ASBESTOS MANAGEMENT PLANNER CERTIFICATION

U.S. ENVIRONMENTAL PROTECTION AGENCY
NEW YORK STATE DEPARTMENT OF HEALTH
ACCREDITED ASBESTOS TRAINING PROVIDER

STUDENT MANUAL

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HISTORY AND USE OF ASBESTOS

INTRODUCTION

Asbestos: The Magic Mineral

Asbestos is not man-made; it is a naturally occurring mineral, which is mined out of the earth in much the same way as coal. It is a generic term referring to a group of minerals possessing a unique blend of inorganic chemicals and fibrous crystalline structures. For hundreds of years, it was regarded as "the magic mineral" due to its amazing properties and versatility of use and has yet to be replaced with material of comparable qualities.

Specific attributes and characteristics vary to some degree with the different types, but the commercial value, in general, rests with it's high tensile strength, good thermal and electrical insulating properties, and moderate to good chemical resistance. Because of these qualities, some 36 million metric tons were used worldwide in well over 3000 products between the years 1900 and 1980.

THE HISTORIC TIME LINE

Ancient civilizations, such as the Egyptians, Greeks and Romans are known to have used asbestos mainly because of its fire-resistant properties (see Table 1-1). It was used in such things as curtains, tablecloths, cremation shrouds, blacksmith gloves for forging weapons and lamp wicks. In fact, that's how the mineral got its name. The Greeks, marveled by the fact that their lamp wicks were not consumed by the flames, called the material "Sasbestos" which translates to ""unquenchable" or "inextinguishable". The Romans named it "amianthus", meaning "incorruptible".

It was used in ancient pottery and later by the Chinese as a component of gunpowder. In writings from the Ninth Century A.D., Charles the Great (Charlemagne) was reported to have cleaned his woven asbestos tablecloth by tossing it into a fire. Several other civilizations actually believed that asbestos had medicinal properties.

Mining/Manufacturing Operations

It wasn't until the late 1800's that asbestos was used commercially in the United States. In the 1930's, asbestos became one of the most popular construction materials in the United States (the largest consumer of this mineral in the world). The most important use of asbestos was a fireproofing material. Some of the many products containing asbestos are summarized in Table 1-2.

Asbestos usage soared in 1941 with the coming of World War II. Thousands of workers were hired by the shipyards to meet the demand for the vast fleets of both cargo and military vessels. The working conditions were often less than adequate and rarely involved the use of any respiratory protection during the application of asbestos

insulating materials. Although many lives were spared due to the unique fire resistant qualities of asbestos, 20 to 30 years after heavy exposures to this mineral proved to be catastrophic to the well-being of many a shipyard worker.

As the number of asbestos-related respiratory disorders increased during the 1960's through 1970's, Congress was forced to acknowledge the problem and initiate measures to control this new environmental hazard. This coupled with many personal lawsuits against asbestos manufacturers, served to fuel federal intervention as well as abatement activities

Advent of Asbestos Regulation

The early 1970's saw the birth of a regulatory framework to control both environmental and occupational asbestos exposures. The key players were the Environmental Protection Agency (EPA) and the Occupational Safety & Health Administration (OSHA) respectively. In May of 1971, OSHA published an airborne asbestos standard which included a Permissible Exposure Limit (PEL) of 12.0 fibers/cubic centimeter, which over the past years has been lowered in several steps, to the current PEL of 0.1 fibers/cc.

The Environmental Protection Agency initiated further control by banning spray-on asbestos containing materials for fireproofing in April of 1973, and later issuing a phase –out and overall ban on virtually all asbestos usage by the mid to late 1990's. However, this ban and phase-out rule was overturned and eliminated by court action. The rules and regulations governing asbestos exposure and abatement activities will be discussed in a later section of this manual.

TABLE 1-1
HISTORY OF ASBESTOS USES

- Archeological evidence indicates possible use during the Stone Age (in Pottery).
- The Greeks knew well its usefulness in items such as curtains, tablecloths and wicks in candles.
- There are records of cases of asbestos related diseases showing up in Egyptian slaves that wove asbestos into cloth.
- The Romans would wrap bodies in asbestos cloth before cremation, so they could collect the ashes easier.
- Some ancient civilizations believed that asbestos contained medicinal properties.
- The Chinese used asbestos in gunpowder.
- Charlemagne used a tablecloth, which was made of asbestos.
- Marco Polo recorded its use in the Great Empire of Tartary (part of Siberia).
- Use declined during the Middle Ages but it was still highly prized by Nobles and the Court of Kings.
- 1720; First mining & manufacturing of asbestos attempted in the Ural Mountains.
- Late 1800's; Commercial mining in Quebec and in Normandy (from 300 tons initially to well over 5 million tons in the 1970's).
- Asbestos was used in thermal insulation during the mid 1900's, as well as a fire retardant in the 1960's and 1970's.
- Even though use of friable asbestos materials has been banned in the United States, the use of non-friable asbestos products has soared until the 1980's.

TABLE 1-2
ASBESTOS-CONTAINING MATERIALS FOUND IN BUILDINGS*

Subdivision	Generic Name	Asbestos (%)	Dates of Use	Binder/Sizing
Surfacing Material	Sprayed-on or Troweled-on	1 - 95	1935 - 1970	Sodium silicate Portland cement organic binders
Performed thermal insulating materials	Batts, blocks and pipe coverings	15	1926 - 1949	Magnesium carbonate
	Calcium silicate	6 - 8	1949 - 1971	Calcium silicate
Textiles	Cloth*			
	Blankets (fire)*	100	1910 – present	None
	Felts	90 - 95	1920 – present	Cotton / Wool
	Blue stripe	80	1920 – present	Cotton
	Red stripe	90	1920 – present	Cotton
	Green stripe	95	1920 – present	Cotton
	Sheets	50 - 90	1920 – present	Cotton / Wool
	Cord/rope/yarn*	80 - 100	1920 – present	Cotton / Wool
	Tubing	80 - 85	1920 – present	Cotton / Wool
	Tape/strip	90	1920 – present	Cotton / Wool
	Curtains* (theatre, welding)	60 - 65	1945 - present	Cotton
Cementitious concrete-like	Extrusion panels	8	1965 – 1977	Portland cement
	Corrugated	20 – 45	1930 – present	Portland cement
	Flat	40 – 50	1930 – present	Portland cement
	Flexible	30 – 50	1930 – present	Portland cement
	Perforated			
	Laminated (outer surface)	35 – 50	1930 – present	Portland cement
	Roof tiles	20 – 30	1930 – present	Portland cement
	Clapboard	12 – 15	1944 – 1945	Portland cement
	Siding shingles	12 – 14	Unknown - present	Portland cement
	Roofing shingles	20 – 32	Unknown - present	Portland cement
	Pipe	20 - 15	1935 - present	Portland cement
Paper products	Corrugated;			
	High temp.	90	1935 – present	Sodium silicate
	Moderate temp.	35 – 70	1910 – present	Starch
	Indented	98	1935 - present	Cotton & organic binder
Roofing felts	Millboard	80-85	1925 – present	Starch, lime, clay
	Smooth surface	10 - 15	1910 – present	Asphalt
	Mineral surface	10 – 15	1910 – present	Asphalt
	Shingles	1	1971 – 1974	Asphalt
	Pipeline	10	1920 - present	Asphalt

Note: * The information is taken, with modification, from Lory, E.E. and Coin, D.C., *Management Procedure for Assessment of Friable Asbestos Insulating Material*, February, 1981, Port Hueneme, CA, Civil Engineering Laboratory Naval Construction Battalion Center. The U.S. Navy prohibits the use of asbestos-containing materials when acceptable non-asbestos substitutes have been identified.

Asbestos Containing Materials (ACM)

These are products, which contain greater than 1% when analyzed by Polarized Light Microscopy (PLM). These materials may be classed as friable or non-friable, and the products may be placed in one of the three categories of building materials as described below. The United States Environmental Protection agency (USEPA) and others distinguish between friable and non-friable forms of ACM. Friable ACM can be "crumbled or reduced to powder by hand pressure". Other things being equal, friable ACM is thought to release fibers into the air more readily than non-friable materials, however, many types of non-friable ACM can also release fibers if disturbed.

Categories of Asbestos-Containing Building Materials (ACBM)

EPA identifies three categories of ACM used in buildings:

- ***Surfacing Materials*** - ACM sprayed or troweled on surfaces (walls, ceilings, structural members) for acoustical, decorative, or fireproofing purposes. This includes plaster and fireproofing insulation.

- ***Thermal System Insulation*** – Insulation used to inhibit heat transfer or prevent condensation on pipes, boilers, tanks, ducts, and various other components of hot and cold water systems and heating, ventilation, and air conditioning (HVAC) systems. This includes pipe lagging, pipe wrap; block, batt, and blanket insulation; cements and "muds"; and a variety of other products such as gaskets and ropes.

- ***Miscellaneous Materials*** – Other, largely non-friable products and materials such as floor tiles, ceiling tile, roofing felt, concrete pipe, outdoor siding and fabrics.

While it is often possible to "suspect" that a material or product contains asbestos by visual determination, actual determinations of asbestos content can only be made by laboratory analysis. The EPA requires that the asbestos content of suspect materials be determined by collecting bulk samples an analyzing them by PLM. The PLM technique determines both the percent and type of asbestos present in the bulk material.

CURRENT ISSUES

Asbestos is still used in the manufacture of several thousand products. The Federal government estimates that one-half of all multi-story buildings in the United States contain asbestos (probably a very conservative estimation). In one form or another, asbestos exists in millions of buildings across the country, including schools, homes, factories, hospitals and offices.

Of particular concern are those employees who must work on or come in contact with "friable" asbestos or materials which have deteriorated to the point where the asbestos

fibers are no longer, bound within its matrix. These are the fibers most likely to become airborne and pose the greatest threat to one's health.

As with all products subjected to the normal elements of use, the integrity of asbestos containing materials (ACM) is susceptible to gradual wear and disintegration. Therefore, their widespread applications in construction, industry, and transportation affords plenty of opportunity for continued episodic fiber releases to the environment and consequently, for worker exposures.

A prime contributor to the overall environmental burden of asbestos is the inadvertent demolition of buildings containing this contaminant in heavily populated areas. Because it is a mineral, asbestos does not biodegrade, but remains with us virtually forever.

Asbestos fibers are, for the most part, invisible. Inhaling these fibers does not produce any immediate effect and asbestos related diseases usually take years to develop. Such attributes tend to promote a false sense of security as well as easily relaxed attitudes about health and safety concerns. Table 1-3 summarizes some of the occupations at risk.

TABLE 1-3
OCCUPATIONS AT RISK FOR ASBESTOS EXPOSURE

Process	Products Made or Used	Jobs Potentially at Risk
Production Mining Milling Handling		Rock Mining, loading, trucking Crushing, milling Transport workers, dockers, loaders, those who unpack jute sacks (recently replaced with sacks that do not permit fibers to escape)
Primary uses in spray insulation	Spray of fiber mixed with oil	Spray insulators (construction, ship building)
Manufacture of Textiles	Cloth, curtains, lagging, protective clothing, mailbags, padding, conveyor belts	Blending, carding, spinning, twisting, winding, braiding, weaving, slurry mixing, laminating, molding, drying
Cement products	Sheets, pipes, roofing shingles gutters, ventilation shafts, flower pots	
“Paper” products	Millboard, roofing felt, fine quality electrical papers, flooring felt, fillers	
Friction materials	Automotive products, gaskets, clutch plates, brake linings	
Insulation products	Pipe and boiler insulation, bulkhead linings for ships	
Application New construction	Boards and tiles: putties, caulk, paints, joint fillers; cement products (tiles, pipes, siding, shingles)	Directly, carpenters, laggers, painters, tile layers, insulation workers, sheet metal and heating equipment workers, masons; indirectly all other workers on construction sites, such as plumbers, welders, electricians, demolition workers for all of these
Repair, demolition Shipbuilding Construction	Insulation materials (boards, mattresses, cloth) for engines, hull, decks, lagging of ventilation and water pipes	Laggers, refitters, strippers, steam fitters, sailmakers, joiners, shipwrights, engine fitters masons, painters, welders, caulkers

SECTION 2
IDENTIFICATION & CHARACTERIZATION OF ASBESTOS

INTRODUCTION

Asbestos is distinguished from other minerals by the fact that its crystals form long, thin fibers. Magnified 2000 times, asbestos fibers are shaped either like needles or wavy hairs and are as strong as steel wire. These microscopic fibers possess several desirable characteristics besides incredible tensile strength. These include: high density; high degree of flexibility; chemical resistance; bacterial resistance; good electrical insulator; non-combustible (at temps. <800); excellent thermal insulator; good friction and wear characteristics and desirable acoustical properties.

The fiber surface area is also highly absorbent making it an ideal component for the manufacturing of filter products, and as "active filler" constituent during the fabrication of products like cement, vinyl floor tiles, paints, and plastics. In the latter uses, asbestos fibers also serve as a reinforcing medium. This is accomplished by virtue of the chemical interaction of the surface of the fiber with the added components (the hydroxyl group-studded surface of the fiber).

Asbestos is a catch-all term describing a number of silicates, containing varying amounts of calcium, magnesium, and iron, occurring in metamorphic rock. Once liberated from the ore, it takes on the appearance of a fluffy mass that can be processed much like cotton or wool. However, in smaller concentrations, they are invisible to the human eye. Their incredible aerodynamic properties allow asbestos fibers to drift almost indefinitely on air currents. As a matter of a fact, a fiber at eye level may take hours or even weeks to settle to the ground.

ASBESTOS TYPES

There are two major groups or classes of asbestiform minerals, known as the *serpentines* and the *amphiboles*. The distinction between these two groups is based upon crystalline structure. Serpentine minerals have a sheet or layered structure, while amphibole minerals have a chain-like crystal structure.

There are six commonly recognized types of asbestiform minerals; chrysotile, amosite, crocidolite, actinolite, tremolite, and anthophyllite. Only the first three are widely produced commercially (see figure 2-1). U.S. markets used approximately 90% chrysotile (white asbestos), 9% amosite (brown asbestos), and 1% crocidolite (blue asbestos).

Chrysotile

Chrysotile has been the most widely used type of asbestos in the United States. White in its processed form, its high tensile strength and flexibility make it highly favored. It has been used extensively in the manufacture of insulating products (see Table 2-1).

Unaided by magnification, chrysotile is long and silky in appearance. Microscopic examination shows that chrysotile is a layered lattice of fine cylindrical/hollow tubes bundled together. Its chemical composition is mostly hydrated magnesium silicate, with several impurities, including iron, nickel, and chromium. Due to its layered structure, it is the only asbestiform mineral that belongs to serpentine group. It was commonly used in cement products, textiles, brake linings, and in several forms of thermal system insulation.

Amosite

Amosite, also known as brown asbestos, belongs to the amphibole group. Amosite usage accounts for a small percentage of the U.S. market, but can be found in many of the same products as chrysotile. Amosite was also used as a binder component in some plastics. It is ferrous magnesium silicate. An important feature of amosite from an abatement perspective is that it is more difficult to wet than other asbestos minerals.

Crocidolite

Less commonly used and carrying a greater health concern, crocidolite or blue asbestos is also an amphibole. Mined exclusively in South Africa, crocidolite is incredibly strong and characterized by thick, rigid fibers and is highly resistant to acids and weathering (see Table 2-1). Its chemical composition is sodium iron silicate. Though it is unclear why, this particular type of asbestos seems to lead the others in promoting cancer.

Anthophyllite, Actinolite and Tremolite

These three asbestos minerals are rare and of little commercial value, although they were used in a number of products and are sometimes found as contaminants along with the other more common types of asbestos minerals.

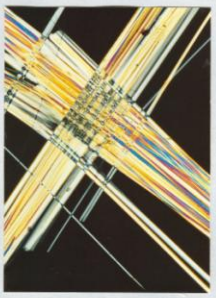
Table 2-1
Varieties of Asbestos: Properties, Sources and Usage*

Mineral Type	Serpentine	Amphibole				
Chemistry, approximate	$Mg_3Si_2O_5(OH)_4$	$X_{2-3}Y_5(Si,A1)_8\ O_{22}(OH)_2$ with X,Y representing different elements				
Fiber Type	Chrysotile (white)	Crocidolite (blue)	Amosite (brown)	Anthophylite	Tremolite	Actinolite
Main elements determining specific composition	Mg	Na, Fe^{2+}, Fe^{3+}	Fe^{2+}, Mg, Fe^{2+}	Similar to Amosite, but more Fe^{2+}, less Mg	Ca, Mg	Like Tremolite, but contains , Fe^{2+}
Physical properties Tensile strength 1000 psi Flexibility Acid resistance Texture Heat resistance	 350 – 450 Very good Poor Silky to harsh 500^{0}C	 500 Good Good Harsh 200^{0}C	 175 - 350 Poor Good Course 200^{0}C	 240 Fair to brittle Fair to good Harsh to soft 200^{0}C	 <75 Brittle Fair Harsh to soft Fair to good	 Brittle Very good Harsh Very good
Main sources, present and future	Canada (Quebec, B.C. Yukon, Newfoundland, Ontario) Russia (Urais, Siberia) S. Rhodesia Botswana Swaziland Australia (NSW) Cyprus Italy United States (Vt, Ca, Az)	S, Africa (N. W. Cape, Transvaal) Bolivia W. Australia	S. Africa (Tvl)	Finland United States (Georgia+ Carolinas)	Italy	Not usually commercially exploited
World use, approx %	93	3.5	2.5	<1	<1	
Industrial uses	Textiles Cement products Friction materials Insulation** "Paper" products	Textiles Pressure pipes Cement products Felts for plastics	Cement Plastic re-inforcement Refractory tiles Pressure pipes	Cement (limited) Chemical industry	Chemical industry as fillers and filters; Talc fillers	

*** Information collected by Dr. Graham Gibbs from the following reference sources: Zussman (3), Spell and Leineweber (18), N.W. Hendry, in (5), p. 12: R. Gaze, in (5), p. 23: K.V. Lindell, in (7), p. 323.**
+ No longer in operation.
**** Being phased out.**

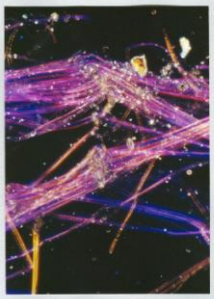
FIGURE 2-1
VARIETIES OF ASBESTOS: PROPERTIES, SOURCES, AND USAGE

Chrysotile in 1.55 Dispersion Staining Liquid, Plane Polarized Light, 100x magnification.

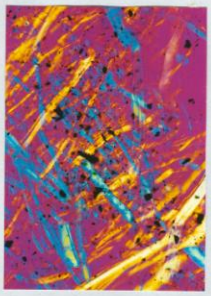


Amosite in 1.68 Dispersion Staining Liquid, 100x magnification under crossed polars.

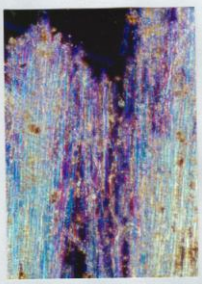
Chrysotile in 1.55 Dispersion Staining Liquid Central Stop Objective, crossed polars with 530 nm compensator.



Chrysotile in 1.55 Dispersion Staining Liquid Central Stop Objective, 100 Magnification



Chrysotile in 1.55 Dispersion Staining Liquid, 100 times magnigication, crossed polars with 530 nm compensator.



Chrysotile in 1.55 Dispersion Staining Liquid, Central Stop Objective, Parallel to Plane Polarized Light 100x magnification.

