

Health Effects

Smoking Warning

Government Regulations

The fibrous nature and durability that make asbestos attractive as a construction material unfortunately make it a troublesome environmental problem. The fibers are not easily destroyed and, because of their shape and small size, can remain airborne for long periods of time. The key to good work practices which reduce exposure to asbestos is the prevention of fibers from becoming airborne and the reduction of the possibility of inhalation or ingestion of any fibers that might escape the preventative measures.

8.1.1 Health Effects of Exposure to Asbestos

Although asbestos has been in use for over 2,000 years, it was not until about 1900 that its health problems became known.

Asbestos fibers that are either inhaled or ingested in food or drink can ultimately cause health problems. If sufficient fibers are inhaled, asbestosis, mesothelioma, lung cancer, and other tumors may result. Manifestations may appear as late as 20 to 40 years after exposure, unless exposure is severe, and may result from less than one year's exposure. Smoking is particularly hazardous for those working around asbestos. Studies have shown that lung cancer is 92 times more frequent in asbestos workers who smoke than in the nonsmoking general population.

8.1.2 Applicable Government Regulations

The Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) have regulations relative to asbestos which include work practices designed to protect the surrounding population and the worker.

A demolition contractor shall therefore comply with both OSHA and EPA regulations and any other regulations governing asbestos removal and disposal which might arise from state or local governments. Figure 8-3 provides a general outline of the EPA and OSHA regulations which shall be followed when demolishing a structure which contains asbestos.

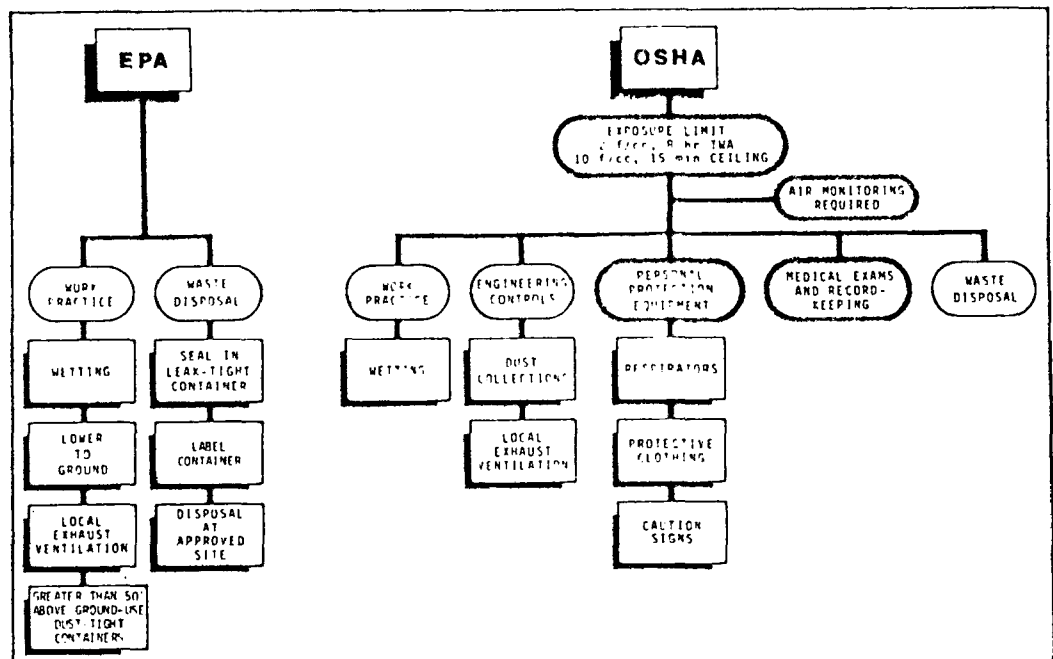


Figure 8-3 EPA/OSHA regulations.

Freezing Temperatures

- c. The use of surfactants is not required by any governmental regulation.
- 4) EPA calls for the suspension of their wetting requirements when the temperature falls below freezing (0° C–32° F).
 - a. At that point only asbestos material which can be removed in sections is allowed to be worked on.
 - b. All stripping of walls and ceilings should cease until wetting is possible.



Figure 8-4
Worker wetting asbestos.

C) Required Work Practices

In order to prevent emissions of particulate asbestos material to the outside air, the EPA requires the following procedures:

- 1) The removal of all friable asbestos materials shall occur before wrecking or dismantling the structure begins. The wetting requirements outlined above are in effect at this time.
- 2) When stripping friable asbestos material from walls, ceilings, boilers, tanks, and other structural members, adequate wetting to ensure no emissions to the outside air is required.
- 3) When removing asbestos material in sections from pipe or ductwork, adequate wetting is also required. EPA regulations also require that such units shall not be dropped or thrown to the ground but shall be carefully lowered to ground level.
- 4) All friable asbestos material that has been removed shall be adequately wetted to ensure that it remains wet during all remaining stages of demolition or handling.
- 5) When removing friable asbestos material from more than 50 feet above ground level, except that material removed in sections, EPA requires the use of dust-tight chutes or containers.

