup must be supervised by a trained supervisor. The supervisor is called the "competent person."

Before you do any work, find out if you need to put on a suit and respirator. Set up the work room in this order:

1. Put up warning signs and barrier tape.
2. Shut off the ventilation system.
3. Shut off the electrical system.
4. Bring in extension cords.
5. Build the decontamination unit (decon).
6. Cover all openings to the room with plastic.
7. Clean everything in the room.
8. Throw out what you can't clean.
9. Take out anything you can move.
10. Wrap anything you can't move in poly.
11. Hook up and test the negative air machine.
12. Put poly on the floor.
13. Put poly on the walls.
14. Bring scaffolds and tools into the room.
15. Position decontamination unit.

1. Put Up Warning Signs & Barrier Tape

Put up a barrier outside the work room. This will keep non-workers out. Hang asbestos warning signs on the barrier. The signs must look exactly like the one on the next page. The signs should be at eye level. They should be in a language that building users can read.



OSHA SIGN

2. Shut Off the Ventilation System

The ventilation system carries air through the building. **It can carry asbestos through the building**. Asbestos goes where air goes. The ventilation system for the work room must be shut off. Shut off the system at the electrical box. Lock the box and label it with a tag. The ventilation system is often called the **HVAC system**. HVAC stands for Heating, Ventilating, and Air Conditioning.

3. Shut Off the Electrical System (Lockout/Tag-out: 29 CFR 1910.147)

Asbestos jobs are wet. Electrical shocks are one of the worst dangers on an asbestos job. Water can leak into an electrical outlet and kill you. The electrical system must be shut off. Shut off the system at the electrical box. Lock the box and label it with a tag. Turning off wall switches is not enough. **Someone who doesn't know about asbestos work could electrocute you by mistake. Never take another worker's lock off of a box.** Machines also have to be shut off. A machine with moving parts could hurt someone. It has to be turned off and locked so that people can work safely around it. Steam pipes have to be shut off, too. Let the pipe cool for at least 12 hours before working on it.

4. Bring in Extension Cords

Negative air machines, safety lights, HEPA vacuums, and hand tools all need power. Bring in extension cords for all equipment. Extension cords are sometimes called **temporary wiring. Tape cords onto the walls so that workers won't trip on them. Do not hang cords with metal wire.** This could cause a shock.

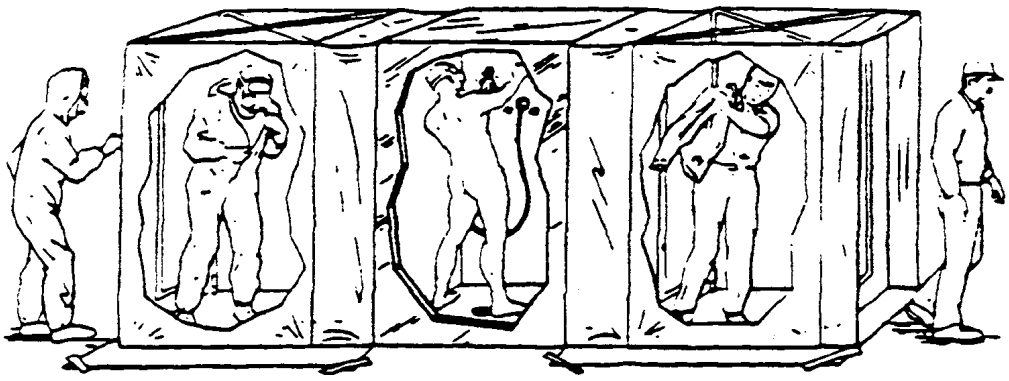
Cords should be hooked up to sensitive circuit breakers. These are called **Ground Fault Interrupters(GFIs).**

5. Build the Decontamination Unit (decon)

You go into and leave the work room through a special room. It is called the decontamination unit (decon). The decon has a shower. Every time you leave the work room, you must take a shower. Don't take asbestos with you out of the work room on your body.

The decon has three rooms. They have to be in this order (starting from the work room) --

Dirty room — Shower — Clean room



The decon is lined with two layers of poly and duct tape. The rooms have plastic flaps between them. The flaps keep air from moving out, but let air come in. Seal the decon air-tight to the work room.

Some decons have extra empty rooms (air locks). These keep air from moving out through the decon. Some new decons have solid doors with gaskets (rubber strips around the edge). Air comes in through HEPA filters or flaps built into the walls of the decon or work room.

Some contractors build their own decons. They use wood, pipes, poly, spray glue, and tape. Some contractors use hard plastic decons. Others use decon trailers that go outside the building. An outside decon should be windproof and waterproof. Use plywood and 16-mil reinforced poly on the floor.

Sometimes a separate decon is built for waste bags and tools. This is called a waste load-out.

6. Cover All Windows and Openings to the Room

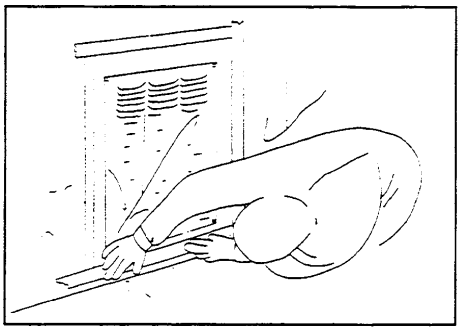
In the work room, air should only come in through the decontamination unit (decon). Air should only go out through the negative air machine. Seal up any other places where air can go into or out of the room. Cover windows and doors with two layers of poly and duct tape. Leave one window prepared for the negative air machine's clean air exhaust.

Cover all these places --

- windows
- electrical outlets
- light wells (where lights were taken out)
- air vents
- doors
- pipe chases (where pipes go through a wall)

Cover air vents with two layers of poly. Seal them with duct tape. Seal the poly so that no water and no air can get in or out. Cover light wells with two layers of poly and duct tape. If you can't take the lights out, seal them up with poly and tape.

Putting poly over windows and their openings forms what are called **"critical barriers."** (Sometimes they are called **"primary barriers."**)



COVER AIR VENTS WITH POLY

7. Clean Everything in the Room

You might do a great job of scraping the asbestos off a ceiling. But what about the asbestos dust that was on the floor before you started the job? If you can see asbestos dust on surfaces, it must be cleaned up. If you don't clean before you take off the asbestos, the room will still be dirty at the end of the job. **Clean everything in the room before you put up the poly (plastic).** Use damp rags and HEPA vacuums.

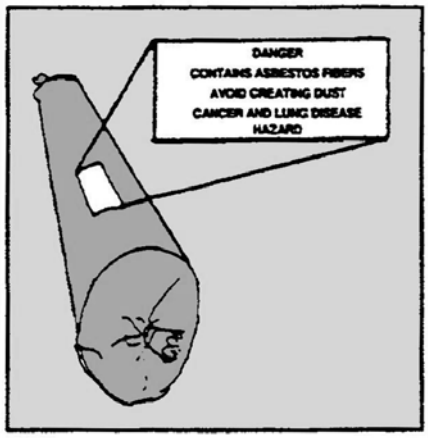
When you clean, you may get asbestos in the air. Even if you can't see it, the asbestos may be there. **As soon as you start to handle asbestos, put on a respirator. Your employer should test the air.** You must have permission from a doctor before you may wear a respirator. You must pass a fit test before you may wear a respirator.

Clean everything in the room --

- walls
- floors
- window sills
- furniture
- air vents
- electrical outlets
- paintings
- posters
- books
- office equipment
- office supplies
- machines
- circuit breakers
- fuse boxes
- lights

Clean air vents with damp rags and HEPA vacuums. Take the grates out of the work room. Wet the filters and throw them out with the asbestos. Clean electrical outlets with HEPA vacs. Clean circuit breakers and fuse boxes. Clean the lights inside and out.

Clean carefully, starting at the top of the walls and working down. Otherwise you will spread asbestos onto places you've already cleaned. The rags have to be thrown out with the asbestos.



RUG WRAPPED UP

8. Throw Out What You Can't Clean

Rugs and fabric on furniture should be steam cleaned. If they can't be cleaned, they should be thrown out. Wrap the rug in two layers of poly. Seal it up with duct tape and put a label on it. The label must look like this one. Send the rug to an asbestos landfill.

9. Take Out Anything You Can Move

Move anything you can out of the room --

- chairs
- desks
- cabinets
- office supplies
- equipment
- paintings
- books
- air grates
- lights

There is no excuse for piling furniture in a corner of the room. Even if you cover it with poly, it will get asbestos or water on it. Lights should always be taken out unless they can be sealed up.

10. Wrap Anything You Can't Move in Poly

If you can't move machines, seal them up. Wrap them in two layers of poly and duct tape. Put tape on all of the seams. Tape the poly to the floor. The poly has to be totally sealed, not just draped over the machine.

Sinks and water fountains also have to be sealed in two layers of poly. Shut them off at the valve. Label them with DO NOT DRINK signs. **You may not use the sinks or electrical boxes in the room during the job.**

Seal up electrical boxes, blackboards, thermostats, alarms, and anything else that must stay in the room.

In places like boiler rooms you may have to seal off a working machine. This is hard, since poly will melt and can burn at 150° F. Machines give off heat and may also need air to work. You have to keep asbestos out of the machine without starting a fire. Experienced companies know how to seal off working machines.

11. Hook up and test the negative air machine

The clean air from the negative air machine goes out a window. The seal at the window has to be air-tight. Cut holes in a piece of plywood and tape the hose in. If you are working in a large room, there will be more than one machine.

Put the negative air machine as far away as possible from the decon. Air should be pulled across the longest possible distance from the decon. You may have to use hoses if the only window in the room is right next to the decon. If there is more than one machine, they should all be on the side of the room farthest from the decon.

When the negative air machine is on, air comes into the room through the decon. The negative air machine should be on 24 hours a day. **Air should only leak in, not out.** Sometimes extra holes are cut in the poly so that enough air will come in. This is called **makeup air**. These holes **must** be covered on the inside with plastic flaps or HEPA filters in case the negative air machine shuts down.

Control panel side view of a negative air machine.

12. Put Poly on the Floor

The first layer of poly goes on the floor. **Cut the poly big enough so that it goes up the walls at least one foot.** Tape all the way around the edges of the poly. The idea is to build a water-tight plastic bubble inside the room. The poly on the floor should catch all of the asbestos and water. Air and water should not leak out.

Try to cover the whole floor with one piece of poly. If there are seams in the poly, they have to be sealed. Overlap the pieces of plastic 6 to 12 inches. Use **spray glue** (glue in a spray can) and duct tape. It is a good idea to put a line of blue carpenters chalk under the seams. If water and asbestos leak through, they will make the chalk dark. Then you can clean up the leaks before they damage the floor.

There may be seams in both layers of poly. Put the seams at least six feet apart. Then a leak in the top layer of plastic won't leak through the bottom layer.

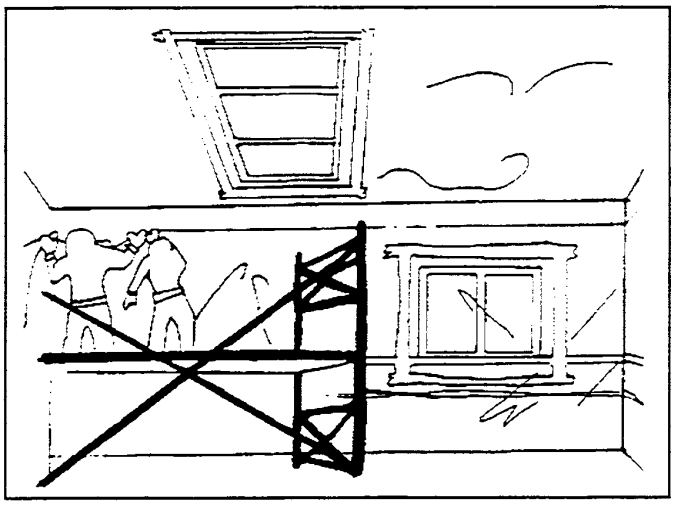
There are gases in spray glue that can make you sick. Use a respirator "combo" filter that protects you from both spray glue (vapors) and asbestos (fibers).

13. Put Poly on the Walls

Cut the poly big enough so that it comes down at least one foot onto the floor. There should be at least a two foot overlap between the poly on the floor and on the walls.

Tape the poly to the top of the walls. Tape it two or three inches below the ceiling so that you can clean the corner. Don't tape it one or two feet down from the ceiling. Remember, the poly has to make an air-tight and water-tight bubble inside the room. It protects the walls from asbestos and water. If the top of the wall is not covered, it may get asbestos on it. It will probably be damaged. Tape all the way around the edges of the poly at the bottom.

Poly is heavy, and duct tape can come loose when it's wet. Duct tape and spray glue may not be strong enough to hold the poly on the walls. You may have to nail furring strips (small pieces of wood) to the walls. Staple the poly to the furring strips. Put duct tape over all the staples and the edge of



PUT POLY ON THE WALLS

the poly, Put two layers of poly on the floor and two on the walls. If there is a leak, the asbestos will get on the poly, not on the floor or walls.

Another way to cover the walls and floor is with **spray poly.** This is liquid polyethylene plastic. It is sprayed onto walls and floors with a low-pressure sprayer. You have to put regular poly on the windows and doors first (critical barriers). **Spray poly has ammonia in it.** Use a respirator filter that protects you from both ammonia and asbestos.

Work rooms can be dark and confusing, especially in an emergency. It is a good idea to make some arrows out of bright tape at different heights on the walls that point the way to the decon. In an emergency, the arrows will show you how to get out of the work room.

14. Bring Scaffolds and Tools into the Room

Scaffolds may be too big to bring through the decontamination unit (decon). Bring the scaffolds in before the decon is hooked up. Put tape over the ends of the scaffolds so that asbestos won't fall in. Bring in any large equipment. Be sure that all the tools you need are in the work room before removal begins.

15. Position Decontamination Unit

Now that all of the large, bulky equipment is inside the work area, you may move the decon into position. From this point on everyone and everything that enters the work area will do so through the decon.

Testing the Negative Air Pressure

The negative air machine should pull the plastic doors in the decon toward the machine. You can test the negative air pressure in the room. Use a machine to puff chemical smoke from outside the clean room. The air and

smoke should be pulled in through the decon. The smoke should be sucked in, not drift out through cracks. Test the seals on primary barriers to make sure they are really air-tight. You have now built an air- and water-tight bubble which is under negative air pressure. The negative pressure enclosure must be smoke tested before the job starts and **before each shift.**

Class II Setup

The removal of ACM that is not thermal system insulation or surfacing material is considered to be Class II work. Class II ACM materials include roofing and siding shingles, floor tile and sheeting, wallboard, ceiling tile, and construction mastics. Working with Class II asbestos materials is not considered to be as dangerous as working with Class I materials. Class II asbestos work does not require quite as much setup as Class I work.

You may not have to wear a respirator and protective clothing when doing this kind of work. Your supervisor will make this decision before you begin working. It is important to remember that even when you aren't suited up, you must still be careful to keep asbestos fibers out of the air. The Class II work area should be setup in the following order:

1. Put up warning signs and barrier tape.
2. Shut off the ventilation system.
3. Shut off the electrical system.
4. Bring in extension cords.
5. Cover all openings to the room with plastic (poly).
6. Clean everything in the room.
7. Throw out what you can't clean.
8. Take out anything you can move.
9. Wrap anything you can't move in poly.
10. Bring scaffolds and tools into the room.
11. Put poly on the floor.

In addition, if there is no negative exposure assessment for the job, then

all openings to the room must be covered with plastic (poly). The same is true if the material is not being removed intact. For example, if floor tiles are being removed by breaking and chipping them up off the floor, then all vents, outlets, doors, windows, etc., must be covered with plastic. When working on a roof, all air intake vents must be sealed in plastic.

Decontamination

On Class II jobs, decontamination areas consist of an equipment room large enough to allow the workers space to clean themselves and their equipment. It is positioned directly next to the work area so that all employees must enter and exit through it. The room must have a plastic-lined floor to keep any debris from spreading beyond the established area.

SETUP

Key Facts

Always wear a suit and respirator when you work with asbestos.

1. Put up warning signs and barriers at eye level.
2. Shut off the ventilation system.
3. Shut off the electrical system. Lock the electrical box.
4. Bring in extension cords and tape them up off the floor.
5. The decon has three rooms (starting from the work room): Dirty room (Equipment room) - Shower - Clean room.
6. Poly all doors, windows, air vents, pipe chases, and electrical outlets.
7. Clean everything in the room before you put up poly.
8. If you can't clean something, wrap it in poly, label it, and take it to an asbestos landfill.
9. Take out anything you can move.
10. If you can't take something out of the work room, seal it air-tight and watertight with poly and duct tape.
11. Set up the negative air machine at the other end of the room from the decon.
12. Tape one layer of poly on the floor, going up the walls one foot. Tape the edges of the poly to the walls.
13. Put one layer of poly on the walls. Tape the edges of the poly to the floor. Put another layer of poly on the floor and the walls.
14. Bring scaffolds and tools into the room before you build the decon.
15. Position the decontamination unit.

Discussion Questions

1. Why shouldn't the electricity be turned off at the wall switches?

2. Why are two layers of poly put on the floor?

3. Some state laws say you have to put plywood on the floor if you leave carpets on the floor when you remove asbestos. Why is this done?

4. You have to protect yourself from asbestos when you set up. What other dangers do you need to think about when setting up?

5. You are about to start a project where the material being removed is on the ceiling of a computer room and the computers cannot be shut down. How could you do the preparation of the work area?

6. You are working on an asbestos removal job in a multi-storied building. Several elevators run through the middle of the floor. What kinds of problems does this pose? What could you do to solve them?

For More Information

OSHA Asbestos Standard, 29 CFR 1926.1101, Appendix F, "Work Practices and Engineering Controls for Major Asbestos Removal."

Georgia Tech Research Institute, Chapter VI, "Pre-Work Activities and Considerations" and "Preparing the Work Area and Establishing the Decontamination Unit" in "Model Curriculum for Training Asbestos Abatement Contractors and Supervisors," available from National Technical Information Services, (703) 487-4650.

EPA, "Guidance For Controlling Asbestos-Containing Materials in Buildings," ("Purple Book") EPA Publication No. EPA 560/5-85-024.

National Institute of Building Sciences, "Temporary Enclosures," in Model Asbestos Abatement Guide Specification, Section 01526.

CLASS I & II
ASBESTOS REMOVAL

Work Methods ...

Ed: Hey! Slow down up there! You 're scraping that plaster off faster than I can bag it!

Jeff: Don't worry. Just bag as fast as you can. I'll help you clean up the rest as soon as I finish the ceiling.

Ed: But the longer we leave the asbestos on the floor the more fibers will get into the air.

Jeff: No problem. Your respirator will protect you.

Ed: Respirators will only protect you so much. You really need to slow down.

Jeff: Listen. My job is to do the scraping. If you can't keep up, that's **your** problem.

Discussion Questions

(Choose one or two of the following questions to discuss.)

1. Who is right, Ed or Jeff?

2. Is there anything wrong with leaving asbestos waste on the floor instead of bagging it right away?

3. Why should you be concerned about stirring up fibers if you are wearing a respirator?

4. Do you agree or disagree with the following statements?
   Why or Why not?
   - ➢ Ed should work faster to keep up with Jeff. **(Yes/No)** _____
   - ➢ Jeff should slow down so Ed can keep up. **(Yes/No)** _____
   - ➢ Ed should have a partner to help him clean up faster. **(Yes/No)** _____

5. Why do you think Jeff is in a hurry?

6. What could the supervisor do to make sure the asbestos is bagged as soon as it is scraped?

Class I Removal

Four basic rules for working with asbestos:

- ✧ **Keep the asbestos wet;**
- ✧ **Contain the work area ;**
- ✧ **Filter the air; and**
- ✧ **Use negative air pressure**.

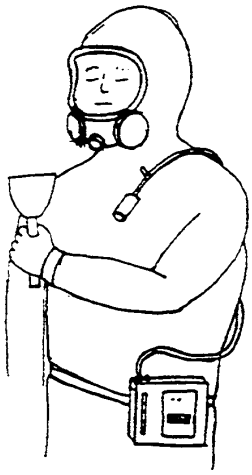
Good setup makes the work of taking the asbestos off the ceiling much easier. **Taking off asbestos safely means using the basic rules we've talked about all through this manual.** You have to keep the asbestos wet, contain the work area, filter the air, and use negative air pressure. You also have to use respirators that fit right and disposable suits.

Entering the Work Room

When you go into the work room, start in the clean room of the decon. In the clean room, take your street clothes off. Put them in a locker. Inspect your respirator. Put it on and do the negative and positive pressure seal checks. Make sure your respirator fits.

Inspect your suit and put it on. Use duct tape to make it fit right so you won't trip over it. Pull the hood of the suit over the respirator straps. Tighten the hood around your face.

Walk through the shower room into the dirty room. Put on any gear stored there. You might put on boots, hard hats, or a belt for your respirator hose. Pick up scrapers, squeegees, and other tools. If you are using a Type C respirator, the hookup is usually in the decon.

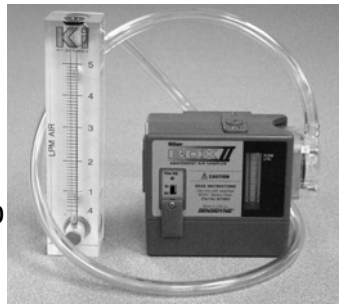


AIR SAMPLING PUMP

Some workers will put on pumps. These are called personal air sampling pumps. At least one worker doing each type of job should wear an air sampling pump. They are small air pumps that you wear on your belt. A hose goes over your shoulder. A small paper filter clips on your collar. The filter faces down. The pump pulls air through the filter. The pump should be on all the time you are working. Asbestos in the air is caught on the filter. Your employer sends the filter to a lab. The lab tells him how many fibers are in the air when you are working.

Never touch the filter when you are working. This will interfere with the air sample. You need good air samples to be sure you are wearing the right respirator.

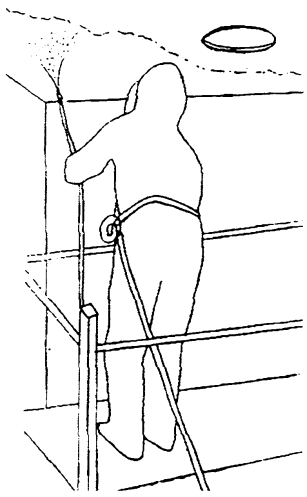
Personal air sampling tells you how much asbestos is in the air. Then your supervisor will decide which respirator you will wear. When there is more asbestos in the air, you have to wear a respirator with a higher Protection Factor.



Personal Air Sampling Pump with Calibrating Rotameter

Keep the Asbestos Wet

The first step in taking off the asbestos is getting it wet. Wet the asbestos before you remove it, while you remove it, and after you remove it.

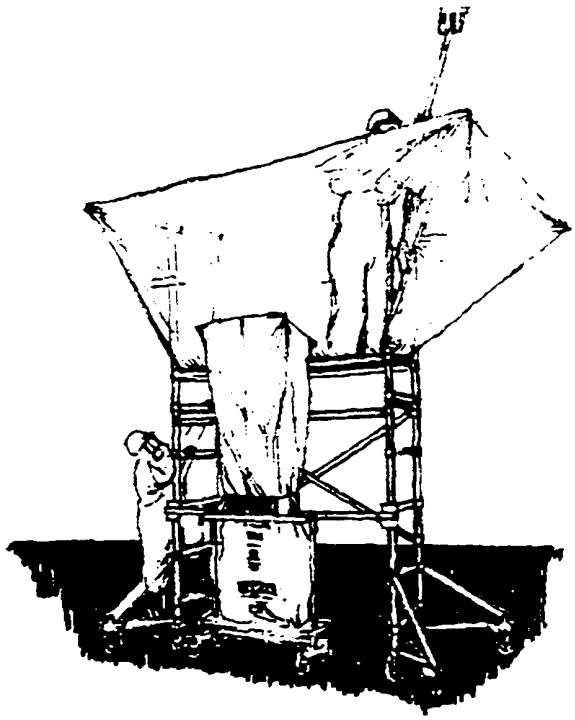


KEEP THE ASBESTOS WET!

Use a low pressure sprayer or a garden sprayer. Amended water is water that has a surfactant, a detergent, added to it. Amended water soaks the asbestos better than plain water. The asbestos may turn a darker color or swell a bit. Sometimes asbestos is in a paper cover. Make a small hole in the paper and spray water inside it.

At least one worker should wet the asbestos as the work goes on. He or she should make sure that the asbestos on the ceilings, pipes, etc., is really wet. The worker should mist the air as the work goes on. Drops of water will catch the asbestos in the air and pull it down to the floor. The worker should wet the asbestos on the floor until it is put in bags.

Don't use too much water. The work area should be damp, not flooded. If you use too much water, it will make puddles on the floor. The water could leak through the poly or make someone slip. Remember that water will not soak into amosite asbestos. **Never use water on live electrical lines. You could get a bad shock. Never use water on a hot steam line. The water could boil and burn you.** At least one sprayer on each shift should wear an air sampling pump.



Scraping

Once the asbestos is wet, it is usually the texture of cooked oatmeal. You can easily scrape it off with metal or plastic scrapers. You may have to use ladders, scaffolds, or long-handled scrapers to get to the asbestos. It is safer to use a scraper with a long handle than to stand on a scaffold.

Take asbestos off pipes with scrapers and utility knives. You may

need snips to cut wire or metal bands. Chicken wire can be sharp. Use the right tool to cut the metal. You can burn yourself on a hot pipe. Wear gloves to protect your hands. Asbestos may be in wire lath, which is heavy and sharp. You may need a hard hat or steel-toed boots to protect you from falling material or tools.

As you take asbestos off, don't throw it. Don't drop it more than 10 feet. If you work on a high ceiling, bag the asbestos on the scaffold or lower it to the ground.

Never use an air gun to blow the asbestos off. Scrape it or cut it off. Some contractors now use water guns on high ceilings. Water guns have some problems. Air samples show that they blow a lot of asbestos into the air. High-pressure water or air can force the asbestos into cracks or blow it out of the work room.

After you scrape off the big pieces, there will still be some asbestos on the ceiling. Use a nylon brush to take off all the asbestos. **Wire brushes break the asbestos into smaller, more dangerous fibers.** Be sure to scrub off all the asbestos. Wipe the surface with a damp rag until you can't see any asbestos. At least one scraper on each shift should wear an air sampling pump.

Bagging

A few workers will use **plastic** shovels and squeegees to bag the asbestos as it is taken down. (Metal shovels can rip the poly.) Be sure the asbestos is wet when you put it in the bag. **Bagging asbestos right away is one of the best ways to keep asbestos out of the air.**

Asbestos must be put in sealed containers (bags or drums) with warning labels. The asbestos will dry out if it sits on the floor or piles up. When workers walk through it, a lot of asbestos will get in the air.

When you bag asbestos, use the following process:

1. **Tape the bag**
   Use a HEPA vac to pull the air out of the bag. Then twist the top of the bag. Tape around it.

2. **Gooseneck the Bag**
   Double the top of the bag back on itself. Tape

around it again. This is called **"goosenecking"** the bag. Tying a knot in the top of the bag will not make a water-tight seal.

3. **Use Double-bagging**
   On the job, workers usually put one bag inside another. If the first bag breaks, asbestos won't leak out. This is called **double-bagging.**

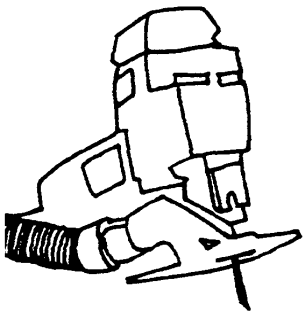
Put sharp metal lath in cardboard drums. Wrap large pieces of waste (like carpets) in two layers of poly and tape them up. Put a label on the poly.

Keep the floor dry so that workers won't slip. Use a wet/dry HEPA vac to pick up small amounts of asbestos and water. (Water will ruin a dry HEPA vac.) At least one worker bagging asbestos on each shift should wear an air sampling pump.

Special Tools

Use plastic or wood tools, such as scrapers, shovels, and squeegees. Metal tools can rip the poly. They can also cause electric shocks.