SECTION 3
HEALTH EFFECTS OF ASBESTOS AND MEDICAL SURVEILLANCE

INTRODUCTION

It may have been the Romans that first recognized a health risk with the use of asbestos. Available literature indicates that Roman slaves weaving asbestos cloth succumbed to disabling pulmonary diseases. This may have been the first account of asbestosis, now known to be a degenerative disease process linked to chronic asbestos exposure.

In the late 1800's, a Viennese physician wrote of how pulmonary problems and gastrointestinal disorders among asbestos workers and their families were quite common. During this same period, inspectors of various manufacturing plants in England often singled out those processes involving asbestos. They knew all too well that cases of respiratory impairment amongst workers in these areas were common and attributed them directly to asbestos exposures.

Great concern has been generated over potential low-level asbestos exposures of children in schools where asbestos materials exist. With the EPA's ruling on the ban of. virtually all asbestos containing products by the late 1990's (now reversed by court action), there's no wonder why the public, on the whole, is close to hysteria over its presence around them.

However, to avoid hysteria or **"asbestosphobia"** it is important to understand the relationship between asbestos exposure and its potential to produce an effect on those functions of the human body most vulnerable to asbestos-related diseases. **How** asbestos enters the body, **where** it does its greatest damage and **why**, may serve as rational starting points to assess the extent of any asbestos exposure hazard.

ROUTES OF ENTRY

The routes by which asbestos fibers enter the body are through ***Inhalation*** (respiratory tract) and ***Ingestion*** (digestive tract). A third, but less emphasized pathway includes the ***Skin***. Of the three, inhalation is by far the route of entry posing the greatest concern and is considered the *primary* route of entry. Because of its intimate relationship with the body's circulatory system and the constant need to provide cells with oxygen, the respiratory system provides a **direct** avenue of entry for a multitude of toxic airborne materials.

THE RESPIRATORY SYSTEM

The lung's primary function is the exchange of oxygen (O_2), which all cells need, and carbon dioxide (CO_2), a waste product produced by the body as a result of metabolic activity. As one inhales, air containing oxygen and other gases, as well as vast numbers of particulates, is drawn into the nose and/or mouth (see Figure 3-1).

The larger particles are filtered out in the nose by passing through thick nasal hairs and an intricate array of moist mucus covered pathways. The inhaled air mass continues on down through the pharynx, larynx and trachea (upper respiratory tract).

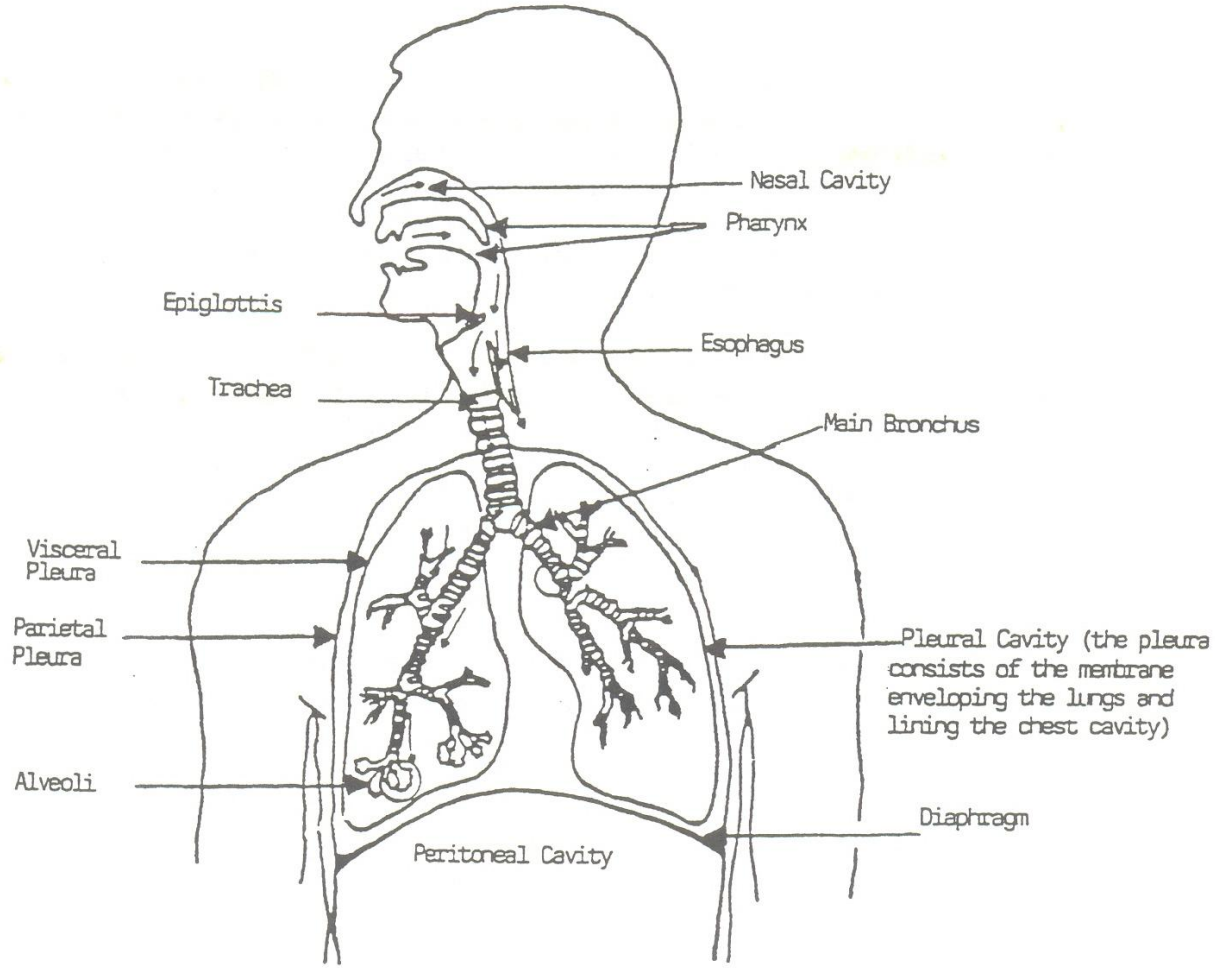
The airway branches into two primary passage ways (bronchi) and continue to branch out, dividing into smaller *secondary bronchi* and still smaller airways called *bronchioles*, finally terminating in the deep lung, at the alveolus or air sacs. These are considered the functional units of the lungs since they are the primary site of gaseous exchange between the blood and the inhaled air.

The exchange of gases (ie, respiration) occurs via a system of diffusion between capillary beds (very small blood vessels) and the very thin walls of the alveolar sacs (approx. 0.15 µm-.5µm thick). It has been estimated that the human lungs contain approximately 21 million alveolar sacs with 550 million individual alveoli. This totals a combined surface area of over 80 square meters!

THE THORACIC CAVITY/MECHANISM OF BREATHING

The thoracic region of the chest houses the right and left lungs. *Pleural membranes* separated by a thin layer of fluid, envelope the exterior of the lungs and the interior of the chest wall. This allows for the almost friction free surface required for lung expansion and contraction. When this fluid filled space is altered or damaged, severe difficulty in breathing occurs.

FIGURE 3-1
THE RESPIRATORY SYSTEM



Routes of inhalation and ingestion of asbestiform fibers are shown by small arrows. Mesothelial cells line the outside of the lungs and the pleural and peritoneal cavities. Interaction of asbestos with these cells can result in either pleural or peritoneal mesothelioma. Adapted from Wagner, 1980. *

* Figure from Asbestiform Fibers, Non-Occupational Health Risks, National Research Council, National Academy Press, Washington, D.C, (1984) page 101.

PARTICLE DEPOSITION AND LUNG CLEARANCE MECHANISMS

Nose

The nose is the first line of defense against inhaled particulates. The thick hair at the entrance of both nostrils, as well as the high level of moisture, helps to filter out very large suspended particles. The nasal cavity continues to trap particles through the narrowing of nasal passages and through the folds of the mucus covered nasal turbinates. Here, particles impact the mucus lining of the passages as a result of the swirling and eddies of air currents caused by the turbulent flow of inhalation. Some of the particles may have sufficient inertia to impact on the back of the pharynx.

As a defense, the nose is almost 100% efficient in trapping particles 20 microns or larger. This trapping efficiency gradually decreases as the particle size decreases. Those particles trapped in the upper respiratory tract may also initiate a reflex, through irritation, commonly referred to as sneezing, which can force some deposited material out the nose. The cough mechanism is often stimulated when particle deposition occurs in the lining of the larynx, trachea or main stem bronchi. By creating a tremendous backpressure, particles are thrust upward toward the mouth for the purpose of expectoration or swallowing.

Those particles not trapped in the upper respiratory tract can gain access to the deeper areas of the lungs and are acted upon by additional defense mechanisms in these lower regions of the lung. As a general rule, the smaller the size of the particle, the deeper it can be deposited in the respiratory tract.

The defense mechanisms of the lungs include the *muco-ciliary* escalator comprised of a *mucus blanket* and *cilia*, as well as the particle engulfing cells called *macrophages*.

Muco-ciliary Escalator

Special cells (goblet cells) along the innermost layers of tissue in the trachea and bronchi produce continuous thin mucus covering (mucus blanket) which is constantly being directed up towards the mouth by tiny projections called cilia. These are small hair-like structures occurring on special cells in specific regions of the respiratory tract. Their presence ranges from areas in the nasopharynx to the regions extending between the trachea and the terminal bronchioles of the deep lung.

Through a kind of harmonic motion, the cilia move the mucus blanket (impregnated with trapped particles and debris) up towards the mouth where it may be coughed out or swallowed. It is a known fact that cigarette smoking temporarily paralyzes the action of cilia, inhibiting one of the body's most effective defenses against particulates. This is illustrated with the condition termed "smoker's hack" often appearing in the morning after a nights sleep. During sleep, the paralyzing effects of a days worth of cigarette smoking begins to wear off. The cilia begin beating normally, mobilizing large quantities of stagnant mucus towards the mouth. This produces the characteristic morning cough. The cough mechanism is again paralyzed with the first couple of cigarettes.

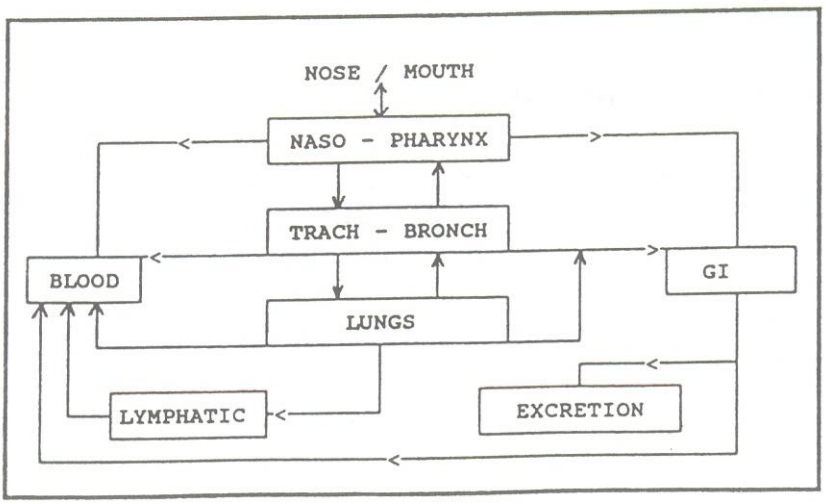
Macrophages

Those particles escaping the first few lines of defense may fall prey to mobile particle eating cells called *macrophages*. These special white blood cells cruise the deep lung region in pursuit of foreign materials, which have escaped other defenses. Although several types exist, their primary function is to engulf (phagocytize) material and digest it through the use of acids and enzymes. Asbestos fibers tend to pose special problems to the engulfing capabilities of macrophages and, as will be discussed elsewhere in this text, with often-detrimental results.

Lymphatic System

Another clearance/defense mechanism often overlooked includes the *lymphatic system*. Its importance becomes more apparent in dealing with those very small asbestos fibers penetrating into tissue spaces. See Figure 3-2 for a diagrammatic representation of clearance mechanisms for particles, including fibers.

FIGURE 3-2



(->) Represents particle/fiber clearance routes

NATURE OF ASBESTOS RELATED DISEASES

The fate and biological effects of inhaled asbestos fibers depends on three primary factors:

1. Airway dimension.
2. The breathing patterns carrying the fibers.
3. The aerodynamic characteristics of the fibers.

The latter is mainly a function of diameter, but also involves size, shape, and density.

The size range of an asbestos fiber has been defined by various regulatory agencies as having a length greater than 5 microns, a maximum diameter less than 5 microns, and a length-to-diameter ratio equal to or greater than 3 (1centimeter=10,000 micrometers). Their lengths and diameters vary greatly, and this may play a critical role in causing various diseases. Both airway dimensions and breathing patterns help to govern fiber deposition in the lungs.

Once in the body, fibers may be cleared, retained in lung tissues, swallowed, or engulfed by defense cells called macrophages. When discussing asbestos related diseases, it can be said that the fate of the invading fiber determines the severity of the biological response. But these responses are far from uniform and vary greatly from one person to another. Just as some individuals resist colds and infections more successfully than others, so seems the circumstances surrounding asbestos related illness. What may constitute a disease causing exposure for one may cause no apparent harm to someone else.

DOSE-RESPONSE RELATIONSHIP

Perhaps the most fundamental concept used to describe the effects of a given amount (exposure) of an agent or contaminant and the resulting health effects is that of the dose response relationship. The concept is based on the following assumptions:

- The magnitude of a response is a function of the concentration of the chemical (or agent) at the biological site of action (target organ).
- The concentration at the site is a function of the dose and duration of exposure.

Dose is the concentration or amount of material to which the body is exposed. The biological *response* to a dose can be classified as either *toxic* or *non-toxic*.
Typically, as the size of the dose increases, the potential for a toxic (harmful) response increases as well. It is not clear what the dose-response relationship is for the most minimal health effects attributed to asbestos exposure. However, the possibility exists that such abnormalities may develop in some individuals long after exposure to very low doses of asbestos.

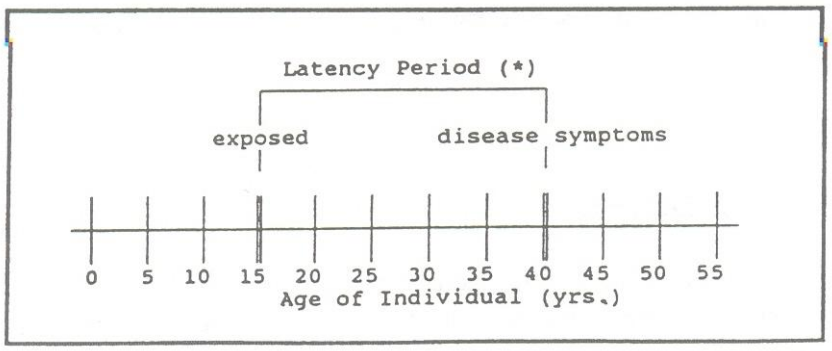
Current evidence indicates that there exists an increased risk of developing some asbestos related disease with increases of asbestos exposure, for example, *asbestosis*. However, other studies have demonstrated that with brief low-level lung and gastro-intestinal exposures, asbestos-related diseases have appeared, such as *mesotheliomas* and *lung cancers*. This may be related to genetic susceptibility to the carcinogenic effects of asbestos. Thus, it would be appropriate to suggest that *no safe level* exists and that one should take reasonable protection against all asbestos fiber exposures.

Toxicity is the ability of a substance to produce an adverse or unwanted effect. Toxicity is an inherent property of a substance and cannot be changed.

DELAYED EFFECTS/LATENCY PERIOD

One of the more severe concerns over asbestos exposure involves the length of time between exposure and the occurrence of asbestos related diseases. As illustrated in Figure 3-3, this is termed a “latency period”. A latency period is defined as the amount of time that elapses between an exposure and the first sign of damage. For asbestos exposures, this may involve a period of 15 to 40 years before a asbestos related disease makes itself known. It is important to note that the actual latency period may vary greatly depending upon the individual exposed and specific processes.

Figure 3-3
Latency Period



*Length of period varies with different asbestos diseases and different individuals.

COMMON ASBESTOS RELATED DISEASES

Pleural Plaques

Two types of pleural reactions have been associated with asbestos exposure:

1. A radiating response of inflammation accompanied by pleural space and lung tissue destruction.
2. A discrete reaction within the pleural membranes, in one or more locations.

The first may occur in association with all asbestos-related lung diseases, *pulmonary fibrosis, or as a pleural effusion*. The result of the second type of reaction is referred to as a pleural plaque.

Clinical Features & Diagnosis

Because they are often asymptomatic (present without symptoms), pleural plaques are usually diagnosed by observing chest x-rays in an otherwise healthy individual.

Pleural plaques have been found not only in exposed workers, but also in their family members as well. This implies that contaminated clothing or hair provide sufficient sources of secondary exposures.

Pleural plaques alone do not constitute a debilitating disease and are generally considered *benign*. They do not require any specific treatment. However, they can be considered a “signpost” or indicator of asbestos exposure and they do tend to increase the statistical likelihood of developing lung cancer. A dose-response relationship has not been confirmed. Plaque formation seems to be related to elapsed time from initial exposures rather than to the accumulated dose. A latency period ranging from 10 to 50 years after initial exposure has been documented.

Pleural Effusions

Clinical Features & Diagnosis

One of the most common health effects associated with asbestos exposure, as well as one of the few effects surfacing within ten years from initial exposure, the pleural effusion is a gradual (occasionally sudden) development of fluid in the pleural space between the chest wall and the surface of the lung. Although often asymptomatic, the presentation may be acute (sudden onset), accompanied with chest pain and fever. Often, the condition is associated with current or brief exposures occurring in the past. Pleural effusions may be benign and self-limiting or develop into a chronic condition of pleural thickening or pleural plaques.

Asbestosis

Asbestosis is classified as *pneumoconiosis.* It is **not** a cancer. Pneumoconiosis constitutes a group of lung diseases directly related to the chronic inhalation of high concentrations of dust (including fibers) in certain occupations. Fully described for the first time in the early twentieth century in asbestos textile workers, asbestosis was also the first asbestos-related disease to be recognized. Several disease-causing mechanisms have been equated to this chronically progressive, debilitating lung condition.

Fibrosis Formation: Unlike other digestible particles, asbestos does not respond to the digestive enzymes and acids of the macrophages. As a result, the macrophages eventually die and rupture, causing their contents to spill out into the surrounding areas, resulting in inflammation, which ultimately destroys normal lung tissue.

This process is continually repeated with the same fiber as well as others. So, not only is there a build-up of dead macrophages to contend with, but also the body's response to chronic irritation and tissue destruction. The loading of dead macrophages obstructs normal air sac function. The body attempts to heal itself through the formation of non-functional scar tissue. This chronic condition, producing scar tissue deposits of collagen, thickens air sac walls and develops into a progressive diffuse (spread throughout) fibrosis which greatly decreases lung function. It may also lead to a malignant cellular transformation.

Asbestos Bodies: The term "asbestos or ferruginous body" refers to the yellowish-brown particles, which are the hallmark of asbestos exposures. They consist of fibers that are heavily coated with a combination of proteins and iron-containing pigments. This encasement of fibers, as asbestos bodies, is a strong indicator of exposure and usually accompanies the diagnosis of asbestosis.

Clinical Features & Diagnosis

In simple terms, asbestosis is nothing less than gradual suffocation. Although not a cancer, lung function progressively deteriorates and the constant work of breathing causes an enlargement of the heart with subsequent circulatory impairment. This disease process may take 15 to 40 years before it results in clinical signs of disease, and smoking cigarettes may enhance its occurrence. Some of the clinical symptoms associated with asbestosis are synonymous with many other chronic obstructive pulmonary diseases and include the following:

- Progressive shortness of breath.
- Chronic cough, either dry or with sputum.
- Chest tightness accompanied with or without pain.
- Respiratory crepitations (rattles)
- Clubbing of the fingers and toes.
- Abnormal chest x-ray.
- Abnormal pulmonary function test.