Required Work Practices

Protective Practices for Workers

Notification of the Worker

Warning Signs

8.1.5 Protective Practices for Workers

These practices are prescribed by OSHA and cover five major areas of regulation designed to protect the demolition worker when handling asbestos material.

A) Notification of the Worker

- 1) Workers shall be notified that asbestos is present at the job site and that appropriate steps are being taken to control their exposure to it.
- 2) Warning signs containing the information shown in Figure 8-5 should be posted around the demolition site.
- 3) Workers shall be told not to smoke, eat, or drink around the site when asbestos is being removed.

Air Monitoring

C) Monitoring of Workers' Exposure

- 1) The use of respirators is required to safeguard workers removing asbestos material. The correct type of respirator is determined by monitoring the air at the job site. If the concentration of asbestos fibers is reasonably expected to exceed 200 fibers per cubic centimeter on a time weighted average (TWA), a Type C supplied air respirator of the continuous flow or pressure demand class is required.

OSHA ASBESTOS STANDARD

Average must be less than:

$\frac{2 \text{ fibers}}{\text{cc}} \times 8 \text{ hours}$

with no peaks greater than:

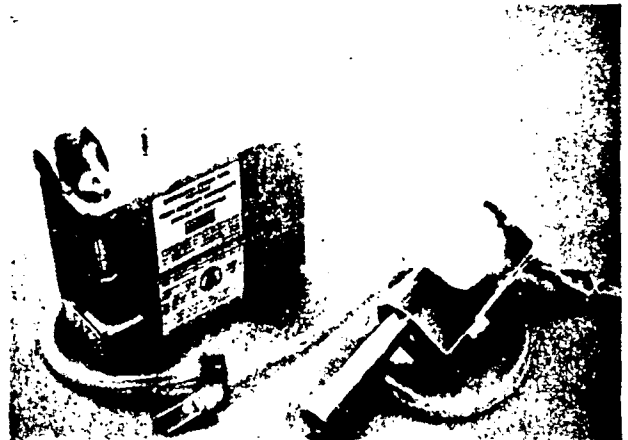
$\frac{10 \text{ fibers}}{\text{cc}} \times 15 \text{ minutes}$

Figure 8-8
OSHA asbestos standard.

OSHA Exposure Standard

- 2) OSHA has set permissible exposure limits for asbestos. Over an 8-hour period, the TWA may not exceed 2 fibers in excess of 5 micrometers in length per cubic centimeter of air (2 f/cc). Over the 8-hour period at no time can a 15 minute concentration exceed 10 fibers per cubic centimeter of air (ceiling).

Figure 8-9
Asbestos personnel
monitoring unit.



Personnel Dosimetry

Lab Procedures

- 3) Air monitoring for asbestos is accomplished by open-faced membrane filters which are part of a personal monitoring device whose pumping rate simulates breathing. It must be laboratory-calibrated each day, batteries must be recharged, and the unit reset to the calibration mark at least hourly in the field. Environmental and industrial hygiene laboratories provide such services.
- 4) The asbestos fiber counts on the carefully preserved membrane filter are done at a laboratory either by phase contrast light microscopy (PCLM) or by scanning electron microscopy (SECM). Cost of SECM is about eight times that of PCLM, and fewer laboratories have the instrument.

Recordkeeping
Monitoring
Medical Exams

**Safe
Disposal**

**Bagging
Requirements**

**Sealed
Containers**

**DOT
Requirements**

- 2) When the asbestos has been removed and the airborne concentration level is below 2 fibers per cubic centimeter (2 f/cc), the respirators need no longer be used for the remaining demolition.
- 3) Training the worker in the proper use of the respirator and its limitations and stressing the importance of wearing it while working with asbestos material are essential if the workers' health and safety are to be protected.

E) Recordkeeping

- 1) OSHA requires that employers maintain records of all asbestos monitoring for a period of 20 years.
- 2) OSHA also requires that employers provide pre-placement, annual, and termination medical exams for all employees exposed to asbestos. Medical records must also be maintained for 20 years.

8.1.6 Safe Disposal of Asbestos

Both EPA and OSHA have regulations concerning the safe disposal of asbestos material.

- A) After removal, the wetted asbestos material must be placed in sealed, leak-tight plastic bags. The bags must be labeled with the warning label shown in Figure 8-12.