Use special power tools on an asbestos job. They must have a HEPA vac attached. (This is called local ventilation or local exhaust ventilation.) Never use a regular shop vacuum. You should not use a regular drill, saw, or other power tool. All tools should have HEPA vacuums attached to them.



SPECIAL TOOLS

Power tools should be double-insulated. They should also be grounded. This means they won't shock you, even if they are wet.

Filters in the negative air machine need to be changed many times a day. Be sure they are wet before you put them in a waste bag.

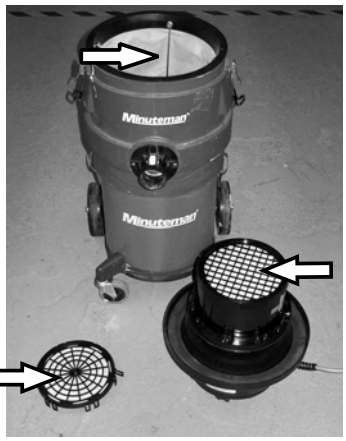
Always wear your respirator and suit inside the work room. If your suit tears, fix it with duct tape. If you have to put on a new suit, you must decontaminate first. **You may not eat, drink, chew gum, chew tobacco, or smoke in the work room.** To do that, you would have to take your respirator off. **Don't do it!**

Air Samples

Your employer must take 8-hour air samples from some workers on every shift. (There are a few exceptions.) Your employer has to know how much asbestos is in the air under the worst conditions. Usually, 1/4 of the workers wear sampling pumps each day.

Personal air samples also tell you whether you're doing the work right (keeping asbestos out of the air). If air samples show a lot of asbestos in the air, you should be sure that the asbestos is really wet, that the negative air machine is working, and that asbestos isn't piling up on the floor.

Building owners sometimes take air samples outside the work room. They want to know if asbestos is leaking out of the work room. These are called area air samples. You may see air sampling pumps outside of the clean room. You may also see them outside the negative air machine or outside the building. **Even if your employer takes area air samples, the employer also has to sample workers.**



The three filters of a HEPA vacuum.

Clean Up Every Day

Clean all of the asbestos off the floor at the end of every day. Use wet rags and HEPA vacuums to clean the poly. It is easy to rip poly. Shovels, scaffolds, equipment, and tools can all rip the poly on the floor. A supervisor must check the poly at the end of every day and fix any rips or holes right away.

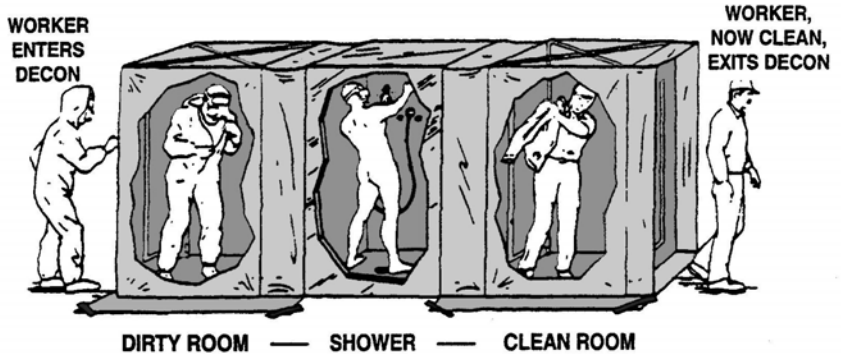
Decontamination

You must go through decontamination every time you leave the work room. When you leave the work room, clean off your suit and respirator. In the decon take off your suit, take a shower, and wash your respirator. Leave the asbestos behind you.

In the work room, clean off your suit with a damp rag. Go into the dirty room (this is also called the **equipment room**). Take off your hard hat, boots, and any other dirty equipment. Take off your air sampling pump and turn it off. Wipe off your equipment and leave it in the dirty room.

Take off your suit carefully and throw it out. Fold it inside out as you take it off. Try to keep the asbestos on the suit and off your skin. Leave your respirator on, and get into the shower.

Wash off the outside of your respirator. Rinse your face and the rest of your body. Take the dirty, wet filters off your respirator and throw them out. You can also put tape on the outside of the filters and put the filters in a bag. Remember that water destroys HEPA filters. If your filters get wet, you must throw them out. Take off your respirator and wash it with soap and water. Wash your body and your hair with soap and water. In the clean room, put on street clothes or another disposable suit.



The shower must have warm water, towels, and soap. There must be one shower for every ten workers. If men and women both work on the job, they will shower separately.

You must decontaminate every time you leave the work room. Every time you take a break, you must decontaminate. Every time you go to the bathroom, wash your face, eat, drink, or smoke a cigarette, you must decontaminate. You must throw out your suit, wash your respirator, and take a shower. On the way back in, you have to put on another suit. You can't take short cuts with decontamination. You may decontaminate four or more times each day.

At the end of the day, clean the decon. Use wet rags and HEPA vacuums. Clean up any asbestos you can see. Seal up the bag with dirty suits and respirator filters. The clean room should be wet-wiped each day.

Air Sampling

At the end of the day the filters from the air sampling pumps go to a lab. At the lab, the technician cuts a small piece of the filter. The technician dissolves the filter and counts the asbestos fibers under a microscope. The microscope is called a **Phase Contrast Microscope (PCM).**

The lab sends your employer a report of the results. The report has the number of asbestos fibers per cubic centimeter of air (fibers per cc or f/cc). **Your employer must post the air sampling results as soon as he or she gets them from the lab.** Here's an example of a lab report.

Received: 02/27/94
SAMPLE ID: AH-129

ABC ANALYTICAL LAB, INC. REPORT

NAME: Asbestos Air Sample Analysis
DATE ANALYZE : 02/28/94 ANALYST: Christopher VERIFIED BY: LAL

Sample Number	Location	Sample Duration (Minutes)	Sample Volume (Liters)	Total Fiber Concentration (f/cc)
ASD-267	Personal sample, inside enclosure, on W. Mata scraping and bagging.	30	59	2.75
ASD-268	Personal sample, inside enclosure, on P. Moses bagging and wetting.	388	577	1.07
ASD-269	Personal sample, inside enclosure, on L. Lane cleaning and spraying.	365	601	0.32
ASD-270	Personal sample, inside enclosure, on J. Cromley scraping.	379	598	3.50

In this example, an employer sent some air samples to a lab. The lab reported how much asbestos was in the air for each worker. The numbers on the right show the number of fibers per cc. The second column from the left shows who the sample was taken from. The first sample was taken from Mr. W. Mata. His sample had 2.75 fiber of asbestos per cc in it. He was scraping asbestos and bagging it.

Asbestos Cleanup Jobs

Most asbestos jobs are planned ahead of time. But sometimes you may work on a job that wasn't planned. If there is an accident – a fire, or a flood, or a ceiling falls in – you may have to go and clean up the asbestos. The building owner has to shut off the ventilation and electricity as soon as the accident happens. The building owner must also get people out of the area and put up OSHA signs to keep non-workers out.

If you clean up an asbestos spill, you can't just walk in and put up poly.

You have to make sure that the building will stay up while you take out the asbestos. Is the electricity shut off? Is the fire totally out? Once you are sure the building is safe, then you can think about the asbestos. After you set up, the job will look just like any other removal job. You will have to put up plastic, build a decon, and run a negative air machine. You must wear a respirator and a suit. There may be a lot of asbestos in the air. You might wear a Type C respirator.

When you come in, there will probably be dry asbestos all over the floor. Everyone must wear suits and respirators while setting up. Build the decon before you handle any asbestos. The first step is to get the asbestos wet. Bag some of the asbestos to make room to walk around in. Cover the air vents and set up a negative air machine. You may have to build barriers if the room opens up into a hallway. After that, take out the asbestos, just like any other job.

If you are already on the job and a lot of asbestos falls down, get it wet right away. Stop all the other work and bag up the asbestos.

The Competent Person

One of the most important people on an asbestos job is the "competent person." **By law, your employer has to have one person on every shift who makes sure that rules are followed.** The competent person is always a supervisor. This person must be certified as an EPA- or state-approved asbestos contractor/supervisor.

The competent person must make sure that no one but trained workers are on the job. The competent person must make sure that everyone wears respirators and suits. This person must make sure that there are enough suits, duct tape, respirator filters, and other supplies.

The competent person must supervise setup. The competent person must make sure that the negative air machine is working. The competent person must check the work room to make sure that the poly stays up. He or she must make sure that everyone goes through decontamination. This person must make sure that rules about eating, drinking and smoking on the job are followed. If the competent person on your shift is well-trained, he or she will be a good source of information. **You may have questions about how to do the work safely. You should be able to go to the competent person and get the answers.**

What You Can Do To Work Safely

There are many things your employer has to do to make the work safer.

Your employer has to give you the right respirator and tools. He or she has to set up the work room correctly. Your employer has to run the negative air machine.

But **there are also a lot of things you have to do to keep yourself safe.** Always wear your respirator. Keep it in good shape. Do your seal checks. Wear your suit and a hard hat if you need one. Clean yourself off carefully in the decon. Don't take asbestos home with you. You are the only one who can do these things. **The difference between doing a good job and doing a sloppy job could cost you your health.**

Class II Asbestos Removal

Removal of ACM that is not thermal system insulation or surfacing material is considered Class II asbestos work. The OSHA asbestos standard requires specific methods and controls for each type of Class II material. These materials include the following:

- floor tile and sheeting;
- roofing and siding shingles;
- wallboard and ceiling tiles;
- gaskets; and
- construction mastics.

In addition to the specific requirements for each type of material, there are several general requirements for any Class II asbestos work.

1. All work must be supervised by a competent person.
2. ACM must be wetted down before it is worked on.

Listed below are brief descriptions of how to remove each type of Class II material.

1. Removal of Vinyl Asbestos Tile (VAT) and Sheeting

When removing VAT or asbestos sheeting, you should begin by wet mopping the area with amended water. This will help to keep asbestos dust levels down. Tiles should be removed whole whenever possible. (When using heat to remove tiles whole, wetting is not required.) Be careful of damaged tiles. They often chip during removal. Keep all damaged tiles wet until you can dispose of them properly. Asbestos sheeting is removed by cutting while continuously wetting. Ripping-up of asbestos sheeting is prohibited. Sanding

of any asbestos flooring material is also prohibited.

Use heat, dry ice, or a solvent to more easily remove whole tiles. Heat (infrared) equipment melts the mastic. Dry ice cools the glue so the tile pops away from the mastic. Solvents remove the mastic itself. All scraping of residual mastic or backing must be done using amended water. All of these methods keep dust out of the air, but be careful when you use them. They may present other, more immediate hazards than asbestos exposure. Dry ice can produce carbon dioxide, which can be dangerous in an enclosed space. Solvents can be inhaled and absorbed through your skin. Use appropriate protective equipment and avoid solvents with methylene chloride or trichloroethylene.

Although not all flooring was made with asbestos, the law requires **all** resilient flooring material, including its mastic and backing, to be treated as ACM. The exception to this rule is when the material has been tested and shown to be asbestos free.

2. Removal of Asbestos Containing Roofing Material

Most asbestos containing roofing material is non-friable. However, in order to remove it, you may have to cut into the material. This will create asbestos dust. For this reason, precautions must be taken to minimize the amount of dust released into the air.

Remove the Material Intact

The less cutting, chipping, and sawing of roofing materials, the better. As much as is possible, roofing shingles, felt, flashing, and other materials should be removed whole.

Wet the Material

Like other Class II asbestos jobs, the use of amended water is a primary means of reducing dust. On a roof though, water may present a serious fall hazard. Care must be taken to insure the safety of the workers. This may mean less water can be used. Additionally, use of too much water may damage the deck or room below. It is a good idea to install a shut off valve on the hose at the roof level. This way you can turn the water on and off from the roof. Place a misting attachment at the end of the nozzle to break the water into smaller droplets.

Use a Special Roof Cutter

Roofers have roof cutters specially designed for asbestos projects. This is important because roofing felts can contain high levels of asbestos. The cutter should have a skirt over the blade guard to keep the dust inside. The skirt will often rip and will have to be replaced. Before using the cutter, remove all non-asbestos debris from the roof. This includes rock, gravel, and any other debris.

The special cutter must have a mister attachment to spray amended water on the surface of the material and the cutting edge. In addition to keeping most of the dust out of the air, the water also helps the cutter blade last longer. A 5-gallon tank of amended water on top of the cutter will last for half a day.

HEPA vacuums must be used to collect all loose dust. HEPA vacuums attached to roof cutters fill up very quickly due to the large amounts of non-asbestos dust found on roofs. The vacuum has to be emptied every half hour. The filters on the HEPA vac may have to be changed more often than on an inside job.

Contain the Debris

Waste debris should be wrapped in plastic sheeting and lowered to the ground by the end of the shift. If the waste is not wrapped, it must be lowered to the ground in an enclosed chute or crane immediately after removal.

3. Removal of Asbestos-containing Siding, Shingles, and Transite Panels

Before removal, each panel or shingle must be wetted down with amended water. This is the primary way in which fibers are kept out of the air when working with these materials.

These materials should always be removed intact. Cutting, abrading, or breaking of the siding, shingles, or panels is not permitted unless the employer can demonstrate that there is no other way to remove the material.

Use HEPA-equipped Tools ...

If you have to cut, abrade, or break non-friable asbestos materials, it is even more important to keep dust levels down. HEPA-equipped power tools can catch the asbestos fibers as they

are released. Wetting the material prior to cutting or drilling helps keep asbestos out of the air.

Most power tools used to work on asbestos materials can be fitted with a hood or shroud. The hood connects to a HEPA vacuum, which sucks up the asbestos dust created by the tool. These tools include:

- ✔ Jigsaws
- ✔ Drills
- ✔ Circular saws
- ✔ Cast cutters

Contain the Debris

Panels and shingles should be wrapped in plastic sheeting and lowered to the ground by the end of the shift. If the waste is not wrapped, it must be lowered to the ground in an enclosed chute or crane immediately after removal.

REMOVAL

Key Facts

Protection
Use good work methods-keep the asbestos wet, contain the work area, use negative air pressure, and use HEPA filters. Use respirators that fit right and disposable suits. Do negative and positive pressure fit checks before you go in the work room. Never take your respirator off inside the work room.

Removal
Wet the asbestos and keep it wet. Do not use metal scrapers, brushes, or shovels. Do not use vacuum cleaners or power tools unless they are equipped with HEPA-vacuums. Do not drop asbestos. Keep asbestos out of the air by wetting the air.

Waste disposal
Keep asbestos out of the air by bagging it as soon as possible. Use waste bags with warning labels. Pull all the air out of the bag and gooseneck it.

Decontamination
Enter and leave through the decon. You must decontaminate yourself every time you leave the work room.

Class II Removal
Remove the material intact whenever possible.
Wet the material before removal whenever possible.

Setup and Decon Exercise

This is not a test. It is an exercise. Use it to see for yourself how well you understand the material in the chapter.

1. Why do you contain the work area?

2. How do you do it?

3. In what order do you cover the work area with poly?

4. Where is the equipment (dirty) room?

5. What happens in the equipment room?

Discussion Questions

1. Why do you put colored chalk under the seams between sheets of poly on the floor?

2. Why do you put tape or wood over poly on stairs in the work area ?

3. There are some jobs where you need to be extra careful. If you know about good work methods, how to wear a respirator, and how to understand air sampling results, you can figure out what to do on an unusual job. Here are a few examples which you can use for discussion:
   - ➢ Amosite asbestos;
   - ➢ Can't shut off electricity;
   - ➢ Working equipment in the work room; or
   - ➢ Taking off part of the asbestos in a large room (like taking off half of the ceiling from a whole warehouse).

For More Information

OSHA Asbestos Standard, 29 CFR 1926.1101, Appendix F, "Work Practices and Engineering Controls for Major Asbestos Removal...."

Georgia Tech Research Institute, Chapter XI, "Confining and Minimizing Airborne Fibers," in "Model Curriculum for Training Asbestos Abatement Contractors and Supervisors," available from National Technical Information Services, (703) 487-4650.

EPA, "Guidance For Controlling Asbestos-Containing Materials in Buildings," (the "Purple Book"), EPA Publication No. EPA 560/5-85-024.

National Institute of Building Sciences, "Removal of Asbestos Containing Materials" (Section 02081), "Building Demolition: Asbestos Abatement" (Section 02051), and "Resilient Floor Removal" (Sections 02085 and 02087), in Model Asbestos Abatement Guide Specifications.

MAINTENANCE-RELATED REMOVAL–– MINI-ENCLOSURES AND GLOVEBAGS

Maintenance-related Removal ...

Supervisor: We need to replace one of the hangers on the sprinkler pipe above the ceiling tiles. Help me set up a mini-enclosure.

Brian: I think we need to enclose the whole room, don't we?

Supervisor: That's not necessary. The mini-enclosure will be big enough for the job. We'll use a HEPA-vacuum to maintain negative air pressure. Make sure you wet the asbestos down well and wear two suits and a respirator. We'll do everything we do in a regular enclosure. It will just be in a smaller area.

Brian: I've never seen that done. I'm not sure it's safe.

Supervisor: I've just explained to you why the mini-enclosure is safe. Come on. I haven't got all day!

Discussions Questions

(Choose one or two of the following questions to discuss.)

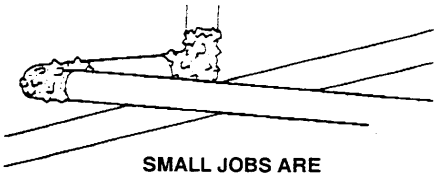
1. Who do you think is right, Brian or the supervisor?
2. When is it OK to use a mini-enclosure?
3. What are the principles you should use when working in a mini-enclosure?
4. Should Brian be trained in how to use a mini-enclosure before being required to do the work?

Class III (small) Asbestos Jobs

When you take asbestos off a whole ceiling, you need to cover the whole room with poly. You also need to do this for a whole run of pipes or air ducts, or a whole wall or floor. You need to put up poly, build a decon, and set up a negative air machine.

But there are lots of jobs where you only need to take off a little asbestos. It would be silly to cover a whole room with plastic just to take asbestos cement off one pipe elbow. **But you still need to protect yourself and others from the asbestos.**

You can use a mini-enclosure (a plastic closet) or a glovebag (a plastic bag with gloves built in) to do a small job. Small jobs are usually repair jobs.


SMALL JOBS ARE USUALLY REPAIR JOBS

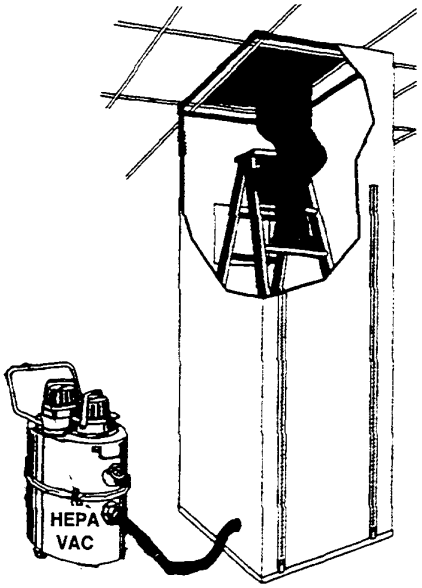
When you do a small job you must **keep the asbestos wet, contain the work area, filter the air, and use negative air pressure. Protect yourself with respirators that fit right and disposable suits.** On a small job, you just apply these work methods in different ways.

Mini-enclosures

How do you take off a small patch of asbestos to hang a sprinkler pipe? You don't have to build a full room. You can build a tiny work room, a mini-enclosure, without a decon.

A mini-enclosure is also good for --

- ✔ Taking off the insulation around one electrical box.
- ✔ Taking off the insulation around one outlet.
- ✔ Taking off ceiling insulation to put up lights.



A mini-enclosure looks like a plastic closet. Line a wood frame with two layers of plastic or attach the plastic to a part of the ceiling that is not covered with asbestos. There are also mini-enclosures that have metal frames with springs.

When you use a mini-enclosure, follow the same four basic rules as on a large job: keep the asbestos wet; contain the work area; filter the air; and use negative air pressure. With a mini-enclosure, use a HEPA vac for negative air pressure.

A small job is a lot like a large job. Use two layers of poly on the floor and walls of the mini-enclosure. Just like any other asbestos job, you have to wet the asbestos. You have to put it in asbestos waste bags. You have to scrub the surface clean. You have to lock down the asbestos fibers you can't see with a lockdown sealant.

In a mini-enclosure, you need these tools:

- spray bottle with amended water;
- HEPA vacuum;
- labeled waste bag; and
- scrapers.

You may need these tools:

- ladder; and
- power tools with HEPA vacuums.

Since a mini-enclosure does not have a decon, wear two suits when you do the work. When you finish, clean off the outside suit with a HEPA vac or a damp rag. Stand on a piece of poly. Wipe off your respirator. Take the outside suit off and put it in an asbestos waste bag. Go to a shower wearing the inside suit and your respirator. Some mini-enclosures have a small change room.

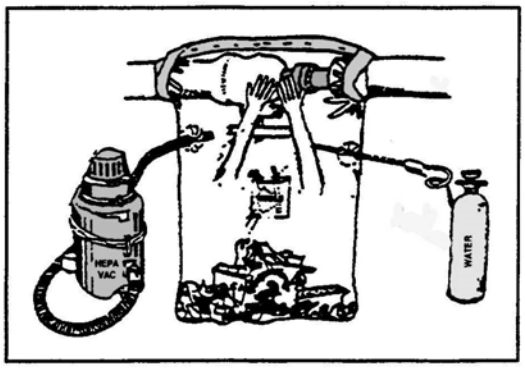
Use one or more HEPA vacs for negative air pressure in a mini-enclosure. The two main differences between a mini-enclosure and a large scale job are: **(1)** there is no decon; and **(2)** negative air pressure comes from a HEPA vac.

In a mini-enclosure:

- You still have to use respirators and protective suits.
- You can't eat or smoke.
- You have to put up warning signs and barriers.
- You have to use electricity safely.

Glovebags

A glovebag is a large plastic bag with gloves built into it. **Glovebags are good for taking off the insulation around a valve, pipe elbow, or pipe.** The asbestos inside the bag is contained. The bag is sealed air-tight to the pipe. Your bare hands never touch the asbestos. You do the work through the gloves. Use a garden sprayer and a HEPA vacuum to keep asbestos out of the air.



This section tells you how to use one glovebag to take off a small amount of asbestos. These small jobs are all maintenance jobs-you take off the asbestos so someone else can fix the pipe. If a contractor wants to use glovebags to take off a lot of asbestos, the contractor has to:

- Set up a negative air machine.
- Set up appropriate decontamination facilities.
- Take clearance air samples (in a school).

Glovebags come in many sizes and shapes. They are usually made of poly with latex gloves. They have a warning label printed on them. Some companies make glovebags from thicker poly. There are special glovebags for work on vertical pipes. There are glovebags for pipe elbows and glovebags with only one glove. **You may only use a glovebag only once and you cannot move or slide it along a pipe.** After you are done, throw it away with the asbestos.

A glovebag can only be used on a cool pipe. Poly burns at 150°F. Glovebags can usually be used on hot water pipes. They are usually about 140°F. **A glovebag cannot be used on pipe that is above 150°F.** Steam pipes are about 300°F. If you take asbestos off a steam pipe, turn the steam off, and let the pipe cool for at least 12 hours.

Glovebag Removal of Class I Material

If you are removing a small amount of thermal system insulation (TSI) using a glovebag, then a minimum of 2 people must do the work. In addition, both people must wear personal protective equipment, including respirators.

Glovebags are primarily used for maintenance-related repairs. A good rule of thumb for maintenance work is: if you have to take off more than 3 feet of insulation at a time, build a mini-enclosure. Many employers use glovebags instead of building a work room. This is illegal, and your employer can be fined for it.

The typical glovebag is open at the top and has a tool pouch inside the bag. Cut the sides of the bag at the top. Attach the top of the bag to the pipe with duct tape. Then put your hands inside the gloves and take off the asbestos. Asbestos doesn't get into the air because it is trapped inside the bag. **When you are done, pull the air out of the glovebag with a HEPA vac. Throw out the glovebag in a sealed asbestos waste bag.**

Just like a large job, 40% of a glovebag job is preparation:

1. Put up barrier tape and warning signs.
2. Put on a respirator. A PAPR is better than a half-mask, air-purifying respirator.
3. Put on a disposable suit.
4. Tape plastic over the heating and ventilating system.
5. Clean the area.
6. Put a piece of poly on the floor.
7. Put all tools and materials inside the glovebag.
8. Apply duct tape to the section of pipe the glovebag will be attached to.
9. Attach the glovebag to the tape on the pipe creating an airtight seal.
10. Attach a HEPA vacuum cleaner to the glovebag (negative air).
11. Attach a low-pressure water sprayer to the glovebag.
12. Smoke-test the bag.

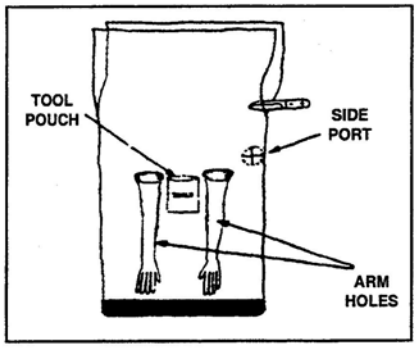
When you use a glovebag, follow the same rules you do on a large job: **keep the asbestos wet, contain the work area, filter the air, and use negative air pressure.** With a glovebag, the bag contains the work and a HEPA vac supplies the negative air pressure.

Just like a large job, you need to clean the pipe until all the asbestos is gone. Wash the area to clean off any asbestos. Spray a lockdown sealant. Cover up the edge of the insulation where you cut it. Put the asbestos in a sealed, labeled waste bag.

The following illustrations go through a glovebag job step by step. Use any combination of duct tape, staples, or spray glue to seal up the bag, as long as it is sealed totally air-tight.

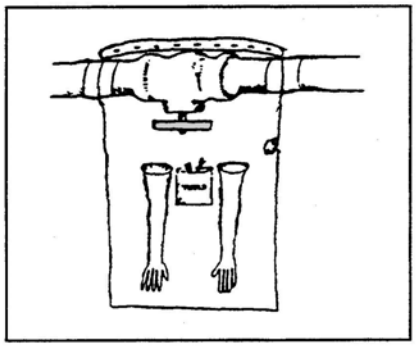
1. Inspect the bag. Tape any holes or tears.

2. Use duct tape to strengthen the bottom of the bag. Cut a slit about 12 inches down each side of the bag.



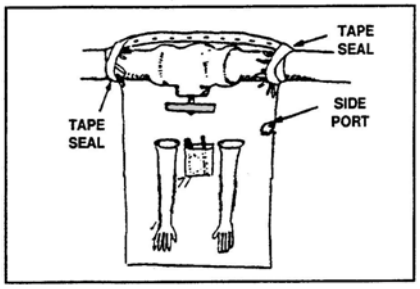
3. Put a knife, nylon bristle brush, lockdown sealant, encapsulant, and other tools inside the tool pouch.

4. Put tape around the pipe where you will attach the bag.



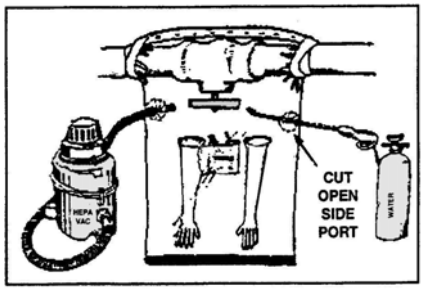
5. Fold down the top edge of the bag about one inch. Staple or glue it shut. Fold the sealed edge down again. Tape over the seam and all the staples.

6. Fold in the sides of the bag about one inch, and glue or staple. Tape over the side seams and all the staples.



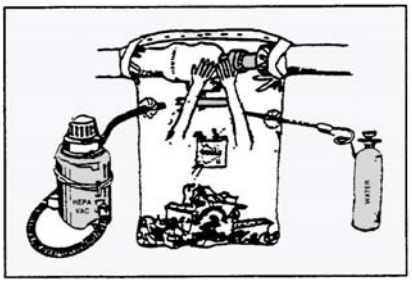
7. Tape the sealed bag onto the tape on the pipe.