The good news is that improved working conditions, personal protection protocols and employee awareness should virtually eliminate chronic exposure to high concentrations of asbestos dust thus making asbestosis a disease of the past, since development of asbestosis requires long exposures to high concentrations of asbestos fibers.

Lung Cancer

Asbestos is a known human carcinogen (cancer causing agent). Epidemiologic studies have unequivocally documented the association between asbestos exposure and the occurrence of various lung cancers, especially bronchogenic carcinomas (cancers of the bronchus or bronchi).

The underlying mechanism linking asbestos exposure to the initiation of malignant tumor growth is unclear, but fiber size appears to play a significant role.

Unlike asbestosis, chronic high exposures to asbestos fibers are not necessary to result in lung cancers. However, the extent of exposure (either high or low) may dictate the actual latency period for disease onset. In highly exposed workers, the latency period observed for asbestos induced lung cancer is 20 to 30 years.

Clinical Features & Diagnosis

The clinical features of lung cancer are common to many lung infections and may include the following symptoms:

- Persistent cough.
- An increase in sputum with cough.
- Blood-streaked sputum.
- Chest pain, unrelated to cough.
- Abnormal sputum cultures.
- Abnormal chest x-ray.
- Abnormal pulmonary function tests.

Crucial to regulatory agencies and the employee is the controversy surrounding whether there exists a safe or non-carcinogenic concentration of airborne asbestos. Currently, there is no conclusive evidence that such a threshold level, or safe dose, exists for the entire population.

SMOKING AND ASBESTOS EXPOSURE

There is little doubt that smoking cigarettes and exposure to asbestos is a potentially lethal combination. Epidemiologic studies have helped to clarify the risk factors, as well as demonstrate a potent synergistic or multiplicative effect on promoting lung cancer when both are present. However, it is unclear why the combined effects of smoking and asbestos exposure promote such a drastic increase in the risk of lung cancer. Table 3-1 presents the relative risks of asbestos exposure and smoking.

TABLE 3-1
RELATIONSHIP OF SMOKING & ASBESTOS EXPOSURE
TO RISK OF LUNG CANCER

Worker Status	Risk Multiplier
Nonsmoker/Asbestos Neg (-)	1
Nonsmoker/Asbestos Pos (+)	5
Smoker/Asbestos Neg (-)	10
Smoker/Asbestos Pos (+)	50-90

Note: (-) = No occupational exposure to asbestos
(+) = Occupational exposure to asbestos

Mesothelioma

Pleural membranes separated by fluid, envelope the exterior of the lungs (the pleura), abdominal cavity (peritoneum) and the heart (the pericardium). In all cases, these membranes act to reduce friction between organs and surrounding tissues. With the exception of the pericardium, primary malignant mesotheliomas (cancers) arising from the mesothelial cells of these membranes have been confirmed with low level, short duration exposures to asbestos fibers.

Although considered very rare cancers (incidence of the order of 1 per 1,000,000 per year in the general public), their association with asbestos exposure has been well documented since the early 1900's. The death of actor Steve McQueen attributed to a mesothelioma stimulated public interest and awareness of this rare disease.

Although all commercial fibers have been implicated, including talc, there seems to be important differences between fiber types in mesothelioma risk. The greatest risk appears to be associated with exposure to crocidolite (blue asbestos), less with amosite, and even less with chrysotile. These distinctions in response from different forms of asbestos are uniformly agreed upon within the scientific community. Smoking does not seem to play a synergistic role in the development of mesotheliomas, nor does there appear to be a dose-response relationship.

Clinical Features & Diagnosis

The underlying mechanism linking asbestos exposure to the development of mesotheliomas is unclear, but both fiber size and physical differences may play a significant role. There is some evidence that fibers less than 2.5 micrometers in diameter or between 10 and 80 micrometers in length are particularly effective in triggering mesothelioma growths.

As with lung cancer, the typical latency period is 20 to 40 years before the disease appears. The clinical features may include the following symptoms:

- Dull chest or shoulder pain, insidious at first but quite persistent to the point of interfering with sleep.
- Breathlessness, related to pleural fluid accumulation.
- Weight loss.
- Tiredness.
- Chronic cough.
- History of pleural effusions.
- Finger clubbing.
- Partial or complete intestinal obstruction.
- Abnormal chest x-ray.
- Abnormal pulmonary function tests.

The clinical course is usually quite rapid. For tumors involving the *pleura* (lung lining), the average survival time from onset of symptoms has historically been approximately 6 months. Recent advances in screening; diagnosis and treatment have increased survival time significantly. The typical survival time for those tumors of the *peritoneum* (gastrointestinal tract) is 13 to 14 months.

OTHER ASBESTOS-RELATED DISEASES

In addition to the above-mentioned diseases or conditions there is increasing evidence that other diseases may be attributable to asbestos exposures (see Table 3-2). An excess of gastrointestinal tract cancers and disorders, including cancers of the larynx, pharynx, stomach, colon and rectum have been documented in mortality studies of asbestos workers. Some evidence linking asbestos exposure to an increase in ovarian cancer among female asbestos workers has been documented in both clinical and animal studies, but has not been adequately substantiated. There has been some association of asbestos exposure with carcinoma of the breast in women, as well as genital carcinomas in men and women as well as kidney cancer.

Asbestos fibers can penetrate through the skin and give rise to “asbestos corns or warts.” In sufficient numbers, such corns appear to produce arthritis-like responses, including clubbing of fingers. There is also potential for asbestos corns to convert to malignancies. These conditions tend to be more prevalent in miners of raw ore and those employed in asbestos manufacturing plants.

HEALTH RISK ASSESSMENT

Asbestos Exposure Health Effects

Most of the evidence for a relationship between asbestos exposure and health effects is based on epidemiological studies. These studies, while presenting a relationship between exposure and disease, are from exposure data generated many years ago, during a period when workers were routinely exposed to much higher levels than they are today. It is not clear from these studies, if the dose-response relationship is linear, curved or if there is a threshold below which there is no effect. The vast majority of people who have developed asbestos related diseases were exposed to very high concentrations of fibers over an extended period of time, a condition very unlike that of building occupants or even abatement workers of today.

Many questions remain to be answered as to the development of disease and exposure to asbestos. Among these questions are:

- Do fiber size and shape make a difference? It is believed that long, thin fibers are more dangerous.

- Do different forms of asbestos present different levels of health risk? Sufficient evidence has not been presented as of yet.

- Do low levels of exposure present an increased risk? Asbestos fibers can be found in most human lungs at autopsy.

- Does asbestos exposure increase health risks from other types of chemical exposures? It has been shown through epidemiological studies that a relationship exists between smoking and increased risk of developing asbestos related illnesses.

- Are there specific genetic differences among individuals rendering some more susceptible to the carcinogenic effects of asbestos?

Related Health Effects

Exposure to other natural and man-made substances have been connected or suggested to produce similar health effects as those produced from exposure to asbestos, including:

- Erionite, a fibrous form of a mineral called *Zeolite*, which has been shown to produce mesothelioma in test animals.
- Ceramic fibers made from silicates which have been connected to pulmonary fibrosis and lung cancer.
- Fiberglass, which has been suggested to be linked to pulmonary fibrosis and lung cancer.

Health Risk to Family Members of Asbestos Workers

Exposures to asbestos fibers have not been confined to occupational settings. Asbestos related disease in persons who have not been directly exposed at the workplace has been reported since the early 1960's. Of considerable importance are the data on the prevalence of x-ray abnormalities and the incidence of mesothelioma in family contacts of asbestos workers. The source of exposure for this group of individuals is presumed to be the dust brought home on a worker's clothing.

TABLE 3-2
PATHOLOGICAL EFFECTS OF ASBESTOS EXPOSURE IN MAN

ORGAN	EFFECT	ASSOC WITH ASBESTOS EXPOSURE*
Skin	Asbestos Corn	Established
Larynx	Carcinoma	Possible
Lungs	Asbestos Bodies	Established
	Interstitial Fibrosis (Asbestosis)	Established
	Carcinoma (Bronchial)	Cofactor with Cigarettes
Pleura	Hyaline Plaques	Established
	Malignant Mesothelioma	Established +
	Pleural Effusion	Possible
Peritoneum	Malignant Mesothelioma	Established +
GI Tract	Neoplasia	Established
	Carcinoma	Established
Ovary	Carcinoma	Remotely Possible
Breast	Carcinoma	Remotely Possible
Genitals (Male/Female)	Carcinoma	Remotely Possible

*Association thought to be causal, except where indicated.
+Association, not cause, established.

THE IMPORTANCE OF MEDICAL SURVEILLANCE

It is important for all companies or industries involved in any operations that may disturb asbestos to establish an ongoing medical surveillance program for several reasons. These include the safety and health of all employees, regulatory requirements and other legal liability concerns.

Through implementations of a sound medical surveillance program, a company will be able to verify every employee's medical status at time of employment, comply with OSHA standards on medical surveillance of workers exposed to asbestos, and reduce other associated liability risks.

WHO NEEDS MEDICAL SURVEILLANCE?

Some of the employees that should be provided medical surveillance include:

- Custodial and maintenance workers who may encounter asbestos-containing materials (ACM) while performing their normal duties.
- Asbestos abatement workers.
- Asbestos abatement air monitoring personnel.
- Building inspectors.
- Pipe fitters.
- Roofing workers.
- Laboratory personnel involved with asbestos analysis.
- Asbestos manufacturing personnel.
- Other allied trades that may encounter asbestos-containing materials.

According to Federal regulations, any employee working at an occupation in which the levels of airborne asbestos fibers meet or exceed certain levels must participate in a medical surveillance program. Additionally, any employee who must wear a respirator must be medically evaluated on a regular basis. This is to ensure that the use of the respirator does not adversely affect his or her health.

OSHA STANDARDS – MEDICAL SURVEILLANCE

According to the OSHA Asbestos Construction Standard 29 CFR 1926.1101, medical examinations must be provided or made available by the employer, at their expense, for all employees who are or will be exposed to airborne concentrations of asbestos at or above the Permissible Exposure Limit of 0.1 fibers per cubic centimeter (f/cc) during an 8 hour time weighted average (TWA) and/or the excursion limit of 1.0 f/cc during a 30 minute time weighted average for 30 or more days per year. This exposure is without regard to respirator use. An acceptable medical surveillance program must include pre-placement, annual, and termination examinations.

The initial pre-placement exam may be waived provided there is sufficient evidence that demonstrates that an employee has been examined in accordance with the standard, within the past year. This standard also outlines the requirements maintaining medical records on each employee.

Pre-Placement Exams

A pre-placement examination must take place prior to an employee's assignment to an occupation where they are exposed to airborne concentrations of asbestos. A comprehensive medical evaluation must be performed and should include as a minimum:

- A medical and work history
- A complete physical examination of all systems with emphasis on the respiratory system, the cardiovascular system and the digestive system.
- Completion of the respiratory disease standardized questionnaire (see Appendix D).
- A chest x-ray, at the discretion of the physician (posterior-anterior 14 x 7 inches).
- Pulmonary function test to include Forced Vital Capacity (FVC) (the maximum amount of air that can be expired from the lung after full inhalation) and Forced Expiratory Volume at 1 second (FEV^1) (the mount of air forcible expired in one second after full inhalation).
- Any additional tests deemed appropriate by the examining physician.

The results of this examination will be used to determine the employee's baseline health status, as well as to evaluate whether or not they should be allowed to wear respirators. The findings of the examination (Physician's Report) are reviewed with the employee and furnished to the employer for their files.

Only those items of the examination pertinent to potential asbestos exposure or respirator usage are reported to the employer. The employer must furnish a copy of the report to the employee upon request.

Individual test results are normally kept by the physician or clinic to maintain confidentially. To assure the proper steps are taken, a copy of the medical monitoring and record keeping requirements of the OSHA Standard should be provided to the physician. It is very important for the employer to be sure the clinic maintains the results of all examinations as required by the Standard. In the event that an employee develops a health related problem, the employer will be able to check their records and confirm whether or not the condition could have occurred as a result of employment with their company.

In addition to the medical reports the employer should request that the physician provide a signed statement indicating the following:

- Whether or not an employee is capable of wearing a respirator.
- Any limitations associated with respirator use.
- Any other workplace limitations, (intense heat, extreme cold, etc.).

- Any detectable medical conditions that would place the employee at an increased risk of material health impairment from exposure to asbestos.
- The physician has reviewed the results of the exam with the employee.
- The physician has informed him/her of any medical conditions that may result from exposure to asbestos.

Information beyond this, such as medical history and contents of the medical questionnaire must be kept confidential and must not be transmitted to the employer or others without written consent by the employee. Naturally, results of other tests done as part of routine employment physicals, such as hearing or vision tests would be supplied to the employer.

Annual/Periodic Examinations

As an ongoing surveillance mechanism, periodic medical examinations must be made available annually. Such annual examinations must include, as a minimum, all elements of the initial exam with the exception of the chest x-ray requirement. OSHA provides guidelines for the frequency of chest x-rays depending upon the years since a first exposure and the age of the employee. In addition, an abbreviated questionnaire is substituted for the initial one and must be completed.

The physician will be able to compare the annual examinations with the pre-placement evaluations to determine if there are any changes in an employee's health status. If there are noticeable changes, such changes can be evaluated promptly to reduce any long-term health implications. Actions may include early medical treatment, transfer to another job, discontinue respirator use, etc.

Termination of Employment Examination

Within 30 calendar days before or after the termination of an employee, OSHA requires that each employee exposed to asbestos be offered a termination medical examination. The employee may waive his/her right to this exam, but this must be done in writing.

The termination examination must include those elements of a periodic exam. Records of these exams must be retained by the employer/building owner for a minimum period of 30 years to provide documentation of the health status of the employee. The reason for this 30-year period is due to the latency period associated with asbestos-related diseases (between 15-30 years). Thus, if an employee develops a health problem or files a disability claim 25 years later, the employer will have records on file for reference.

REASONS FOR SPECIFIC TESTS

Chest X-Ray: These are performed primarily to detect irregularities in the lungs and the heart, including any fibrosis or plural plaques induced by exposure to asbestos and are also used as a baseline for comparing against future x-rays.

Pulmonary Function: These tests are conducted to determine if a person's lungs are expanding normally, and if there is adequate air movement in and out of the lungs. The FVC and FEV 1.0 are conducted through the use of a spirometer. The spirometer measures the ventilatory capacity of the lungs. Changes in the ability of an individual to move air into and out of the lungs, in a normal manner, can be described as either restrictive or obstructive ventilatory impairment.

Pulmonary History: This part of the examination is simply a questionnaire that is completed by the employee. It is used to identify the potential for respiratory diseases. Several questions relate to chronic lung diseases, while others address the employee's personal habits such as smoking.

Physical Examination: The routine physical examination often includes medical history, blood pressure, pulse, vision (depth perception, peripheral), audiogram (hearing test), urinalysis, and follow-up classification with appropriate recommendations. It is good recommended practice to require individuals over 40 years of age, or other people who might be at an increased risk, to have an electrocardiogram performed. It is a known fact that the use of respirators places increased strain on the cardio-pulmonary system. If abnormalities show up on an electrocardiogram, appropriate actions can then be taken; such as administration of medication or transfer to a job that does not require respirator use.

ACCESS TO MEDICAL AND EXPOSURE RECORDS

U.S. Department of Labor *OSHA*
Ann McLaughlin, Secretary *John Pendergrass, Asst. Secretary*
1988 OSHA 3110

INTRODUCTION

More than 32 million workers may be exposed to toxic substances and harmful physical agents to an extent that may severely impair their health. Yet workers are often the least informed about the toxic exposures they face and their potential health effects.

*In 1980, the Occupation Safety and health Administration (OSHA) issued a standard requiring employers to provide employees with information to assist in the management of their own safety and health. The standard, "Access to Employee Exposure and Medical Records" (29 CFR 1910.1020), permits direct access by employees or their designated representatives and by OSHA to employer-maintained exposure and medical records. * This access is designed to yield both direct and indirect improvements in the detection, treatment, and prevention of occupational disease. For example, access to these records will enable workers to determine patterns of health impairment and disease and to establish causal relationships between disease and exposure to particular hazards. Access to these records also should result in a decreased incidence of occupational exposure and should aid in designing and implementing new control measures*

Although OSHA revised the standard in 1988 to eliminate certain recordkeeping requirements and to provide additional protection for employer trade secrets, the standard still provides employees with basic right to know the extent of their exposure to the harmful substances they work with and any associated health effects. This knowledge, in turn, allows them to detect, treat, and help prevent occupational disease. ****Note**: The standard limits access only to those employees who are, have been (including former employees), or will be exposed to toxic substances or harmful physical agents.*

ACCESS

"Access", for the purpose of the standard, means the right and opportunity to examine and copy. Access to employee medical and exposure records must be provided in a reasonable manner and place. If access cannot be provided within 15 days after the employee's request, the employer must state the reason for the delay and the earliest date when the records will be made available. Responses to initial requests, and new information that has been added to an initial request, are to be provided without cost to the employee or representative. The employer may give employees copies of the requested records, give the employees the records and the use of mechanical copying facilities so the employee may copy the records, or lend employees their records for copying off the premises. In addition, medical and exposure records are to be made available, on request, to OSHA representatives to examine and copy.

Exposure Records

Upon request, the employer must provide the employee, or employee's designated representative access to employee exposure records. If no records exist, the employer must provide records of other employees with job duties similar to those of the employee. Access to these records does not require the written consent of the other employees. In addition, these records must reasonably indicate the identity, amount, and nature of the toxic substances or harmful physical agents to which the employee has been exposed. Union representatives must indicate an occupational health need for requested records when seeking access to exposure records without the written authorization of the employee(s) involved.

Medical Records

The employer also must provide employees and their designated representatives access to medial records relevant to the employee. Access to the medical records of another employee may be provided only with the specific written consent of that employee. The standard provides a suitable sample authorization letter for this purpose (see page 7 for sample authorization). Prior to employee access to medical records, physicians, on behalf of employers, are encouraged to discuss with employees the contents of their medical records. Physicians also may recommend ways of disclosing medical records other than by direct employee access. Where appropriate, a physician representing the employer can elect to disclose information on specific diagnoses of terminal illness or psychiatric conditions only to an employee's designated representative, and not directly to the employee. In addition, a physician, nurse, or other responsible health care person who maintains medical records may delete from requested medical records the names of persons who provided confidential information concerning an employee's health status.

Analyses Using Exposure or Medical Records

The standard assures that an employee (or designated representative), as well as OSHA, can have access to analyses that were developed using information from exposure or medical records about the employee's working conditions or workplaces. Personal identities, such as names, addresses, social security and payroll numbers, age, race, and sex, must be removed from the data analyses prior to access.

Trade Secrets

In providing access to records, an employer may withhold trade secret information but must provide information needed to protect employee health. Where it is necessary to protect employee health, the employer may be required to release trade secret information but may condition access on a written agreement not to abuse the trade secret or to disclose the chemical's identity.

An employer also may delete from records any trade secret that discloses manufacturing processes or the percentage of a chemical substance in a mixture. The employer must, however, state when such deletions are made. When deletion impairs the evaluation of where or when exposure occurs, the employer must provide

alternative information that is sufficient to permit the requester to make such evaluations.
The employer also may withhold a specific chemical identity when the employer can demonstrate it is a trade secret, the employer states this to the requester, and all other information on the properties and effects of the toxic substance is disclosed. The specific chemical identity, however, must be disclosed to a treating physician or nurse that physician or nurse states that a medical emergency exists and the identity is necessary for treatment. When the emergency is over, the employer may require the physician or nurse to sign a confidentiality agreement.