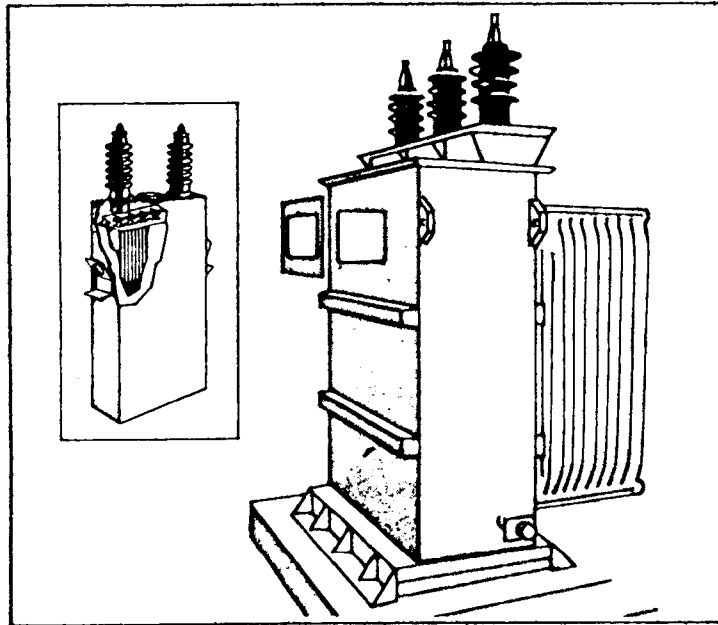
*Figure 8-12
Asbestos disposal warning
label.*

- B) Current regulations require that the asbestos waste material be sealed in "leak-tight containers". This includes sealed plastic bags. However, the disposal practices of certain landfill operators might require that the sealed plastic bags be placed in drums.
- 1) U.S. Department of Transportation requires that asbestos be transported in containers which prevent the leaking of hazardous material during transit.
- C) The asbestos waste material in the sealed leak-tight bags shall be deposited at an approved waste disposal site. Your state environmental agency will provide you with a list of approved sites.

Health Effects

8.2.1 Health Effects of Exposure to PCBs

Studies performed on animals exposed to PCBs indicate that the substance is a potential cancer-causing agent to man, and can cause liver damage and stomach problems. An acne-like skin irritation called chloracne is a common health effect from exposure to PCBs. PCBs do not break down into harmless materials after they enter the environment but can move up the food chain to man.



*Figure 8-15
PCBs are found in
transformers and
capacitors.*

Government Regulations

8.2.2 Applicable Government Regulations

Because of the harmful nature of PCBs, Congress enacted legislation as part of the Toxic Substances Control Act (TSCA), to deal with the problem. Under TSCA, the U.S. EPA banned the production of PCBs in July 1979, and developed regulations for its marking and disposal. The U.S. EPA is in the process of developing a final enforcement strategy to implement these regulations. This strategy is based on imposition of a "gravity-based penalty" assessed on the basis of the seriousness of the violation. A penalty of up to \$25,000 a day may be assessed for a major violation, such as a spill of over 1100 gallons of PCB-containing liquid. Penalties of lesser amounts are assessed for violations such as improper storage or failure to use required PCB warning labels on equipment containing PCBs.

The National Institute of Occupational Safety and Health (NIOSH) has developed a recommended occupational exposure standard for PCBs of 1.0 micrograms total PCBs per cubic meter of air ($\mu\text{g}/\text{cu m}$), determined as a TWA concentration for up to a 10-hour workday, 40-hour workweek.

8.2.3 Planning

Planning

The demolition contractor often has two goals when dealing with PCBs. He wants to protect the worker and the general public from exposure, and he may wish to salvage a valuable piece of equipment. With careful planning it is possible to accomplish both goals. Planning starts with an appreciation of what is required of the demolition contractor under a variety of conditions, as depicted in Figure 8-16.

The first task is to determine if PCBs are present at the job site. The easiest way to do this is to inspect the nameplate on the equipment for the tradename of the insulating fluid. Monsanto Corporation, the principal manufacturer of PCBs in the United States, sold them under the tradename "Askarel". Other companies marketed PCBs under other tradenames such as:

can be drained out of the transformer first. If the liquid is drained, the transformer must be flushed with solvent for 18 hours; the solvent and the dielectric fluid must then be disposed of in an EPA-approved high temperature incinerator. After it is resealed, the drained transformer must be disposed of in an EPA-approved chemical landfill.