8. Tape the nozzle of the garden sprayer into the side of the bag. Tape the nozzle of the HEPA vac into the other side of the bag.



9. Puff chemical smoke into the bag to check for leaks. Squeeze the bag to move the smoke around in the bag. Fix any leaks.

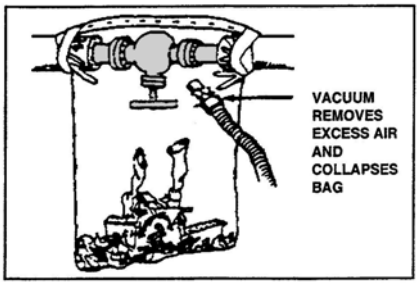
10. Wet the asbestos with amended water. Cut the asbestos off the pipe carefully. Lower it to the bottom of the glovebag.



11. Brush off all the asbestos that's stuck to the pipe.

12. Rinse all the asbestos off the pipe. Rinse the sides of the bag.

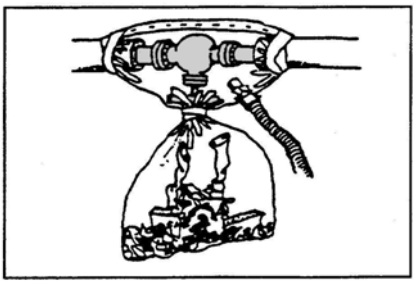
13. Spray a lockdown sealant to seal the fibers you can't see onto the pipe.



14. Seal the cut edge of the insulation with encapsulant (paint).

15. Grab the tools in your hands, and pull the gloves inside out. Turn on the HEPA vac and pull the air out of the bag.

16. Twist the gloves (with the tools inside) and tape them shut with two pieces of tape. Cut the gloves off the bag.



17. Turn the vacuum on again. Twist the bottom of the glovebag shut. Put tape around the twist.

18. Cut the tape holding the vacuum hose and sprayer hose onto the bag.

19. Put a waste bag under the glovebag. With the vacuum on, carefully cut the glovebag off the pipe. Lower it into the waste bag.

20. Use the vacuum to pull the air out of the waste bag. Twist the waste bag shut. Remove the HEPA vac and tape the bag shut.

21. Fold over the top of the waste bag, and tape it down (gooseneck the bag).

Open up the gloves in a bucket of soapy water. Clean the tools. Take the poly off the floor and air vents. Seal up the poly, gloves, suit, and respirator filters in a waste bag.

Problems with Glovebags

There are some problems with glovebags. It can be clumsy to use your hands inside the gloves. When the bags get wet, it is hard to see the pipe inside. If the pipe is hot, the bag can fog up. A glovebag can melt on a hot pipe. The seams on the bags can leak. The gloves can tear off. Glovebags work well if the work is done right. But this is often not the case.

Whether you use a mini-enclosure or a glovebag, do all the same things you do on a large job to keep asbestos out of the air. On a small job, you just adapt those methods. Instead of a negative air machine, use a HEPA vac for negative air pressure. Instead of a decon, use a HEPA vac and damp rags to clean yourself off. Then take a shower.

Repairing Asbestos

Another kind of maintenance-related work is repairing asbestos. It is usually the pipe covering or jacket that is repaired, not the friable asbestos itself. (Sprayed-on insulation can't be repaired.) **You must wear a respirator when doing repairs.** You may need to wear a suit, especially if you are working in a dirty boiler room.

Repairs are usually done by putting a canvas or fiberglass patch over the torn jacket or covering. Mastic (glue) is then painted over the patch. You may use fiberglass that has glue already in it. Dipping the patch in water activates the glue. You may also use caulk or plaster to repair hard materials.

It is possible to do repairs inside a glovebag or mini-enclosure. For large repairs (more than 3 feet long or 3 feet square), use negative air pressure, put poly on the walls and floor, and build a decon. **A large-scale repair is just like any large job.** If you have to remove crumbling plaster or other materials to do a small repair, use a mini-enclosure.

Use a HEPA vacuum to clean any dust off the surface. Mist the torn covering with water. Be careful not to tear the asbestos or the covering. Work carefully and make the patch air-tight.

MAINTENANCE-RELATED REMOVAL

Key Facts

To take off small amounts of asbestos, follow the same rules you do on a large job:

- Keep the asbestos wet;
- Contain the work;
- Filter the air with HEPA filters; and
- Use a HEPA vacuum for negative air pressure.

When you work on a small job, you must wear a respirator and you should wear a disposable suit.

A mini-enclosure is the same as a full containment without a full decontamination unit.

Use HEPA vacuums for negative pressure in a mini-enclosure.

In a mini-enclosure, wear two disposable suits. Clean the outside suit off with a damp rag and a HEPA vac. Go to a shower wearing the inside suit.

You can only use a glovebag on a pipe or column.

A glovebag cannot be used on a pipe above 150°F.

With a glovebag, your hands never touch the asbestos inside the bag.

When you are done, pull the air out of the glovebag with a HEPA vacuum.

Throw out the glovebag in a sealed asbestos waste bag.

GLOVE BAG EXERCISE

This is not a test. It is an exercise on the use of the glove bag. Use it to see for yourself how well you understand the procedures for safely doing glove bag removal of asbestos insulation. Read over all of the steps below. Put these steps in order by writing a number in the space before each item to show the order in which each step would be performed.

Setup

_____Put tape around the pipe where you will attach the bag. Staple and tape the glove bag closed. Tape the bag to the tape on the pipe.

_____Reinforce the bottom of the bag with tape. Cut about a foot down the sides of the glove bag. Place tools in the pouch inside.

_____Put on a respirator and disposable suit. Do negative and positive pressure fit checks.

_____Put up barrier tape and hang asbestos warning signs.

_____Cut two small holes in the bag and insert the nozzles of the HEPA vac and the sprayer. Seal the openings with duct tape. Smoke test the bag to insure that it is sealed air-tight.

_____Lay a plastic drop cloth under the area in which the work is to be done.

Removal

_____Break the insulation away from the pipe and lower it to the bottom of the bag.

_____Spray the inside of the bag with water to wash any asbestos to the bottom of the bag.

_____Spray the insulation with amended water, being sure to soak the area to be cut.

_____Cut the insulation with a saw at each end of the section to be removed. Cut it lengthwise along the bottom with a knife.

_____Put encapsulant paint on the cut edges of the asbestos on the pipe. Spray lockdown on the pipe and upper part of the bag.

_____Grab the tools in your hands and pull the gloves inside out. Twist the sleeve and tie it off with duct tape. Cut the sleeve in the middle of the tape. Put the sleeve containing the tools in the next glove bag to be used or open it in a pail of water for cleaning.

_____Spray, scrub, and wipe the exposed pipe to remove any asbestos on the pipe. Use a brush with nylon or fiber bristles.

_____Vacuum the work area and your clothes.

_____Remove rope and signs from the work area.

_____Remove the air in the bag by turning on the HEPA vacuum.

_____Twist the bag below the pipe and tape it closed.

_____Slip a large plastic disposal bag around the glove bag. Remove the glove bag from the pipe and fold it into the disposal bag. Carefully fold up the drop cloth and place it in the disposal bag.

_____Wipe your respirator with a damp cloth. Remove your suit inside out - and place it in a disposal bag with contaminated rags and used filters. Seal and label the bag for disposal.

Removing the glovebag after a repair.

Discussion Questions

1. When you use a HEPA vac for negative air pressure in a mini-enclosure, where do you put it? At the top of the mini-enclosure? At the bottom? In the decon room?

2. How do you use a mini-enclosure to string cables above a dropped ceiling? Do you need an enclosure at both ends? How can you set up negative air pressure?

3. What kind of enclosure would you use to take the asbestos off one small boiler in a large basement?

For More Information

OSHA Asbestos Standard, 29 CFR 1926.1101, Appendix G, "Work Practices and Engineering Controls for Small-Scale, Short-Duration Renovation."

Asbestos Operations and Maintenance Work Practices," National Institute of Building Sciences, Washington, DC. 1992

Using a bone-saw to remove pipe covering ACM – in a glovebag

CONTRACTORS/SUPERVISORS

PRE-WORK ACTIVITIES AND CONSIDERATIONS

ASSESSING THE WORK AREA

Never bid or accept an asbestos abatement project without first viewing and assessing the site. There is much valuable information to be gained during one of these assessments, including determining the size of the job (number of square feet or linear feet of asbestos-containing material – ACM) or examining the configuration of the ceiling surface and noting the accessibility for abatement of the material (irregular ceiling shape can increase the amount of ACM originally believed to be present). A site survey, or walk-through, also provides a basis upon which the contractor can formulate an effective abatement strategy for removal and/or control. Existing damage or potential problems (expensive rugs, light fixtures, fixed objects, etc.) need to be identified and procedures developed before work begins.

Check Analytical Results of Bulk Samples

The first questions that a contractor probably should ask during the pre-bid walk-through include:

1. Who did the initial survey?
2. What type of sampling was conducted?
3. What forms of analysis were used?

The contractor should ensure that appropriate bulk sampling was performed by qualified individuals using proper analytical methods.

1. Any inspections conducted in a school (K-12) or public and commercial buildings fall under the AHERA and ASHARA requirements respectively and must have been conducted by an **accredited inspector**.

2. AHERA regulations require that bulk sample analysis be done by laboratories accredited by the National Institute of Standards and Technology (NIST) **National Laboratory Accreditation Program (NLAP)**.

    a. Any bulk samples collected under the National Emission Standards for Hazardous Air Pollutants (NESHAP) must be analyzed using the **point counting method** under controlled conditions.

The contractor should review the analytical results of the bulk samples to determine the **types and percentages of asbestos present**. There are several reasons why this type of information will benefit the contractor.

1. The analytical reports provide excellent documentation that can be used in **establishing a project file**. This file can be used as a **source of reference** should any questions arise concerning the ACM in the building.

2. **Different types of asbestos will require various handling techniques.** Amosite is considered by some scientist to be more hazardous than chrysotile. It does not accept wetting agents as readily as other types of asbestos which usually results in higher fiber counts. Therefore, amosite may require different handling procedures. It is important to know what type(s) of asbestos is in the structure.

If analytical reports are not available prior to or during the walk-through, the contractor should obtain her or his own by including it as a part of the assessment. It is important that the information from these accredited lab reports be used as the main criteria on which to base decisions and not rely on word-of-mouth from a resident maintenance worker or other building occupant which could lead to confused facts or other misinformation.

Inspect the Nature of the Asbestos-Contaminated Material

The contractor should **determine the hardness and texture** of the ACM to be removed – it has to be touched – which would imply some PPE measures, including at least a half-mask APR with P100 filters. The contractor may also test a sample area of ACM to determine its ability to absorb amended water (a mixture of water and a surfactant/wetting agent). If

the material cannot absorb the amended water, other abatement strategies will be need to bedeveloped which may increase the cost and project time.

Check Accessibility of Material

The contractor should determine whether or not the ACM is accessible enough to remove. If not, alternative means of control, such as enclosure or encapsulation, might have to be used. Several factors that may enter into this determination are –

- ceiling height
- false ceilings
- pipes
- sprinklers
- ducts
- sloping floors
- fixed barriers

All of these considerations will affect the bidding price – upward.

Check for Difficulty Isolating the Work Area[1]

Is it possible to enclose the work area completely by using polyethylene (poly, plastic, or visqueen®)? Or, will other measures have to be implemented in certain area to adequately isolate the removal site? **In schools** it may be easiest to simply line the walls and floors with two (2) layers of poly since the contractor will usually remove all desks and chairs from the work area. However, in cases such as **a church, computer room, or industrial facility,** plywood and plastic enclosures may have to be constructed so that the materials left in the room will b not be contaminated by the asbestos removal activities or damaged by water.

Determine if Areas Adjacent to Abatement Activity Will be Occupied

If areas adjacent to the abatement activity will remain occupied, several important practices should be observed.

1. The **HVAC system** will need to be altered or the opening of the duct into the work area should be completely sealed off. If possible, the supply, return, and exhaust systems serving a specific work area should be shut down and disconnected. Sealing of the HVAC helps ensure that airborne fibers will not be drawn into the air return system and dispersed

[1] Work area = Regulated area

throughout adjacent areas while helping ensure that the area is under negative pressure.

2. An excess number of **negative air machines (NAMs)** will minimize the risk of loss of negative pressure and the ensuing asbestos fiber release to the occupied areas.

3. A qualified person should take **background air samples** before abatement work begins and then compare these background results with those results obtained in these same areas during and after the abatement work is completed.

Determine Room Volume and Natural Air Movement in the Work Area

During the pre-bid walk-through, consideration should be given to the **number and placement of negative air machines**. A calculation of the air volume in the work area is necessary for determining the number of units needed to achieve the required four (4) air exchanges per hour. Air flow also has to be factored in when deciding the placement of the NAMs.

Check Items Requiring Special Attention

During the walk-the contract will note special items like –

- wood paneling
- trophy cabinets
- glass piping
- carpets
- lab equipment
- dangerous chemicals
- electronic equipment
- elevators

When confronted with **wood paneling**, common sense should be used when hanging poly to enclose the work area. Care must be used when tacking up the plastic so that the paneling will not be damaged. Nails should be set between the panel strips in the natural gaps as near the ceiling as possible to prevent any small holes from being visible.

Trophy cases and other fixed or stationary storage cabinets that must remain in the work area during ACM removal require proper measures to ensure that the storage unit is adequately enclosed with **six (6) mil poly (also called "critical barriers")**. Special attention must to be given to the condition of all these cases and cabinets and their contents noted.

Glass piping is an item that contractors should note during the pre-bid walk- through because special procedures must be followed to ensure that it does not become damaged. These glass/ceramic pipes often contain hazardous materials (i.e., toxic and or explosive chemicals or products). Therefore, the pipes should be tagged and/or labeled per 29CFR1926.59 or 29CFR1910.1200 and the contractor's abatement workers will have to be trained about the pipe's contents as a part of their **Hazard Communication training**. These pipes are often found in the vicinity of other pipes which have asbestos-containing lagging on them. Some abatement areas may also be permit-required confined spaces (PRCS). If this is the case, then they will need to receive **PRCS training** under 29CFR1926 or 29CFR1910.146.

Determine Contractor's Responsibility Concerning Moveable Objects

Discuss with the owner or representative during the walk-through about **any equipment, furnishings, and fixtures that must be cleaned, moved, stored, and reinstalled or discarded and replaced.** If the contractor neglects this area, he or she may be in for some unanticipated high costs. Discussing the items below and any others that come to mind will help reduce misunderstandings and increased costs for all parties once the job has been bid.

1. Does contamination already exist which would require cleaning objects before moving?

2. Where are these items to be stored, and for how long?

3. Will the owner provide space in an area not being abated or must the contractor provide space (i.e., truck or rented space)?

4. Is reinstallation also, then, the responsibility of the contractor?

5. Is it more cost effective to discard some items (i.e., carpeting, light fixtures, contaminated fabrics, furniture, curtains)?

6. Is the contractor for replacement costs of damaged or broken items?

Carpeting. In most cases, carpeting should be removed completely from the area in which asbestos removal will be taking place. If carpet is specified for removal, **assess the difficulty of removing and disposal**.

Note Any Materials or Equipment Which Will Require Special Handling

Lab equipment and/or hazardous chemicals should be examined closely by the contractor during the pre-bid walk-through. It may be necessary to remove much of the equipment and/or materials from the work area before abatement activities take place. **If the contractor's employees will be moving expensive lab equipment of hazardous chemicals, the contractor has to ensure that all items are appropriately handled through training and direct supervision.** This work may be tedious and require extra time to complete.

Note Stationary Objects that Require Special Attention

As previously mentioned, if the abatement work area will be an area that contains **computers and/or electronics** which cannot be moved, other strategies must be developed such as building an elevated platform (plywood and plastic) over the computers and such.

The **elevator or shaft** can become contaminated with ACM or their movement can cause air displacement in the contaminated areas. The contractor will need to take special precautions to properly seal off the doors with six (6) mil poly and/or plywood and key the elevator not to stop at the floor(s) on which the abatement work is located.

Utilities

It is essential that the job specifications spell out exactly **who is to pay the utilities** used during the abatement project. Usually the building owner will pay these expenses but, if not, this should be clearly understood by both parties before work begins. Also, does the building have existing utilities or must the contractor provides these services? Finally, the **waste water filtration and disposal** method should be agreed upon and specified.

Existing Damage

Photographs, video, diagrams, lists, and tape recording can be used by the contractor to **document all existing damage** in areas where her or his employees will be working. The damage should include all surface damage (walls, tables, desks, etc.), vandalism, roof leaks, or other water damage. By using the list that was developed at the beginning of the project, the contractor can verify if the damages were existing – not a result of the contractor's work.

Safety Considerations

All electrical circuits and/or receptacles, cords, equipment, have to be considered. Since the work area in an asbestos abatement job will commonly contain **large amounts of water**, the potential for **electrical and slipping hazards** will be greatly increased. The use of **ladders and scaffolds** is likely. **Hot surfaces** from existing pipes is a major issues at industrial sites. The list can and does go on. During the pre-bid walk-through, the contractor has to have an eye on safety issues. Once the building owner is made aware of these and other situations, an appropriate plan of action can be agreed upon.

Work Area Configuration

The contractor, while walking through the proposed project, will be estimating **how much material (poly, plywood, lumber, piping, tape, and fasteners) if will take to enclose all the work/area**. And if elevated or upper floor work is to be done, man lifts and scissor lifts may have to be used during work are prep. Will there be occupants on site? Will there be residents and/or pedestrian flow around the site?

Decontamination Units

The **location and type of decontamination units with appropriate EPA-approved waste water filtration** must be used is a major consideration before submitting a bid. Will it be possible to have one central decon unit or will it be necessary to establish multiple units? Will a "decon-on-wheels be utilized? What building materials will be needed and what will it take to put it (them) up and take it down?

Air Monitoring

Is the person or persons conducting the air monitoring qualified and who will be paying for what monitoring is an important bid and specification provision. The building owner should always be responsible for daily area air sampling, but the contractor is often responsible (OSHA) to conduct personal air sampling on his or her employees. Get the monitoring responsibilities figured out.

Time

The contractor should ensure that the job specifications **allow adequate time for the company to complete the abatement project** with a high degree of quality.

Job Specifications

There will be cases in which specifications from other jobs are copied and sent out for bids to other jobs – and these specifications may not necessarily apply in full to the proposed jobs. And in some cases those attempting to coordinate an asbestos abatement project for a facility or building may not be adequately educated or experienced in what needs to be included in a set of job bib specifications. **The contractor must ensure that the specifications being bid are designed for the work and work area of the facility being bid on.**

Other Considerations

A partial list of important aspects that should be considered by a contractor when conducting a pre-bid walk-through include **(1) an estimate of the temperature when the project is scheduled to begin**. It may be that the bid is being submitted during the summer while the project is scheduled to begin in the winter, or vice vera. In these cases, appropriate climate control strategies will need to be implemented. Also, at this time, it should be decided **(2) who will provide security at night or off-hours** to assure that no unauthorized entries into the work area will occur.

(3) Is this project a full or partial removal? If a partial removal will be performed, the airborne fiber clearance levels under the contract specifications should be examined closely to determine if that level can be achieved.

(4) Where will the contractor be able to park vehicles and/or trailers? Is there adequate space and security or will work need to be done or arrangements made? Along with th is consideration, **(5) where will the contractor's equipment and supplies be stored?** If there isn't adequate space on site, it may be necessary to rent additional space at some nearby location.

If Type C suppled air respirators are used, the contractors must **(6) determine whether or not the air lines will reach the work area from**

the air generating sources. Will there be **more that one source of Grade D breathing air?** Will the workers be equipped with **dual-supply capability** on their belts?

(7) AHERA requires that a school asbestos abatement project must designed in accordance with its management plan and that the **(8) TEM (Transmission Electron Microscope) be used for clearance** – not the PCM (Phase Contract Microscope). There is a big difference in cost.

The last few pages do not cover all of the special considerations that an asbestos abatement contractor needs to examine during a pre-bid walk-through; rather, they are some common cost, time, and safety and health-related concerns that should typically be evaluated before beginning an abatement project.

MEDICAL SURVEILLANCE

Employers, as contractors, are required to provide at no charge to the employees a physical examination by qualified physician. There are specific items that these physicals must cover [29CFR1926.1101(m) and mandatory Appendix D].

EMPLOYEE TRAINING

Any workers who will be in or around an asbestos abatement work area must be trained about the hazards associated with asbestos exposure, how to properly protect themselves from exposure using proper personal protective equipment (PPE), and in the correct work procedures for each of type of asbestos work. AHERA and ASHARA require that all response action workers and supervisors attend a US EPA-approved (and state approved where applicable) training course and pass an exam. OSHA also has training requirements [29CFR1926.1101(k)] based on the type of work which will be done (Class I - IV, with Class I being full containment/engineering controls and abatement and Class IV being awareness training) and requires training for the use of respirators. There may also be state licensing requirements and fees for supervisors and workers.

DESIGN AND USE OF A PROJECT LOG BOOK

Prior to the start of any asbestos abatement project, a log book should be established. **This book serves as a depository and organizer for all**

records associated with a project. At a minimum the log book should include copies of:

- the employee's medical reports, including base, annual, and exit exam reports;
- any accident and/or injury reports, including Workers' Compensation documents;
- the OSHA Log 300 and all record summaries;
- all unusual events or occurrences;
- air sampling results;
- notes concerning any deviation from standard work procedures;
- sign-in/sign/out sheets;
- employee training/certification/ licenses documents and/or cards; and
- all other pertinent documents, permits, correspondence, photos, or records.

The log book serves many important functions.

1. It provides an **easy reference for projects that can be accessed at any time during the project or long after its completion**. It may be reproduced by the contractor to demonstrate to future clients the procedures followed during a project. It can also be an important reference for planning future job and estimating costs.

2. The log book may be useful for its **possible protection for a contractor when there are questions regarding liability**. A log book indicates that the contractor performing the work actually attempts to do the best job possible using state-of-the-art techniques. The sign-in/out sheets maintain a record of all people entering and exiting the work area, for what purpose, for how long, and what personal protective equipment (PPE) was required. When coupled with air sampling data, one can quickly estimate how much asbestos the person was exposed to and for how long. Copies of daily safety inspection (competent person) reports will also reveal if employees were wearing the appropriate PPE and whether or not it was adequate in protecting them from the airborne fiber levels documented by the air sampling records. It is important to keep all records, not just some.

3. The log book should be well organized and in an order and style that the contractor is comfortable with. There are two common methods of organization. First, there is the **day-to-day method** – like a captain's log. If this format is chosen a loose-leaf or bound notebook with dividers

labeled with each day should be maintained for each job. Be sure to make entries on days that no work is done, including how the integrity/security of the job site was maintained.

Another and more common **log book format is by activity**. Using this method, a loose-leaf notebook is divided into each activity and all documentation, notes, and receipts concerning each activity is maintained in the appropriate activity binder.

The responsibility for maintaining the log book should be assigned to responsible personnel. Normally this function is performed by the job site supervisor or the other person responsible for coordinating activities at the work site. Upon conclusion of the job, this person may write a short summary of the project. This summary can then be compiled with others and produced as evidence of previous jobs performed by the contractor to prospective clients.

The following outline is a suggested log book organization format. It is just a generic outline which can be added to or subtracted from based on types and scopes of job done and experience.

LOG BOOK ORGANIZATION

SECTION	CONTENTS
Pre-Work Papers	EPA and/or state notification forms, any necessary state licences, county or city permits (contractor license, disposal permits, etc.) and records regarding the bonding company, size of bond, insurance coverage, etc. go here.
Contract Specifications	Contract specifications, including all drawings/ diagrams, would be in this section.
Personnel	Personnel records, including employment applications, W-4 withholding forms, medical records, state certification/license numbers and training certificates and notes on employer-provided or sponsored training, and any other records pertaining to each employee are kept in this section.

Sign-in/ Sign-out Sheets

This section contains the daily sign-in/out sheets indicating when each employee and visitor went in and out of the work area. In this section would be a list of all authorized personnel permitted to enter the regulated/work area. Payroll records are kept in this section as well.

Subcontractors

A record of all subcontractors' activities, including copies of the contract, names, dates, etc. are stored in this section.

Bulk Sampling Air Sampling

All bulk samples and area and personal air sampling results for the project should be included in this section. A copy of the sampling and analytical analysis methods along with information concerning who performed the work are kept in this section.

Waste Disposal

Records of waste disposal activities (copies of manifests, trip tickets, inventory of containers, and such) go in this section.

Daily Inspection Reports

Copies of daily inspections reports, including those by competent persons, should be maintained. These reports should also indicate who performed the inspections, the inspection dates, and the times and duration of the inspections. It is important to include comments on unusual aspects of the project and how the any problems that arose were handled.

Other Sections

Other sections are added based on need. Possible sections might include those covering injury/illness reports, receipts from equipment rental, lodging, outside inspections, news reports, etc.

Daily Log
Alright Abatement Technologies, Inc.