The employer must provide access to a specific chemical identity in non-emergency situations to an employee, an employee's designated representative or a health care professional if it will be used for one or more of the following activities:

- *Assess the hazards of the chemicals to which employees will be exposed.*
- *Conduct or assess sampling of the workplace atmosphere to determine employee exposure levels.*
- *Conduct pre-assignment or periodic medical surveillance of exposed employees.*
- *Provide medical treatment to exposed employees.*
- *Select or assess appropriate personal protective equipment for exposed employees.*
- *Design or assess engineering controls or other protective measures for exposed employees.*
- *Conduct studies to determine the health effects of exposure.*

In these instances, however, the employer may require the requester to submit a written statement of need, the reasons why alternative information will not suffice, and to sign a confidentiality agreement not to use the information for any purpose other than the health need stated and not to release it under any circumstances, except to OSHA.

The standard further prescribes the steps employers must follow if they decide not to disclose the specific chemical identity requested by the health professional, employee, or designated representative. Briefly, these steps are as follows:

- *Provide a written denial.*
- *Provide the denial within 30 days of the request.*
- *Provide evidence that the chemical identity is a trade secret.*
- *Explain why alternative information is adequate.*
- *Give specific reasons for the denial.*

An employee, designated representative, or health professional may refer such a denial to OSHA for review and comment.

EMPLOYEE INFORMATION

At the time of initial employment and at least annually thereafter, employees must be told of the existence, location, and availability of their medical and exposure records. The employer also must inform each employee of his or her rights under the access standard and make copies of the standard available. Employees also must be told who is responsible for maintaining and providing access to records.

TRANSFER OF RECORDS

When an employer ceases to do business, he or she is required to provide the successor employer with all employee medical and exposure records. When there is no successor to receive the records for the prescribed period, the employer must inform the current affected employees of their access rights at least 3 months prior to the cessation of business and must notify the Director of the National Institute for Occupational Safety and Health (NIOSH) in writing at least 3 months prior to the disposal of records.

RETENTION OF RECORDS

Each employer must preserve and maintain accurate medical and exposure records for each employee. The access standard imposes no obligation to create records but does apply to any medical or exposure records created by the employer in compliance with other OSHA rules or at his or her own violation.

Exposure records and data analyses based on them are to be kept for 30 years. Medical records are to be kept for at least the duration of employment plus 30 years. Background data for exposure records such as laboratory reports and work sheets need to be kept only for 1 year. Records of employees who have worked for less than 1 year need not be retained after employment, but the employer must provide these records to the employee upon termination of employment. First-aid records of one time treatment need not be retained for any specified period.

OSHA does not mandate the form, manner, or process by which an employer preserves a record, except that chest X-ray films must be preserved in their original state. Three months before disposing of records, employers must notify the Director of NIOSH.

HAZARD COMMUNICATION

The OSHA Hazard Communication Standard (29 CFA 1910.1200) helps reduce the incidence of illnesses and injuries caused by chemical hazards in the workplace by informing employees of the nature and effect of hazardous materials they work with. The standard requires the development of Material Safety Data Sheets (MSDS's) and their communication to all employees exposed to chemical hazards. An MSDS describes the physical and chemical properties of products, health hazards and routes of exposure, precautions for safe handling and use, emergency and first-aid procedures, reactivity data, and control measures. Information on an MSDS aids in the selection of safe products and their safe handling and use, and helps employees to respond effectively to emergency situations.

OSHA's Access rule supplements the Hazard Communication Standard and its informational benefits for employees by adding information on exposure and medical effects. Both standards together give employees and employers the information they need to help avoid, reduce or eliminate workplace hazards.

STATE PLAN STANDARDS

States with OSHA approved occupational safety and health programs must adopt an access standard that is at least as effective as OSHA's standard, subject to OSHA approval and monitoring (see page 8 for state plan states). Since the requirement is that state standards be "at least as effective as" the federal rule, they may differ in some respects.

Sample Authorization Letter for the Release of Employee Medical Record Information to a Designated Representative (Non-mandatory)

I _____, hereby authorize
(Full name of worker/patient)

_____, to release to
(Individual or organization holding the medical records)

_____, the following medical
(Individual or organization authorized to receive the medical information)

information from my personal medical records: _____
(Describe generally the information desired to be released)

_____

_____

_____

I give my permission for this medical information to be used for the following purpose:

_____,

but I do not give permission for any other use or re-disclosure of this information.

**Note: several extra lines are provided below so that you can place additional restrictions on this authorization letter if you want to. You may, however, leave these lines blank. On the other hand, you may want to: (1) Specify a particular expiration date for this letter (if less than 1 year); (2) Describe medical information to be created in the future that you intend to be covered by this authorization letter; or (3) Describe portions of the medical information in your records that you do not intend to be released as a result of this letter.*

_____

_____

_____

_____

_____
Full name of Employee or Legal Representative

_____ _____
Signature of Employee or Legal Representative *Date of Signature*

STATES WITH APPROVED PLANS

Jim Sampson, Commissioner
Alaska Dept. of Labor
PO Box 21149
Juneau, Alaska 99802-1149
907-465-2700

Larry Etchechury, Director
Industrial Commission of Arizona
800 W. Washington
Phoenix, Arizona 85007
602-255-5795

Ron Rinaldi, Director
California Dept. of Industrial Relations
525 Golden Gate Avenue
San Francisco, California 94102
415-557-3356

Betty L. Tianti, Commissioner
Connecticut Dept. of Labor
200 Folly Brook Blvd.
Wethersfield, Connecticut 06109
203-566-5123

Elizabeth Howe, Director
Michigan Dept. of Labor
309 N. Washington
PO Box 30015
Lansing, Michigan 48909
517-373-9600

Raj M. Wiener, Acting Director
Michigan Dept. of Public Health
3423 North Logan Street
Box 30195
Lansing, Michigan 48909
517-335-8022

Allen J. Meier, Commissioner
Iowa Division of Labor Services
1000 E. Grand Avenue
Des Moines, Iowa 50319
515-281-3447

Carole Palmore, Secretary
Kentucky Labor Cabinet
U.S. Highway 127 South
Frankfort, Kentucky 40601
502-564-3070

Henry Koellein, Jr., Commissioner
Maryland Division of Labor & Industry
Dept. of Licensing & Regulations
501 St. Paul Place
Baltimore, Maryland 21202-2272
301-333-4176

Mario R. Ramil, Director
Hawaii Dept. of Labor & Industrial Relations
830 Punchbowl Street
Honolulu, Hawaii 96813
808-548-3150

Donald W. Moreau, Commissioner
Indiana Dept. of Labor
1013 State Office Bldg.
100 North Senate Avenue
Indianapolis, Indiana 46204
317-232-2663

Ray H. Bohn, Commissioner
Minnesota Dept. of Labor & Industry
443 Lafayette Road
St. Paul, Minnesota 55101
612-296-2342

Juan Manuel Rivera Gonzalez, Secretary
Puerto Rico Dept. of Labor & HR
Prudencio Rivera Martinez Bldg.
505 Munoz Rivera Avenue
Hato Rey, Puerto Rico 00918
809-754-2119-22

Michael J. Tyler, Administrator
Nevada Dept. of Industrial Relations
Division of Occupational Safety & Health
Capitol Complex
1370 S. Curry Street
Carson City, Nevada 89710
702-885-5240

Edgar L. McGowan, Commissioner
South Carolina Dept. of Labor
3600 Forest Drive
PO Box 11329
Columbia, South Carolina 29211
803-734-9594

Richard Mitzelfelt, Director
New Mexico Environmental Improvement Division
Health & Environment Dept.
PO Box 968
Santa Fe, New Mexico 87504
505-827-2850

James R. White, Commissioner
Tennessee Dept. of Labor
Attn: Robert Taylor
501 Union Bldg.
Ste. A 2nd Floor
Nashville, Tennessee 37219
615-741-2582

Thomas F. Hartnett, Commissioner
New York Dept. of Labor
One Main Street
Brooklyn, New York 11201
718-797-7281

Douglas J. McVey, Administrator
Utah Occupational Safety & Health
160 East 300 South
PO Box 5800
Salt Lake City, Utah 84110
801-530-6900

John C. Brooks, Commissioner
North Carolina Dept. of Labor
4 West Edenton Street
Raleigh, North Carolina 27603
919-733-7166

Jeanne Van Vlandren, Commissioner
Vermont Dept. of Labor & Industry
120 State Street
Montpelier, Vermont 05602
802-828-2765

John A. Pompei, Administrator
Accident Prevention Division
Oregon Dept. of Insurance & Finance
Labor & Industries Bldg.
Salem, Oregon 97310
503-378-3304

Paul Arnold, Commissioner
Virgin Island Dept. of Labor
Box 890 Christiansted
St. Croix, Virgin Islands 00820
809-773-1994

Carol Amato, Commissioner
Virginia Dept. of Labor & Industry
PO Box 12064
Richmond, Virginia 23241
804-786-2376

Joseph A. Dear, Director
Washington Dept. of Labor & Industries
General Administration Bldg.
Room 334-AX-31
Olympia, WA 98504
206-753-6307

John Chambers, Assistant Administrator
Wyoming Dept. of Occupational Health & Safety
604 East 25th Street
Cheyenne, WY 82002
307-777-7786 or 777-7787

**Approved state plans are required to provide standards and enforcement programs, as well as voluntary compliance activities that must be at least as effective as the federal OSHA standard.*

Note: Connecticut and New York plans cover public employees only.

In California, OSHA currently is exercising concurrent private-sector federal enforcement authority.

RELATED PUBLICATIONS

Single free copies of the following publications can be obtained from the OSHA Publications Office, U.S. Department of Labor, 200 Constitution Avenue, N.W., Room N-3101, Washington, D.C., 20210. Send a self-addressed mailing label with your request.

OSHA 2056 - ALL ABOUT OSHA
OSHA 3084 - CHEMICAL HAZARD COMMUNICATION
OSHA 3047 - CONSULTATION SERVICES FOR THE EMPLOYER
OSHA 3021 - OSHA: EMPLOYEE WORKPLACE RIGHTS
OSHA 2098 - OSHA INSPECTIONS
OSHA 3077 - PERSONAL PROTECTIVE EQUIPMENT
OSHA 3079 - RESPIRATORY PROTECTION
OSHA 3091 - SAFETY AND HEALTH GUIDE FOR THE CHEMICAL INDUSTRY
OSHA 2254 – TRAINING REQUIREMENTS IN OSHA STANDARDS AND TRAINING GUIDELINES
BLS Publication OMB No. 1220-0029 - Recordkeeping Guidelines for Occupational Injuries and Illnesses.

A “Hazard Communication Compliance Kit” may be ordered from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 for $18.00 ($22.50 for foreign addresses). Specify OSHA Publication 3104, GPO Order Number 929-022-00000-9. The kit can be ordered from GPO by phone using VISA or MasterCard; call 202-783-3238.

SECTION 4
ASBESTOS LAWS, REGULATIONS AND GUIDELINES

INTRODUCTION

Several Federal laws, regulations and guidelines regarding asbestos and asbestos-containing materials have been established in the United States to reduce the risk to workers, the community and the environment. The most recent OSHA standards for asbestos in General Industry, Construction and Maritime became effective on October 11, 1994. These laws and regulations establish acceptable work practices, mandate specific training requirements, outline medical surveillance and exposure criteria as well as set forth several administrative responsibilities. Other Federal regulations cover the use of asbestos in products (EPA), transportation (DOT) and disposal (EPA) of asbestos waste as well as asbestos installed in school buildings (EPA).

In addition to Federal regulations, several states and local entities have established asbestos regulations which govern abatement activities, air monitoring/testing criteria and transportation/disposal requirements. Many of these rules, because they are more stringent, supersede Federal laws, especially with regard to ACM disposal and worker accreditation or certification. Therefore, it is important to become highly familiar with all regulations prior to undertaking any activities involving asbestos.

This section outlines the key aspects of current primary Federal, State and local regulations and industry standards that govern activities involving asbestos and asbestos-containing building materials (ACBM). In addition, this section addresses a number of notices and permits which either must be applied for and received, or which must be forwarded to governmental agencies before the start of work involving asbestos. Its intention is to provide a brief overview of the regulatory framework as well as to summarize current, key elements of specific regulations designed to protect the worker, community and the environment. The complete text of many of the primary Federal and State regulations have been provided under separate cover and must be referred to for specific applications.

REGULATORY FRAMEWORK

Federal Level

The Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) under the Department of Labor (DOL) are the principal Federal agencies responsible for establishing and implementing regulations regarding asbestos in buildings and worker protection. The EPA is responsible for developing and enforcing regulations necessary to protect the general public from exposure to airborne contaminants that are known to be hazardous to human health. OSHA is responsible for the health and safety of workers who may be exposed to asbestos in the workplace, or in connection with their jobs. Several other agencies contribute to the regulatory

process, including the National Institute for Occupational Safety and Health (NIOSH) and the Department of Transportation (DOT).

State Level

The New York State Department of Labor (NYSDOL), the New York State Department of Health (NYSDOH) and the New York State Department of Environmental Conservation (NYSDEC) are the primary State agencies responsible for establishing and implementing regulations regarding asbestos abatement, worker training programs, worker protection and disposal of asbestos waste materials in New York State.

Local Level

In New York City, the New York City Department of Environmental Protection and the New York City Department of Sanitation regulate abatement, transportation, storage and disposal of asbestos within the City.

REGULATIONS

At the Federal level, there are five key regulations designed in whole or in part to control asbestos. They are:

1. EPA Asbestos Hazard Emergency Response Act (AHERA), 40 CFR Part 763,Subpart E.

2. EPA National Emission Standards for Hazardous Air Pollutants (NESHAPs) 40 CFR Part 61, Subparts A&M.

3. EPA Worker Protection Rule, 40 CFR Part 763, Subpart G.

4. OSHA Asbestos Standard for General Industry, Construction and Maritime, 29 CFR 1910.1001, 1926.1101 & 1915.1001.

5. DOT Hazardous Substances 49 CFR Part 171 & 172.

At the New York State Level there are eight key areas of regulatory authority over asbestos. They are:

1. NYSDEC Waste Collector Registration Regulations Title 6, Part 364 of the New York State Official Compilation of Codes, Rules and Regulations (6 NYCRR 364).

2. NYSDEC Solid Waste Management Regulations Title 6, Part 360 of the New York State Official Compilation of Codes, Rules and Regulations (6 NYCRR 360)

3. NYSDOL Asbestos Industrial Code Rule 56, Title 12, Part 56, of the New York State Official Compilation of Codes, Rules and Regulations (12 NYCRR 56)

4. NYSDOL Public Employees Safety and Health Act Article 2, Section 27 (a) of the New York State Labor Law as amended effective August 2, 1985.

5. NYSDOL Asbestos or Products Containing Asbestos Licensing Article 30, Sections 900-911 of the New York State Labor Law Created by Laws of 1986, Chapter 775.

6. NYSDOH Laboratory Accreditation Requirements Title 10, Parts 55.2 and 55.3 of the New York State Official Compilation of Codes, Rules and Regulations (10 NYCRR 55.2 & 55.3).

7. NYSDOH Laboratory Accreditation Requirements Article 502 of the New York State Health Laws.

8. NYSDOH Asbestos Safety Program Requirements Title 10, Part 73 of the New York State Official Compilation of Codes, Rules and Regulations (10 NYCRR 73).

FEDERAL REGULATIONS

AHERA

Congressional action concerning asbestos in schools began with the Asbestos School Detections and Control Act of 1980. The purpose of this law was to offer technical assistance to schools concerned about the potential health effects of friable asbestos. The program was administered by the U.S. Education Department, but was ineffective due to lack of sufficient funding. In 1982, the EPA expanded the technical assistance program and issued inspection regulations under the Asbestos-In-Schools Rule. The rule required all public and private schools to inspect their buildings for friable asbestos materials. Schools were required to complete their inspections by June 28, 1983. The rule also required schools to take samples and have them analyzed for asbestos, maintain records, and notify employees and parents of any identified asbestos. Actual abatement was not required by the rule. By 1985, Congress determined the need for new statutory authority to force schools to abate asbestos hazards. On October 22, 1986, President Reagan signed into law (as Title II of the Toxic Substance Control Act) the Asbestos Hazard Emergency Response Act (AHERA, Asbestos Containing Materials in School, 40 CFR Part 763, Subpart E). AHERA was more inclusive than the Asbestos-In-School Rule. The law directed EPA to publish regulations for addressing asbestos in public and private schools, grades K-12. The proposed rules were promulgated in the Federal Register on April 30, 1987. The Final rules were issued on October 30, 1987. AHERA established a number of requirements, with deadlines, for the EPA, which is summarized below.

Key Definitions

Asbestos Containing Materials (ACM) is defined as any material or product that contains more than 1% asbestos.

Asbestos Containing Building Materials (ACBM) are defined as surfacing ACM, thermal system insulation ACM, or miscellaneous ACM found on the interior structural members or other parts of school buildings.

Surfacing Materials are defined as material that is sprayed on, troweled on, or otherwise applied to surfaces, such as acoustical plaster on ceilings and fireproofing materials on structural members.

Surfacing ACM is surfacing material that contains more than 1% asbestos.

Thermal System Insulation is material applied to pipes, fittings, boilers, breeching, tanks, ducts or other structural components to prevent heat loss or gain or water condensation.

Miscellaneous Materials are interior building materials that contain more than 1% asbestos.

Friable means a dry material that may be crumbled pulverized or reduced to powder by hand pressure.

Homogeneous Area is an area of surfacing material, thermal system insulation or miscellaneous material that is uniform in color and texture.

EPA REQUIREMENTS UNDER AHERA

DATE	**REQUIRED ACTION**
4/20/87	Publish proposed rules. Develop a Model Accreditation Plan.
10/17/87	Publish final rules. National Bureau of Standards (NBS) to establish laboratory accreditation for bulk sample analysis. States must notify schools where to send management plans, and must establish review of filed plans.
10/12/88	NBS must establish lab accreditation program for air sample analysis. Schools must submit management plans to states.
07/89	Schools must implement management plans.

Responsibilities of Schools (LEAs) under AHERA:

- Inspections, surveillance, management plans and response actions must conform to EPA regulations.
- Maintenance employees must be properly trained in Operations and Maintenance (O&M).
- Warning labels must be posted.
- Management plans must be available for inspection by parents, employer organizations, etc.
- LEAs must designate a responsible person.

Inspections and Re-inspections:

- LEAs must inspect each school building leased, owned or otherwise used as a school building for friable and non-friable ACBM.
- Accredited Inspectors must visually inspect each area of a school building.
- All suspect materials are to be sampled or be assumed to contain asbestos.
- All suspect ACBM must be touched to confirm friability.
- Re-inspection must occur at least once every 3 years by an accredited Inspector.
- An accredited Management Planner must review each inspection, re-inspection and assessment.

Response Actions:

- LEAs must select and implement response actions consistent with the results of the building inspection and assessment.

Worker and Occupant Protection:

- AHERA extended coverage of the EPA Worker Protection Rule to maintenance and custodial personnel.
- Requires air monitoring to document exposures.
- LEAs may choose to institute the provision of Appendix B of the Act in the case of small-scale, short duration projects.

- Establishes basic occupant protection requirements, including restricted access, posting of signs, etc.

Management Plans:

- Must be developed by accredited Management Planners and submitted to the state governor on or before 10/12/88. Must implement plan by 7/9/89.

- Must contain descriptions/locations of all assumed and confirmed ACBM, inspection results, response actions, LEA designate, description of occupant notification procedures, and an evaluation of resources needed to complete response actions.