2. If the transformer is a PCB-contaminated transformer, containing between 50 and 500 ppm PCB, the transformer and the liquid can also be incinerated or the dielectric liquid can first be drained. If the liquid is drained it can be disposed of in a high temperature incinerator, an EPA-approved chemical landfill, or in a high efficiency boiler. The drained transformer can be disposed of as scrap or in a disposal facility equivalent to good municipal solid waste disposal facilities.
3. EPA has recently approved a chemical destruction technique which uses chemical reagents to strip chlorine from the PCBs, causing the substance to break down into environmentally safe residues. This process is mobile, being mounted on a 40-foot long trailer which could be brought to the demolition job sites. Several large chemical manufacturers have commercial units available.



Figure 8-17 Drums containing askarel, a PCB-containing dielectric fluid.

Preventing Occupational Exposure

Spills

8.2.4 Preventing Occupational Exposure

Demolition workers face occupational exposure to PCBs if they attempt to drain a transformer in preparation for salvage. The current practice used by the electrical equipment salvage industry is to transport the transformer or capacitor from the demolition job site to a processing plant capable of safely handling PCBs. These processing facilities are required to use EPA-approved procedures and equipment to handle the hazardous material.

Exposure to PCBs is also possible from leaks or spills from old or damaged transformers. Under the authority of the Toxic Substances Control Act (TSCA), PCB spills have to be reported to the EPA whenever the incident poses a substantial risk to human health or the environment. "Substantial risk" has not been defined; therefore, any spill should be reported to EPA when people come into direct and uncontrolled contact with PCBs, or when the extent of the spill is unknown—such as spills that enter drainage systems. As a general rule, spills involving a single capacitor, which normally contain approximately 10 gallons of dielectric fluid, do not have to be reported unless PCBs threaten or enter a water

Worker Protection Practices

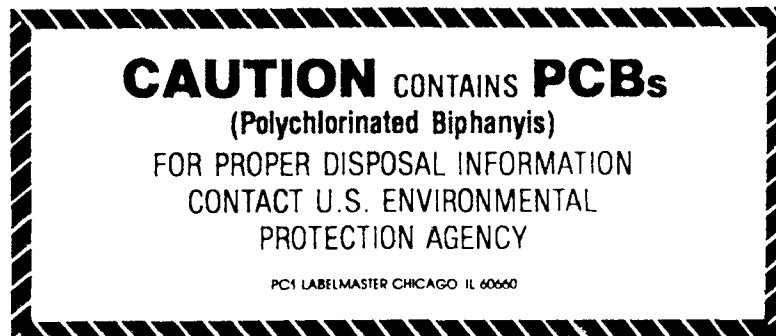
8.2.5 Protective Practices for Workers

In order to safeguard workers against occupational exposure to PCBs, there are a number of steps demolition contractors should take.

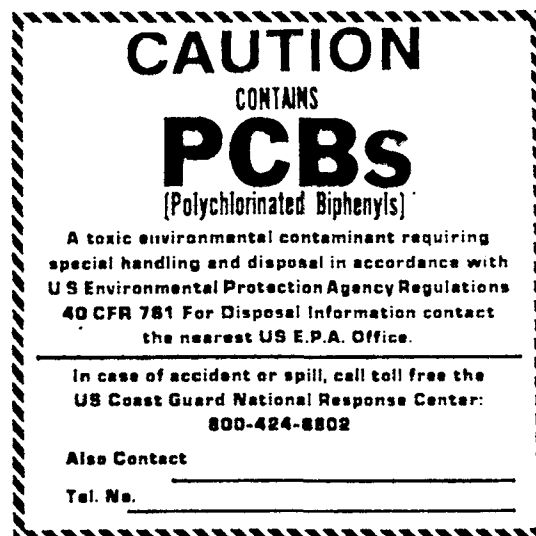
If it is determined that there are PCB transformers and capacitors at a job site, all workers should be informed of the hazards, relevant symptoms, and effects of overexposure to PCBs. They should be told of the location of all PCB work areas and advised to avoid these areas unless authorized to enter them.

Medical surveillance shall be made available to all employees subject to occupational exposure to PCBs. Employers should also make provisions for periodic reexaminations, at least annually, for any employee who handles PCB materials. It will be the responsibility of the employer to maintain pertinent medical records of those employees for the period of employment plus 30 years.

Demolition contractors or job supervisors should designate specific personnel to work in PCB work areas and should regulate access to these areas. Warning placards shall be affixed in readily visible locations in or near PCB work areas. These warning signs shall read:



Any equipment determined to contain PCBs shall have labels affixed in a readily visible location reading:



Assistance

8.2.6 Assistance Available

The development of regulations and procedures to deal with the problem of PCBs is an ongoing process. EPA is currently finalizing its enforcement strategy and developing a list of approved disposal sites across the country. Help is available to deal with these regulations from the EPA regional offices as well as the EPA's Office of Industry Assistance. The latter has a toll-free number: 800-424-9065.

8.3

Technical References

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