Date: _____

Project Name: _____ Job No.: _____

Superintendent: _____

Note: Fill in GENERAL comments on routine progress for the above date. DETAIL major problems and action taken, equipment breakdown, unusual conditions or situations, inspections, hiring or firing of personnel, and any other occurrence which may affect this project. This log may be used as a legal document.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Signature: _____

SAMPLE INVENTORY CHECKLIST FOR ASBESTOS ABATEMENT PROJECTS

Project: _____

PERSONAL PROTECTIVE EQUIPMENT

- ____ Safety Boots
- ____ Rubber Boots
- ____ Deck Shoes
- ____ Disposable Protective Suits w/hoods
- ____ Foot Coverings
- ____ Outer chemical gloves
- ____ Leather Gloves
- ____ Surgical (inner non-latex) Gloves
- ____ Hard Hats
- ____ Hearing Protection
- ____ Eye Protection
- ____ Duct Tape

RESPIRATORY EQUIPMENT

- ____ ½ Mask APRs (Brand “A” & “B” - S, M, L)
- ____ P100 filters (Brands “A” &“B”)
- ____ Combo Filters (Brands “A” & “B”)
- ____ FF PAPRs (Brand “A” & “B” - S, M, L)
- ____ PAPR Breathing Hose (Brands “A” & “B”)
- ____ PAPR Batteries (Brands “A” & “B”)
- ____ PAPR Batter Chargers (Brands “A” & “B”)
- ____ PAPR Combo Filters (Brands “A” & “B”)
- ____ APR/PAPR Spare Parts & Tool Box
- ____ SAR Kits (FF respirator, breathing hose, belt w/ 5 min. egress bottle, 2-stage regulator, belt manifold w/ by-pass valve and dual-supply valve
- ____ 5/16" Air lines, 50' lengths
- ____ Quick Connect Fittings (Foster)
- ____ Air Line Manifold(s)
- ____ Grade D Air Supply Compressor w/Air Board Monitor & Alarms
- ____ Backup Grade D Air Supply “K” Bottles
- ____ SAR Spare Parts & Tool Box
- ____ Portacount QFT & Printer w/Probed Facepieces, Probe Tube Adapters & Extra Alcohol, Candles
- ____ Bitrex QLFT Kit & Spare Solutions
- ____ Respirator Wash & Dry Stations
- ____ Copies of Respirator Program

HAND TOOLS & SUPPLIES

- ____ Bent 3" Scraper
- ____ Straight 3" Scraper
- ____ 12" Wide Knives
- ____ 6" Wide Knives
- ____ Putty Knives
- ____ Hawk Bill Knives
- ____ Wire Cutters
- ____ Cable Cutters
- ____ Razor “Utility” Knives
- ____ Razor Knife Blades
- ____ Measuring Tapes
- ____ Nylon Bristle Brushes
- ____ Bottle Sprayers
- ____ Low Pressure Sprayers
- ____ 5 Gallon Buckets Surfactant
- ____ 5 Gallon Buckets Encapsulant
- ____ Mixing Buckets
- ____ Screwdrivers, all sizes
- ____ Phillips Screwdrivers, all sizes
- ____ Pliers
- ____ Vice Grips; flat and curved mouth
- ____ Hammers
- ____ Nails (fasteners)
- ____ Power Staple Guns
- ____ Staples
- ____ Mops
- ____ Mop Heads, replacements
- ____ Mop Buckets
- ____ GFCIs, individual and gang
- ____ Extension Cords
- ____ Voltage Testers
- ____ ABC Fire Extinguishers
- ____ First Aid Kits
- ____ AED

VACUUMS

- ____ Upright HEPA Vacuums
- ____ Vacuum Attachments
- ____ Replacement Pre-filters
- ____ Replacement HEPA Filters
- ____ Over-the-shoulder HEPA Vacuums
- ____ Vacuum Attachments
- ____ Replacement Pre-filters
- ____ Replacement HEPA Filters

NEGATIVE PRESSURE EQUIPMENT

_____ Negative Pressure Machines
_____ Replacement Pre-filters
_____ Replacement HEPA Filters
_____ Flexible Duct (“Slinky”)
_____ Manometer

CONSTRUCTION MATERIALS

_____ Lumber
_____ Plywood
_____ Nails, Screws – Fasteners
_____ 10 mil Poly, 20' x 100' Clear
_____ 6 mil Poly, 32' x 100' Clear
_____ 6 mil Poly, 20' x 100' Black
_____ 4 mil Poly, 24" x 100' Clear
_____ 4 mil Poly, 20" x 200' Clear
_____ 4 mil Poly, 12" x 100' Clear
_____ Cases of Liquid Poly
_____ Cases 2" Duct Tape
_____ Cases 3" Duct Tape
_____ Cases 3" Masking Tape
_____ Tape Guns
_____ Cases Spray Glue
_____ 4' Ladders
_____ 6' Ladders
_____ 8' Ladders
_____ 12' Ladders
_____ 24' Extension Ladders
_____ 40' Extension Ladders
_____ Tarps, various sizes
_____ “Caution” Barricade/Tape
_____ “Warning” Barricade Tape
_____ Warning Signs
_____ System Scaffolds, including ...
_____ ... Braces
_____ ... Pins
_____ ... Boards
_____ ... Jacks
_____ ... Base Plates
_____ ... Wire Nuts
_____ ... Wall Nail Blocks
_____ Conduit Frames
_____ Straight Conduit
_____ Radial Power Saws
_____ 7" Circular Saws
_____ 10" Circular Saws
_____ Replacement Saw Blades
_____ Screw Gun/Drill w/batteries & Bits
_____ Flashlights w/Batteries or Chargers
_____ Hard Hat Lights w/Batteries or Chargers
_____ Flood Lights, clamp
_____ Flood Lights, Stand
_____ Spot Light, Hand-held
_____ Spot Light, clamp
_____ Batteries or Chargers for Spot Lights

DECON & WASTE LOADOUT MATERIALS

_____ 6 mil Labeled Clear Asbestos Waste Disposal Bags
_____ 6 mil Clear Asbestos Waste Disposal Bags
_____ Rolls of Asbestos Disposal Labels
_____ 2-Stage Water Filter
_____ Replacement 50 Micron Water Filters
_____ Replacement 5 micron Water Filters
_____ Water Pump Hoses
_____ Hose Connections, Gaskets & Attachments (low pressure spray heads)
_____ Portable Shower Enclosures
_____ 6 mil Poly, 28' x 100' Clear
_____ 6 mil Poly, 24' x 100' Clear
_____ 6 mil Poly, 20' x 100' Clear
_____ 6 mil Poly, 12' x 100' Clear
_____ Drums, Metal
_____ Drums, Cardboard
_____ Sponges
_____ Respirator Wash Brushes
_____ Respirator Wash Sanitizer
_____ Cotton Rags
_____ Buckets
_____ Table-top Wash Tubs/Basins
_____ Garbage Cans
_____ Secure Dumpster

PAPERWORK (SUPERVISOR)

_____ Project Log Book w/Contract Specifications, Bonding/Insurance Contacts, etc.
_____ Construction and General Industry CFRs (if not on laptop)
_____ Sign-in/Sign-Out Forms
_____ Disposal Forms
_____ Bulk Sampling and Air Monitoring Results
_____ Worker Release Forms
_____ Accident Report Forms
_____ Personal Medical & Respiratory Medical Evaluations
_____ Worker/Supervisor Training/ Certification/Licensing Files

CONTRACTORS/SUPERVISORS

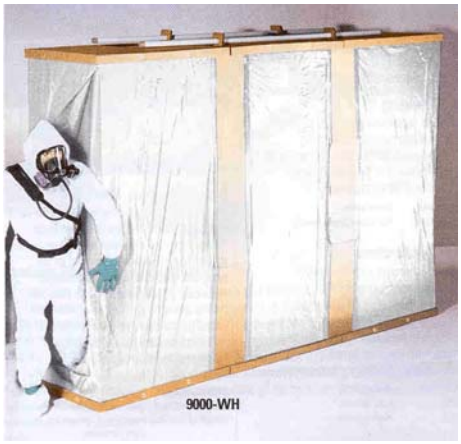
ENTERING/EXITING THE DECON UNIT

Entering the Clean Room, the worker will –

- ☐ Remove clothing and place it in a locker
- ☐ Put on a swimsuit or some other modesty clothing
- ☐ Put on clean coveralls or a disposable suit
- ☐ Put on disposable foot coverings if not a part of the Coveralls, disposable suit
- ☐ Applies tape around ankles, wrists, etc.
- ☐ Inspects, dons, and seal checks respirator
- ☐ Dons safety glasses/goggles and hearing protection (if required)
- ☐ Pulls up hood or other approved protective hood covering (over the straps)
- ☐ Moves into the next room (through or around the Shower Room)

In the Equipment Room, the worker will –

- ☐ Put on any additional PPE, including hard hat
- ☐ Collect any tools and such not already in the work (regulated) area
- ☐ Moves into the work (regulated) area



In the Work Area, the worker will –

- ☐ Brush or wet wipes off coveralls/disposable clothing, etc.
- ☐ HEPA vac coveralls/disposable clothing
- ☐ Exit to the Equipment room

In the Equipment Room, the worker will –

- ☐ Remove all clothing except the respirator
- ☐ Place disposable protective clothing is a bog or bin
- ☐ Store any other contaminated PPE for disposal or cleaning
- ☐ Move into the shower room

In the Shower Room, the worker will –

- ☐ Rinse the respirator and removes and soaks the filters
- ☐ Place the filters in receptacle in the shower or reaches back and puts them in a receptacle just behind the door in the Equipment room – Remove the respirator and wash it
- ☐ Wash self
- ☐ Move into the Clean Room (taking the respirator – or not – based on SOPs)

In the Shower Room, the worker will –

- ☐ Dry off, dress, (and clean and dry respirator – or not – based on SOPS)
- ☐ Exit the decon

The Equipment Room will probably **require cleanup several times daily** to prevent asbestos materials from being tracked into the shower and Clean Rooms. Depending on state law, 2 – 4 **air locks** 3' long may be added to the decon line, one on either side of the Shower Room and perhaps on at the entrance to the Clean Room from the outside and one before the Equipment Room on the work area side.

CONTRACTORS/SUPERVISORS

CONFINING AND MINIMIZING AIRBORNE FIBERS: NEGATIVE PRESSURE SYSTEMS[2]

The use of negative pressure during asbestos removal helps protect against the large-scale release of fibers to the surrounding area in case of a breach in the containment barrier. A negative pressure system also can reduce the concentration of airborne asbestos fibers in the work area by increasing the dilution ventilation rate (diluting contaminated air in the work area with uncontaminated air from the outside) and exhausting contaminated air through HEPA filters. The circulation of fresh air through the work area reportedly also improves worker comfort by increasing the cooling effect which may aid the removal process by increasing the amount of work done.[3]

[2] A negative pressure system is one in which the static air pressure in an enclosed work area is lower than that of the environment outside the containment barriers. Air moves into the work area through designated access spaces and any other barrier openings. Exhaust air is filtered is filtered by a series of pre-filters and a HEPA filter.

[3] Too high a rate of circulation may also damage and/or destroy a containment barrier.

Structural Specifications

The cabinet should be **ruggedly constructed** and made of durable materials to withstand damage from rough handling and transportation. The **width of the cabinet should be less than 30"** to fit through standard-size doorways. Appropriate **cabinet seals** should prevent asbestos-containing dust from being emitted during use, transport, or maintenance.[4] Larger door frames and alternative entrances will allow for larger sized and more powerful negative air machines (NAMs). Except for one room small window-sized units, NAMs should be **mounted on wheels or a least a dolly** so it can be easily moved.

Mechanical Specifications

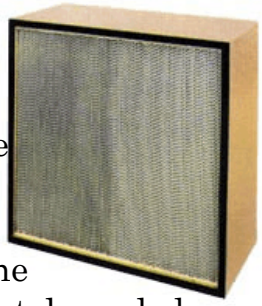
Fans. The centrifugal-type fan for each unit should be sized to draw a desired air volume through the filters in the unit at a specific static pressure drop, per manufacturer's specifications). The unit should have an air-handling capacity of at least 1,000 - 2,0000 cfm (cubic/feet/minute) under clean filter conditions.

For large-scale abatement projects, where the use of a higher capacity, specially designed exhaust system may be more practical than several smaller units, the fan should be appropriately sized according to the proper load capacity established for the application –

$$\text{Total ft}^3\text{/min (load)} = \frac{(\text{Volume of work area in ft}^3)\ (\text{air changes/hour})}{60\ \text{min/hour}}$$

Smaller capacity units in 500 ft^3/minute range equipped with appropriately sized fans and filters may be used to ventilate smaller work areas. The desired air flow can be achieved with several units.

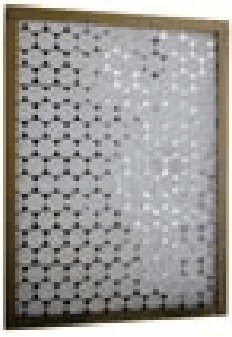
[4] Damage to the cabinet can result in contamination of the work area. During transportation, a damaged and/or improperly contained (wrapped in poly) negative air machine can contaminate the vehicle and surrounding areas during the loading/unloading process. Many contractors will not ship a NAM with a "partially used" set of filters for fear of a law suit over contamination outside the work area.



Filters. The final filter must be the **HEPA type**. Each filter should have a **standard nominal rating of at least 1,200 ft^3/min with a maximum pressure drop of 1 inch H_2Oclean resistance**. This pressure drop will increase as the filters load and the manufacturers; literature/specs will indicate a clean pressure drop and a **recommended maximum allowable drop for filling or "dirty" filters**. The filter media (folded into closely pleated panels) must be completely sealed on all edges with a structurally rigid frame and cross-braced as required to prevent air by-passing the filter. Exact dimensions of the filter should correspond with the dimensions of the filter housing inside the cabinet or the dimensions of the filter-holding frame. The **recommended standard size HEPA filter is 24" x 24" x 11- ½"**. The overall dimensions and **squareness should be within 1/8"**.

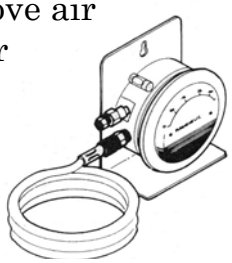
Each HEPA filter should be individually tested and certified by the manufacturer to have **an efficiency of not less than 99.97%** when challenged with 0.3 microns dioctylphthlalte (DOP) aerosol. Each filter should have a **UL586 label** to indicate ability to perform under specific conditions. Additionally, each filter should be marked with the name of the manufacturer, a serial number, air flow rating, efficiency and resistance, and the direction of the test air flow.

Pre-filters, which protect the final filter by removing the larger particles, are recommended to prolong the operating life of the HEPA filter. Pre-filters prevent the premature loading of the HEPA filter. They can also save energy and cost. One (minimum) or two (preferred) stages of pre-filtration may be used. The first stage pre-filter should be a **low-efficiency type** (for particles 10 microns or larger). The second stage pre-filter should have a **medium efficiency** (for particles down to 5 microns). Various types of filters and filter media for pre-filtration applications are available from many manufacturers. **Pre-filters and intermediate filters should be installed either on or in the intake grid of the unit** and held into place with special housings or clamps.



Instrumentation. Each unit should be equipped with a Magnehelic or **manometer to measure the pressure drop across the filters** which would indicate when filters have become loaded and need to be changed. The static pressure across the filters (resistance) increases as they become

loaded with dust, affecting the ability of the unit to move air at its rated capacity. (Picture to the right is an "older model" manometer.)



Electrical.

General. The electrical system should have a remote fuse disconnect. The fan moor should be totally enclosed, fan-cooled, and the non-overloading type. The unit may use a standard 115 -V, single-phase, 60-cycle service. All electrical components must be approved by the National Electrical Manufacturers Association (NEMA) and Underwriter's Laboratories (UL).

Fans. The motor, fan, fan housing, and cabinet should be grounded. All units should have an electrical (or mechanical) lockout to prevent the fan from operating without a HEPA filter.

Instrumentation. An automatic shutdown system that would stop the fan in the event of a major rupture in the HEPA filter or blocked air discharge is recommended. **Optional warning lights** are recommended to indicate normal operation, too high of a pressure drop across the filters (filter overloading), and too low of a pressure drop (major rupture in the HEPA filter or obstructed discharge). **Elapsed time meters** may also be purchased to show how the total accumulated hours of operation of the negative pressure units.

SETUP AND USE OF A NEGATIVE PRESSURE SYSTEM

Determining Approximate Ventilation Requirements For a Work Area.

Experience with negative pressure systems on asbestos abatement projects indicates **a recommended minimum rate of one air change every 15 minutes**. The volume (ft^3) of the work area is determined by multiplying the floor area by the ceiling height. The total volumetric air flow requirement (ft^3/min) for the work area is determined by dividing this volume by the recommended air exchange rate (1 per 15 minutes).[5]

[5] The recommended air exchange rate is based on engineering judgment.

$$\text{Total ft}^3\text{/min} = \frac{\text{Volume of work area – ft}^3}{\text{15 minutes.}}$$

This formula is expressed differently from the one provided on an earlier page, but both are correct and will yield the same result.

The number of units or NAMs needed for a project is determine by dividing the **Total ft^3/min** by the **exhaust rate capacity** of the NAM.

$$\text{Number of units needed} = \frac{\text{Total ft}^3\text{/min}}{\text{Capacity of the NAM (ft}^{3/}\text{min)}}$$

Because of mechanical difficulties and time needed to change filters, especially the HEPA filters, the supervisor needs a margin of safety. This margin is achieved by multiplying the **Capacity of the NAM** by 2/3rds and divide this result into the **Total ft^3/min**. Now the supervisor has an extra NAM or two.

Location of the Negative Air Machines

Each unit must have temporary electrical power (115V A.C.) If necessary, three-wire extension cords can supply power to a unit. The **cords must be in continuous lengths (without a splice), in good condition, and should not be more than 100' long**. **They must not be fastened with staples, hung from nails, or suspended by wire. Extension cords should be suspended off the floor and out of the workers' way to protect the cords from traffic, sharp objects, and pinching**.

Additional makeup air may be necessary to avoid creating too high of a pressure differential which could cause the plastic coverings (barriers) to detach from the walls and fall. Additional makeup air also may be needed to move air most effectively through the area. **Supplemental makeup air inlets** may be made by making openings in the plastic sheeting that allow air from outside the building into the work area. **Auxiliary makeup air inlets should be as far as possible from the exhaust units** (on the opposite wall), **off the floor** (preferably near the ceiling), and **away from the barriers that separate the work area from the occupied clean areas**. They should be constructed in such a fashion (**using weighted flaps**, etc.)

that allow the openings to be sealed in the case of accidental pressure differential loss. Also, the openings should be re-sealed whenever the negative pressure system is turned off after removal is started. Because the pressure differential (and ultimately the effectiveness of the system) is affected by the adequacy of makeup air, the number of auxiliary air inlets should be designed and placed in order to maintain adequate pressure differential and to maximize air circulation throughout the work area.

USE OF THE NEGATIVE PRESSURE SYSTEM

Testing the System

The negative pressure system should be tested before any asbestos-containing material is wetted or removed. After the work area has been prepared, the decontamination line set up, and the exhaust unit(s) installed, the units or **NAMs should be started one at a time**. Observe the barriers and plastic sheeting. The **plastic doors of the decontamination line should move slightly in toward the work area**. The use of **ventilation smoke tubes** and an aspirator bulb is another easy and inexpensive way to visually check system performance and direction of air flow through the openings in the barrier.

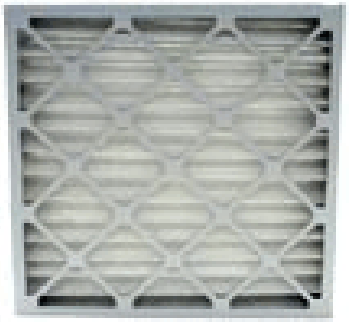
Another test method for negative pressure is a **water pressure gauge or some other manometer to measure the static pressure differential across the barrier**. The measuring device must be sensitive enough to detect a relatively low pressure drop. The pressure drop is measured by punching a small hole in the plastic barrier and inserting one end of a piece of rubber tubing. (If the tub is left in the plastic, it must be sealed.) The other end of the tubing is connected to the "low pressure" tap of the instrument. The "high pressure" tap must be open to the atmosphere. The pressure is read directly on the scale. After the test is completed, the hole in the barrier is patched. These units can be set up for continuos monitoring as well. An audible or visual alarm may also be attached. **OSHA requires a pressure differential of -0.02 inches of water.**

Filter Replacement

Since all NAM filters are changed out in the work area, the supervisor or competent person makes the filter changes must be wearing proper PPE. **The operating life of HEPA filter and its two pre-filters depends on the level of particulate contamination in the work area.** During use, filters

will become loaded with dust which increases resistance to air flow and diminishes the air-handling capacity of the unit. The difference in pressure drop across the filters between "clean" and "loaded" conditions is a convenient means of estimating the extent of air low resistance and determining when the filters should be replaced.

When the pressure drop across the filters, as indicated by the manometer on the unit, exceeds the pressure specified by the NAMS manufacturer, **the low-efficiency pre-filter is changed out first**. This pre-filter, which may be held in place on the intake grill by fan suction, should be **removed with the unit running by carefully rolling or folding in its sides if it is not a rigid filter**. Any dust dislodged from the pre-filter during removal will be collected by the remaining intermediate efficiency pre-filter. **The used pre-filter should be wetted and place in a 6 mil waste bag, sealed, labeled, and disposed of as asbestos waste.** A new pre-filter is then placed on the intake grill or slipped into its slot.



If the pressure drop still exceeds the manufacturer's specified pressure after the first pre-filter has been replaced, the intermediate pre-filter is replaced. **With the unit still operating, the first pre-filter is again removed and then the second pre-filter is removed.** Any dust dislodged from the intermediate filter during removal will be collected by the HEPA filter. The used intermediate filter should be wetted and placed in a sealable and labeled 6 mil waste bag and disposed of as asbestos waste. A new replacement intermediate filter is slid in or installed. **The first pre-filter is placed back in or on the intake grill.**

The HEPA filter should be replaced if the replacing of the two pre-filters does not restore the pressure drop across the filters to its original clean resistance reading or if the HEPA filter has somehow become damaged. (HEPA filters fail if the absorb to much moisture.) The NAM is shut off and disconnected from its power source. After the HEPA filter is removed from the unit, it is wetted down and placed in a sealable and labeled 6 mil waste bag and disposed of as asbestos waste. **The gasket between the filter and the housing should be inspected for any gaps or cracks.** Worn gaskets should be replaced as needed. A new HEPA filter should be installed. The two pre-filters put back in place, and the NAM turned on. (Depending on the

model, the unit may have to be turned on so that the first pre-filter can be held on by suction from the fan.) **Whenever the HEPA filter is replaced, replace all three filters.**

When several units are used to ventilate a work area, negative pressure can be maintained during the HEP filter replacement and the direction of the air flow into the work area will be maintained. **If only two NAMS are operating on-site, a backup unit should be available and operating before an original unit is shut down for HEPA filter replacement. An abatement enclosure should never have only one NAM operating.** A failure of this sole unit, for any reason, would eliminate the negative pressure in the work area.

Generally, low-efficiency pre-filters should be replaced 2 – 4 times a day or when accumulations of particulate matter become visible. Intermediate pre-filters must be replaced every day or so, and the HEPA filter may be replaced at the beginning of each new project.

Conditions in the work area dictate the frequency of filter changes. Filters can be used effectively until resistance diminishes the exhaust capacity of the unit.

Dismantling the System

As the gross removal of asbestos-containing material nears completion, filters should be checked for loading and replaced if necessary. If a pre-filter is being used on the outside of the NAM, it should be removed before final cleanup begins. When the negative air system is shut down at the end of a project, the filters should be left in the negative air unit and the openings sealed with poly and duct tape and/or sprayed with liquid poly to avoid spreading decontamination when the unit is removed from the worksite. Filters in the units should not be replaced after final clearance is complete in order to avoid any risk of re-contaminating the area.

TIPS FOR USING NEGATIVE AIR PRESSURE SYSTEMS

➢ Check the integrity of the gasket between the HEPA filter and the housing each time the filter is changed or after the unit has been transported to a new location.

➢ A general rule of thumb for filter life during an "average" removal is:

2 hours for the ½" pre-filter (low-efficiency);
24 hours for the 2" pre-filter (intermediate efficiency); and
500 hours for the 12" HEPA filter

Changing out the ½" pre-filter frequently (every ½ hour or so) during "heavy"removal will prolong the life of the much more expensive HEPA filter.

➢ Before removal begins, check the availability of a 20 amp circuit. Most NAMs require 18 amps for startup and 15 amps for normal operation.

➢ NAMs usually pull less volume that the rating assigned by the manufacturer. A 2000 cfm often pulls only 1300 – 1500 cfm. Also, as the filters load, the cfm is further reduced. Adjust you calculations according for the number of units necessary. (Remember the 2/3rds rule for a start.)

➢ Start the negative air system before beginning work and check to see if it is functioning properly. Make sure there is adequate makeup air; otherwise, the poly may be pulled away from the walls.

➢ Smoke tubes are useful for checking air flow inside the containment,

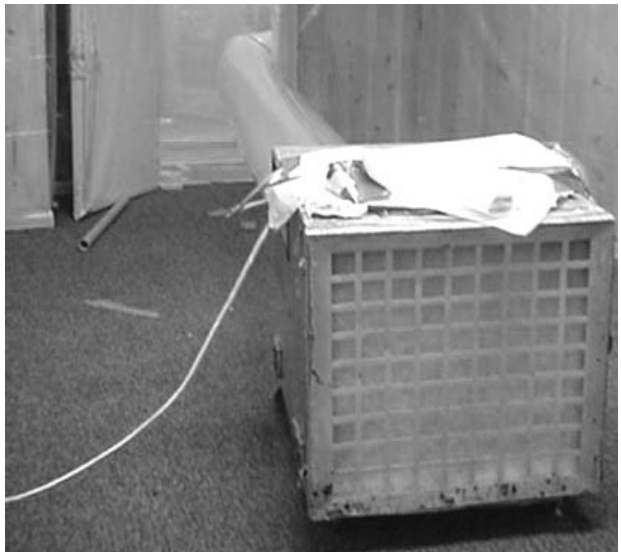
➢ Use heavy extension cords to energize the NAMs. If a series of cords are connected, take necessary precautions to avoid shock hazards. Make sure the temporary electrical system is properly grounded.

➢ As a rule of thumb, the containment area should be no larger than 10,000 ft^2 for efficient use of a negative air filtration system.

➢ The negative air system is most effective in reducing fiber concentrations when workers start removal at the farthest point from the negative air units and work toward them.

- When venting the NAM exhaust outside a window, a good seal can be formed by placing a piece of plywood with a hole cut for the flex or plastic duct in the window and sealing it with duct tape. Another seal can be formed by placing a piece of 6 mil poly over the plywood template and cutting a slit in it for insertion of the exhaust duct. Tape is used to seal the space around the slit in the poly and the duct.

- The use of supplied air respirators will increase the air pressure in the work area. Negative air filtration units should always be used in conjunction with Type C respirator systems to prevent a build-up of positive pressure.



CONTRACTORS/SUPERVISORS

CONFINING AND MINIMIZING AIRBORNE FIBERS: WET REMOVAL TECHNIQUES

EPA: 40CFR Part 61, Subparts A & B

EQUIPMENT USED FOR REMOVAL OF FRIABLE INSULATION MATERIALS

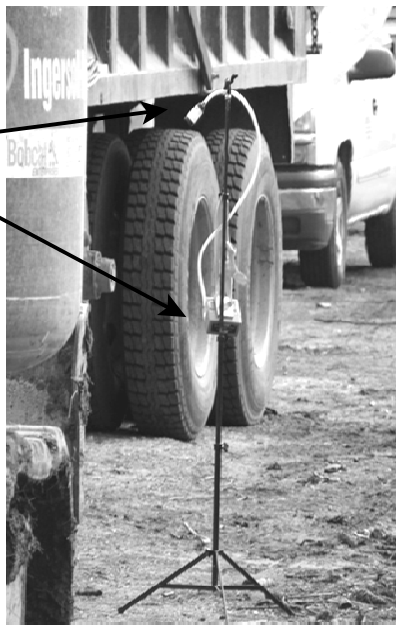
- ☐ Portable HEPA filtered Exhaust Units (NAMs)
- ☐ Replacement Low-Efficiency Filters
- ☐ Replacement Intermediate Filters
- ☐ Replacement HEPA Filters
- ☐ Manometers
- ☐ Flexible or Rigid Ducts
- ☐ Electrical Extension Cords
- ☐ Airless Sprayers
- ☐ Garden Spray Bottle Attachments for Water Hose
- ☐ Hand Pump Garden Sprayer (extra long hose, if needed)
- ☐ Wetting Agent (50% polyoxyethylene & 50% polyoxyethylene ester or equivalent)
- ☐ Nylon Brushes, Various Sizes

- ☐ Stiff Scrapers, Ranging in Size From Narrow, Putty Knife Type to 4" Wide Blades & 6" Wide Scrapers Mounted on 6' Long Wooden Handles
- ☐ Plastic Dust Pans
- ☐ Plastic Shovels
- ☐ Mop Heads & Handles
- ☐ Buckets with Squeegees
- ☐ Scaffolds with Rails, Toe Boards, and Braces
- ☐ Labeled 6mil Poly Bags
- ☐ Variety of Wood or Fiberglass Ladders
- ☐ Gloves Bags
- ☐ Pipe Insulation Repair Material
- ☐ Replacement Pipe Insulation
- ☐ Duct Tape
- ☐ Scissors
- ☐ Retractable Knives
- ☐ Wire Cutters
- ☐ Ventilation Smoke Tubes and Bulbs
- ☐ Portable HEPA Vacuums
- ☐ Wheeled HEPA Vacuums
- ☐ Temporary Lighting

ASBESTOS SAMPLING AND ANALYTICAL METHODS

AIR SAMPLING

Air sampling involves drawing a known volume of air through a filter and analyzing that filter for the presence of asbestos fibers. The filter is housed in a black plastic cassette which is attached to a sampling pump with flexible tubing. The sampling pump can be either electric (plug in) or battery powered and it is calibrated to draw a known volume of air through the filter material over a given period of time – usually expressed in liters of air per minute (lpm).



Two (2) basic air sampling methods are area and personal sampling. **Areas samples** are taken with a pump, tubing, and filter cassette (called a **sampling train**) place at **breathing zone** height at some stationary location. **Personal samples** are collected from within the breathing zone (as close to the nose and mouth as possible) of an individual, but outside the respirator.

Personal samples are collected in the same manner as area samples, except the **pump is hung from a belt around the worker's waist and the filter cassette is attached, pointing downward, to the workers lapel or collar**.

Pumps are the backbone of the air sampling process, providing the means by which air is drawn through the filter that is housed in the cassette. Sampling pumps are typically categorized as either high volume (electric), or low volume (personal) pumps which are usually battery powered. High volume pumps are typically

larger and heavier than the battery powered pumps and draw upwards of 40 liters of air per minute through the filter. High volume pumps are usually used for area air sampling.

1/10 hp w/up to 40 LPM air flow – $199

One advantage of the high volume pumps is their ability to draw large volumes of air through the filter in a relatively short period of time. Since being able to detect low concentrations of airborne asbestos fibers relies, on part, on sampling large volumes of air, these pumps are useful for sampling in environments where low levels of airborne asbestos are expected (e.g., outside of a work area containment or following the clean-up of an abatement project.