RESPONSE ACTIONS

CLASSIFICATION	ACTION
Damaged or Significantly Damaged Thermal Insulation	Repair damaged area or remove if Damaged repair not feasible. Maintain all thermal insulation and covering in an intact, undamaged state.
Damaged Friable Surfacing ACBM or Damaged Friable Miscellaneous ACBM	Select encapsulation, enclosure, removal or repair depending on building ACBM usage patterns and economic factors.
Significantly Damaged, Friable Surfacing ACBM or Significantly Damaged, Friable Miscellaneous ACBM	Isolate space and restrict access. Remove the material or enclose or encapsulate if sufficient to contain fibers.
Friable Surfacing, Thermal System or Miscellaneous ACBM with Potential for Damage.	Establish an O&M program.
Friable Surfacing, Thermal System or Miscellaneous ACBM with Potential for Significant Damage	Establish an O&M program. Institute measures to prevent damage. Remove material when preventative measures cannot be implemented.

Enforcement:

- Establishes civil penalties for violations.
- Each building in a state of non-compliance constitutes a separate violation.
- Criminal penalties may be assessed for willful violations.

Model Accreditation Plan:

The original Model Accreditation Plan (MAP), developed by the EPA pursuant to a provision of the Asbestos Hazard Emergency Response Act (Section 206 of TSCA), required accreditation for all persons who inspect school buildings for the presence of asbestos, develop school asbestos management plans, or design/conduct response actions with respect to friable asbestos in schools. After consulting with affected organizations, as required by AHERA, the EPA issued the current MAP which specifies minimum training requirements for those required to obtain accreditation to conduct asbestos related work in schools, including Inspectors, Management Planners, Project Designers, Contractor/Supervisors and Workers.

In November of 1990, the MAP was amended by the Asbestos School Hazard Abatement Reauthorization Act (ASHARA). The basic intent of ASHARA is to extend many of the AHERA requirements to public and commercial buildings. In addition, ASHARA mandates that the MAP be revised to provide for the extension of accreditation requirements to include certain persons performing asbestos-related work in public and commercial buildings (Federal Register, March 29, 1991). An extension to the effective date for the ASHARA Training Amendments was announced in the Federal Register on January 16, 1992. On May 13, 1992, a Federal Register notice announced EPA's consideration of potential additions and changes to the current MAP. The EPA has most recently made additional changes to the MAP as necessary to implement ASHARA in 1994. These are related to additional practical (hands-on) training requirements for asbestos handlers, supervisors, designers and project monitors.

NESHAP

The Clean Air Act (CAA) of 1970 required EPA to develop and enforce regulations to protect the general public from exposure to airborne contaminants that are known to be hazardous to human health. In accordance with Section 112 of the CAA, the EPA established the National Emission Standards for Hazardous Air Pollutants (NESHAPs). Asbestos was one of the first hazardous air pollutants regulated under Section 112. On March 31, 1971, the EPA identified asbestos as a hazardous air pollutant, and on April 6, 1973, it promulgated the Asbestos NESHAP in 40 CFR Part 61, Subpart M. Since then, the Asbestos NESHAP has been amended several times, most recently in November 1990.

The Asbestos NESHAP is intended to minimize the release of asbestos fibers during activities involving the handling of asbestos. Accordingly, it specifies work practices to be followed during renovations of buildings which contain a certain threshold amount of friable asbestos, and during demolitions of all structures, installations, and facilities (except apartment buildings that have no more than four dwelling units). The Asbestos NESHAP requires action to be taken by the person who owns, leases, operates, controls or supervises the facility being demolished or renovated (the "Owner"), as well as by the person who owns, leases, operates, controls or supervises the demolition or renovation (the "Operator").

The regulations require owners and operators subject to the Asbestos NESHAP to notify delegated State and local agencies and/or their EPA Regional Offices prior to the start of any demolition or renovation activities. The regulations restrict the use of spray asbestos. Materials containing more than 1% asbestos may not be spray-applied unless they are encapsulated with resinous or bituminous binders. In addition, no owner or operator may install wet applied and molded asbestos-containing insulation (pipe lagging). Also regulated by the Asbestos NESHAP is asbestos waste handling and disposal.

The Asbestos NESHAP was amended to clarify existing regulatory policies, and to add regulations which explicitly address monitoring and record-keeping at facilities which mill, manufacture and fabricate asbestos products.

Because of the high risk associated with the transfer and disposal of ACM, the EPA also wanted to strengthen the requirements which govern asbestos waste disposal by implementing tracking and record keeping requirements. Furthermore, the EPA wanted to incorporate the availability of improved emission controls and desired to make the NESHAP consistent with other EPA statues that regulate asbestos.

The following activities and facilities are currently regulated by the Asbestos NESHAP:

- Milling of asbestos.
- Roadways containing asbestos.
- Commercial manufacturing of products that contain asbestos.
- Demolition of all facilities.
- Renovation of facilities that contain friable asbestos.
- The spray application of asbestos.
- Processing (fabrication) of any manufactured products that contain asbestos.
- Use of insulating materials that contain asbestos.
- Disposal of asbestos-containing waste generated during milling, manufacturing, demolition, renovation, spraying and fabricating operations.
- Closure and maintenance of inactive waste disposal sites.
- Operation of and reporting on facilities that convert asbestos-containing waste material into non-asbestos materials.
- Design and operation of air cleaning devices.
- Reporting of information pertaining to process control equipment, filter devices, asbestos generating process, etc.
- Active waste disposal sites.

Under the Asbestos NESHAP, written notification must be made to the regional Asbestos NESHAP contact at least 10 days prior to beginning any work on an asbestos abatement project. In region 2, which includes New York State, the address for this notification is:

Asbestos NESHAP Contract
Air & Waste Management Division
USEPA
26 Federal Plaza
New York, NY 10007
212-264-9500

A sample Asbestos Project Notification Form is attached at the end of this section.

Regarding disposal requirements as specified under the Asbestos NESHAP, there is to be no visible emissions to the outside air during the collection, packaging, transportation or disposal of asbestos containing waste materials. All friable ACM must be wet and sealed in a leak tight container and the containers must be labeled with the appropriate warning labels as specified in the OSHA Asbestos Standard.

Since the NESHAP mandates removal of friable ACM before a building is demolished, the plan for managing ACM should take into account the costs of eventual removal. The same is true for future renovation work covered by NESHAP. It should be noted that certain abatement methods such as encapsulation and enclosure might make eventual removal more difficult and expensive.

40 CFR Part 763, Subpart G
EPA WORKER PROTECTION RULE

This regulation extends the OSHA standards to state and local employees who perform asbestos work and who are not covered by the OSHA Asbestos Standards, or by a state OSHA plan. The Rule parallels OSHA requirements and covers medical examinations, air monitoring and reporting, protective equipment, work practices, and record keeping.

OSHA 1910.1001
OCCUPATIONAL EXPOSURE TO ASBESTOS
(GENERAL INDUSTRY STANDARD)

The General Industry Standard applies to all occupational exposures to asbestos in all industries covered by the Occupational Safety and Health Act, except exposure to asbestos in construction and maritime work.

Key Definitions

Asbestos is defined under the standard as Chrysotile, Amosite, Crocidolite, Tremolite asbestos, Anthophyllite asbestos, Actinolite asbestos, and any of these minerals that have been chemically treated and/or altered.

The Permissible Exposure Limit (PEL is established as 0.1 fibers/cubic centimeter over and 8 hour Time Weighted Average (TWA), with an Excursion Limit (EL) of 1.0 fibers/cubic centimeter for a 30 minute average.

Presumed Asbestos Containing Material (PACM) is defined as Thermal System Insulation (TSI) and surfacing materials present in buildings constructed no later than 1980.

A regulated area is an area where airborne concentrations of asbestos exceed or are expected to exceed the PEL. These areas must be demarcated from the rest of the workplace and access limited to trained personnel who must wear respirators when entering the area.

Exposure Monitoring

- Each employer shall perform monitoring to determine airborne concentrations to which each employee in each job classification in each work area may be exposed.
- Breathing zone air samples representative of an 8 hour TWA and 30 minute short-term exposure shall be used.
- 8 hour TWA based on one or more samples representing full shift exposure.
- 30-minute short-term exposures based on one or more samples representing the potentially highest exposure operations.
- Initial monitoring must be performed when an employee is or may be expected to be exposed above the PEL or excursion limit.
- Periodic Monitoring must be performed at least every 6 months and whenever there is a change in a process, control equipment, personnel or work practice.
- All samples must be personal samples which are collected and evaluated with the OSHA Reference Method.
- Results of air sampling must be provided in writing to the affected employees within 15 working days.

Regulated Areas

- Must establish regulated areas wherever airborne concentrations of asbestos or PACM are present which may expose employees in excess of the PEL or Excursion Limit.

- Regulated areas must be demarcated from the rest of the workplace in a manner that minimizes the number of persons who will be exposed.

- Access to regulated areas must be limited.

- Respirators must be supplied to, and worn by all persons entering a regulated area.

- Eating, drinking, smoking, tobacco or gum chewing, or applying cosmetics is prohibited within regulated areas.

Methods of Compliance

- The employer must institute engineering controls and work practices to reduce and maintain employee exposures to or below the PEL where feasible.

- Where engineering controls and work practices are not sufficient or not feasible, respiratory protection must be employed as a supplement.

- Worker rotation cannot be used as a means of compliance.

- Hand operated and power operated tools must be equipped with local exhaust systems.

- Wet methods must be used where practical.

- Compressed air shall not be used to remove asbestos.

- Local exhaust ventilation and dust collection systems must be maintained in accordance with good practices, i.e., ANSI Z9.2-1979.

- A written compliance program must be established to reduce employee exposures. This program must be audited periodically and available to employees.

- The use of negative pressure enclosure/HEPA vacuum system or low pressure/wet cleaning or equivalent methods must be used for brake and clutch repair work.

Respiratory Protection and Protective Clothing/Equipment

- The employer must have a written respiratory protection and personal protective equipment program and must provide all necessary PPE to the employees.

Hygiene Facilities and Practices

- Must include change room, showers, and clean break/lunch areas.

Communication of Hazards

- Building and facility owners must identify ACM or presume materials are ACM (PACM).

- Project bidders, employees and tenants must be notified of the presence, location and quantity of ACM or PACM.

- Following abatement, employees and tenants must be notified of the remaining presence of any ACM and the results of clearance air monitoring.

- All regulated areas must be demarcated with warning signs that can be easily read by employees.

- All products containing asbestos whose handling could cause the PEL to be exceeded must be labeled.

- Training programs and medical surveillance must be provided prior to, or at the time of job assignment, to all employees who may be exposed above the PEL. Records of training, medical surveillance and exposure monitoring must be maintained for a minimum of 30 years.

- Suspect materials must be presumed to be asbestos (PACM) unless rebutted by sampling and analysis in accordance with AHERA procedures.

Housekeeping

- Where vacuuming methods are selected, HEPA filtered vacuum equipment shall be used.
- Asbestos waste, scrap, debris, bags, containers, equipment, and contaminated items consigned for disposal shall be collected and disposed of in sealed, labeled, impermeable bags or containers.

Medical Surveillance

The employer shall provide medical surveillance for all employees exposed to airborne asbestos at or above the PEL. Surveillance includes:

- Pre-placement exam
- Periodic exams (annually)
- Termination of employment exam
- Physicians written opinion
- Information regarding the standard and the workers duties shall be provided to the physician.

Record Keeping

- Personal monitoring data
- Operations involving exposures
- Sampling and analytical methods
- Numbers, durations and results of samples taken
- Names of employees exposed and Social Security numbers
- Objective data for exempted operations
- Medical surveillance
- Training
- Availability of records
- Transfer of records

OSHA 1926.1101
OCCUPATIONAL EXPOSURE TO ASBESTOS
(CONSTRUCTION STANDARD)

Definitions

Class I Asbestos Work means activities involving the removal of TSI and surfacing ACM and PACM.

Class II Asbestos Work means activities involving the removal of ACM, which is not TSI or surfacing material.

Class III Asbestos Work means repair or maintenance operations, where ACM is likely to be disturbed.

Class IV Asbestos Work means maintenance and custodial activities during which employees contact ACM and PACM and activities to clean up waste and debris containing ACM and PACM.

Competent Person is a person capable of identifying and selecting controls for asbestos hazards, and who has authority to take corrective action. Also one who possesses 5 days of training (i.e. Asbestos Contractor Supervisor certification) for Class I and II asbestos work and at least O&M certification for Class III and IV asbestos work.

Presumed Asbestos Containing Material (PCAM) is defined as Thermal System Insulation (TSI) and surfacing materials present in buildings constructed no later than 1980.

A Regulated Area is an area where airborne concentrations of asbestos exceed or are expected to exceed the PEL. These areas must be demarcated from the rest of the workplace and access limited to trained personnel who must wear respirators when entering the area.

Exposure Monitoring must be performed to determine the airborne concentrations to which each employee in each job classification in each work area may be exposed.

Initial Monitoring must be performed when an employee is or may be expected to be exposed above the PEL.

Periodic Monitoring must be performed at sufficient intervals and whenever there is a change in a process, control equipment, personnel or work practice. All samples must be personal samples and results must be provided in writing to the affected employees within 15 working days.

Required Steps if Permissible/Excursion Limit Exceeded

- Medical surveillance if level exceeded 30 days or more per year.
- Medical surveillance if employee is required to wear a respirator.
- Daily personal air monitoring.
- Notification of air monitoring results ASAP
- If PEL is exceeded, inform employees of corrective actions to be taken.

Exposure Levels Above PEL/Excursion Limit

- Establish regulated area.
- Limit access.
- Provide respirators to all persons entering area.
- Prohibit eating, smoking, drinking, chewing tobacco or gum, and applying cosmetics.
- Establish negative pressure enclosure if feasible.
- Designate competent person.

Competent Person

- Provides frequent and regular inspections of job sites.
- Class I jobs require inspections during each work shift and at employee request.
- Class I and II jobs require a competent person to perform or supervise containment set up and integrity checks, conformance with PPE requirements, proper hygiene facility use, proper work practices and engineering controls are used and that notification requirements are met.
- Training requirements for competent person are equivalent to supervisor training.

Regulated Areas

- Airborne levels of asbestos fibers may exceed the PEL.
- Include all Class I, II, and III areas.
- Must be isolated to restrict access.
- All persons within the area must wear respirators.

Exposure Assessment Via Air Monitoring

- Each employer shall perform monitoring to accurately determine airborne concentrations to which employees may be exposed.
- Breathing zone air samples representative of 8 hour TWA and 30 minute short-term exposures shall be used.
- 8 hour TWA based on one or more samples representing full shift exposure.
- 30 minute short term exposures based on one or more samples representing potentially high exposure operations.
- Initial monitoring shall be performed at the start of each job.
- Daily monitoring shall be performed which is representative of exposure to each employee.
- Employer shall notify affected employees of all monitoring results ASAP.
- Affected employees must be granted the opportunity to observe any monitoring.
- Objective demonstration of consistent exposures “closely resembling” actual exposures.
- Monitoring is required unless positive pressure supplied air respirators are used or if a “negative exposure assessment” is obtained.

Methods of Compliance/Engineering Controls & Work Practices

Employer shall use the following regardless of the level of exposure:

- HEPA filtered ventilation systems and vacuum cleaners.
- Wet methods.
- Prompt clean up and disposal of asbestos containing wastes.

Employer shall use the following to comply with PELs:

- Enclosure or isolation of source.
- General ventilation that draws air from the breathing zone and HEPA filters it.
- Any additional work practices the Assistant Secretary can show to be feasible.
- Respirators and protective equipment when engineering controls and work practices are not sufficient.

Prohibitions:

- Power tools not equipped with HEPA filters.
- Use of compressed air.
- Employee rotation for exposure control
- Dry sweeping or shoveling.

Class I Areas:

- Exposure assessment.
- Competent person supervision.
- Work practices.
- If negative exposure assessment (NEA) not produced, must use critical barriers, perimeter monitoring, isolate HVAC, negative pressure enclosures, enclosure inspections, deactivated electrical circuits or GFCI, glove bag and glove box procedures or water spray processes.

Class II Areas:

- Exposure assessments.
- Competent person supervision.
- If negative exposure assessment (NEA) not produced for indoor jobs, must use critical barriers, perimeter monitoring, isolate HVAC, negative pressure enclosures, enclosure inspections, deactivated electrical circuits or GFCI, glove bag and glove box procedures or water spray processes.
- Floor covering removal controls and work practices.
- Roofing material removal controls and work practices.
- Transit materials removal controls and work practices.
- Gasket removal controls and work practices.
- Other control methods can be used if they are designed and certified by a competent person and they perform adequately.

Class III Areas:

- HEPA filtered ventilation systems.
- Wet methods.
- Mini-enclosures or glove bags.
- Impermeable drop cloths and plastic barriers.

- If “negative exposure assessment” not produced, must have respiratory protection program.

Class IV Areas:

- Trained employees (asbestos awareness minimum).
- HEPA filtered vacuum cleaners.
- Wet methods.
- Prompt clean up and disposal of asbestos containing wastes.
- Must have respiratory protection program.

Respiratory Protection

- Employers shall select and provide appropriate respirators during all Class I jobs, Class II jobs when ACM is not intact, Class II & III jobs not using wet methods or having a NEA, Class III jobs where TSI or surfacing material is being removed, when exposures exceed the PEL and in emergencies.

- A respiratory protection program must be instituted as follows:
    1. Must conform to 29 CFR 1910.134.
    2. Filters changed when increase in breathing resistance detected.
    3. Employees permitted to leave work areas to wash faces and/or face pieces.
    4. Employees must be able to function normally in job assignment.
    5. Fit tests shall be performed at time of initial fitting and annually thereafter.

Protective Clothing

- Employer shall provide and require the use of appropriate protective clothing if the PEL is exceeded, there is no NEA, or in Class I jobs exceeding removal of 25 linear feet or 10 square feet of TSI or surfacing material.
- Informed laundering shall be performed in a manner that prevents the release of airborne asbestos fibers.
- Contaminated clothing shall be transported in labeled, sealed bags or containers.
- The Competent Person shall examine employee work suits for rips and tears at least once per shift. Such rips and/or tears shall be immediately mended, or the work suit replaced.

Hygiene Facilities & Practices

- Employers shall provide Decontamination areas for all Class I jobs exceeding removal of 25 linear feet or 10 square of TSI or surfacing materials.
- The Decontamination area consists of an equipment room, shower area, clean change room and proper decontamination procedures. Clean lunch/break room if consumption occurs on the worksite.
- Employees may clean protective clothing using HEPA vacuum and use a remote decon when the work is outdoors or adjacent decon is not feasible.

- Employee shall provide equipment room, entry and exit procedures, waste out procedures and control visible contamination for all Class I jobs where removal of less than 25 linear feet or 10 square feet of TSI or surfacing material takes place.

Communication of Hazards

- Building and facility owners must identify ACM or presume materials are ACM (PACM).
- Project bidders, employees, and tenants must be notified of the presence, location and quantity of ACM or PACM.
- Following abatement, employees and tenants must be notified of the remaining presence of any ACM and the results of clearance air monitoring.
- All regulated areas must be demarcated with warning signs that can be easily read by employees.
- All products containing asbestos whose handling could cause the PEL to be exceeded must be labeled.
- Training programs and medical surveillance must be provided prior to, or at the time of job assignment, to all employees who may be exposed above the PEL. Records of training, medical surveillance and exposure monitoring must be maintained for a minimum of 30 years.
- Suspect materials must be presumed to be asbestos (PACM) unless rebutted by sampling and analysis in accordance with AHERA procedures.