$709

Battery powered, or personal sampling pumps, are small, lightweight pumps usually encased in a hard plastic shell. These pumps typically draw from ½ to 5 liters of air per minute through the filter and are ideal for indexing workers' exposure (or potential exposure, when wearing a respirator) to airborne asbestos fibers.

FILTERS

Two main types of filter material are used to sample for airborne asbestos fibers. **Mixed cellulose ester (MCE)** or membrane filters are the most common and have the widest use. MCE filters are cellulose strands bound together in a web called "tortuous pore" and display a very irregular surface when under magnification. **Polycarbonate filters,** on the other hand, are thin sheets of plastic with holes punched in them by neutrons and enlarged in an alkali bath. Once quite popular for applications such as final clearance air monitoring (where analysis was to be performed by electron microscopy), polycarbonate filters should be used with caution and are being used less frequently because of fears of fiber loss from the smooth filter surface during sample handling and transport.

Regardless of the type used, filters are characterized by their diameter (of exposed surface) and their pore size. The table on the next page details the recommended filter types, pore size, and diameter for the sampling method

and analytical alternative used.

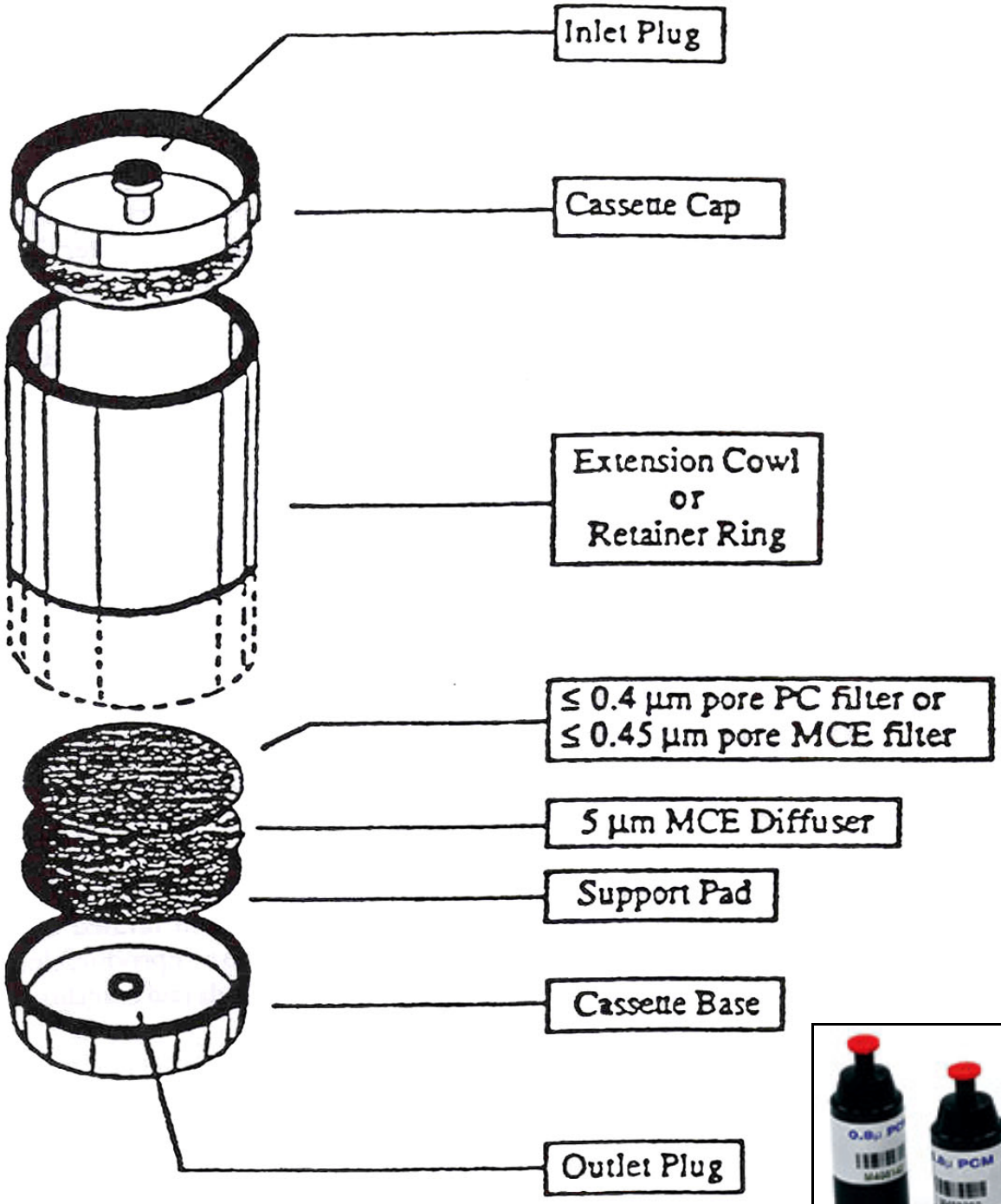
All filters are housed in a sampling cassette which includes a cap, extension cowl or retainer ring, the filter, a MCE diffuser when collecting TEM samples, a support pad, and a cassette base – see picture.

RECOMMENDED FILTER - BASED ON SAMPLE TYPE AND ANALYTICAL ALTERNATIVE

	Analytical Alternative	Personal	Area(as final clearance)
PHASE CONTRAST MICROSCOPY	NIOSH 7400	25mm MCE, 0.45-1.2µm pore size	25mm MCE, 0.45-1.2µm pore size*
	OSHA Reference Method (ORM)	25mm or 37mm ** MCE, 0.8 - 1.2 µm pore size	
TRANSMISSION ELECTRON MICROSCOPY	AHERA Mandatory Method	—	25 or 37mm MCE, 0.45µm pore size
			25 or 37mm PC, 0.4µm pore size
	Yamate Method	—	37mm PC, 0.4µm pore size
	NIOSH 7402	—	25mm MCE, 0.8 - 1.2µm pore size
	Burdett & Rood	—	25mm MCE, 0.1, 0.8, 1.2µm pore size
			25 mm PC, 0.45, 0.8µm pore size***

* per 40 CFR, Part 763, Subpart E, Appendix A (AHERA)
** Use of 37mm cassette in ORM requires written justification.
*** Burdett, G.J. "Proposed Analytical Method for Determination of Asbestos in Air"

MCE = mixed cellulose ester filter
PC = polycarbonate filter



Actual PCM Cassettes
$24 - $27/50

PUMP CALIBRATION

The total flow volume of air sampled is the flow rate of the sampling pump (liters of air per minute) multiplied by the time (in minutes) the pump ran. Accurate calibration of the pump flow rate is very important in the calculation of sample results. EPA and OSHA recommend that sampling pumps be calibrated before and after each use and it is good practice to maintain these calibration records together with other sampling data.

Although not always practical, a **primary calibration standard** is the best way to determine the flow rate of a sampling pump. A primary calibration standard is one that is known to have the highest degree of accuracy and repeatability when determining a pump's flow rate.

Typically, a one liter flow bubble buret or equivalent is used as a primary calibration standard for air sampling pumps. From this, a smaller, more durable, a great deal less expensive, and less accurate **rotameter** ($35 - $50) can be calibrated and taken into the field to calibrate each sampling pump before and after use.

$1,292 - $3,129

It is important to ensure that persons performing air monitoring are routinely calibrating their sampling pumps. **Regular request for calibration data or requiring this data to be included in reports of sample results** are two ways to help maintain the technical and legal validity of sampling data.

ANALYZING AIRBORNE FIBERS

The primary analytical techniques used for analyzing airborne fibers colleted on a filter are **1) Phase Contrast Microscopy (PCM)** and **2) Transmission Electron Microscope (TEM).**[6]

Phase Contrast Microscopy (PLM)

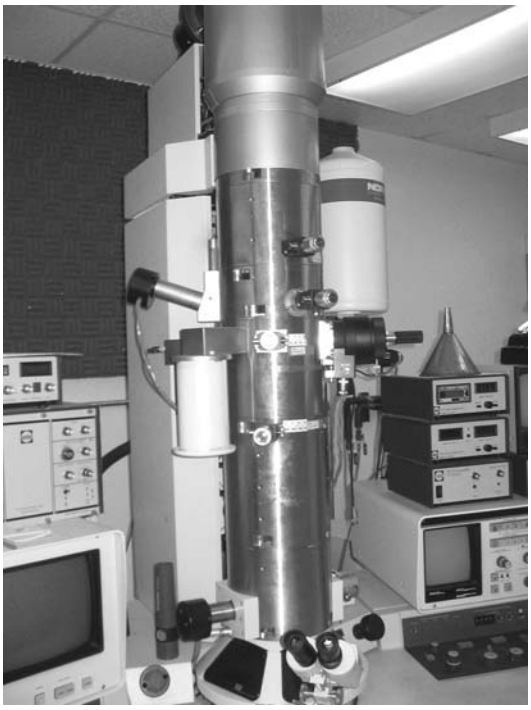
PCM is a techniques using a light microscope equipped to provide

[6] Sometimes a Scanning Electron Microscope (SEM) or a Fibrous Aerosol Monitor (FAM) may be used.

enhanced contrast between the fibers collected and the background filter material. Samples for analysis by PCM are collected in either a 25mm or 37 mm cellulose ester (MCE) filter with a 0.45 t0 1.2 micron pore size. Filters are then prepared by either a liquid chemical solution or an acetone vapor that renders the filter material optically transparent. The filter is then examined under a positive phase contrast microscope at a magnification of approximately 400x. Fibers are sized and counted using a calibrated reticle fitting onto the microscope eyepiece. PCM is inexpensive and can be performed on the job site in a few hours.

PCM is frequently referred to as the light microscopy method, the filter membrane method, or the NIOSH method. PCM is the analytical method specified in the OSHA Asbestos Standards. This method does not identify the fibers it counts and it only counts those fibers longer than 5 microns and wider than about 0.25 microns. Because of these limitations, analysis by PCM typically provides only an index of total concentration of airborne fibers in the environment monitored. As the proportion of the airborne fibers which are less than 0.25 microns in diameter increases (i.e., non-industrial settings such as asbestos abatement projects), PCM becomes a less reliable analytical tool.

Transmission Electron Microscope (TEM)



TEM is a technique which focuses an electron beam onto a thin sample mounted in the microscope column (under a vacuum). As the beam transmits through the sample, an image resulting from the varying density of the sample is projected onto a fluorescent screen. Air samples for TEM analysis can be collected on either mixed cellulose ester or polycarbonate filters and are prepared using direct transfer techniques per EPA regulations. Direct preparation allows for the transfer of a carbon-coated replica of the filter material (with embedded fibers and particles, etc.) right on to a copper grid suitable for TEM analysis. Indirect transfer techniques require an

intermediate step that may break up fiber bundles, resulting in an increased fiber count. Depending on the TEM method used, preparation of the sample can take as much as 24 hours or more and analysis can take several hours to a day or more.

AIR SAMPLING DURING AND AFTER THE ASBESTOS ABATEMENT PROJECT

Personal Sampling

Personal samples should be collected during the first full day of removal activity. It is generally accepted that **this initial monitoring** must be **performed on at least 25% of the work force involved in the project** and that it is required regardless of the respiratory protection used (no waiver for Type C respirators). **Initial monitoring must be conducted to determine both the 8-hour time weighted average and the 30 minute short term exposure.**

Periodic monitoring must be performed when the type of material being removed or the location of the removal changes. This means daily air monitoring on 25% of the work force is required – for both the TWA and the EL. Wearers of Type C systems are exempt from this monitoring. If and when monitoring indicates exposures below the PEL and EL, daily monitoring may be terminated until conditions significantly change. However, it is prudent to conduct personal sampling on a periodic basis regardless of the type of respiratory protection used.

Personal sampling pumps are typically collected at a flow rate of 0.5 - 2 lpm. Samples for asbestos exposure should be taken to determine the 8 hour TWA as well as the 30 minute EL. Over an eight hour period, filters have to be changed several times to prevent overloading. Results are put into the following equation to obtain a TWA:

$$\frac{C_1T_1 + C_2T_2 + C_3T_3 \ldots.}{T_1 + T_2 + T_3 \ldots.} = \text{TWA}$$

Where C is the fiber concentration expressed as f/cc and T is the duration of the sample.

SAMPLING LOG FORM

Sample Number	Location of Sample	Pump ID	Start Time	Middle Time	End Time	Flow Rate

Inspector: _____ Date: _____

_____

_____


NO EATING
DRINKING
OR
SMOKING

CLEANUP AND DISPOSAL 6

In this chapter you will learn:

How to clean up the work area.
How to take down the poly on the walls and floor.
What happens to asbestos after it leaves the job.
How your employer tests the air at the end of the job.
How to replace the insulation.

Cleanup ....

Phil: There's just a little bit of dust left on the floor. I'll bring in the shop vac and clean it up.

Pat: Don't do that. Use the HEPA vacuum.

Phil: The HEPA vacuum broke this morning. Besides, the shop vac is OK to use inside the containment. The negative air machine will filter out any dust we kick up.

Pat: Why don't we just wet the dust down and sweep it up?

Phil: That will take too much time. I've got a date tonight and I want to get out of here before the second shift comes to take down the enclosure. ⇨

Discussion Questions
(Choose one or two of the following questions to discuss.)

1. Is it OK to use a regular shop vacuum to clean up asbestos as long as you're inside an enclosure? Why or why not?
2. Do you need to worry about kicking up asbestos dust inside the containment? Why or why not?
3. If Phil uses the shop vac, how could it effect the people on the next shift?
4. How could it affect the next person who uses the shop vac?

Cleanup and Disposal

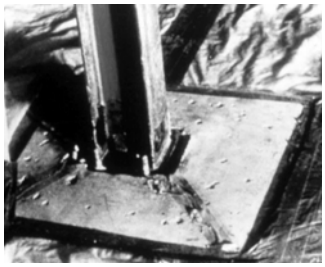
It is very important to clean up the work room after you remove the asbestos. The work is not finished until the job passes an air sample. This is a very strict test. If all of the asbestos has not been cleaned off of beams, poly, waste bags, tools, and other surfaces, the job will not pass the air sample. Everything will have to be cleaned again until the job passes the air sample. It can be very expensive to clean and take air samples again. If you do a careful job the first time, you will not have to spend time later on cleaning the room again.

1. Clean Up the Asbestos You Can See

It takes a long time to clean up an asbestos job. The first step is to clean up all the asbestos you can see. As you take the asbestos down, bag it up. Clean the ceiling and other surfaces with a nylon-bristle brush. Wipe the surface with a damp rag until you can't see any fibers.

Then clean the poly on the walls and floors with damp rags and HEPA vacs.

Start at the top and work down. After the first cleaning, a supervisor may do an inspection. She makes sure there is no asbestos she can see.



2. Lock Down the Asbestos You Can't See

Then seal up the asbestos fibers you can't see. Use a low-pressure sprayer to spray a sealant called "lockdown." Spray the ceiling and the poly. This glues down any fibers you missed so they can't get in the air. Not all contract specs say you have to use a lockdown spray. But it is hard to pass th air sample at the end of the job without it. You may not use lockdown spray instead of cleaning.

3. Take down the first two layers of poly

After you clean, you're ready to take down the first layer of poly. Cut the sheets into six-foot-wide strips. Cut through one layer of poly only. Roll the poly onto itself, from the top down. Fold it into bundles that you can handle easily and bag it.

Then take the first layer off the floors. Cut through the first layer of poly and roll it, bundle it, and bag it.

Once you take down the first layer of poly, put lockdown spray on the second layer. Cut, roll, bundle, and bag this second layer of poly. (Sometimes the job is left overnight to let the dust settle.) The critical barriers (on the doors and windows) must stay up until the job passes an air test at the end of the job.

4. Waste disposal

All poly has to be sealed in air-tight bags with labels, just like asbestos. Sometimes there is a waste load-out, which is like a decon for waste bags. It has two rooms – a wash room and a holding room. A worker inside the work room puts the bag into the wash room. A worker in the wash room washes off

the bag and stores it in the holding room. **People don't walk through the waste load-out. Only waste bags go through it.**

Anything with asbestos on it must be taken to an EPA-approved asbestos landfill. It must be sealed in leak-proof, labeled bags or containers. **The waste truck should have closed sides and a top. The truck should be lined with poly. It should be cleaned at the end of the job.** Bladder bags are very large 6-mil poly bags. Bladder bags are used to line a dumpster or truck.

5. Cleaning Tools

Everything that leaves the job has to be cleaned. This includes:

- scrapers
- squeegees
- water sprayers
- tools
- respirator hoses
- hard hats
- boots
- HEPA vacuums
- scaffolds
- ladders
- negative air machines

Scrub everything off and rinse it well. Seal it in clear waste bags (with labels) and take it to the next job. You must clean scaffolding very well if it will be used on non-asbestos jobs.

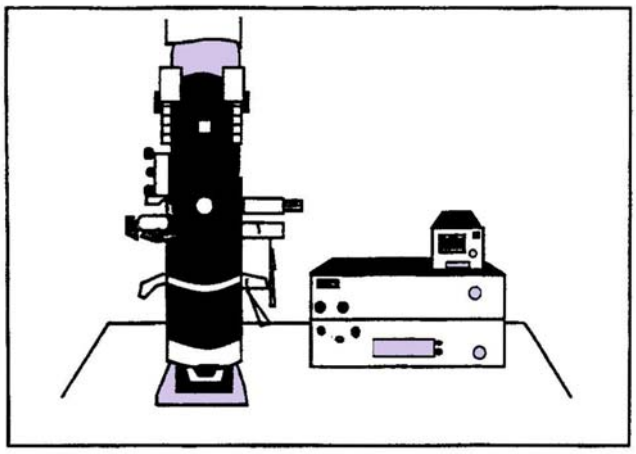
6. Testing the air at the end of the job

A job may look clean, but what about the asbestos you can't see? **There is no way to know if the room is clean without testing the air.** After the poly is taken down, an **industrial hygienist (IH)** will take an air sample. This air sample tells the building owner whether the room is clean enough.

This final air sample is called a clearance air sample. Clearance air samples are different from the air samples taken on workers. The air is stirred up with fans. A pump pulls the air through a filter. The fans stir up any fibers that are on the walls,

floors, or corners. More fibers can be caught on the filter. **Stirring up the air is called aggressive sampling.**

The final air sample is sent to a lab, where the fibers are counted. There are several ways to count the fibers. In many specs, the room is clean enough when an air sample is .01 ("point oh one") fibers per cc or less. [.01 is equal to l/l0th of the Permissible Exposure Limit (PEL = 0.1 f/cc).] Sometimes the room is clean enough when it is at least as clean as the air outside the room. (This is how clearance air samples are done in most schools.) For final air samples taken in schools, the lab usually uses a very powerful microscope called a **TEM (Transmission Electron) Microscope.**



TRANSMISSION ELECTRON MICROSCOPE

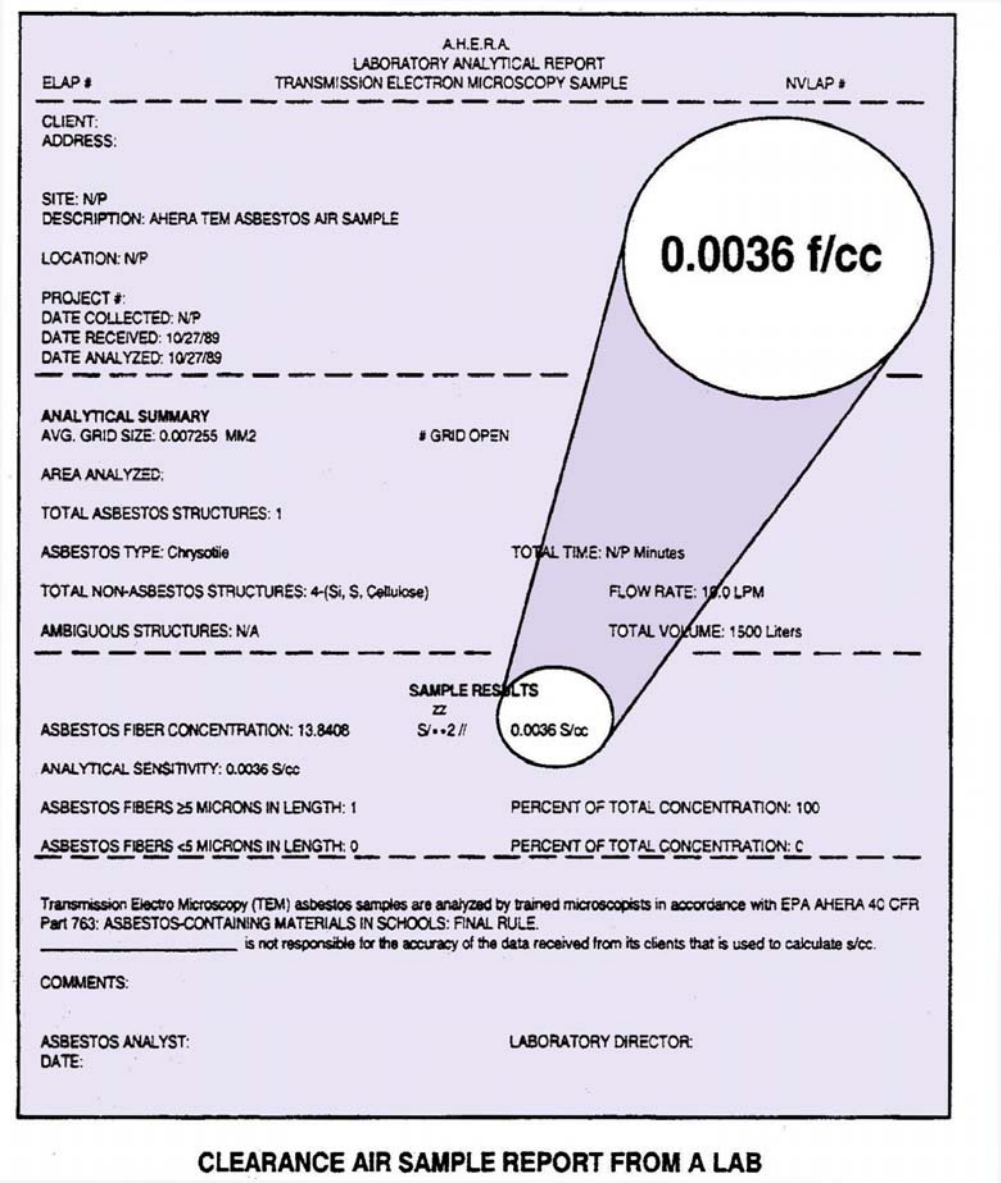
If the job does not pass the clearance air sample, the room must be cleaned again. This is why critical barriers are left up until the job passes the test.

Take a look at the sample lab report on the next page. A building owner sent a clearance air sample to a lab. The lab looked at the sample under a microscope. How many fibers per cubic centimeter did they count? Did the job pass the final clearance air test?

The lab counted 0.0036 fibers per cubic centimeter. That amount 0.0036 f/cc - is less than the clearance level - 0.01 f/cc. The job is clean enough to pass!

Sprayback

Contract specs may also ask for new insulation to replace the asbestos. This could be fiberglass, mineral wool, or some other non-asbestos insulation.



A.H.E.R.A.
LABORATORY ANALYTICAL REPORT
TRANSMISSION ELECTRON MICROSCOPY SAMPLE

ELAP # NVLAP #

CLIENT:
ADDRESS:

SITE: N/P
DESCRIPTION: AHERA TEM ASBESTOS AIR SAMPLE

LOCATION: N/P

PROJECT #:
DATE COLLECTED: N/P
DATE RECEIVED: 10/27/89
DATE ANALYZED: 10/27/89

ANALYTICAL SUMMARY
AVG. GRID SIZE: 0.007255 MM2 # GRID OPEN

AREA ANALYZED:

TOTAL ASBESTOS STRUCTURES: 1

ASBESTOS TYPE: Chrysotile TOTAL TIME: N/P Minutes

TOTAL NON-ASBESTOS STRUCTURES: 4-(Si, S, Cellulose) FLOW RATE: 10.0 LPM

AMBIGUOUS STRUCTURES: N/A TOTAL VOLUME: 1500 Liters

SAMPLE RESULTS

ASBESTOS FIBER CONCENTRATION: 13.8408 S/••2 // 0.0036 S/cc

ANALYTICAL SENSITIVITY: 0.0036 S/cc

ASBESTOS FIBERS ≥5 MICRONS IN LENGTH: 1 PERCENT OF TOTAL CONCENTRATION: 100

ASBESTOS FIBERS <5 MICRONS IN LENGTH: 0 PERCENT OF TOTAL CONCENTRATION: 0

Transmission Electro Microscopy (TEM) asbestos samples are analyzed by trained microscopists in accordance with EPA AHERA 40 CFR Part 763: ASBESTOS-CONTAINING MATERIALS IN SCHOOLS: FINAL RULE.
_____ is not responsible for the accuracy of the data received from its clients that is used to calculate s/cc.

COMMENTS:

ASBESTOS ANALYST: LABORATORY DIRECTOR:
DATE:

0.0036 f/cc

CLEARANCE AIR SAMPLE REPORT FROM A LAB

This replacement material is called **sprayback when it is applied to surfaces where the original material was sprayed on.** Don't put up sprayback until the job passes the air test. You may need to wear a respirator when you put up fiberglass or mineral wool. Just because the material isn't asbestos doesn't mean it's safe.

After you put up sprayback, you can take down the critical barriers. You can take the poly off the objects in the room. You can clean the decon and take it down. You can take out the negative air machine.

Re-insulation

After removing pipe insulation, muds, wraps, or any other asbestos material that was not spray applied, you need to re-insulate. Most re-insulation materials are put on in the same way the asbestos materials were applied. Replacement materials can be dangerous to work with so be sure to read the labels and ask questions about them.

Storage, Transportation, and Disposal

Project Design

Asbestos removal is the primary goal of abatement. However, improper storage onsite, transportation offsite, and land fill disposal of waste can create a nightmare if improperly conducted.

Correct disposal begins with good project design. Planning for waste disposal answers the following:

- How will asbestos be securely stored onsite?
- How will it be safely transported offsite?
- What kind of landfill should it be transported to to ensure proper disposal?

These questions must be answered prior to officially removing any amount of asbestos. In fact, project specifications should address each item separately. If specification does not address these issues, each item should **be addressed before project begins.** Even if you remove only one-bag of ACM as part of a Class III -- Repair Activity or Class IV -- Maintenance Activity, you must treat your disposable waste the same was as Class l or Class II projects. Your project is not complete until all removed ACM is deposited into an EPA-approved and certified landfill and, moreover, a complete waste shipment record must be returned to the Building Owners (Generator). If materials are improperly handled, the building owner, contractor, and transporter can all be fined.

Typically, good waste handling requires good project design. On small jobs, waste load-out is usually conducted by passing it out the decon. This procedure can lead to contamination of the decon unit. For larger more complex abatement jobs, a separate waste load-out area should be considered. This may include a sectioned storage area where bagged material can be thoroughly decontaminated before leaving the job site.

Friable versus Non-Friable

As discussed, pre-job abatement activities should resolve how wastes are to be handled. This should also include also how friable and non-friable materials will be handled. All friable materials are regulated when removed. However, non-friable material removal will depend on how it is handled during the removal process. For example, intact non-friable floor tile may be left as is for demolition in some states. However, if this material is likely to become friable (i.e. sanding, grinding, etc.), then it must be removed as required by NESHAPS. A similar situation occurs when removing roofing materials. All dust generated during cutting of roof materials should be controlled at point-of-release. However, disposal of roofing waste will depend on state or local requirements.

Labeling

OSHA labeling regulations, as contained in **29 CFR Part 1926.1101 Section K (8),** require that each bag, container, or sealed waste material contain the following warning label:

DANGER

CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

Once asbestos waste materials are labeled, little guidance for storage onsite is contained within Federal regulations. However, security of material is extremely important. All waste materials must be securely stored in order to prevent vandalism and release of asbestos fibers. Local and state authorities can provide additional guidance on this matter.

Chain of Custody

All during the removal process, a documented chain of custody must be maintained. The kind of materials removed, the amount of material, and the

amount transported to the landfill must be documented. All Chain of Custody forms must be signed off on as waste changes hands along its route to the landfill.

Transportation

Once demolition or renovation waste materials have been prepared, materials must be properly transported to an EPA- approved landfill. EPA guidance for proper disposal is contained in NESHAPS Regulations 40 CFR Subpart M (Section 61.150).

In summary, asbestos waste transportation and disposal requires:

1. Discard no visible emissions during transportation;

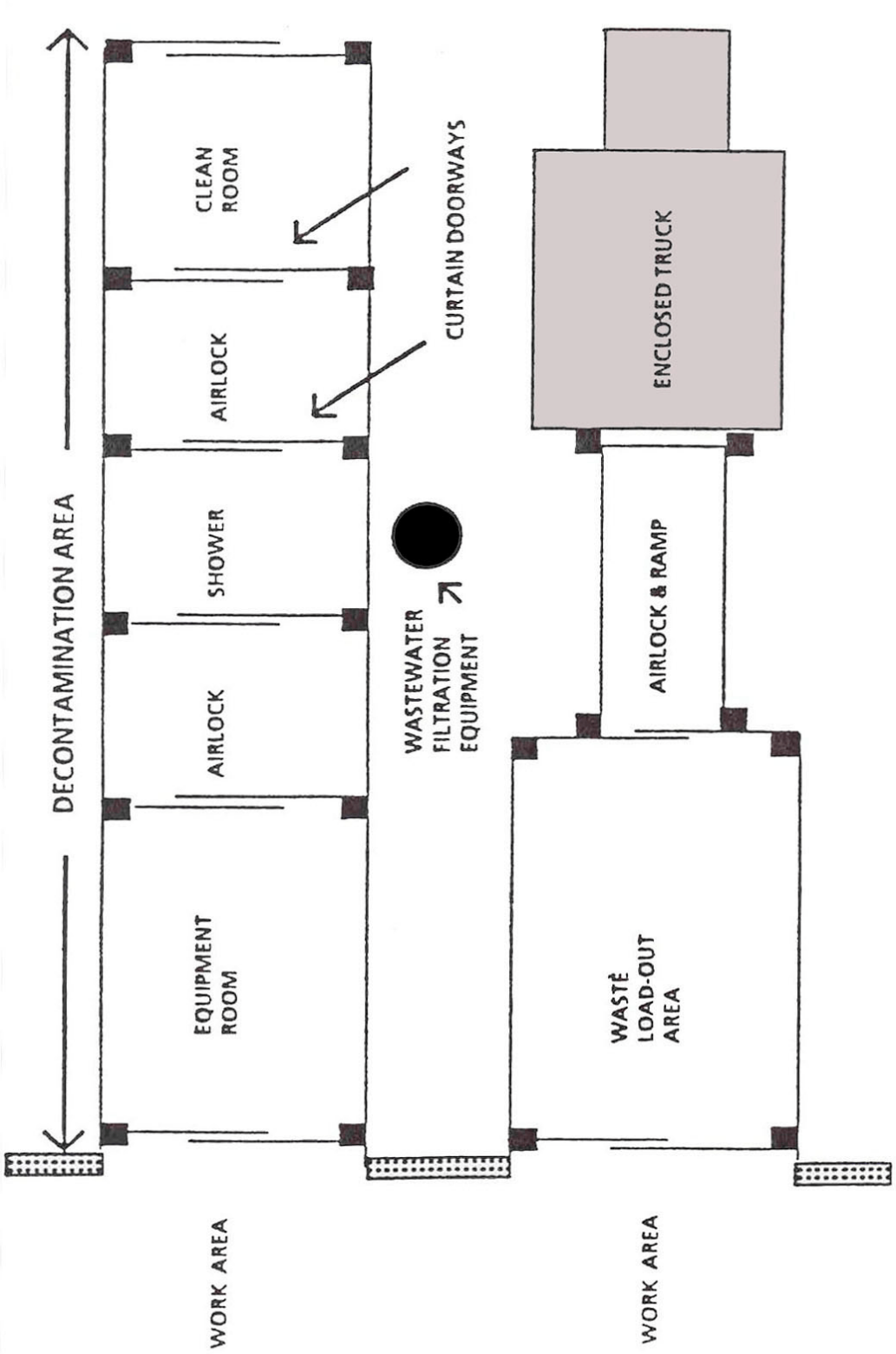
2. Maintain asbestos waste in adequately wet state during transportation;

3. All ACM must be transported to and deposited in an EPA landfill; and

4. Complete and return to building owner (generator), a fully executed signed copy of waste shipment record after deposit in landfill. All chain of custody forms generated should be maintained as part of project file. Project closeout is not complete until waste shipment record is submitted.

DOT regulations 49 CFR 171 and 172 regulate transportation of asbestos-containing waste materials. It also contains requirements for waste containment, shipping papers, and placarding of transport vehicles. Vehicles transporting hazardous waste such as asbestos must contain the following placard symbol **ORM 9.**

WORKER DECON AND WASTE LOADOUT



SAMPLE QUESTIONS

ADDITIONAL DISCUSSION QUESTIONS:

1. When should waste collected from a job remain onsite?

2. Why do EPA/NESHAPS regulations require "No Visible Emissions?"

3. Who is always responsible for assuring that waste is sent to an EPA approved landfill?

4. How does a generator insure that all waste is properly placed in a landfill?

5. What document(s) are necessary to complete a job?

6. Should Class I, II, 111, and IV friable waste be handled differently? If yes, why? Explain

7. When does NESHAPS treat friable and non-friable waste equally?

8. What is the primary concern with NESHAPS?

9. Why should waste remain adequately wet during transportation to a landfill?

For More Information:

U.S. EPA. National Emissions Standards for Hazardous Air Pollutants (NESMPS) Asbestos Regulations (40 CFR 61, SubQart M), 1994.

DOT 49 CFR 171 and 172. Regulates Transportation of Asbestos Containing Waste Material. Requires Waste Containment and Shipping Papers, 1992.

OSHA Asbestos Standard, 29 CFR 1926.1101, Appendix F, "Work Practices and Engineering Controls for Major Asbestos Removal...."

Georgia Tech Research Institute, Chapter XIV, "Sampling and Analytical Methodology Pertaining to Asbestos Abatement," in "Model Curriculum for Training Asbestos Abatement Contractors and Supervisors," available from National Technical Information Services, (703) 487-4650.

EPA, " Asbestos Waste Management Guidance: Generation, Transport, Disposal," Publication No. EP N530-SW-85-007.

National Institute of Building Sciences, "Removal of Asbestos Containing Materials," in Model Asbestos Guide Specification, Section 02084.

Discussion Questions

1. Why is it important to clean up the poly if it will be will thrown out anyway?

2. Some people say that lockdown should not be used. They argue that cleanup should be done so well that lockdown is not needed. What do you think?

3. After taking off most of the asbestos, a contractor spray painted the beams instead of cleaning them off. What is the problem with this?

4. Why is the air stirred up before clearance air samples are taken?

5. Why do you wait until the job passes the air test to put up sprayback?

6. In what order would you conduct the following clean-up activities?

___ Wet wipe/HEPA vacuum first (inside) layer of plastic.
___ Conduct visual inspection of the work area.
___ Disassemble the decontamination unit.
___ Wet wipe/HEPA vacuum the second (outside) layer of plastic.
___ Clean primary (critical) barriers.
___ Conduct clearance air monitoring.
___ Take down primary (critical) barriers.
___ Spray a lockdown encapsulant on substrate surface and/or plastic.
___ Remove all bags of waste from the work area.

CLEANUP AND DISPOSAL

Key Facts

1. **Use damp rags and HEPA vacuums to clean up the work room.**
   First clean all the asbestos you can see.
   Then clean all the asbestos you can't see.

2. **Spray a lockdown spray on the surface and on the poly.**

3. **Roll up the poly from the top down and bag it as asbestos waste.**
   Leave the critical barriers up until the job passes the clearance air sample.

4. **Take asbestos, poly, dirty suits and other waste to an EPA approved asbestos landfill.**

5. **Clean all tools with wet rags and HEPA vacs.**

6. **The clearance air sample tells the building owner whether the room is clean enough.**
   Clearance air sampling uses aggressive sampling-stirring up the air with fans.

   Clearance air samples are sent to a lab, where the fibers are counted. A Transmission Electron Microscope (TEM) is often used.

   A job is not clean until the air sample shows 0.01 f/cc or less.

7. **After the job passes the clearance air sample, put up new insulation (sprayback).**

CONTRACTORS/SUPERVISORS

CLEANUP & DISPOSAL

- ENDUST™ or PLEDGE™
- SUPERVISORY VISUAL INSPECTIONS
- SUGGESTED SEQUENCE FOR CLEANING UP ASBESTOS ABATEMENT WORK AREA
- LOCKDOWN SEQUENCE
- AIR SAMPLING AFTER FINAL CLEANUP OF WORK AREA
- AHERA FINAL CLEARANCE TESTING

"3-PHASE CLEANING"

Wait Overnight/Repeat Wet Wipe and Wet Mop Procedures

Frequently, abatement project specifications will call for "3-phase cleaning". This process may require more time spent on the project, but if properly conducted, it will actually save money and prevent confusion at t he conclusion of the project. After the **(1)** walls and other surfaces have been wet-wiped and the floors and been mopped, **(2)** activity in the area may be stopped until the following day. The next day, **(3)** the same wet wiping and mopping procedures are often repeated. As an alternative to using amended water for the second wipe down, the cleaning efficiency may be increased by using a commercial cleaning product such as **Endust™** or **Pledge™**.

SUPERVISORY VISUAL INSPECTIONS

Work areas should be dry before the final visual inspection is conducted. The inspection is again conducted by the owner's representative and the job supervisor. All surfaces are carefully checked for visible contamination and

any areas which need further cleaning are listed on the inspection form. Ledges, tops of beams, and all other hidden locations should also be inspected for ACM dust or debris. After any necessary re-cleaning has been conducted, the inspector and job supervisor make a final walk-through to assure the items listed have been addressed. Here again, the ASTM standard for visual inspections (ASTM E1368 "Standard Practice for Visual Inspection of Asbestos Abatement Projects") may be used as a guideline for final inspections.

Following this second visual inspection, the lockdown of any microscopic fibers should be completed.

■■■

Suggested Sequence For Cleaning Up An Asbestos Abatement Work Area (A Simplified Scheme)

1. Continuous Cleaning During Abatement

2.a. Complete Gross Removal and Start Final Cleanup

2.b. All Asbestos Waste Removed From the Work Area

3. Visually Inspect For Any Residual Asbestos in Work Area.

4. Lock/down/Encapsulant Solution Applied to Substrate and Inner Layer of Poly Misted to Contain Residual Asbestos Fibers

5. Lockdown Material Dry/Setup for Next Step.

6. Inner Layer of Poly taken Down , Contained, and Disposed of as Asbestos-Containing Waste

7.a. Second, More Stringent, Visual Inspection of Outer Poly Layer still in Place.

7.b. Check for Possible Contamination Inside Layer.

7.c. If Asbestos-containing Debris is Found During Inspection, Further Cleaning is Necessary.

8.a. With Outer Layer of Poly and Critical Barriers Still in Place, Pre-Clearance Air Samples May be collected.

8.b. Pre-Clearance Results Indicate Work Area Clear, Proceed to Step 9.

8.c. Pre-Clearance Results Work Area Not Clean. Re-clean and Sample again

9. Outer Layer of Poly Removed, Critical Barriers Remain in Place, and Final Clearance Air Samples Collected.

10. Work Area Passes Final Clearance and is Cleared for Re-occupancy by Unprotected Personnel.

LOCKDOWN SEQUENCE

When considering a lockdown operation, it is important to follow a logical sequence of steps. One recommended sequence to follow os outlined below.

- ☐ Complete removal of asbestos-containing material from the substrate.
- ☐ Collect the asbestos-containing waste material and transport it out of the regulated area according to appropriate asbestos waste handling procedures and clean all any remaining visible debris by HEPA vacuuming and wet wiping.
- ☐ Conduct a visual inspection of the work area for any remaining visible debris and re-clean it necessary.
- ☐ If possible, as test area of suitable size should be sprayed first to observe conditions. If satisfactory, a heavy coat of lockdown sealant should be low-pressure spay-applied to the substrate in accordance with manufacturer's instructions. At the same time, the top layer of poly on the walls and floor should me misted with a coat of lockdown material.
- ☐ After the lockdown material has dried per manufacturer's directions, the coated layer of poly should be taken up and treated as asbestos-containing waste and transported out of the work area.
- ☐ With the final layer of poly still in place, a second, more comprehensive visual inspection should be conducted to locate any visible asbestos materials that may have penetrated the top layer. HEPA vacuuming and wet-wiping will be done to remove any accumulations, if present. When finished, the remaining wall and floor poly may be sprayed and given time to dry.
- ☐ At this point, pre-clearance monitoring may be conducted to determine if any airborne asbestos fibers remain. The final poly layer is taken down and disposed of as asbestos-containing waste when preliminary air sample results indicate an acceptable clearance level. Lockdown may be applied to the cleaned substrate.
- ☐ While critical barriers remain in place, it is now time to conduct the final clearance air monitoring using aggressive sampling techniques.

Lockdown products are usually applied as sprayed-on sealants, but special case alternatives include latex paint, encapsulating solutions, and concrete sealants. The lockdown product must be compatible with the substrate which it is to cover as well as with any replacement material – sprayback – and it must be evaluated for any additional hazards its use might bring (i.e., toxic, flammable).

AIR SAMPLING AFTER FINAL CLEANUP OF WORK AREA

Area air sampling is conducted upon conclusion of an asbestos project to estimate the airborne concentration of residual fibers. The area must pass a thorough visual inspection for remaining material before final clearance sampling is started.

A visual inspection process is typically conducted in two phases. First, an inspector determines the completeness of the removal. If any visual ACM is clinging to the substrate, then removal is not complete and the inspection does not continue. Once the removal is determined to be complete, the work area is inspected for cleanliness. If any dust or debris is found, the area is re-cleaned before air sampling starts.

Final clearance air samples are typically collected using high volume pumps to draw a pre-determined volume of air. The number of samples collected depends on the amount of ACM affected by the response action, where the project is taking place, and the sampling and analytical procedures being followed. Samples should be collected using aggressive techniques.

Aggressive air sampling involves physically or mechanically agitating the air in the work area to dislodge any residual fibers. Then, a standard box fan is left on for the duration of sampling to keep dislodged fibers airborne. The purpose of final clearance air sampling using aggressive techniques is to produce a “worst case” scenario. If the work passes the final clearance level in the “worst case” environment, then the likelihood of airborne asbestos fiber levels ever rising above the clearance level is remote.

Clearance samples are typically analyzed by phase contrast microscopy or transmission electron microscopy. Ideally, PCM and TEM are used in

combination as a two state process for final clearance sampling. Phase contrast analyses can be used to determine if any gross contamination remains in the work area. **Collect a minimum of thirteen (13) samples if TEM is to be used or five (5) samples if PCM is to be used** (5 per abatement area; 5 per are ambient are [outside the abatement area – TEM only]; 2 field blanks [required for TEM and recommended for PCM – 1 near entrance to the work area and 1 at an ambient area; 1 sealed blank – TEM only)**.** If the PCM samples indicate airborne fiber levels are below 0.01 f/cc using aggressive
sampling techniques, then the samples are submitted (or new samples are collected) for analysis by a TEM. The TEM analytical method is recognized as having the best resolution and positive fiber identification capabilities, and it is required in most cases when performing clearance sampling under AHERA regulations.

AHERA
FINAL CLEARANCE TESTING

1. TEM

- ☐ Required for projects involving ACM in amounts greater than 160 ft^2 or 260 linear feet
- ☐ Collect at least 13 samples
- ☐ Analyze 5 inside samples
- ☐ If greater than or equal to 1,199 liters of air collected (for 25mm cassettes) or 2,799 liters of air (for 37mm cassettes), area passes if the arithmetic mean is less than or equal to 70 structures per mm^2 of filter area (70 s/mm^2)
- ☐ If less than 1,199 or 2,799 liters of air, respectively, is collected or if the arithmetic mean is greater than 70 s/mm^2, analyze 3 blanks
- ☐ If arithmetic mean of blanks is greater than 70 s/mm^2, terminate analysis, identify source of contamination, collect new samples
- ☐ If arithmetic mean of blanks is less than 70 s/mm^2, analyze outside samples and compare using Z-test
- ☐ If Z-statistic is less than or equal to 1.65, response action (abatement) is complete
- ☐ If Z-statistic is greater than 1.65, re-clean and resample.

2. PCM

- ☐ Allowed if amount of ACM involved in the abatement project is less

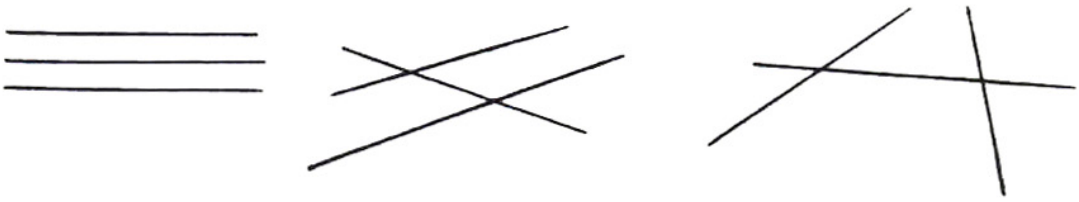
than or equal to 160 ft^2 or 260 linear feet.

3. COUNTING GUIDELINES USED IN DETERMINING ASBESTOS STRUCTURES

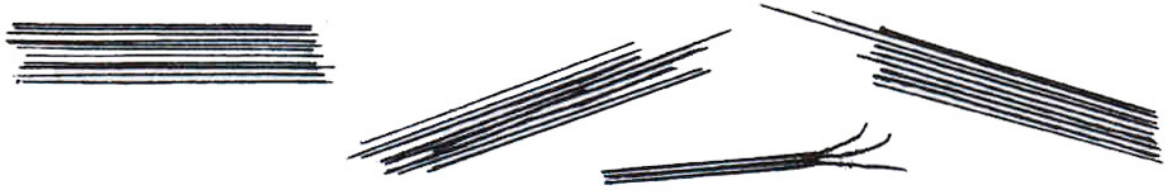
Count as 1 fiber; 1 Structure; no intersections.

Count as 2 fibers if space between fibers is greater than width of 1 fiber diameter or number of intersections is equal to or less than 1.

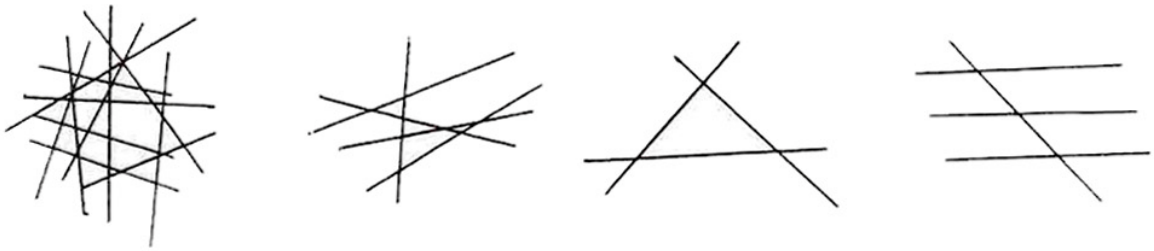
Count as 3 structures if space between fibers is greater than width of 1 fiber diameter or if the number of intersections is equal to or less than 2.



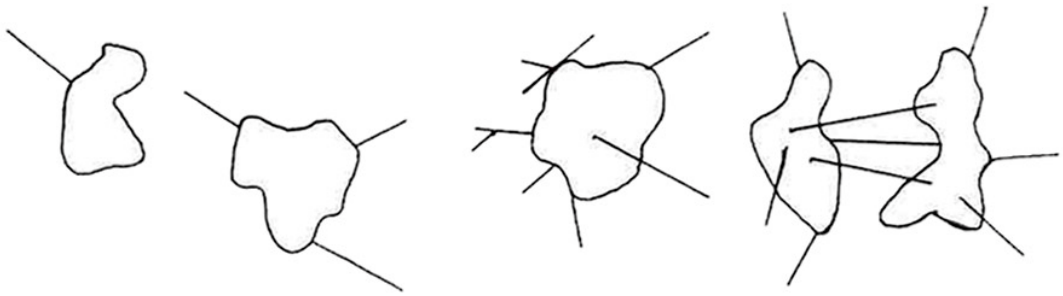
Count bundles as 1 structure; 3 or more parallel fibrils less than 1 fiber diameter separation.



Count clusters as 1 structure; fibers having greater than or equal to 3 intersections.



Count matrix as 1 structure.



DO NOT COUNT AS STRUCTURES:

Fiber protrusion <5:1 Aspect Ratio

No fiber protusion

Fiber protrusion <0.5 micrometer

—— <0.5 micrometer in length

▬ <5:1 Aspect Ratio

7

OTHER HEALTH AND SAFETY PROBLEMS

In this chapter you will learn about these dangers on asbestos jobs:

Problems with heat.
Cuts and bleeding.
Chemicals other than asbestos.
Oxygen-deficient atmospheres.
Slips, trips, and back injuries.
Fires & Explosions.
Dangers from scaffolds and ladders.
Noise.
Burns.
Shock.
Tight spaces.
Electrical shocks.
Mold.

Safety ...

Supervisor: Why are you taking your mask off? You know you're supposed to keep it on while you're in the work area.

Brian: I'm too hot. And I've got a real bad itch right under my facepiece.

Supervisor: You're the third person who's done that today. I'm going to write up the next person who takes their mask off in here!

Brian: It's not our fault! These half-mask respirators are just too uncomfortable to wear in the summer. We asked the company for PAPR's last month, but they won't give them to us.

Supervisor: Listen, you've just got to be more careful. It's for your own good.

Discussion Questions
(Choose one or two of the following questions to discuss.)

1. Who is right, the foreman or Brian?
2. Why did Brian take his mask off?
3. Is it OK to take your mask off in the containment?
4. What should the workers do if they have to take their masks off?
5. What could the company do to make it easier for workers to keep their masks on?
6. What could the foreman do?
7. What would you do if you were Brian ?
8. What would you do if you were the foreman?

Other Health and Safety Problems

Asbestos is a slow danger on a removal job. But short-term hazards, such as electrocution and fires, can hurt you much more quickly. Asbestos removal is demolition work. Demolition is the most dangerous type of construction work. In this chapter we will discuss some of the short-term dangers on asbestos jobs, such as:

1. Problems with heat
2. Cuts and bleeding
3. Burns
4. Chemicals other than asbestos
5. Oxygen-deficient atmospheres
6. Electrical shocks
7. Noise
8. Fires and explosions
9. Tight spaces
10. Dangers from ladders and scaffolds
11. Slips, trips, and back injuries
12. Shock
13. Mold

Problems with Heat

Your body tries to cool itself by sweating. On the job, you work in a suit that doesn't let your body heat escape. Your lungs have to work harder to pull air through a respirator. The air conditioning must be shut off. You work very hard. If your body overheats, you can get very sick. Overheating can cause heat stroke (a medical emergency) or heat exhaustion.

Heat stroke happens when your body can't control its temperature. You stop sweating. Sweating is your body's way of cooling itself. Your body overheats. Heat stroke can kill you or cause brain damage. Here are some signs of heat stroke.

Signs of Heat Stroke

- Hot skin
- Dry skin
- Flushed skin
- Confusion
- Headache
- Dizziness
- Nausea
- Fainting

If a worker shows signs of heat stroke, get the person to the hospital right away. Pack ice around the person until the ambulance arrives. Unless the victim is treated quickly, he or she could die. Call 911 and tell the operator there is a medical emergency. There may be a few places in the country where the 911 system is not available. If you are working in one of these areas, memorize the number for emergency help. Until the ambulance comes, you need to cool off the body of a person with heat stroke. The body can't do this by itself.

Get the worker out of the work room. Take off the suit and respirator. Be sure the person is still breathing. Cool the body off with water as soon as possible. You can hold the worker in the shower for a minute. Be sure you don't get water in the nose or mouth. You can wet the skin and fan it. Don't give water to a person who has fainted. You could make the person choke.

Heat exhaustion happens when you lose a lot of water from sweating. Sometimes you lose a lot of salt, too.

Signs of Heat Exhaustion

- Cool skin
- Sweaty skin
- Pale skin
- Headache
- Dizziness
- Nausea

Do these sound familiar? The last three signs of heat stress: headache, dizziness, and nausea are also signs of heat stroke. If a worker has hot, dry, flushed skin, he or she probably has heat stroke. Cool the person down until an ambulance arrives. If the person has cool, clammy, pale skin, he probably has heat exhaustion – cool the body down.

Get the worker out of the work room. Take off the suit and respirator and give the person cool water to drink. If the worker faints, call an ambulance. She may have heat stroke. Don't give water to a person who has fainted. You could make the person choke.

Watch out for these warning signs of heat problems:

- Less alert;
- Gets a headache;
- Less coordinated; and
- Feels sick to stomach

These signs could be the beginning of heat stroke or heat stress. If you start to feel like this, leave the work area. Be sure to take off your booties and wash up. Drink some cool water. If a co-worker shows these signs, get the person out of the work room and have him or her drink cool water.

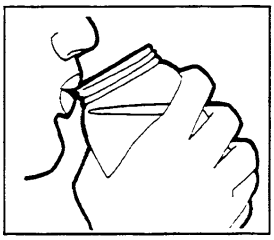
Heat can make you less coordinated. This can cause other accidents. Heat can also cause muscle cramps or heat rash. These can also be used as warning signals of heat stress or heat stroke. Heat can also make a worker faint. Take a worker who has fainted out of the work area. Be sure that a person who has fainted does not have a more serious problem.

Preventing Heat Problems

Here are some ways to prevent heat problems:

Drink lots of water – Your body loses lots of water when you sweat. It is best to drink every half hour. But you probably won't be able to go through the decon that often. Drink 8 to 16 ounces of water at every break.

Drink some orange juice and eat bananas – or eat potato chips or one salty food once a day. Your body may need a little extra salt. But most Americans already eat too much salt. If you are on a low-salt diet for your heart do not eat extra salt. Salt tablets are very dangerous. Do not take them. You may want to drink a thirst quencher like Gatorade™.



DRINK WATER

Take breaks – Your body will handle heat better if it can cool down sometimes. At least two breaks a day and a lunch break will help your body handle heat better.

Get used to heat gradually -- It takes about two weeks for your body to get used to working in the heat. Your body can get unused to heat in about four days. New workers should only work a half day in the heat for the first few days. They should not work a full shift until the end of their first week.

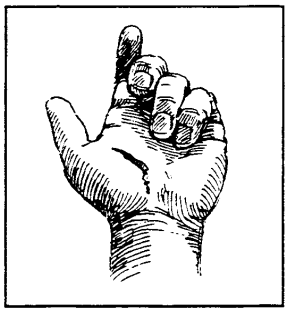
Use cooling vests -- There is some new equipment that can help keep you cool. Cooling vests have ice packs in them. The ice melts, and they can be uncomfortable. When you are working in very hot areas, cool vests can prevent heat problems.

Cut down on alcohol -- Alcohol dries out your body. Even if you only have two beers the night before work, you are more likely to have problems with heat. If you drink, do it on the weekend when you don't have to work the next morning. Then drink lots of water before going to work.

Heat Related Disorders		
Disorder	**Symptoms**	**Remedy**
Heat Rash	• Rash on Skin • Prickly feeling • Tiny red blisters	• Apply mild drying lotions • Keep skin clean
Heat Cramps	• Pain in muscles	• Replenish salt and electrolyte levels
Heat Fainting	• Fainting after working in a hot area for long time	• Move worker to cool, dry place • Lie worker down and raise his/her legs
Heat Stress	• Headache • Nausea • Dizziness • Cool, sweaty, pale skin	• Move worker to a cool, dry, shady place. Have someone stay with the worker. • Cool the worker with cold water or by fanning. • Replace body liquids.
Heat Stroke	• Headache • Nausea • Dizziness • Hot, dry, flushed skin • Confusion • Fainting	• Call 911 for help!! • Move worker to a cool, dry, shady place. • If the worker is conscious, give him/her something to drink. • Cool victim by fanning • Follow doctor's orders.