Housekeeping

- Where vacuuming methods are selected, HEPA filtered vacuum equipment shall be used.
- Asbestos waste, scrap, debris, bags, container, equipment, and contaminated items consigned for disposal shall be collected and disposed of in sealed, labeled, impermeable bags or containers.
- Procedures for ACM flooring including no sanding finish stripping while wet (low abrasion pads run at less than 300 RPM).

Medical Surveillance

Employees covered by medical surveillance include:

- Employees engaged in Class I, II, and III work or are exposed to fiber levels greater than the PEL or the excursion limit for 30 days or more per year.
- All employees required wearing negative pressure respirators.

Examinations must be performed by or under the supervision of a licensed physician, at no cost to the employee and at a reasonable place and time.

- Pre-placement (initial) exam
- Periodic exams (annually)
- Termination of employment exam

- Information regarding the standard and the workers duties shall be provided to the physician

Examinations must include:

- Medical and work history
- OSHA standardized questionnaires
- A physical examination (pulmonary and gastrointestinal), with chest x-ray
- Pulmonary function test
- Physicians written opinion

Record Keeping

Records must be maintained for at least 30 years and must include:

- Objective data for exempted operations
- Exposure assessments
- Medical surveillance
- Training records
- PACM rebuttals
- Required notifications
- Availability of records to the Assistant Secretary
- Transfer of records

DOT HAZARDOUS SUBSTANCES
49CFR Part 171 & 172

The Department of Transportation requires the placarding of vehicles carrying more than 1001 pounds of any hazardous substance. Asbestos products and asbestos waste are classified as Class 9 hazardous materials. Vehicles transporting these materials must display the proper placard for hazard class 9 and the ID number for the material.

NESHAP SUMMARY

	DEMOLITION		RENOVATION	
Amount	≥ 260 ft or ≥ 160 ft^2 or ≥35 ft^3	< 260 ft or < 160 ft^2	≥ 260 ft or > 160 ft^2 or ≥35 ft^3	<260 ft or <160 ft
Notification	YES	YES MODIFIED	YES	NO
How Far in Advance	10 DAYS	20 DAYS	EARLY AS POSSIBLE BEFORE	
Emission Controls	YES	NO	YES	NO
Disposal Standard	YES	NO	YES	NO

NEW YORK STATE REGULATIONS

Of the New York State regulations listed above which pertain to asbestos, the two key regulations are Code Rule 56 and the accreditation of training programs. These regulations are summarized below.

INDUSTRIAL CODE RULE 56
12 NYCRR PART 56

Purpose and Intent

Reduce risks to the public associated with exposure to asbestos.
Conforms to Federal requirements set forth in AHERA, NESHAPs, and the OSHA Construction Standard.
Define standards and procedures for installing, removing, enclosing, applying, encapsulating or disturbing asbestos-containing materials.

Application

- Throughout New York State
- Does not apply to the manufacturing of asbestos or asbestos materials, or to manufacturing processes involving the use of asbestos.
- Also, does not apply to the owner of an owner-occupied single family home, where the owner does the work

Key Definitions

Asbestos Material: Any material containing more than 1% asbestos.

Asbestos Project:

Large Project:	260 linear feet or 160 square feet or greater
Small Project:	Less than 260 linear feet or 160 square feet Greater than 25 linear feet or 10 square feet
Minor Project:	Less than or equal to 25 linear feet or 10 square feet

NEW YORK STATE DEPARTMENT OF HEALTH
ASBESTOS SAFETY PROGRAM
PART 73 OF 10 NYCRR

Purpose

Specifies the terms and conditions under which training programs must be designed to certify asbestos handlers and thereby minimize exposure of the public.

Application

All workers who apply for State certification to work on asbestos projects in New York State.

Key Definitions

Approved asbestos safety program: A program approved by the Commissioner of Health providing training in the handling and use of asbestos and asbestos material, education concerning safety and health risks inherent in such handling and use, and training in techniques for minimizing the exposure of the public to asbestos fibers, which shall include but not be limited to instruction in all applicable Federal, State and local laws and regulations.

Asbestos Handler: An individual, who removes, encapsulates, repairs, or encloses asbestos or asbestos material or who disturbs friable asbestos.

Asbestos Project: Work undertaken by a contractor which involves the installation, removal, encapsulation, application or enclosure of any asbestos material or the disturbance of friable asbestos, except for work in an owner occupied single-family dwelling performed by the owner of such dwelling. Where all asbestos work on a project is subcontracted to a contractor with an asbestos handling license, only that part of the work involving asbestos shall be deemed to be an asbestos project.

- Basic Core Course for Asbestos Handler
- Operation and Maintenance
- Restricted I – Allied Trades
- Restricted II – Air Sampling Technician
- Restricted III - Inspector
- Project Monitor
- Contractor/Supervisor
- Management Planner
- Project Designer

SECTION 14
CONTRACTS, INSURANCE AND LEGAL LIABILITIES

INTRODUCTION

Project Designers, Management Planners and Contractor/Supervisors face significant potential for liability and litigation as a result of their actions. This potential is due to the critical role they play in the short and long term management of asbestos in buildings as well as their responsibility for assuring the health and safety of project workers, building occupants and the environment.

Project Designers, Management Planners and Contractor/Supervisors assume considerable legal responsibility in the decisions, course of action and the management of asbestos related activities. These individuals should carefully assess all asbestos projects prior to submitting or accepting a bid, or beginning a project. Errors on the part of any of these individuals could result in future liabilities and legal action against the individual and/or their employer.

Field supervisors, Project Monitors and Project Superintendents bear similar responsibility and liability.

LEGAL LIABILITY

Negligence, failure to use 'Reasonable care" or violation of Federal, State, or local laws/regulations in the design or performance of an asbestos project, can result in liability for resultant damages and possible criminal charges against the designer, abatement firm, and in some cases, the Building Owner.
The three areas of potential liability include:

- Contractual Liability
- Tort Liability
- Regulatory Liability

Contractual Liability (Breach of Contract)

Failure to design or perform the abatement project within the statutes and contract specifications in terms of completeness and adequacy can lead to resultant damages on the theories of breach of contract and/or breach of warranty. Contractual liabilities exist when the contracted services are not performed properly or in a timely manner. Breach of contract can be charged if the contractor or designer fails to design or perform the abatement project as specified by the contract and/or by the Federal, State or local asbestos regulations.

Tort Liability (Négligence)

The second area of liability concerns the failure to perform work in accordance with the skills of the profession. If such a failure occurs, the contractor or designer may be sued in "tort". A tort is a legal wrong. The breach of a legal duty is often termed "negligence". Negligence can arise from the failing to document an area of ACM, or failure to properly notify occupants that asbestos abatement is being performed, contamination of the building, employee exposure, injury or other acts of negligence.

Regulatory Liability

The last area of liability concerns noncompliance with Federal, State or local regulations. A primary area is the compliance with worker certification requirements. Not only must the abatement, design and monitoring personnel take an EPA approved course and pass an examination, but they must also comply with State and possible local regulations (New York City) for certification.

Other issues include but are not limited to, use of protective clothing, respiratory protection and work practices while conducting the abatement project, personal air monitoring, chain of custody and disposal of asbestos containing materials. Noncompliance may result in fines, loss of license and/or imprisonment. Fines or convictions may also lead to loss of bonding, insurance and right to bid on Federal, State and/or local government projects.

LEGAL CONSIDERATIONS OF INSURANCE

Obtaining *professional liability* insurance is the normal method for a professional such as an Asbestos Inspector, Designer or Project Monitor to secure protection from possible litigation arising from his or her professional activities.

Contractors typically must have *general liability insurance*.

Most Building Owners require that all persons involved in asbestos related work have liability insurance, in order to have some financial security for significant claims that may arise. Under certain State and local laws, general liability insurance in specified amounts is often required.

A related aspect of this issue is the necessity for indemnification clauses in the contract, whereby the asbestos services provider is obligated to indemnify and defend the Owner (or each other) against claims brought against the Owner arising out of the asbestos firm’s work.

At the same time, asbestos services providers need such insurance to protect themselves against claims which can be financially ruinous, and to provide for legal defense of any such claims. While work done in accordance with specifications and applicable regulations may ultimately provide a shield from such liability, the assumption of defense of a legal action by the Insurance Carrier, or the Client (Building Owner) who indemnifies you, is a significant benefit.

It is obvious that insurance adds to the cost of performance and thus is eventually paid by the owner, either on a prorated basis or in many cases, dollar-for-dollar. Complicating this situation is the significant difficulty many involved in asbestos services are having in obtaining insurance at any price. Building owners and municipalities have begun simultaneously requiring higher liability limits than in the past.

The relative unavailability of insurance has forced asbestos services providers in some cases to purchase any insurance available, without paying adequate attention to whether risks are covered or the strength or credibility of the carrier. Similarly, owners in some cases are accepting insurance certificates without analyzing the coverage being offered. Changes in the type and scope of coverage offered by the insurance industry must therefore be analyzed carefully to accomplish the goal of insurance. Rather than protection against liability, insurance for some has become a "license to work" in the asbestos industry.

Those in the industry who purchase insurance, regardless of the cost or quality of coverage, can obtain work. Others are forced to attempt to negotiate alternatives with owners to provide such insurance. However, unless the insured understands what coverage is being purchased, the insured may be left unprotected by merely buying a "license to work".

TYPES OF INSURANCE COVERAGE

1. Occurrence Liability Insurance is defined as a policy, which covers an incident that occurs while the policy is in force. The actual claim may be made years later and the coverage of the policy is still afforded at the later time. Occurrence Liability is related to Exposure Theory, and Manifestation Theory. The exposure occurs during the period covered by the policy, but the manifestation of symptoms (and consequent claim) does not arise until a later date.

2. Claims-Made Policies generally provide coverage as long as the policy is in existence and in force. All exclusions, conditions and terms of this type of policy must be carefully assessed, including:

    - Reporting occurrences.
    - Extended reporting period.
    - Retroactive date.

3. General Liability Insurance Policies typically include a "pollution exclusion". This type of policy excludes all other damages or injuries due to pollutants, including asbestos. Contractors involved in environmental work (including asbestos) must purchase additional coverage to include these pollutants under their general liability policy. Issues which, must be carefully assessed include:

    - Financial claims for bodily injuries and property damage.
    - Expense and availability of policies.
    - Policy limits: per occurrence or per loss and aggregates.
    - Inclusion or exclusion of defense costs.

4. Professional Liability Insurance may also be required. This type of policy is commonly referred to as "errors and omissions".

5. Workers Compensation Insurance is state regulated and required, providing for work-related accidents and injuries of the Contractor's employees. This insurance includes:

    - Time limits on claims.
    - "Exclusive remedy" clause.

6. Insurance exclusions:

    - Past and present form or type of pollution exposure and exclusion of asbestos claims.
    - Punitive damages as regulated by various states
    - Professional or personal liability as separate issues.

In the past, liability insurance has been written on an "occurrence" basis. Under such a policy, if an incident "occurs" while the policy is in force, coverage is afforded even if the actual claim is made some years later and even if the insured is no longer insured by the same carrier. As a result of writing this type of coverage, insurance carriers must defend claims, even if brought years after companies are no longer insured by the same carriers. Particularly with the long latency period of asbestos related disease, occurrence coverage can result in great losses to carriers who have not received premiums over a period of time. As a result, the carriers have been adding exclusions to existing policies for asbestos related third-party claims and generally have changed the coverage from "occurrence" to "claims made".

Under a "claims made" policy, general coverage exists if a claim is made while the policy is in force. In certain situations, a claim may be made during an extended ("tail") reporting period, which may require an additional premium. For many risks, the difference between occurrence and claims made coverage is not significant since the liability causing event is obvious and claims are generally asserted shortly after the event occurs. However, the release of asbestos fibers from an asbestos abatement project may not be obvious, and injury may

not be detected for 20 to 40 years afterward. Thus, if claims made coverage is obtained, it may not be of value in such cases if:

- The insured changes insurance carriers before a claim is made.
- The carrier terminates coverage under a policy.
- The carrier withdraws from the market before a claim is filed.

In any event, the future of asbestos insurance is with claims-made policies. Also, there is no single definition of what "claims made" means; it is mandatory that the insured read and understand the coverage provided under this policy. All exclusions, conditions and definitions must be carefully analyzed to determine what is actually being purchased.

For example, a general liability policy written for an asbestos contractor may include a "pollution exclusion". This excludes coverage for any personal injury or property damage caused by a broad list of substances. Generally, asbestos is included on the list and consequently the policy provides no coverage for asbestos risks, but only for other, routine risks common to all contractors.

There are several important considerations in making an analysis of available insurance coverage or in specifying same:

1. True "occurrence" coverage is rare. The terms of the policy must be reviewed carefully. Some "occurrence" policies have conditions or exclusions that negate coverage. The name of the policy makes no difference. Claims made policies may, in some situations, cover claims, which arose in prior years, similar to "occurrence" policies.

2. The insurance certificate provides little or no information of benefit to an Owner, Consultant or Contractor. The policy itself must be reviewed.

3. The insurance carrier must be very carefully evaluated. Does the carrier understand the industry; is it committed to writing proper coverage, does it have an acceptable rating?

BONDING

The difficulties in obtaining insurance have also affected the bonding industry. Traditionally, two types of bonds have been required in the construction industry to protect the owner or lender against the contractor's financial default:

1. Payment bonds, under which a surety company agrees to pay for labor and materials supplied to a project in the event the contractor fails to do so. This bond is also referred to as a *Labor and Materials Bond*.

2. Performance bonds, under which a surety agrees to complete performance of a project, if the contractor fails to do so.

Abatement contractors who have had their insurance canceled or not renewed will experience difficulties in obtaining bonding. Bonding companies rely on the financial ability of the principal (the contractor) to respond to claims under payment and performance bonds. If a company is not insured against catastrophic liability, the financial underpinnings of the company are weakened, and the bonding company becomes apprehensive over issuing bonds. In a similar vein, lenders are reacting adversely to the no insurance/no bonding problems of such companies. Lenders are advising companies who find themselves in such positions that lines of credit will not be renewed for the same reasons given by the bonding companies.

The difficulties encountered by asbestos related companies in obtaining bonding is severe. For reasons similar to those which have caused the asbestos insurance crisis, many contractors are unable to obtain sufficient bonding and, in some cases, any bonding. In addition to the general underwriting concerns about the Contractor's ability to perform the work, another reason some bonding companies are unwilling to write bonds for asbestos related work is directly associated with liability insurance problems. Because the bonding contract often has requirements for the Contractor to obtain and maintain certain liability insurance coverage on the project, the bonding companies fear that if the Contractor has insurance problems, such as improper coverage or cancellation during the policy period, the potential loss that may otherwise be covered by liability insurance might be covered by the Contractor's performance bond.

While the traditional concepts of bond underwriting may not be applicable to asbestos contractors, it is nevertheless useful to understand them. The primary considerations of the bonding company in determining whether to bond a Contractor are the capability of the Contractor to perform the work and the Contractor's financial condition. A proven track record of successfully completed projects, without ensuing litigation, is very helpful to the contractor in demonstrating to the bonding company its ability to perform the work. Financial stability is important not only with respect to the Contractor's ability to perform the work, but also its ability to satisfy its indemnity obligations to the bonding company in the event a loss is suffered under the bonds. Unlike insurance, a payment of performance bond gives the bonding company the right to recover back against the contract for any losses sustained by it under the bond. A somewhat more intangible, yet important, factor is the Contractor's good character. Despite satisfactorily proving all of these items, however, a Contractor may still not be able to obtain sufficient bonding in today's market. In such events, an owner may waive or refuse bonding requirements or arrange other contractual mechanisms to assure payment or performance.

EXAMPLES OF INSURANCE REQUIREMENTS FOR ASBESTOS AND/OR ENVIRONMENTAL SERVICE CONTRACTS

1. Comprehensive General Liability

Comprehensive General Liability Insurance or Commercial General Liability Insurance (CGL) including:

- Premises and Operations.
- Personal Injury.
- Blanket Contractual Broad Form (or Designated Contractual, identifying the contract).
- Broad Form Property Damage.
- Independent Contractors.
- Products and Completed Operations (must remain in effect for at least 5 years following the date of final acceptance of work on the last project performed under this contract; or if for any reason work on the most recent project ceases before final acceptance, for at least five years from the date work ceases).
- The Contractor shall provide Comprehensive General Liability Insurance Coverage. Coverage shall be at least $1,000,000 or as required by the contract specifications. The entities named in the indemnification agreement are named as additional insured.

2. Premise/Property Damage Insurance

The property Damage Insurance shall include coverage for damage due to improper handling of equipment, lack of proper hoist, cranes, and dollies, blasting collapse or structural injury or damage to underground utilities.

General Limits:	Bodily Injury:	$1,000,000 each person $1,000,000 each accident
	Property Damage:	$ 100,000 each accident $I, 000,000 aggregate

3. Completed Operations Liability

Bodily Injury and Property Damage Insurance covering the Contractor for claims that may arise after the work has been completed and the Contractor has vacated the premises. This insurance must continue for one year after completion of work.

General Limits:	Bodily Injury:	$ 1,000,000 each person 51,000,000 each accident
	Property Damage:	$500,000 each accident $1,000,000 aggregate

4. Contractual Liability

Contractual Liability: Bodily Injury and Property Damage Insurance covering the Contractor against liability assumed under this contract or any other contract or agreement directly or indirectly affecting operations under this contract or used for the services thereof.

General Limits:	Bodily Injury:	$ 1,000,000 each person $ 1,000,000 each accident
	Property Damage:	$ 500,000 each accident $ 1,000,000 aggregate

5. Automobile Liability

Bodily Injury and Property Damage Insurance covering all automobiles, trucks, tractors, trailers, motorcycles or other automotive equipment whether owned or rented by the Contractor or the employees of the Contractor.

General Limits:	Bodily Injury:	$ 1,000,000 each person $ 1,000,000 each accident
	Property Damage:	$ 500,000 each accident $1,000,000 aggregate

6. Umbrella Liability

Contractor shall provide Bodily Injury and Property Damage Insurance covering liability above and beyond other policies in effect.

General Limits:	Bodily Injury:	$ 2,000,000 each accident
	Property Damage:	$ 3,000,000 each accident

7. Indemnification

Owner and Architect shall be indemnified by the Contractor as per the General Conditions.

8. Workers Compensation/Disability

The Contractor shall provide Workers Compensation and Disability Coverage for all employees engaged under the agreement/contract. Claims under Workers or Workmen's Compensation Disability Benefit and other similar Employee Benefit Acts, which are applicable to the work being performed, must be in effect.

9. Certificates of Insurance

The Contractor shall furnish the Owner with Certificates of Insurance, which shall contain a 10-day prior written notice of cancellation, or Material Change Clause to the Owner.

10. Performance Bonds

If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations. Bonds may be secured through the Bidder's usual sources. (Bonds are generally requested of Asbestos Abatement Contractors, but not Environmental Services Contractors.

11. Limits of Liability

The insurance required shall be written for not less than the limits of liability specified in the Contract Documents or as required by law, whichever coverage is greater. Coverage, whether written on an occurrence or claims made basis shall be maintained without interruption form the date of commencement of the work until date of final payment and continuance of any coverage required to be maintained after final payment.

12. Primary Insurance

The insurance must be primary for the Client regardless of any other insurance the Client may have available. This may be satisfied (the minimum limits) either with a single Comprehensive General Liability (CGL) policy or with a primary CGL policy, plus an umbrella.

13. Professional Liability

Professional Liability Insurance with a limit of at least one million dollars per claim (must remain in effect for at least five years from final acceptance of the work on the most recent project performed under this Contract, or if work ceases on the most recent project before final acceptance for at lease five years following the date work ceases.