Cuts and Bleeding

Whenever someone has a cut that is bleeding heavily, you should cover the wound with a clean cloth. Press on the cloth to give direct pressure on the wound. Elevate the wound also. If the wound does not stop bleeding within a few minutes, call 911 for emergency help.



APPLY DIRECT PRESSURE

At the same time you are applying direct pressure on the wound and elevating it, you can put direct pressure on the pressure points. You have two pressure points on each side of your body that can be used to stop bleeding. One is

inside the arm, under your bicep. The other pressure point is at the top of your leg, just inside your hip. Press hard on the wound and the nearest pressure point, while elevating the wound until emergency personnel arrive.

Burns

Do not clean burns or break blisters; remove any clothing that sticks to the burn; apply ointment or medication to severe burns; or use cotton to cover burns.

First Degree Burns -- redness or discoloration of skin; mild swelling and pain. Run water over the burn for at least 15 minutes. Then blot gently and apply a dry sterile pad if necessary. Medical treatment is usually not necessary; however if severe symptoms exist, call for professional medical help. Be alert for signs of shock. Never heat a needle and puncture a blister.

Second Degree Burns - deep burn with red or mottled appearance; blisters; considerable pain and swelling; and skin surface appears wet. If arms and legs are effected, elevate the injury above heart level. Burns may be deep and potentially serious, requiring medical treatment depending on the extent and location. Be alert for signs of shock and infection. Seek treatment for second degree burns.

Third Degree Burns -- deep tissue destruction with a white or charred appearance; no pain. Call for professional medical help immediately. Be alert for signs of shock. See treatment for third degree burns.

Chemicals Other than Asbestos

You have learned about some dangerous chemicals used at work

- methylene chloride (in spray glue)
- ammonia (in spray poly)
- isocyanates (in polyurethane foam)
- surfactant (in amended water)
- fiberglass (for replacing)
- solvents (for taking off floor tile glue)

Willson brand HEPA/
Organic Vapor combo filter

» lockdown
» encapsulants
» carbon monoxide (from motors)

An asbestos filter on your respirator will not protect you from other chemicals. For example, you might need both a **black** filter (for methylene chloride) **and a magenta** filter (for asbestos). You might need both a **green** filter (for ammonia) **and a magenta** filter (for asbestos).

You may also remove asbestos in a chemical plant, lab, or some place where other chemicals are used. You need to know what you are working with. Your employer must have you trained about the chemicals you work with. This is called Right-To-Know training. When you work with harmful gases or vapors, you must protect yourself. Your employer must give you the right respirator and filters. Your employer also must give you a schedule which tells you when to change your gas or vapor filters.

Carbon Monoxide

Carbon monoxide is a dangerous gas. It can poison you. It can cause permanent brain damage and can even kill you. It has no smell, taste, or color. It comes from motors, such as air compressors and portable generators. It can be a real problem if you are using Type C respirators.

Here are some signs of carbon monoxide poisoning. Suddenly you begin to feel drunk and dizzy and you may start swaying back and forth. Your thinking gets foggy. You may even begin to act crazy and can fall unconscious. You may feel --

- faint
- like throwing up
- sleepy
- headache
- nauseous
- dizzy

Does this sound familiar? Three signs of carbon monoxide poisoning: headache, nausea, and dizziness are also signs of heat stroke and heat stress. If a worker has these signs, get her out of the work room and take off her respirator. If the person faints, call an ambulance. If a person does not respond to you when you call their name and shake their shoulder, they are unconscious. If a worker becomes unconscious because of carbon monoxide, be prepared to give CPR (carpio-pulmonary resuscitation). CPR is a way to get someone's heart and lungs working again. There should always be someone

on your crew who has current CPR certification. You can get certified by taking CPR classes. They are given at your local Red Cross, American Lung Association, and the National Safety Council.

If you begin to have signs of carbon monoxide poisoning and you are wearing a Type C respirator, turn on your escape gear and disconnect your air line. Alert your co-workers and get out of the work area. Help your co-workers to get out and have the air purification system checked.

Oxygen-Deficient and Enriched Atmospheres

Oxygen is a gas in the air you breathe. There must be between 19.5% and 23.5% oxygen in the air when you are working. If the oxygen level goes below 19.5% in a work area, that area has an oxygen-deficient atmosphere.

Oxygen deficient atmospheres may be caused by chemical reactions, work being done, or replacement of oxygen by carbon monoxide or another gas. Air should be tested to see if there is enough oxygen in any confined space.

If you are in an area that has an oxygen-deficient atmosphere, you may feel light headed, anxious, or start to act silly. If you think you are in an oxygen-deficient atmosphere, get out. If the oxygen levels are low enough, you could die in minutes. Only enter an oxygen-deficient atmosphere wearing a self-contained breathing apparatus, or supplied air respirator with bottle escape. If the oxygen content is above 23.5%, it is enriched and is a explosive hazard. Do not enter or remain in an oxygen-enriched area unless you are trained and properly equipped.

Electrical Shocks

Electricity is measured in volts. Even a few volts can kill you if the electricity goes through your heart. Electricity follows the easiest path to the earth. It is very easy for electricity to travel through water. If you are wet and you touch electricity, it may travel through your body.

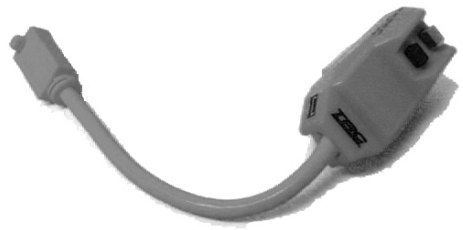
A wire with electricity going through it is called a "live" wire. If a tool or an extension cord is broken, it may have a short. This means that the electricity doesn't flow through the right wires. It may flow through the tool and into your body. Electricity is a problem on asbestos jobs because:

- A lot of water is used.
- Power tools are used.
- Metal tools may be used.
- Power may not be shut off.
- Extension cords are used.
- Exposed wires.

Preventing Electrical Shocks

The best way to protect workers from shocks is to prevent shocks. OSHA says your employer has to prevent shocks. Your employer can use a sensitive **circuit breaker or a written program.**

A Ground Fault Interrupter (GFI) is a very sensitive circuit breaker. If there is a short, the GFI should shut off the power before it can hurt your heart. A Ground Fault Interrupter is a very good way to prevent shocks. Each extension cord should have its own GFI. Your employer can also use a **written program.** With a written program, you count on a person (instead of a piece of equipment) to keep you safe. You can do the following to prevent electric shocks on the job --



Don't use too much water -- Don't use so much water that there are pools on the floor. Clean up small amounts of water with a wet/dry HEPA vac. Never use water around live wires.

Shut off the power -- Lock the electrical box. Your employer should have an electrician come in and test the wires. You might think that all the power is shut off, but it may not be. You could be in for a big surprise.

Cover electrical outlets -- Be sure that electrical outlets and boxes are covered water-tight.

Use safe power tools -- Power tools should be **double insulated.** This means the outside of the tool doesn't touch the wires in the cord. Tools should also be **grounded.** This means there is an extra wire in the cord. If there is a short, electricity will travel through the extra wire. Electricity should not go into your body. A **grounded** tool has three prongs on the plug (instead of two). **Never cut the third prong off a grounded plug.** Use an adapter. Attach the wire on the adapter to the plate on the outlet.

Keep power tools in perfect shape– It is much easier to get a shock from a broken tool. Broken tools should be taken off the job. They should have a DO NOT USE tag on them. Do not try to fix a broken tool unless you have been trained. Always unplug a tool before trying to fix

it. Some companies cut the cord of a broken tool so no one can use it.
Here are some ways to keep tools in perfect shape:

- Inspect the tool before you use it.
- Give broken tools to your supervisor.
- Be sure the tool is sharp-the motor has to work harder if it is dull.
- Don't carry a tool by its cord.
- Don't unplug a tool by pulling on the cord.
- Store tools where they won't be damaged.

Use safe extension cords -- Heavy-duty wire is **not meant** for temporary wiring. Your employer must give you extension cords with plugs for power tools. Your employer should give you grounded extension cords.

Keep extension cords in perfect shape -- There may be a lot of extension cords on the job. The negative air machine needs one. So do power tools and lights. Extension cords need to be taped up off the floor. If a scaffold runs over the cords, it could cut them. **Never hang extension cords with wire.** This could cause a shock. When you attach a tool to an extension cord, put electrical tape around the joint. Also do this when you attach two extension cords together.

Never use metal hand tools or ladders- Electricity travels through metal. If you touch a live wire with a metal shovel, you could get a bad shock. Your employer should give you plastic or wood tools. Metal tools with plastic handles are safer. Metal ladders are also dangerous. Your employer should give you wood or fiberglass ladders.

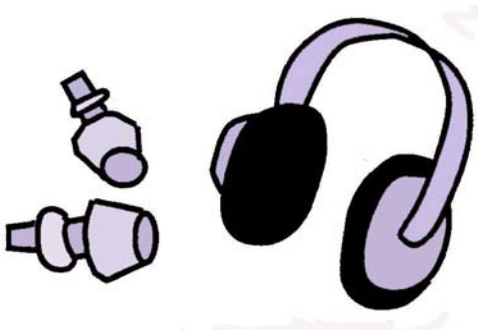
Wires in walls and ceilings -- When you scrape asbestos off a ceiling, you might uncover wires. It is very important to shut off the electricity and have an electrician test it.

If a worker has been shocked, do not touch him -- You might get a shock yourself. Shut off the power first. Then use dry wood pole to move him away from anything metal. **Someone on the job should be trained to do CPR.**

Use protective equipment – Preventing shocks is the best way to protect workers. But if you must work around live wires, you need to protect yourself. You may need rubber gloves, a hard hat, and rubber boots. The equipment must be made for working with electricity. Only some hard hats are made for working with electricity.

Noise

Working in a noisy place can make it more difficult to work. Too much loud noise can also damage your health. Hearing loud noises for short periods of time can make it hard for you to hear normal noises temporarily. If you hear loud noises often for a long time, your hearing can be damaged forever. Noise can also cause you to have high blood pressure, be irritable or, may upset your sleep temporarily.



Noise is measured in units called decibels (dB). If a noise is increased by 3 dB, it sounds twice as loud. A very soft whisper is 30 dB. A loud rock band may play at 120 dB. OSHA has a law that says your employer must make hearing protection available to you if you work for 8 hours when the noise level is above 85 dB. But studies have many scientists recommending that everyone exposed above 80 dB wears hearing protection. The law requires that you have tests every year to measure your hearing if you work at noise levels above 85 dB. Some HEPA vacuums can cause a noise level of 80 dB. You will be more comfortable if you wear ear plugs or ear muffs while working with a HEPA vacuum. Your employer should help you make sure that your plugs or muffs fit properly.

Fires and Explosions

A fire on an asbestos job is very dangerous. **Poly, duct tape, and disposable suits burn fast. Poly will melt and can burn at about 150 degrees. The negative air machine makes the fire spread fast. The work room is dark and there is only one exit.**

The best way to deal with fires is to prevent them. Any fire needs three things: fuel (something that burns); heat (the heat, flame or spark that starts the fire); and oxygen (in the air). **Preventing fires means keeping fuel, heat and oxygen from coming together.**

FUEL	HEAT	OXYGEN
» poly	» welding	» air
» duct tape	» cutting torches	» negative air machine
» spray glue	» electrical wires	
» encapsulant	» lights	
» disposable suits	» broken tools	
» wood	» operating machines	
	» cigarettes	

Welding and cutting -- These are often used in demolition. A worker must stand by with a fire extinguisher in case any sparks fly.

Electrical wires and lights -- An ordinary lamp on the floor can start a fire. Never wrap lights in poly. Heat will build up and can set the poly on fire. Your employer must use safety lights. The lights have cages that keep the hot bulb from starting a fire. They are also safe in water.

A fire or a trip waiting to happen

Tools -- If tools are kept in perfect shape, they are not likely to start a fire.

Operating machines -- These need extra protection during setup.

Cigarettes are not allowed on asbestos jobs. Do not smoke during setup. Poly and spray glue both catch fire very easily. There are some new products which can help prevent fires. Fire-resistant poly doesn't burn as easily. New spray glues use chemicals that don't burn as easily.

Flammable Vapors

Some chemicals can give off vapors that can ignite and burn. Many glues and mastics used on work sites produce flammable vapors.

Flammable gases may also be present at the work site. These include those that the workers bring on site, like acetylene for use in torches or methane gas, a naturally occurring flammable gas. Serious injury or death can result from fires due to flammable vapors. For this reason, OSHA has established standards to prevent workers from being in

flammable atmospheres. If you suspect a flammable atmosphere exists, air monitoring must be conducted to determine if the area is safe.

In case of fire

If there is a fire in the work room, get out. The fire will spread very quickly. You may have to cut through the poly to get out of the work room. Your employer must have **fire extinguishers** and an **escape plan**. Fire extinguishers need to be able to put out wood, chemical, and electrical fires. These are called **ABC-rated fire extinguishers**. If there are sprinklers, your employer should try to leave them in service as long as possible.

The escape plan includes a map and emergency phone numbers. The plan should be hung in the decon. When you start a job, look at the map. Figure out how you would get out in an emergency. Do you have to dial "9" to make a phone call outside of the building? Is there an emergency exit from the work room? Are there arrows made out of tape on the walls to show you how to get out? If the fire started near the decon, you will not be able to get out that way. Where is the fire extinguisher? Do you know how to use it?

Confined Spaces (29 CFR 1910.146.)

There are some cases where you may work in a small area that is hard to get out of. This might happen if you are taking asbestos off the inside of a steam tunnel, a factory oven, or a storage tank. It may be hard to get out of these **confined spaces.**

A "confined space" is an area that has limited opening to get in and out, has poor natural air flow, and is not designed to be worked in continuously. Confined space work can be very dangerous. You need to be trained in special procedures and safety practices.

The air quality inside a confined space may be very different than the air outside of the area. Deadly gases may be trapped inside, or there might not be enough oxygen. The air should be tested inside a confined space before you go in to make sure it is safe. A ventilating system may be hooked up, and air monitoring should continue throughout the entire project.

If you work inside a confined space, you should wear a rescue harness.

CONFINED SPACE ENTRY PERMIT

This permit must be filled out before any entry can occur
and returned to the Safety Officer for filling when work is completed.

1. Name/Location of Area _____
2. Time and Date of Entry _____
3. Personnel who will enter _____

_____

4. Have all valves/electrical equipment been locked? Yes ___ No ___
5. Have all lines been broken, blanked off, or isolated? Yes ___ No ___
6. Combustible gas meter test results _____
7. Oxygen meter test results _____
8. Hydrogen sulfide test results _____
9. Other air monitoring test results _____
10. Warning signs posted? Yes ___ No ___
11. Respirators worn? (list type) _____
12. Lifeline and safety winch? Yes ___ No ___
13. Other safety equipment used? _____
14. Intrinsically safe equipment used? _____

Sign after checking personally:

1. _____ 2. _____
3. _____ 4. _____

There should be another worker outside (attendant) who checks on you at least every few minutes. He can pull you out if something happens to you.

Other safety measures include:

- Preparing a written rescue plan;
- Locking and tagging-out all energy sources;

- Using an entry permit system;
- Using proper entry and rescue equipment; and
- Making sure all team members understand their roles.

People can die in confined spaces. This happens when safety procedures aren't followed. Using an entry permit – a kind of check off list – helps to avoid such deaths and accidents.

No one should go into a confined space to rescue a worker unless he or she is trained and protected. Many people die trying to rescue workers in confined spaces. Hurrying to help out, rescuers often forget to follow safety procedures.

Ladders
(29 CFR 1926. Sub Part X)

Never use metal ladders. Electricity passes through them, and it can shock you. Also be sure that ladders are in perfect shape. Ladders can be dangerous if they are not used properly and kept in good condition. **Every time you use a ladder, check for these things:**

- broken steps;
- broken hinges;
- broken feet;
- wobbly ladder;
- no rubber safety feet; and
- water on the ladder.

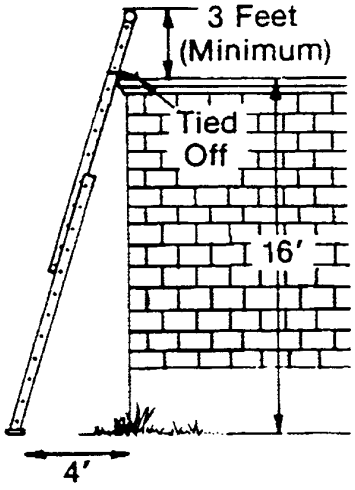
Here are some ways to use ladders safely –

Don't lean a step ladder against a wall. Use a ladder that's made to lean against a wall.

If you lean a ladder against a wall, set it up so that the top of the ladder is four times higher than the distance from the wall to the base of the ladder.

Only use one side of a step ladder. The other side isn't made to hold a person.

Face the ladder. Don't stand on it backwards.



USE LADDERS SAFELY

Don't stand higher than two steps from the top of a step ladder. Get a taller ladder.

Don't use a ladder as a platform. Use a piece of wood.

Scaffolds
(29 CFR 1926 Sub Part L)

Scaffolds on wheels are common on asbestos jobs. Metal scaffolds are not safe. Electricity travels through metal. If you touch a live wire with a metal scaffold, you can get a bad shock.

You can't tell whether a scaffold is safe by looking at it. Scaffolds must be put together by someone with experience. All the parts must fit perfectly. They should be inspected by someone other than the person who built them.

Here are some rules about scaffolds on wheels --

All scaffolds should have railings. These keep you from falling over the side.

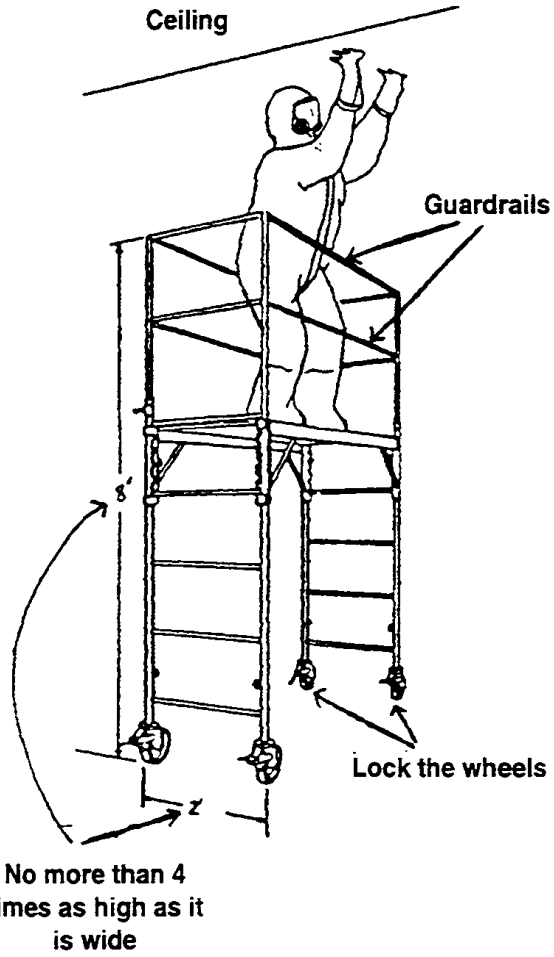
Fall Protection is required if scaffolds are more than 10 feet high.

The scaffold parts must be locked together with pins.

The wheels must be locked when people are on the scaffold.

Generally: Scaffolds may not be more than 4 times higher than they are wide. A scaffold 6' wide may not be more than 24' high; otherwise, they must be secured.

Boards may not overlap the ends of the scaffold more than 1 foot or less than 6 inches. If you step on



the end of the board, the board could tip over and you would fall.

It is safer to use scrapers with long handles than to work on a scaffold.

If you are using air-supplied respirators, it is easy for the hose to be caught on the scaffold. Be sure that there is enough hose for you to move around. It is even more important not to fall off scaffolding. If you fall, you may be trapped by the hose. It can pull the respirator off your face. The hose could pull other people off the scaffold.

Slips, Trips, and Falls

When you work, you wear slippery booties on your feet. The floor has plastic on it. There is water on the floor. You may drag a 300-foot-long air hose behind you. It is easy to slip or trip. You can reduce your risk of falling. **Here are some ways to prevent falls on the job –**

- Keep the floor dry
- Don't use too much water
- Use a wet/dry HEPA vac to pick up small amounts of water
- Wear boots outside of your booties. You cannot wear these boots outside an asbestos job.
- Tape extension cords up on the walls.
- Keep boxes, bags, and other junk out of the way.
- Keep air lines from getting tangled.

Back injuries

Back injuries are very common and very painful. Back injuries are one of the most common injuries to workers in America. They are hard to treat. It is much easier to prevent back problems than to treat them. **Here are some ways to prevent back problems –**

- Figure out how much you can lift comfortably.
- Figure out a way to lift that's comfortable for you. Lift close to your body.
- Try to keep your back straight when you lift. Use your legs to lift.
- Don't lift, twist, and turn at the same time. This is when most back injuries occur.
- Get help to lift heavy bags.

Shock

Whenever anyone has suffered a serious injury , they can go into shock. People who have been cut badly or have a serious burn may go into shock. Shock happens when some parts of the body have a sudden need for a lot of extra blood. Because blood is flowing to other parts of the body, there is less blood going to the brain and the person goes into shock. Symptoms of shock are --

- Cold, wet skin
- Pale
- Rapid heartbeat
- Thready pulse (When someone has a thready pulse, you may not be able to feel a regular beat at their wrist. You may feel the blood running under the skin, but no regular rhythm.)

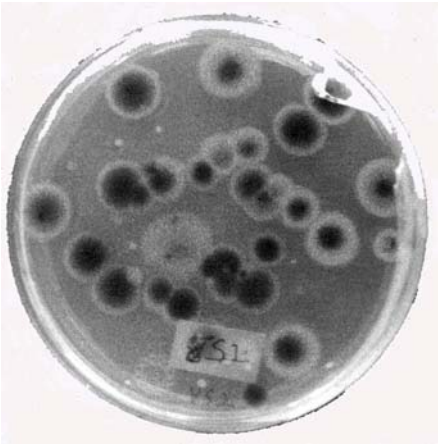
Shock can be very serious. People can die from shock. **Whenever someone goes into shock, you should call 911 or the local emergency number for emergency help.**

To treat a person in shock, the person should lie down. Lift their feet up about 6 inches, unless the person has an injury to their legs. Cover the person with a light blanket, unless they are sweating heavily. Do not give them anything to eat or drink. It is sometimes hard for people to swallow if they are in shock. Treat the person as best as you can until the emergency personnel arrive.

Mold

All molds have potential health effects. Molds can produce allergens than can trigger allergic reactions or even asthma attacks in people allergic (as determined by a physician) to mold. Others are known to produce potent toxins and/or irritants. Unfortunately, medical studies seeking to establish direct health effect results to mold exposure are a mixed bag of results.

Currently there are not any OSHA PELs, NIOSH RELs, nor ACGIH TLVs for exposure to mold. EPA has produced a set of remediation guidelines, as has the city of New York. The term



Mold growth after one week in lab conditions

"professional judgment" can be found in "legally enforceable work practices". OSHA Class 1 asbestos abatement required regulated area setup, disposal, and worker PPE exceeds EPA mold remediation recommended practices. Work practices are necessarily different and personal decontamination for mold exposure is less stringent. If mold is found during an Class 1 asbestos abatement job, the property's owner will decide whether or not to remediate the mold contamination while removing asbestos. Since both removal processes make use of poly wall and room barriers, HEPA vacuums, and negative air machines (depending on the level of mold contamination), an owner might decide to have an Class 1 asbestos abatement crew remove mold damaged building parts. Workers performing Class 2 or 3 asbestos abatement work may find changes in PPE, work setup, and remediation.

Non-Regulatory Mold Remediation Guidelines

Containment ..... Limited: Use poly sheeting ceiling to floor around affected area with slit entry and covering flap; maintain area under negative air pressure with HEPA filtered fan unit. Block supply and return air vents within the containment area.

Full: Use two layers of fire-retardant poly with one airlock chamber. Maintain area under negative air pressure with HEPA filtered air fan exhausted outside of building. Block supply and return air vents within contaminated area.

Cleanup Methods ..... Method 1: Wet vacuum (in case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried.) Steam cleaning may be an alternative for carpets and some upholstered furniture.

Method 2: Damp-wipe surfaces with plain water or water and detergent solution (except wood – use wood floor cleaner); scrub as needed.

Method 3: HEPA vacuum after the material has

	been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags. **Method 4:** Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.
PPE	**Minimum:** Gloves, N95 filtering facepiece respirator, goggles/eye protection **Limited:** Gloves, N95 filtering facepiece respirator or half-face respirator with HEPA filters, disposable overalls, goggles/eye protection **Full:** Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filters

Sources: "Bioaersols: Assessment and Control" (ACGIH, 1999) and "IICRC S500, Standard and Reference for Professional Water Damage Restoration" (Institute of Inspection, Cleaning and Restoration, 1999).

Medical Evaluation

Individuals with persistent health problems that appear to be related to fungi or other bioaerosols should see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures. Clinical tests that can determine the source, place, or time of exposure to fungi or their products are not currently available. Antibodies developed by exposed persons to fungal agents can only document that exposure has occurred.

Persons recovering from surgery, or people with immune suppression, asthma, hypersensitivity pneumonitis, severe allergies, sinusitis, or other chronic inflammatory lung diseases may be at greater risk for developing health problems associated with certain fungi.

OTHER SAFETY AND HEALTH PROBLEMS

Key Facts

Heat stroke
A medical emergency: call an ambulance
Symptoms: hot skin, dry skin, flushed skin

Get the person out of the work room. Take off the suit and respirator. Get the skin wet to cool off the body.

Heat stress
A medical alert
Symptoms: cold skin, clammy skin, pale skin

Get the person out of the work room. Take off the suit and respirator. Give the victim a cool drink.

To prevent heat problems:
Drink lots of water. Get used to heat gradually over 2 weeks. Take breaks.

Other chemicals:
An asbestos filter on your respirator will not protect you from other chemicals. Use a combination filter or an air-supplied respirator.

Never use metal hand tools or ladders.
Use Ground Fault Interrupters (GFI) on all power sources.
Wear rubber gloves, a hard hat, and rubber boots if you work with live wires.

If a worker has been shocked, shut off the power and use a dry wood pole to move the worker.

To prevent fires:
Have a worker stand by with a fire extinguisher when welding or cutting torches are used. Have an ABC-rated fire extinguisher on the job.

Key Facts continued on next page

Key Facts (continued)

To prevent falls:
Inspect ladders every time you use them.

Make sure all scaffolds have railings. Lock the wheels when people are on the scaffold. Scaffolds may not be more than four times higher than they are wide.

Carbon monoxide is a dangerous gas.
Signs of carbon monoxide poisoning: headache, nausea, dizziness, sleepiness, faint, throw up. Get the worker out of the work room and take off the respirator.

Electrical hazards
An electric shock can stop your heart. If you are wet and you touch electricity, it will travel through your body.

To prevent electric shocks:
Never use water around live wires.
Shut off the power and lock the electrical box.
Use tools that are double-insulated and grounded.

OSHA 300 Log of Workplace Injuries (29 CFR 1904)

You have a right to know about on-the-job injuries and illnesses. OSHA requires your employer to keep a record of all **reportable injuries and illnesses** that occur at your workplace. This record is called the **OSHA 300 Log**. There is also the **301 Incident Report** (for injury or illness in the Log) and the **300A Summary** (posted annually). You have a right to see this information. It can help you identify the hazards of your job.

Not all injuries or illnesses are reported. Some workers go to private doctors and they or their insurance companies pay. Other workers are afraid to report injuries or illnesses. Finally, OSHA has its own definitions about what is and isn't reportable. Very often the 300 Log data is an understatement of actual work- related injuries and illnesses.

Safety and Health Exercise

This is not a test. It is an exercise. Use it to see for yourself how well you understand the material in the chapter.

1. Why is electricity a hazard on asbestos jobs?

2. Why do you need Ground Fault Interrupters (GFIs) for extension cords?

3. How do GFIs protect against electrical shocks?

4. What other protection can you use against electrical shocks?

5. Why shouldn't you use metal ladders?

6. Why are scaffolds on wheels dangerous?

7. How do you protect yourself from these dangers?

8. Name two common tripping hazards on asbestos jobs.

9. Why is fire safety a problem on removal jobs?

10. What type of fire extinguishers should be used on an asbestos job?

11. Why is heat stress a problem on asbestos jobs?

12. What are the symptoms of heat stress?

For More Information

USDOL, "Protecting Workers in Hot Environments," USDOL Fact Sheet #84-16.

NIOSH, "Work in Hot Environments," Publication Ko. DHHS (NIOSH) 86-112.

NIOSH, "A guide to Safety in Confined Spaces," Publication No.87-113.

Federal Register, "Permit Required Confined Spaces; Notice of Proposed Rulemaking," Vol. 54, No.106, p. 24080.

OSHA Electrical Standards, 29 CFR 1926.400 to 449.

OSHA, "Controlling Electrical Hazards," Publication No. OSHA 3075.

OSHA, "Ground Fault Protection on Construction Sites," Publication No. OSHA 3007.

OSHA Ladder Standard, 29 CFR 1926. Sub Part X.

OSHA Scaffold Standard, 29 CFR 1926. Sub Part L.

OSHA Permit Required Confined Space Standard for General Industry, 29 CFR 1910.146

NIOSH, "General Safety Considerations," Appendix E to EPA/NIOSH, " A Guide To Respiratory Protection in the Asbestos Abatement Industry," Publication No. EPA-560-0PTS-86-001.

EPA, “Mold Remediation in Schools and Public Buildings,” March 20001, EPA Publication No. 402-K-01-001 (epa.gov/iaq/molds/), 800-438-4318.

New York Department of Health, Bureau of Environmental and Occupational Disease Epidemiology, “Guidelines on Assessment and Remediation of Fungi in Indoor Environments,” (ci.nyc.ny.us/html/doh/html/epi/moldrpt1.html), 212-788-4290.

Additional Resources 8

Digging up the facts.

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Terms in **CAPITALS** are defined in the glossary.

ABATEMENT	Lessening the HAZARD of ASBESTOS. Includes ENCAPSULATE, ENCLOSE, REPAIR, and remove ASBESTOS.
ACM	Asbestos-Containing Material.
ADEQUATELY WET	ASBESTOS is "adequately wet" when it is wet enough so that no particles are released. Surfactant is used to adequately wet asbestos. One indication of this (but not the only one) is no visible emissions.
AGGRESSIVE SAMPLING	A way of taking AIR SAMPLES where the air is stirred up using fans and leaf blowers. Aggressive sampling is used for CLEARANCE AIR SAMPLES.
AHERA	The Asbestos Hazard Emergency Response Act- The EPA law covering ASBESTOS in schools.
AIRLOCK	An empty room in some DECONs. Workers pass through the flapped doors one at a time. Air cannot move through the airlock.
AIR - PURIFYING RESPIRATOR	Protective equipment. A face mask with filters that you wear. It filters or purifies the air in the work area.
AIR SAMPLES	Measuring the amount of ASBESTOS in the air using a pump.
AIR-SUPPLIED RESPIRATOR	Protective equipment. A face mask with a hose. It supplies clean air to you from outside the work area.
ALVEOLI	Tiny air sacs found in your lungs. They are important areas where oxygen enters your body.

AMENDED WATER	Water plus a chemical called SURFACTANT. Amended water soaks into ASBESTOS faster than plain water.
AREA AIR SAMPLE	An AIR SAMPLE taken from one spot in a room.
ASBESTOS	A natural mineral used for insulation in many buildings. Asbestos breaks into FIBERs. It causes lung cancer and other diseases.
ASBESTOSIS	A disease caused by ASBESTOS. It is the scarring of the lungs, also known as white lung.
ATTENDANT	A worker stationed outside a CONFINED SPACE to monitor what's going on inside.
B READER	A doctor who has had special training and has been certified to identify signs of occupational diseases on X-rays.
BRONCHI	A branch off the windpipe where air travels to your lungs.
BULK SAMPLE	A chunk of material which is sent to a lab to test for ASBESTOS.
CANCER	A large group of diseases where cells grow abnormally, rapidly, and out of control.
CARBON MONOXIDE	A colorless, odorless, and tasteless poisonous gas.
CARTRIDGE	A filter used on an AIR-PURIFYING RESPIRATOR.
CATEGORY I NON-FRIABLE ACM	ASBESTOS – containing gaskets, resilient floor covering, and asphalt roofing products containing more than one percent of asbestos as determined by using a PLM.

CATEGORY II NON-FRIABLE ACM	All NON-FRIABLE materials that are not Category I non-friable ACM.
CILIA	Very tiny hairs that line the walls of your windpipe and BRONCHI. They beat rapidly and move mucus up your windpipe to remove objects from your respiratory system.
CLEAN ROOM	The last room in the DECON (going out). Clean suits, sanitized respirators, and street clothes are stored here.
CLEARANCE AIR SAMPLE	An AREA AIR SAMPLE taken at the end of the job. It tells the building owner whether the room is clean enough.
COMPETENT PERSON	In the OSHA regulations, a trained supervisor who makes sure that rules are followed and equipment works on the job.
CONFINED SPACE	A space that has the following characteristics: 1) limited openings for entry and exit, 2) inadequate natural air flow, and 3) not designed to be worked in continuously.
CONTAINMENT	Isolating the work area from the rest of the building. Usually done by putting POLY on the walls and floors and using a NEGATIVE AIR MACHINE. This keeps ASBESTOS FIBERS inside the work area.
CONTINUOUS-FLOW AIR -SUPPLIED RESPIRATOR	An AIR-SUPPLIED RESPIRATOR that has a constant amount of air which is supplied to you. It will not give you more air if you need it.
CONTRACT SPECIFICATIONS	See SPECS.
CONTROL METHODS	Ways of controlling ASBESTOS. Includes: ENCAPSULATE, ENCLOSE, REPAIR, remove, and O&M.

COSH	Committee on Occupational Safety and Health-A community based group which helps workers with health and safety problems on the job.
CUBIC CENTIMETER	A space about the size of a sugar cube. Asbestos in the air is measured in FIBERs per cc.
DECON	Decontamination unit or area – A shower unit. The decon has three rooms: DIRTY ROOM, shower and CLEAN ROOM. Everyone must enter and leave the work room through the decon.
DEMAND-ONLY RESPIRATOR	AIR-SUPPLIED RESPIRATOR which always goes into a NEGATIVE PRESSURE before it supplies you the air that you need. This is not a respirator used for ASBESTOS ABATEMENT work.
DEMOLITION	The wrecking or taking out of a load-supporting building part and any related handling operations or the intentional burning of a facility.
DIRTY ROOM	The first room in the DECON (going out). Workers take their suits off in the dirty room on their way to the shower. Dirty hard hats and tools are also stored here.
DOSE	The amount of a substance that you take, or are exposed to, at a specific time.
DOSE-RELATED	A relationship between the amount of a substance you are exposed to and the reaction you have to that exposure.
DUCT TAPE	Sticky, often silver tape. Used to attach POLY.

ELECTRON MICROSCOPE	A microscope which beams electrons (instead of light) at a sample. Electron microscopes can blow up images much larger than LIGHT MICROSCOPEs.
ENCAPSULANT	A sticky paint used to ENCAPSULATE ASBESTOS
ENCAPSULATE	To cover ASBESTOS with a sticky paint. A way to control ASBESTOS without removing it.
ENCLOSE	To build an air-tight box around ASBESTOS. A way to control ASBESTOS without removing it.
ENGINEERING CONTROLS	Ways of controlling workplace hazards by building barriers, ventilation, etc. Must be done before RESPIRATORs may be used.
ENVIRONMENTAL PROTECTION AGENCY	See EPA.
EPA	Environmental Protection Agency – A U .S. government agency that protects against pollution.
EQUIPMENT ROOM	See DIRTY ROOM.
EXPOSURE	Not protected. If you are in a work area with ASBESTOS fibers in the air and you do not have on the right RESPIRATOR, you are exposed to ASBESTOS.
F/CC	FIBERs per CUBIC CENTIMETER of air – ASBESTOS is measured this way. Air is pumped across a filter. The number of FIBERs are counted. The amount of air is measured in CUBIC CENTIMETERS.
FIBER	A single strand of ASBESTOS. ASBESTOS fibers are so small they are invisible.

FIBROSIS	A disease where scar tissue is formed in the connective tissue of the lungs.
FRIABLE	Crumbly – Friable ASBESTOS can be crumbled by hand pressure.
FULL-FACE RESPIRATOR	A face mask that covers the full area of your face, from the hair line of your forehead to your chin.
GLOVE BAG	A 3-foot by 4-foot plastic bag with gloves built into it. The top of the bag is sealed around a pipe. The work is done inside the bag. Used for maintenance work only.
GRADE D AIR	Air for an AIR-SUPPLIED RESPIRATOR. Grade D air has chemicals, oil, and water filtered out so that it is safe to breathe.
GFI	Ground Fault Interrupter – A sensitive circuit breaker for tools and extension cords. A GFI will stop a current before it can stop a worker's heart.
HALF-MASK RESPIRATOR	A face mask that covers half of your face. It covers your nose and mouth from the bridge of your nose to your chin. These are difficult masks to fit.
HAZARD	A danger or a risk.
HEAT EXHAUSTION	An illness caused by working in a hot area. A medical alert.
HEATSTROKE	An illness caused by working in a hot area. A medical emergency – the worker's body cannot cool itself.
HEPA FILTER	High Efficiency Particulate Air filter – A filter that is fine enough to trap ASBESTOS FIBERS in the air. HEPA filters are used in

	RESPIRATORs, HEPA VACUUMs, and NEGATIVE AIR MACHINES.
HEPAVAC	HEPA – equipped vacuum cleaner – A vacuum cleaner which filters air through a HEPA filter.
HVAC SYSTEM	Heating, Ventilating, and Air Conditioning system- The system that heats or cools a building. Usually a central heating and cooling system that blows air through ducts.
IH	See INDUSTRIAL HYGIENIST.
INDUSTRIAL HYGIENIST	A scientist who knows how to control workplace health and safety HAZARDS. An industrial hygienist usually takes air samples and inspects ASBESTOS jobs.
LATENCY PERIOD	A time gap between when you are exposed to a HAZARD and when you have signs and symptoms of disease. For example, if you breathe ASBESTOS today you may get ASBESTOSIS in 20 years. The latency period for most asbestos diseases is 10 – 40 years long.
LEAK- TIGHT	Sealed so that solids or liquids cannot escape or spill out. It also means dust-tight. Six mil poly waste bags or sealed drums are examples of items that could be considered leak tight.
LIGHT MICROSCOPE	A microscope which shines light on a sample. Light microscopes cannot blow up images as large as ELECTRON MICROSCOPES. POLARIZED LIGHT MICROSCOPES (PLMs) and PHASE CONTRAST MICROSCOPES (PCMs) are light microscopes.
LOCAL EXHAUST VENTILATION	Hooking up a vacuum or air duct right at the place where work is being done (for example, on a power tool). This is different from general ventilation – bringing fresh air into a room.

LOCKDOWN	A sticky sealant which is sprayed on beams, decks, ceilings, etc. **after** ASBESTOS is cleaned off. Lockdown seals in any invisible FIBERs that weren't cleaned up.
LOCKOUT/TAGOUT	LOCKOUT is putting a lock on the electrical box during ASBESTOS work or CONFINED SPACE work so that no one will turn the power on by accident. TAGOUT is putting up a warning sign explaining why the power box is locked.
LUNG CANCER	A disease which is a CANCER of the lung. It is an abnormal growth of cells in the lung tissue, usually growing in the BRONCHI.
MATERIAL SAFETY DATA SHEET	MSDS – A chemical fact sheet. Your employer must train you how to use Material Safety Data Sheets.
MAXIMUM USE CONCENTRATION	The highest amount of asbestos a respirator can handle and protect you against.
MEDICAL EXAM	An exam given by a doctor to check your health.
MESOTHELIOMA	A disease caused by ASBESTOS. It is a CANCER of the lining of the lungs or the lining of the stomach and digestive system.
MSDS	See MATERIAL SAFETY DATA SHEET.
NEGATIVE AIR MACHINE	A heavy-duty fan with HEPA filters in it. All the air that leaves the work room is pulled through the negative air machine.
NEGATIVE AIR PRESSURE	When a NEGATIVE AIR MACHINE is running, the air pressure inside the work room is less than the air pressure outside the work room. ASBESTOS cannot leak out of the work room.

NEGATIVE PRESSURE USER SEAL CHECK	A test to check the seal of your RESPIRATOR to make sure that it is fitted to your face so that there are no leaks for fibers to get in. You use NEGATIVE PRESSURE for this check. It is a check you must do each and every time that you put on your RESPIRATOR.
NEGATIVE PRESSURE RESPIRATOR	A face mask (RESPIRATOR) that works by using NEGATIVE PRESSURE to seal the face piece to the face. NEGATIVE PRESSURE means that there is less air pressure inside the face mask then outside the face piece.
NESHAP	The National Emission Standards for Hazardous Air Pollutants. An EPA regulation for ASBESTOS.
NIOSH	The National Institute for Occupational Safety and Health – A U.S. government agency that researches worker safety and health. NIOSH recommends changes in the regulations to OSHA. NIOSH also approves respirators.
NON-FRIABLE	ASBESTOS that **cannot** be crumbled by hand pressure.
O&M PLAN	Operations and Maintenance Plan – A plan for controlling the ASBESTOS that remains in a building. This plan includes: 1) Where the asbestos is found in the building. Many asbestos materials should be labeled. 2) The amount of training that workers must receive to work with the material. 3) The permits which must be obtained before working with asbestos. 4) Accepted ways to work with asbestos safely. This includes equipment, worker protection, and medical exams. 5) When and how to check the condition of asbestos materials and record any changes.

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION	See OSHA.
OSHA	The Occupational Safety and Health Administration – A U.S. government agency that covers worker safety and health on the job.
OSHA STANDARD	An OSHA regulation, for example, the OSHA Asbestos Standard.
OXYGEN-DEFICIENT ATMOSPHERE	An atmosphere containing an oxygen level less than 19.5 percent.
PAPR	Powered Air Purifying Respirator – An AIR – PURIFYING RESPIRATOR (a face mask with a filter) that has a pump. This pumps air through the filter to the face piece. It is a POSITIVE PRESSURE RESPIRATOR You can request a PAPR whenever a NEGATIVE PRESSURE RESPIRATOR is required by law.
PCM	Phase Contrast Microscope – The microscope used to count ASBESTOS FIBERS from PERSONAL AIR SAMPLES. PCM is sometimes used for AREA AIR SAMPLES.
PEL	Permissible Exposure Limit – The PEL is 0.1 fibers per cubic centimeter over an 8-hour day. This is OSHA' s legal limit on how much ASBESTOS you may be exposed to.
PERMISSIBLE EXPOSURE LIMIT	See PEL.
PERSONAL AIR SAMPLE	An AIR SAMPLE taken in a worker's breathing area. This is an accurate measure of how much asbestos the worker was EXPOSED to. Personal air samples are taken on a few workers every day.

PFT	See PULMONARY FUNCTION TEST.
PHASE CONTRAST MICROSCOPE	See PCM.
PLEURA	A two-layered lining of the chest area. It wraps around the lungs and the inside of the rib cage.
PLM	Polarized Light Microscope – The microscope used to look at BULK SAMPLES.
POLARIZED LIGHT MICROSCOPE	See PLM.
POLY	Polyethylene sheet plastic – Sheet plastic that is taped to walls and floors to protect them from ASBESTOS while work is going on.
POSITIVE-PRESSURE USER SEAL CHECK	A test to check the seal of your RESPIRATOR to your face. You check for leaks by testing the fit with POSITIVE PRESSURE. You make the POSITIVE PRESSURE by blowing into the mask.
POSITIVE-PRESSURE RESPIRATOR	A face mask that has more air pressure inside the mask then outside the mask. These RESPIRATORs are more protective then the NEGATIVE PRESSURE RESPIRATORs. With POSITIVE PRESSURE the air leaks from the inside to the outside.
POWERED AIR PURIFYING RESPIRATOR	See PAPR.
PRESSURE-DEMAND AIR-SUPPLIED RESPIRATOR	A face mask with air supplied to the mask through a hose. The amount of air that is supplied to you is exactly what you "demand." There is a regulator that senses the amount of air that you need to breathe.

PROTECTION FACTOR	PF – The degree of protection of a RESPIRATOR. The Protection Factor is determined in a laboratory.
PULMONARY FUNCTION TEST	A breathing test to see how well your lungs are working. It measures how much air you can breathe in and out. It can tell you if there is a problem with your lungs.
QUALITATIVE FIT TEST	A test that tells you if you have any leaks in your RESPIRATOR. You are tested by someone who follows the OSHA procedure. The test uses smoke, oil or sugar. If you smell or taste the testing substance, you have a leak and the respirator does not fit. You must have a qualitative fit test for any NEGATIVE PRESSURE RESPIRATOR that is issued to you.
QUANTITATIVE FIT TEST	A test that tells you if you have any leaks in your RESPIRATOR. It is a very accurate test. It uses a probe to determine the amount of testing agent outside the mask and the amount inside the mask. It gives you the personal PROTECTION FACTOR which that mask has for you.
RACM	Materials covered by the NESHAP regulations: 1) FRIABLE ASBESTOS material, 2) CATEGORY I NON-FRIABLE ACM that will or has become FRIABLE, or 3) CATEGORY II NON-FRIABLE ACM that has a high probability of becoming or has become FRIABLE during demolition or renovation.
REGULATED ASBESTOS CONTAINING MATERIAL	See RACM.

RENOVATION	Changing a building or one or more building parts in any way, including the stripping or removal of RACM. (Operations whereby load-supporting building parts are wrecked or taken out are DEMOLITIONS.)
REPAIR	Putting a patch on ASBESTOS pipe insulation. A way to control ASBESTOS without removing it.
RESPIRATOR	A face mask used to protect you. It either filters your breathing air or supplies you with clean breathing air.
SCBA	Self-Contained Breathing Apparatus – A positive pressure, pressure demand AIR-SUPPLIED RESPIRATOR for which you carry the air supply in a tank.
SPECS	Contract specifications – A written plan for the job that the building owner writes. The contractor must follow the specs.
SPRAYBACK	New insulation put up **after** ASBESTOS is removed and the job passes the CLEARANCE AIR SAMPLE.
SURFACTANT	A chemical added to water to make it soak into ASBESTOS faster. Surfactant makes water wetter.
TAGOUT/ LOCKOUT	LOCKOUT is putting a lock on the electrical box during ASBESTOS work or CONFINED SPACE work so that no one will turn on the power source by accident. TAGOUT is putting a tag on the box explaining why the power box is locked.
TEM	Transmission Electron Microscope -- The microscope used to count ASBESTOS from CLEARANCE AIR SAMPLES.

TRANSMISSION ELECTRON MICROSCOPE	See TEM.
TIME WEIGHTED AVERAGE (TWA)	A method of determining fiber counts for an eight hour work period by averaging shorter sampling periods together.
TYPE C RESPIRATOR	An AIR-SUPPLIED RESPIRATOR.
VISIBLE EMISSIONS	A substance given off by RACM, asbestos-containing waste material, or any asbestos milling, manufacturing, or production which can be seen without the aid of instruments.
WHITE BLOOD CELLS	A part of the body's defense system against outside substances. They attack foreign objects like bacteria or ASBESTOS.
WORK HISTORY	A part of your medical exam. You list what you have worked with, when and where. This helps the doctor look for job-related diseases that you might have.
WORK PRACTICES	Ways of doing work that affect how safe it is. For example, keeping ASBESTOS wet is a good work practice. It keeps ASBESTOS out of the air.

"Hands-on" practice at putting down the first floor layer of poly.

This was adapted, in part, from a glossary developed by the Maine Labor Group on Health, Inc. and the Maine Division of Asbestos Management Activities. The information was compiled from many sources, including material supplied by the U.S. Environmental Protection Agency.

Acronyms used in the manual...

ACM	Asbestos-containing Material
ACBM	Asbestos-containing Building Material
AHERA	Asbestos Hazard Emergency Response Act
ASHARA	Asbestos School Hazard Abatement Reauthorization Act
CFR	Code of Federal Regulations
CL	Clearance Level
EL	Excursion Level
EPA	Environmental Protection Agency
f/cc	Fibers per Cubic centimeter
GFI	Ground Fault Interrupter
HEPA	High Efficiency Particulate Air
HVAC	Heating, Ventilating, and Air Conditioning
MSDS	Material Safety Data Sheet
MUC	Maximum Use Concentration
NESHAP	National Emission Standards for Hazardous Air Pollutants
NIOSH	National Institute for Occupational Safety and Health
O&M	Operations & Maintenance
PAPR	Powered Air-Purifying Respirator
PCM	Phase Contrast Microscope
PEL	Permissible Exposure Limit
PF	Protection Factor
PLM	Polarized Light Microscope
SAR	Supplied Air Respirator

TEM Transmission Electron Microscope

TSI Thermal System Insulation

VAT Vinyl-Asbestos Tile

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ASBESTOS CONTRACTOR/SUPERVISOR

Class Agenda

DAY ONE	TOPIC	TAB
8:00 a.m. - 8:30 a.m.	Welcome and Introduction	
8:30 - 9:00	Video Tape	
9:00 - 10:15	Background Information: History, Physical Characteristics, and Uses of Asbestos ● Training Fact Sheet ● Supervisory Techniques: Asbestos Bulk Sampling[1]	**1**
10:15 - 10:30	**Break**	
10:30 - 11:45	Health Effects of Exposure and Medical Exams ● Supervisory Techniques: Medical Surveillance/Recordkeepimg • Asbestos Medical Questionnaire	**2**
11:45 - 12:30 p.m.	**Lunch**	
12:30 - 4:00 (w/break)	State and Federal Law and Regulations ● Supervisory Techniques: Legal & Insurance Considerations ● Supervisory Techniques: Contract Specifications	**3**
4:00 - 5:00	Respiratory Protection and PPE ● Respirators – Principles and Types ● Caring for Your Respirator ● Other Safety Equipment	**4**

[1] "●" indicates additional special topic(s)

DAY TWO	TOPIC	TAB
8:00 a.m. - 8:30 a.m.	Day One in Review	
8:30 - 9:30	• Respiratory Protection and PPE cont'd • Caring for Your Respirator • Other Safety Equipment	**4**
9:30 - 11:45 (w/break)	Respirator Fit Testing & PPE (Hands-on Workshop) • Inspection • Donning • Negative and Positive User Seal Checks • Doffing • Fit-testing (Supervisory Techniques) • Cleaning/Sanitizing a Respirator • PPE Dress-out	**4**
11:45 - 12:30 p.m.	**Lunch**	
12:30 - 5:00 (w/break)	Respirator Fit Testing & PPE (Hands-on Workshop)	

DAY THREE

8:00 - 8:30 a.m.	Day Two in Review	
8:30 - 9:15	Supervisory Techniques/Recordkeeping Respiratory Protection Program	**4**
9:15 - 10:30 (w/break)	Control Methods	**5**

10:30 - 11:45	Worksite Setup/Engineering Controls/ Decontamination
	• Supervisory Techniques: Pre-work Activities and
	  • Assessing the work area
	  • Supervisory Techniques/Recordkeeping:
		5

DAY THREE	TOPIC	TAB
	Design and Use of a Project Log Book ○ Log Book Organization ○ Daily Log ● Supervisory Techniques: Sample Inventory Checklist ● Supervisory Techniques: Negative Pressure Systems ● Supervisory Techniques: Entering/Exiting the Decon Unit	
11:45 - 12:30 p.m.	**Lunch**	
12:45 - 2:45	Worksite Setup/Engineering Controls/ Decontamination cont'd	**5**
2:45 - 5:00 (w/break)	Class I - III Work Practices ● Supervisory Techniques: Equipment Used for Removal of Friable Insulation Materials ● Supervisory Techniques: Air Sampling • Filters • Pump Calibration • Analyzing Airborne Fibers • Air Sampling During and After the Asbestos Abatement Project ○ Recordkeeping: Sample Log Form	**5**

DAY FOUR

8:00 - 8:30 a.m.	Day Three in Review	
8:30 - 9:30	Lockdown & Sprayback/Cleanup & Disposal ● Supervisory Techniques: • "3-Phase" Cleaning • Visual Inspection • Recordkeeping: Lockdown Sequence • Recordkeeping: Air Sampling After Final Cleanup	**6**

DAY FOUR	TOPIC	TAB
9:30 - 10:45 (w/break)	Personal Hygiene and Other Safety and Health Considerations	**7**
10:45 - 11:45	Glovebag Principles & Procedures/Worksite Preparation (Slides Show & Demonstration)	
11:45 - 12:30 p.m.	**Lunch**	
12:30 - 5:00 (w/break)	Asbestos Abatement Methods/Cleanup & Disposal Procedures (PPE Practice Dress-out And Hands-on Workshop/Evaluation)	

DAY FIVE

8:00 a.m. - 9:00 a.m.	Course Review
8:30 - 11:45 (w/break)	Asbestos Abatement Methods/Cleanup & Disposal Procedures (Hands-on Workshop/Evaluation)
11:45 - 12:30 p.m.	**Lunch**
12:30 - 2:30 (w/break)	Asbestos Abatement Methods/Cleanup & Disposal Procedures (PPE Hands-on Evaluation)
3:00 - 5:00	Final Exam; Class Evaluation

Fit-testing Hands-on

PPE Dress-out Hands-on Evaluation

ASBESTOS WORKER

Class Agenda

DAY ONE	TOPIC	TAB
8:00 - 8:30 a.m.	**Welcome and Introduction**	
8:30 - 9:30	Background Information: History, Physical Characteristics, and Uses of Asbestos	**1**
9:30 - 10:45 (w/break)	Health Effects of Exposure and Medical Monitoring	**2**
10:45 - 12:00	Asbestos Regulations ● State Regulations ● Federal OSHA Standards ● Federal EPA Regulations: NESHAP, AHERA, ASHARA	**3**
12:00 - 12:30	**Lunch**	
12:30 - 1:15	Asbestos Regulations cont'd	
1:15 - 2:30 (w/break)	Respiratory Protection and PPE ● Respirators – Principles and Types ● Caring for Your Respirator ● Other Safety Equipment	**4**
2:30 - 5:00	Respirator Fit Testing & PPE (Hands-on Workshop)	
DAY TWO		
8:00 - 11:00 a.m. (w/break)	Respirator Fit Testing & PPE cont'd (Hands-on Workshop)	
11:00 - 12:00	Control Methods/Worksite Preparation/ Setup/Decontamination Unit	**5**

DAY TWO	TOPIC	TAB
12:00 - 12:30	**Lunch**	
12:30 - 2:45 (w/break)	Work Practices/Engineering Controls/ Air Monitoring	**5**
2:45 - 5:00	Cleanup & Disposal/Lockdown & Sprayback/Clearance Procedures and Aggressive Sampling	**6**

DAY THREE

8:00 - 9:00 a.m.	Personal Hygiene and Other Safety and Health Considerations	**7**
9:00 - 11:00 (w/break)	Glovebag & Plasticizing Principles & Procedures – Slides and Demonstrations	
11:00 - 12:00 (w/break)	Asbestos Abatement Methods/Cleanup & Disposal Procedures (Hands-on Workshop)	
12:00 - 12:30	**Lunch**	
1:30 - 4:00 (w/break)	Asbestos Abatement Methods/Cleanup & Disposal Procedures (Hands-on Workshop)	
4:00 - 5:00	Course Review	

DAY FOUR

8:00 - 9:00 a.m.	**Final Exam (Written/Verbal)**
9:00 - 10:45	**PPE Hands-on Competency Evaluation**
10:45 - 12:00 (w/break)	Asbestos Abatement Methods/Cleanup & Disposal Procedures (Hands-on Workshop) cont'd
12:00 - 12:30	**Lunch**

DAY FOUR	TOPIC	TAB
12:30 - 4:00 (w/break)	Asbestos Abatement Methods/Cleanup & Disposal Procedures (Hands-on Workshop)	
4:00 - 5:00	**Course Evaluation and Close**	

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