CONTRACTS, SPECIFICATIONS AND CONTRACT ADMINISTRATION

The contract and general requirements are the most important part of the documents for the project in a legal sense. They define the terms and conditions of the contract and the responsibilities of the parties. Forms for these purposes have been developed by AIA (American Institute of Architects), States Attorney's General, NSPE, ACEC, or ASCE/AGC. Asbestos projects, due to their complexity and liability ramifications, are typically written using AIA A201. This is the most complete of the AIA documents, however, there are some items, which are often added. They are:

- Definitions of: Provide, Furnish and Install.
- Conditions for payment of items stored off-site.
- Change Order conditions.
- Schedule of values payments.
- Insurance.

Well-designed contract specifications provide the overall guidance for each asbestos abatement project. These specifications permit the contractor to provide the Building Owner or Architect with an accurate estimate or bid for completing the project.

Poorly designed specifications will result in a poorly performed project. If details are omitted in the specifications or procedures are unclear, the bids will vary widely. Likewise, contractors must spend the necessary time to read the specifications in their entirety before the pre-bid walk-through of the intended project site. The National Institute of Building Sciences (NIBS) "Guide Specifications for Asbestos Abatement Projects" may be a helpful reference for individuals designing projects. Additionally, for school abatement projects, the project must be designed by an accredited asbestos abatement design professional (AHERA regulations). Many states have instituted additional minimum educational and experience requirements for project designers.

Contract Specifications

Contract specifications (specs) are a written set of standards and procedures informing the contractors of the materials and operations necessary to successfully complete a specific abatement project. The specifications are usually prepared in book form, and, with the contract drawings and any addenda or change orders issued, constitute the contract documents. During preparation of the contract documents, conflicts may result between specs and drawings. In a case such as this, specs will take precedence over plans.

During the bidding period, in which contractors estimate the cost of performing the work, quite often, it is necessary to change or alter the project specifications as a result of questions raised during the walk-through or bid preparation process. Such a change is issued as an *addendum* to all bidding contractors to ensure that all parties

are bidding on the same information. Basically, and addendum is a legally incorporated update to the drawings and/or specs prior to submittal of bids.

Should any change be necessary in drawings or specs after the contract has been awarded, a *change order* is issued. This legally binding action is signed by the Owner, Architect and Contractor.

Information, which is often included in contract specifications, is contained on the following pages. It is important for an asbestos abatement professional to keep in mind that no two abatement projects will be identical. Various aspects of a project will be similar from job to job, but no one set of contract specifications can be used from project to project without modification or large-scale changes. Hence, the Architect or Engineer who will develop the specifications and most likely represents the interests of the Building Owner will want to become familiar with all aspects of the project.

Specification Elements

The project *"Scope of Work"* will be laid out in the specifications. These will include a description of ACM locations (also provided on drawings), the type of abatement methods to be used in each case, and any restoration requirements, which may be necessary.

A *"Description of Work"* section will detail abatement measures for each work area. Additionally, the Contractor will be required in this section to supply all labor, materials, services, insurance, equipment, etc. necessary to carry out the work in accordance with the specs and all applicable laws. Any special conditions, which may be encountered on the project (high temperature steam lines, operational equipment, etc.) will be detailed. This section also will include the requirement that the Contractor restore the abatement site to conditions equal to or better than prior to the start of abatement. The Contractor will be held responsible for any damages caused during the course of his work, and will remedy any damages at his own expense.

Submittals and *notices* are important in getting the abatement project off to a smooth start. The contract specs will usually spell out the Contractor's responsibility for properly notifying applicable regulatory agencies, in addition to securing the necessary permits for waste handling and disposal procedures. Documentation that the Contractor's supervisors, foremen, and workers are properly trained, licensed and medically certified under applicable regulations must also be submitted to the Building Owner. It is also important that any existing damage be documented by the Contractor and submitted to the Owner prior to the start of work. This will not only save the Contractor future problems, but may result in change orders during the project.

Included in the Contractor's submittals should be a list of equipment to be used along with any certification documents, which the specs call for. This will include respirators and other special equipment for the project. The specs will typically also call for weekly progress reports, transport manifests, waste disposal receipts, monitor logbooks, air

sample results and documentation of daily inspections, and provide for emergency planning in the event of fire, injury or other worksite problems.

In addition, to requirements for the contractor, the project specifications may obligate the Building Owner to perform certain functions, such as notification to building occupants of the nature of the project and temporary relocation of equipment, activities or occupants.

Material, Equipment and Substitution Specifications

Material Specifications will include documentation of materials to be used in the project (black poly, fire retardant poly, specific wetting agents or mastic removal solvents), as well as replacement products (fiberglass insulation, etc.). Specific manufacturer's products may be required *or equivalent* (where "equivalent", "or equal" products may be substituted, these must be approved by the Owner). Failure to obtain approval may result in payment delays, litigation or costly re-work of the project. Alternately, non-proprietary specifications will provide performance requirements, allowing the Contractor to select materials that meet these requirements.

Equipment Specifications will detail the performance requirements or specific equipment brands, type or performance ratings to be used on the project. Specifications for application of encapsulants and building enclosures may also be set forth here.

Specifications for the Execution of Work

Procedures for the preparation of the work area maybe specified in this section, including requirements for electrical and mechanical lock-outs, temporary utilities and modifications to HVAC and elevator operations. Considerations of furniture, machinery and other items, which must be removed, cleaned or protected, will also be addressed, as well as equipment that must remain in service (computers, telephone systems, transformers, etc.).

This section may also detail construction of the decontamination facilities, exits and entries, waste handling and storage and related issues.

Respiratory protection requirements may be specified (type C air supplied, PAPR or other).

Daily and clearance air sampling requirements (number, analytical technique) may be specified which exceed minimum legal requirements.

Personnel Qualifications/Roles

In addition to requiring appropriate licensing and training of abatement personnel, the specifications may also detail the minimum acceptable qualifications for air monitoring, personnel and laboratory accreditations. The turn around times for analysis and procedures to be used in collecting air samples may also be specified. In addition, specific roles and requirements such as third party project monitor may be specified.

Project Monitoring

A role, which is frequently found on abatement projects, is the position of ***Project Monitor***.

Project Monitors represent the interests of the Owner and may also fill the role of ***Air Sampling Technician***. Where present, the Project Monitor may perform the minimum following functions:

- Review the contractors intended method of abatement and work area prep.
- Review the documentation of the contractor and his employees.
- Verify that all time and material charges are accurate.
- Verify contractor adherence to contract specifications.
- Verify contractor adherence to Federal, State and local regulations.
- Perform daily inspections of the work and work area.
- Perform final inspections to assure no asbestos remains.

NYS Code Rule 56 requires an independent project monitor be hired to conduct a final visual inspection for completeness of abatement and completeness of cleanup in accordance with the current ASTM Standard E1368 "Standard Practice for Visual Inspection of Asbestos Abatement Projects".

SECTION 15

QUALIFICATIONS, ROLES AND RESPONSIBILITIES OF INSPECTORS, MANAGEMENT PLANNERS, PROJECT MONITORS, CONTRACTOR SUPERVISORS AND BUILDING OWNERS

ROLES/RESPONSIBILITIES - THE INSPECTOR & MANAGEMENT PLANNER

INTRODUCTION

The Asbestos Hazard Emergency Response Act (AHERA) suggests minimum qualifications for both Asbestos Building Inspectors and Management Planners. In addition, some states have raised the suggested minimum requirements, adding qualifications and experience they deem appropriate. An attachment in the appendix of this manual lists the most recent qualification requirements for each category of asbestos certification, by state, within the Northeast region. In addition, this attachment provides information on the process for obtaining reciprocity accreditation in these states.

EPA Suggested Prerequisites

Asbestos Building Inspector - High School Diploma
Management Planner - Registered Architect, Engineer, CIH, or Related Scientific Field

To become an accredited Building Inspector, qualified persons are required to participate in an EPA approved 3-day training course and obtain a minimum score of 70 percent on an examination. To maintain their accreditation, Building Inspectors must attend an annual refresher course of one-half day in length. Each state has the option of requiring Inspectors to pass re-accreditation examinations at specific intervals.

To become an accredited Management Planner one must have a building inspector certification as a pre-requisite, qualified persons are required to participate in an approved 2-day training course *in addition to completing the training course for inspectors,* and obtain a minimum score of 70 percent on an examination. To maintain their accreditation, Management Planners must attend an annual refresher course of one-half day in length, *in addition to the Inspector refresher listed above.*

FUNCTIONS

The Building Inspector is responsible for:

1. Determining whether ACBM is present in or on a building.
2. Assessing physical characteristics of the ACBM and of the building.

The Management Planner then uses this information to:

1. Estimate the degree of current or potential hazard posed by the ACBM.

2. Develop a plan for managing the ACBM.

OVERVIEW OF THE INSPECTION PROCESS

A building inspection involves:

1. An investigation of records for the specification of ACBM.
2. An inspection of the building for suspect materials.
3. Sampling and analysis of suspect materials to test for the presence of asbestos.
4. Assessing condition and location of ACBM and other characteristics of the building.

More specifically, the inspection process consists of the following steps:

Review architectural and "as-built" plans, work change orders and other records for the specification of any materials which contain asbestos.

Inspect the building for friable and non-friable materials, including all products or materials which are likely to contain asbestos.

Delineate homogeneous areas and develop a sampling plan for the collection of representative bulk samples (or assume suspect material contains asbestos).

Collect representative samples and have them analyzed by the appropriate methods by an accredited laboratory.

Collect information on the physical condition and location of all confirmed asbestos containing materials or presumed asbestos containing material (PACM), including information on other characteristics of the building which may affect the likelihood that ACBM may be disturbed and that fibers may be released and distributed.

OVERVIEW OF THE MANAGEMENT PLANNING PROCESS

Developing a management plan involves:

1. A review of the building plans.
2. A review of the building uses.
3. A review of the inspection report.
4. An assessment of the hazards of the asbestos containing materials in the building.
5. A determination of appropriate response actions.
6. Development of a schedule for implementing response actions.

To accomplish these goals, a Management Planner will use the information gathered in the inspection process to rate the hazard of each material and prioritize response actions.

In selecting response actions, the management planner must take into account the current and planned uses of the building, the finances available and the priority of the response as indicated by the decision tree for prioritization system used. The advantages and disadvantages of each control option must be weighed.

Once the response actions have been determined, the Management Planner will develop appropriate work practices for each response action through an O&M program (unless all asbestos containing material is to be removed).

ROLES *&* RESPONSIBILITIES OF THE PROJECT MONITOR

INTRODUCTION

Project Monitors represent the interests of the Owner and may also fill the role of *Air Sampling Technician.* It is important to note that a Project Monitor is not required to be present on an abatement project, however, where present, the Project Monitor will perform the minimum following functions:

- Review the contractors intended method of abatement and work area prep.
- Review the documentation of the contractor and his employees.
- Verify that all time and material charges are accurate.
- Verify contractor adherence to contract specifications.
- Verify contractor adherence to Federal, State and local regulations.
- Perform daily inspections of the work and work area.
- Perform final inspections to assure no asbestos remains, and sign off in Abatement Contractor Supervisor's logbook.
- Require submittal of all Project records in a timely manner.

These functions are summarized in NYS Code Rule 56 as "a person who oversees the scope, timing, phasing and/or remediation methods to be utilized". Contract documents must be carefully reviewed to determine the precise responsibilities and powers delegated to the Project Monitor. It should be noted that the Project Monitor will typically be the most knowledgeable individual regarding regulatory compliance associated with the project, and as such, will not only represent the interests of the Owner, but also will provide advice and guidance to the Owner.

REVIEW OF METHODS AND WORK AREA PREP

The project monitor should become familiar with the abatement methods intended to be used on the project. As part of this review, the Project Monitor should request from the contractor, information/specifications on any special equipment to be used in the abatement project as well as any special methods and techniques to be used. The Project Monitor should assess the work area for issues and concerns prior to the start of the project as detailed in Section 13 of this manual.

DOCUMENTATION REVIEW

Prior to the start of the project, the Project Monitor should review all submittals from the contractor. These include should include:

- Medical approvals for all proposed employees.
- Fit test reports (less than 6 months old) for all proposed employees.
- Licenses and worker certifications.
- Project notifications.
- Insurance certificates.
- Lists of equipment to be used.
- Overall project schedule.

TIME AND MATERIAL CHARGES

Often, contracts are written on a time and material basis in which the building owner will be charged unit prices for equipment, supplies and labor utilized on a project instead of on a lump-sum basis. Where this type of contract is in place, the Project Monitor will be responsible for verifying the number of workers on site, the number of hours worked, the amounts of supplies used and equipment present on a daily basis. It is also important to verify that these charges are reasonable and necessary for the performance of work (i.e. if 5 negative air machines are needed, and the contractor has 15 on-site, only 5 will be approved for payment).

VERIFICATION OF ADHERENCE TO CONTRACT SPECIFICATIONS

As the representative of the Building Owner, the project Monitor should verify that the work is being performed in compliance with the contract specifications. Where deviation from specifications is observed, this must be noted and the contractor advised of the failure to perform within the contract specification. Work performed in such a manner, may not be approved for payment. For example, if the contractor performs removal work during the weekend when no Project Monitor is present and the contract specification prohibited weekend work, payment for those days of work may not be approved, even if the work was performed satisfactorily in every other

way. Similarly, if the contractor attempts to substitutes different replacement materials than specified, the Project Monitor may be responsible for enforcing the contract requirements. Alternately, if the contractor wishes to deviate from the contract specifications, such as using a substitute material, the request must go through the Project Monitor, and then, if the request appears to have merit, the Project Monitor would advise the owner and seek his approval.

VERIFICATION OF ADHERENCE TO REGULATIONS

One of the most critical aspects of Project Monitoring is to assure that the contractor adheres to all applicable regulations. Where a Project Monitor is present, any failure of the contractor to perform within regulatory requirements will also expose the Project Monitor to liability for fines and penalties.

DAILY INSPECTIONS

To assure that the contractor is performing within the specifications and regulatory requirements, it is critical for the Project Monitor to perform daily inspections of the work site. These inspections should be documented in the Project Monitor's daily log. A checklist may be useful in assuring that all necessary items have been addressed. As listed in Section 13, the daily inspection should include but not be limited to:

- Project name.
- Date.
- Job number.
- Project description.
- Name of abatement firm and on-site supervisor.
- Inspection of barrier integrity.
- Verification that warning signs and labels are affixed to required surfaces.
- Appropriate air sampling has been conducted and documented.
- Air sampling was performed correctly (calibrations made and results received).
- Protective clothing and respiratory protection have been used correctly, cleaned and/or disposed of in properly labeled containers.
- Abatement procedures have been performed in accordance with contract specifications and Federal, State and local regulations.
- Tools, equipment and supplies have been inventoried/accounted for.

In addition, the progress made each day should be recorded as well as the approximate percentage of work complete. In very large projects, the contractor may receive progress payments based on these observations.

FINAL INSPECTIONS

To verify the completeness of the abatement project, the Project Monitor will perform a final inspection. This inspection should include entering all areas where abatement work has been conducted and inspecting all surfaces for the presence of residue and debris. The inspection may include the use of flashlights held near surfaces to illuminate debris, use of cloth wipes to detect evidence of dust and debris, and testing of encapsulated surfaces to assure that the encapsulant has been applied properly and with the proper thickness. Where penetrating encapsulants have been applied, random core samples shall be taken to assure that the encapsulant has penetrated to the full depth.

If residue or debris is observed, the Project Monitor will require the area to be re-cleaned prior to permitting final clearance air samples to be collected. If abatement is incomplete, the contractor will be required to finish as necessary to comply with the project specifications and good work practices. The plastic sheeting of the enclosure should also be carefully inspected to note any locations where debris may be trapped such as folds and taped seams. The Project Monitor visual inspection for completeness of abatement and completeness of cleanup shall be performed as per the provisions of the current ASTM Standard E1368 “Standard Practice for Visual Inspection of Asbestos Abatement Projects”.

PROJECT CONCLUSION

At the conclusion of the project, the Project Monitor must assure that the work site has been properly restored. Typically, the supervisor and Project Monitor will complete a site walk-through and punch list. Items, which should specifically be addressed, include:

- All barriers, signs and warnings removed.
- All trash, debris and asbestos waste removed.
- All lock-out/tag-outs removed.
- All temporary utilities and tie-ins removed.
- All electrical fixtures, switches, lights, etc., restored to pre-abatement condition.
- All damage identified and repairs agreed to in writing.
- All keys, badges, passes etc., returned to the Client.
- All abatement work inspected and found acceptable by the Client.
- All waste manifests, air sample reports and other project documentation complete.

The Building Owner

The owner has the ultimate responsibility for the abatement process. This includes not only the initiation and the completion of the abatement but also any resultant liability from exposure to asbestos or injuries which may occur in that process. The owner is also responsible for the costs of abatement and must provide funding for the entire project.

The Project Designer relies on the owner to provide direction on administration of the abatement process, including the type of response action (ie, removal, repair, encapsulation, enclosure), the extent of the project, a schedule and of course, a budget. Additional considerations the designer may rely on the owner for are the status of wages paid to the abatement personnel (prevailing wage rates), insurances, bonding and retaining. The building owner, in turn, relies on the designer to provide sound advice on the abatement process. The designer has a legal and professional responsibility to provide the owner with sound, up-to-date advice.

SECTION 19
RECOGNITION AND CLASSIFICATION OF DAMAGE, DETERIORATION OR DELAMINATION OF SUSPECT MATERIAL

INTRODUCTION

An assessment of the condition of suspect material should evaluate:

- The quality of the installation.
- The adhesion of the material to the underlying substrate.
- Deterioration.
- Damage from vandalism or any other causes.

Evidence of debris on horizontal surfaces, hanging material, dislodged chunks, scrapings, indentations, or cracking are all indicators of poor material condition.

Accidental or deliberate physical contact with friable and in some cases, non-friable material can result in damage. Inspectors should look for any evidence that the ACM or PACM has been disturbed. Examples include finger marks in the material, graffiti, pieces dislodged or missing, scrape marks from movable equipment or furniture, or the accumulation of friable material, dust or debris on floors, shelves or other horizontal surfaces.

Asbestos containing materials may deteriorate as a result of either the quality of the installation or environmental factors, which affect the cohesive strength of the asbestos containing material or the strength of the adhesion to the substrate. Deterioration can result in the accumulation of dust on the surface of the ACM, delamination of the material (separating into layers), or an adhesive failure of the material where it pulls away from the substrate. Inspectors should touch ACM to determine if dust is released when the material is lightly brushed or rubbed. If the surface "gives" when slight hand pressure is applied, or the material moves up and down with light pushing, the ACM is no longer tightly bonded to the substrate.

DETERIORATION, DELAMINATION AND PHYSICAL DAMAGE FACTORS

Water Damage

Water damage is usually caused by roof leaks, particularly in buildings with flat roofs or a concrete slab and steel beam construction. Skylights can also be significant sources of leaks. Water damage can also result from plumbing leaks, condensation, high humidity or water in the vicinity of pools, locker rooms and lavatories.

Water can dislodge, delaminate, or disturb both friable and non-friable materials that are otherwise in good condition and can increase the potential for fiber release by dissolving and washing out the binders in the material. Water can also damage substrates such as wood decking and floors to which friable and non-friable materials have been applied, resulting in a failure of the substrate.

Materials, which were not considered friable, may become friable after water has dissolved and leached out the binders. Water can also act as a slurry to carry fibers to other areas where evaporation will leave a collection of fibers that can easily become suspended in the air.

Inspectors should carefully inspect for signs of water damage, such as discoloration of, or stains on the ACM, stains on adjacent walls or floors, buckling of walls or floors, or where pieces of the ACM have separated into layers or fallen down, exposing the substrate.

Close inspection is required since in many areas, staining may occur only in a limited area while water damage causing delamination may have occurred in a much larger area. In addition, water damage may have occurred since an earlier inspection, causing new areas to become friable or damaged.

Delamination is particularly a problem in areas where the substrate is a very smooth concrete slab. Check to see if the material "gives" when pressure is applied by hand.

Air Erosion

An air plenum exists when the return, or in certain cases, conditioned air, leaves a room or hall through vents in a suspended ceiling or raised floor and travels at low speed and pressure through the space between the actual ceiling or floor and the suspended ceiling or raised floor. The moving air may erode any ACM in the plenum. In evaluating whether an air plenum or direct air stream is present, the Inspector must look for evidence of ducts, or cavities used to convey air to and from heating or cooling equipment or the presence of air vents or outlets which blow air directly onto friable material.

A typical construction technique is to use the space between a suspended ceiling and the actual ceiling as a return air plenum. In many cases, the tiles in the suspended ceiling must be lifted to check if this is the case. Inspection of the air handling or HVAC equipment rooms may also provide evidence (such as accumulated fibers) of the presence of this material in the plenums.

Airshafts serve the same function as air plenums, but typically run vertically within the building from one floor to another, connecting several air plenums to complete the circuit of return or supply air.

Elevator shafts are also a type of airshaft, in that movement of the elevator may transport airborne fibers from the shaft to occupied spaces, and from floor to floor. Friable materials may also be present within the components of the elevator system such as fire doors and ceiling tiles as well as spray-on fireproofing, which may be exposed to significant air erosion during elevator operation.

Special attention should be paid to whether frequent activities (such as maintenance) disturb the material in the plenum. It is also important to check for evidence that the material is being released or eroded (deterioration or damage such that the material is free to circulate in the air-stream).

Exposure, Accessibility and Activity

These three considerations are highly interrelated and have been combined into a single factor. In general, for a site to show a high potential for disturbance, it must be exposed (visible) and accessible, and be located near movement corridors or subject to vibration.

The amount of ACM exposed to the area occupied by people will contribute to the likelihood that the material may be disturbed and determines whether the fibers can freely move through the area. ACM is considered exposed if it can be seen. For a material not to be exposed, a physical barrier must be complete, undamaged, and unlikely to be removed or dislodged. ACM should be considered exposed if it is visible, regardless of the height of the material.

If the ACM is located behind a suspended ceiling with movable tiles, a close inspection must be made of the condition of the suspended ceiling, including the likelihood and frequency of access into the suspended ceiling and whether the suspended ceiling forms a complete barrier or is only partially concealing the material.

Asbestos containing material above a suspended ceiling is considered exposed if the space above the suspended ceiling is an air plenum. Suspended ceilings with numerous louvers, grids, or other open spaces should also be considered to be exposed.

If friable ACM can be reached by building users or maintenance personnel, either directly or by impact from objects used in the area, it is accessible and subject to accidental or intentional contact and damage. Material, which is accessible, is likely to be disturbed in the future.

Height above the floor is one measure of accessibility. However, objects have been observed embedded in ceilings 25 feet or more in height. Proximity of friable ACM to heating, ventilation, lighting and plumbing systems requiring maintenance or repair may increase the material's accessibility.

In addition, the activities and behavior of the building occupants should be included in the assessment of whether the material is accessible. For example, athletic activities may result in accidental damage to the material on walls and ceilings of gymnasiums from balls or other athletic equipment. To become fully aware of occupants use of the building, the Inspector should consult with the building staff or maintenance personnel.

When assessing activity levels, consider not only the movement and vibration caused by the activities of people but also movement and vibration from other sources such as from mechanical equipment, highways and airplanes. Another source of vibration is sound, such as music and noise, which sets the airwaves in motion at certain frequencies. As these sound waves impact on ACM, they may vibrate the material and contribute to fiber release. Therefore, more fibers may be released in a music practice room or auditorium than in other parts of the same building.

The amount of activity of the occupants can best be described by identifying the purpose of the area as well as estimating the number of persons who enter the area on a typical day.

Change in Building Use

A planned change in the use of the building from, for example, a junior to a senior high school may imply significant changes in the potential for erosion or disturbance. Of particular note is the increased potential for damage from balls to previously inaccessible ceilings in gymnasiums. The addition of machinery (such as dust collectors in wood or metal shops) to a school or office building may introduce vibrations, which, again, may be a future cause of concern. The Inspector should exercise judgment and draw on experience in evaluating the likely effects of such changes.

CONDUCTING THE PHYSICAL ASSESSMENT

AHERA specifies that the Inspector is to conduct a physical assessment of all friable suspect materials. The physical assessment consists of assessing the condition of the suspect material and the potential for future disturbance. Following the assessment, all friable suspect ACBM is placed in seven categories of condition and potential for disturbance.

Alternative Approaches to ACM Assessment

Air Monitoring

The traditional approach to assessing hazards from airborne contaminants is to measure the concentration of the contaminant in the air. Indeed, many industrial workplaces are monitored continuously for a variety of contaminants. Regular, if not continuous, monitoring is necessary to adequately capture variations in air levels. Unfortunately, routine air monitoring for asbestos in buildings is an expensive and often impractical proposition.

Although the method (Phase Contrast Microscopy - PCM) for measuring asbestos required by OSHA for workplace settings where levels are expected to be elevated is relatively inexpensive, it is not an accurate gauge of asbestos levels in other settings. The reasons are two-fold:

- PCM measures all fibers, not just asbestos fibers.
- PCM cannot detect thin fibers (less than 0.25 microns in diameter) which have been shown to comprise the majority of ambient airborne asbestos fibers in buildings with ACM.

Thus, PCM measurements will be influenced by a variety of non-asbestos fibers, and may miss high levels of asbestos if the fibers are thin.

A better method for measuring asbestos is Transmission Electron Microscopy (TEM). TEM can distinguish between asbestos fibers and other, non-asbestos fibers, and can detect extremely thin fibers. However, TEM is expensive in comparison to PCM, typically costing over $ 100 per sample. This means that a properly designed TEM air-monitoring program with samples collected at several sampling locations and with measurements made every few months under a variety of conditions, will bear a significant cost.

For these reasons, EPA does not recommend and the AHERA Rule does not mention air monitoring for *assessment purposes.* Instead, the condition and location of ACBM should be used to judge the likelihood of fiber release and subsequent exposure of building occupants. Some building owners still wish to "spot test" for high levels of airborne asbestos, reasoning that even if low, recorded levels may give a false sense of security, high levels point to potentially hazardous conditions. Consequently, Inspector and Management Planners may wish to become familiar with air monitoring methodology. Chapters 2 and 3 in EPA's "Silver Book" (Measuring Airborne Asbestos Following an Abatement Action. EPA 600/4-85-049, November 1985) provide valuable technical information on monitoring for airborne asbestos.

Physical Assessment

Various methods have been proposed and used to assess the tendency of ACM found in a particular location to release fibers and thus to increase the potential for exposure of workers and building occupants. Some methods employ numerical scoring schemes, often referred to as "algorithms". The advantage of a numerical scheme is that scores are automatically produced which can then be used to define the degree of hazard or potential for exposure, and the urgency for response action. However. EPA has studied the use of algorithms and concluded that they are not reliable estimators of hazard or exposure potential. Rather, they tend to give the assessment process a false sense of precision.

Various non-numerical or quasi-numerical approaches have been developed for conducting physical assessment of ACM. Most employ many of the same factors used in numerical scoring schemes. The difference is that evaluating each factor leads to a categorical outcome (present/absent, high/medium/low) instead of a numerical score.

The various approaches differ primarily in how the assessment information is formatted and displayed for decision-making. Some use simple tabular displays such as those in the EPA "Purple Book" or a decision tree to aide in selecting appropriate response actions for various combinations of assessment results. The AHERA Rule does not specify any particular type of assessment method. Any method can be used as long as the required response actions are selected.

The approach described below extends the EPA assessment guidelines in the "Purple Book" to include hazard assessment requirements in the AHERA Rule. It is based on an approach described in the draft EPA document "Guidance for Assessing and Managing Exposure to Asbestos in Buildings," D. Keyes, et al., EPA, November 1986.

The fundamental principle of the assessment methodology described here is that the tendency for ACM to release fibers is directly related to the degree that the material has been disturbed or has deteriorated. One of the best measures of past and current disturbance and/or deterioration is the condition of the material. ACM in poor condition reflects past and perhaps ongoing release of fibers into the air. The likelihood of future disturbance can be gauged by the location of the material with respect to:

- Workers and other building occupants (the frequency of potential contact
- Sources of vibration.
- Sources of air erosion.

Identifying Functional Spaces

The basic unit for collecting assessment data is the "functional space". Functional spaces are spatially distinct units within a building and contain different populations of building occupants. For example, a classroom is a functional space because it is enclosed and separate from the rest of the building and contains one or more groups of students and teachers. Similarly, a boiler room would be a functional space containing custodial and maintenance workers. A corridor and an auditorium are other examples. In these cases, the relevant population would be all students, faculty, and staff or office workers.

Several functional spaces may comprise a homogeneous sampling area. For example, an entire floor comprised of many classrooms or offices and a corridor could be a single homogeneous area for purposes of bulk sampling. That is to say, the same suspect material could have been sprayed on all ceilings or on beams above suspended ceilings or wrapped around pipes in every room throughout the floor. A few sites for collecting bulk samples would be located randomly (or by convenience) throughout the floor, whereas the material in each individual functional space would be assessed. This means that the number of separate assessments is likely to exceed the number of sampling areas, at least for surfacing material. Functional spaces with different types of suspect material may present the opposite situation. A boiler room, for example, may have a variety of thermal insulation in addition to surfacing material. Several sampling areas thus would be used in this single functional space. This

should not be confusing as long as one understands that *homogeneous areas are used for sampling* suspect material and *functional spaces are used for assessing* suspect material.

Where several different types of homogeneous areas are found in a single functional space, the physical assessment of the area may be a composite assessment. Surfacing materials are assessed separately from thermal system insulation; however, different types of thermal insulation (pipe wrap, elbow insulation, boiler block) in one space are assessed as a single unit.

If possible, every functional space, which contains suspect material, should be assessed (AHERA requires that all functional spaces in schools be assessed). However, very large buildings may contain many repeating functional units with the same type of suspect material (e.g., a hotel with acoustical plaster throughout). In this case, a representative sample of the repeating units could be used for the physical assessment. If a sampling approach is used, select whole floors for assessment, where the number of floors assessed would be at least 25% of all floors in the building.

A unique number should be assigned to each functional space assessed. Wherever possible, use existing identifiers (e.g., room numbers). For un-numbered areas such as corridors, rest rooms, auditoriums, and vestibules, simple codes should be used. Letter codes could be combined with numbers reflecting specific floor locations. As an example, MR-5 could be used to identify a mechanical room on the fifth floor, while RR-B-2 could be used to identify rest room #2 on the basement level. Using this or a similar coding system, record functional space numbers on the floor plans. Functional spaces such as air plenums and mechanical chases should be sketched on the floor plans, or, if this is confusing, on attached sheets.

Assessing the Condition of Suspect Material

Suspect material will be placed in one of three categories based on a visual inspection: good, fair or poor condition. Exhibits 1 and 2 on the following pages provide descriptions of each category for surfacing and thermal system insulation, respectively. The "fair" and "poor" categories correspond, respectively to the "damaged" and "significantly damaged" categories under the AHERA Rule. The exact wording of the definitions of damaged and significantly damaged are included in the exhibits for comparison with the operational definitions of fair and poor. Note that the definition of "poor condition" is relatively restrictive. In the spirit of AHERA, the definition is designed to identify ACBM that needs to be isolated and removed (or repaired, if possible) as soon as is feasible.

To aid in reliable and repeatable application of the definitions in exhibits 1 and 2, a rough quantitative measure of damage is introduced — the extent of damage. As indicated, if the damage or deterioration covers roughly one tenth (evenly distributed) or one quarter (localized) of the surface, or more, the suspect material is rated as being in poor condition. The presence or absence of other characteristics would also be sufficient for a "poor condition" classification. Of course, even the quantitative aspects of these assessments remain somewhat subjective. The aim is for the building inspector

to gain a "feel" for the appropriate use of the definition through viewing diagrams of 10% distributed and 25% localized damage as shown in figures 18-1 and 18-2 respectively.

The distinction between localized and distributed damage reflects one of the purposes of assessment — developing recommendations for abatement. Localized damage or deterioration should be easier to repair.

Assessing the Potential for Disturbance

The likelihood that the suspect material could be disturbed in the future is related to:

1. The frequency with which service workers need to work near the material.

2. The frequency-building occupants are in the vicinity of the material.

3. The location of the material with respect to vibration sources.

4. The potential for air erosion.

Table 18-1 defines each of these factors and provides guidance for evaluating them in the field. Note that the factors are evaluated differently depending on whether service workers or other building occupants are the ones likely to contact the material.
The results of evaluating the factors in table 18-1 are then used to classify the material with respect to its potential for disturbance. The categories are:

- High
- Moderate
- Low

The high category corresponds to "potential for significant damage" and the moderate category corresponds to "potential for damage", in AHERA terminology.

The classification scheme is illustrated in table 18-2. As shown, if any one of these three factors (frequency of potential contact, influence of vibration, and potential for air erosion) is determined to be high, then the level of potential disturbance is high ("potential for significant damage" as defined by AHERA).

Other Data Important for Estimating Exposure Potential

Once asbestos fibers are released from ACBM, the degree to which they pose a danger to building workers and occupants depends on their concentration in the air at locations where people are present. Knowledge of the building's HVAC system is important to understanding the transport of released fibers, and determining if, and how, they will be transported to occupied spaces. Thus, it is important to note whether or not the ACBM is located in an air plenum. Location in an air supply plenum is more significant than in a return plenum since the distance of transport to the occupied space is shorter and dilution by make-up air is less significant.

The total amount of suspect material in damaged or deteriorated condition may also affect the level of asbestos in the air. The amount of material can be calculated from the estimated percent of damage and the estimated amount of material present.

Finally, additional information may be useful for other purposes. For example, the number of people in the building is needed to apply for EPA grants and loans for ACM abatement.

Recording Assessment Data

All of the data discussed above should be collected in a systematic manner. Section 20 presents further information on record-keeping procedures. A data form, exhibit 3, is provided at the end of this section that could be used for this purpose in the field.

This form, if used, should be filled in as follows:

- Fill in the building name, functional space number, and description of the location in the building. Note the type of space as well, including details such as whether it is a supply or return air plenum.

- Identify the type and amount of suspect material being assessed and describe it.
  Note: Where various types of material are present in a single functional space, (e.g., fire-proofing, acoustical plaster, and thermal system insulation), a separate form should be filled out for each type of material.

- Calculate the approximate amount of material by estimating the square feet of surfacing or miscellaneous material or the linear feet or pipe wrap, the number of pipe elbows, and the square feet of other types of thermal insulation.

- Estimate the extent and type of damage or deterioration and describe it.

- Using the rating scheme summarized in exhibits 1 and 2, rate the overall condition of the material.

- Using the potential for disturbance rating scheme summarized in table 18-1, rate the frequency of potential contact, the influence of vibration and the potential for air erosion. Describe the conditions observed in arriving at your rating.

- Using the classification in table 18-1, rate the overall potential for disturbance.

- Add any additional comments.

SUMMARIZING INSPECTION AND ASSESSMENT RESULTS

Exhibit 4 suggests a format that could be used to summarize the results of inspecting for suspect materials, analyzing bulk samples (or assuming the material contains asbestos), and assessing these materials. If a form such as this is used for an AHERA assessment, non-friable materials should not be included since AHERA does not require assessment of non-friable materials.

FIGURE 19-1
REPRESENTATION OF 10% DISTRIBUTED DAMAGE

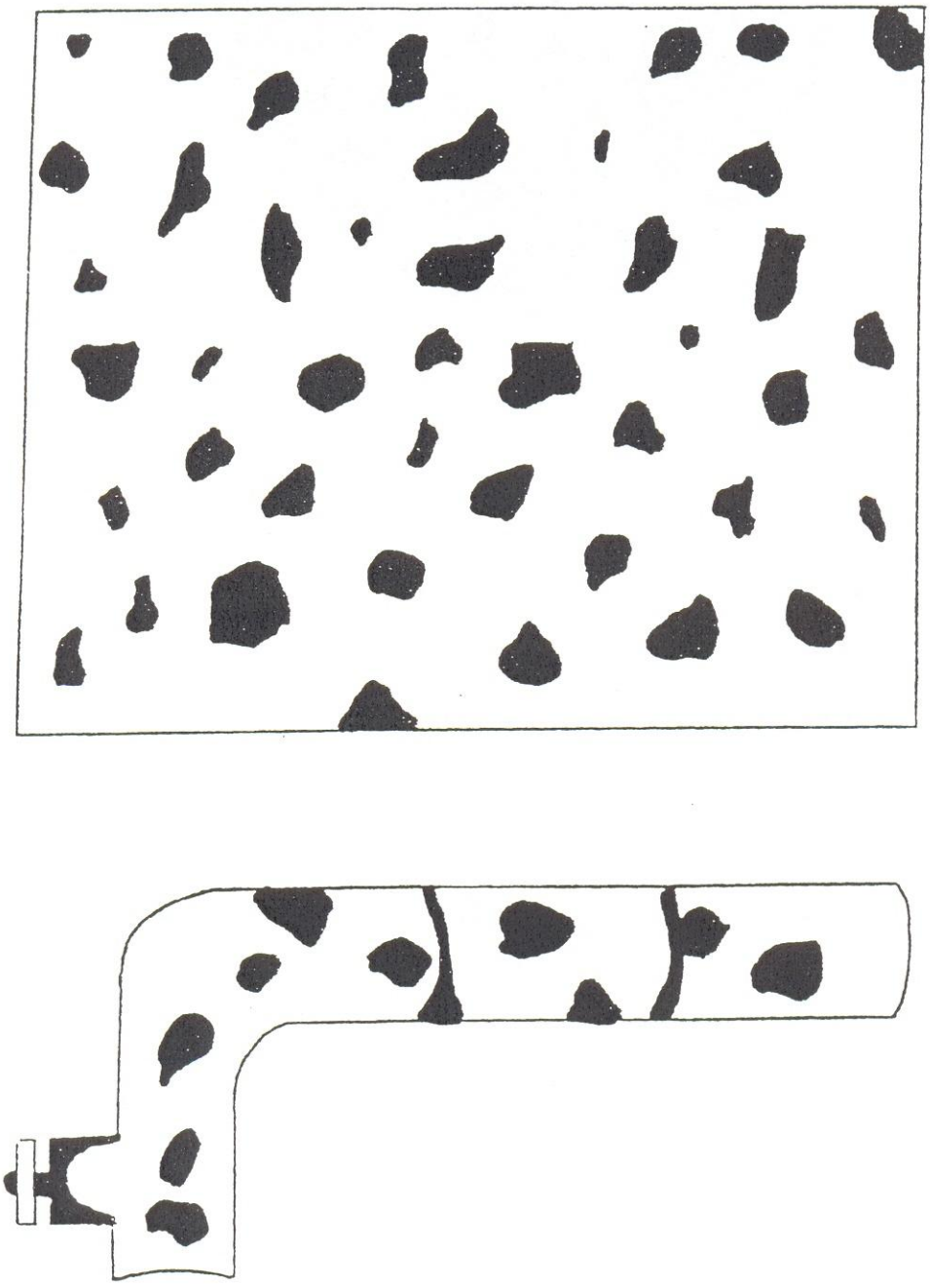


FIGURE 19-2
REPRESENTATION OF 25% LOCALIZED DAMAGE

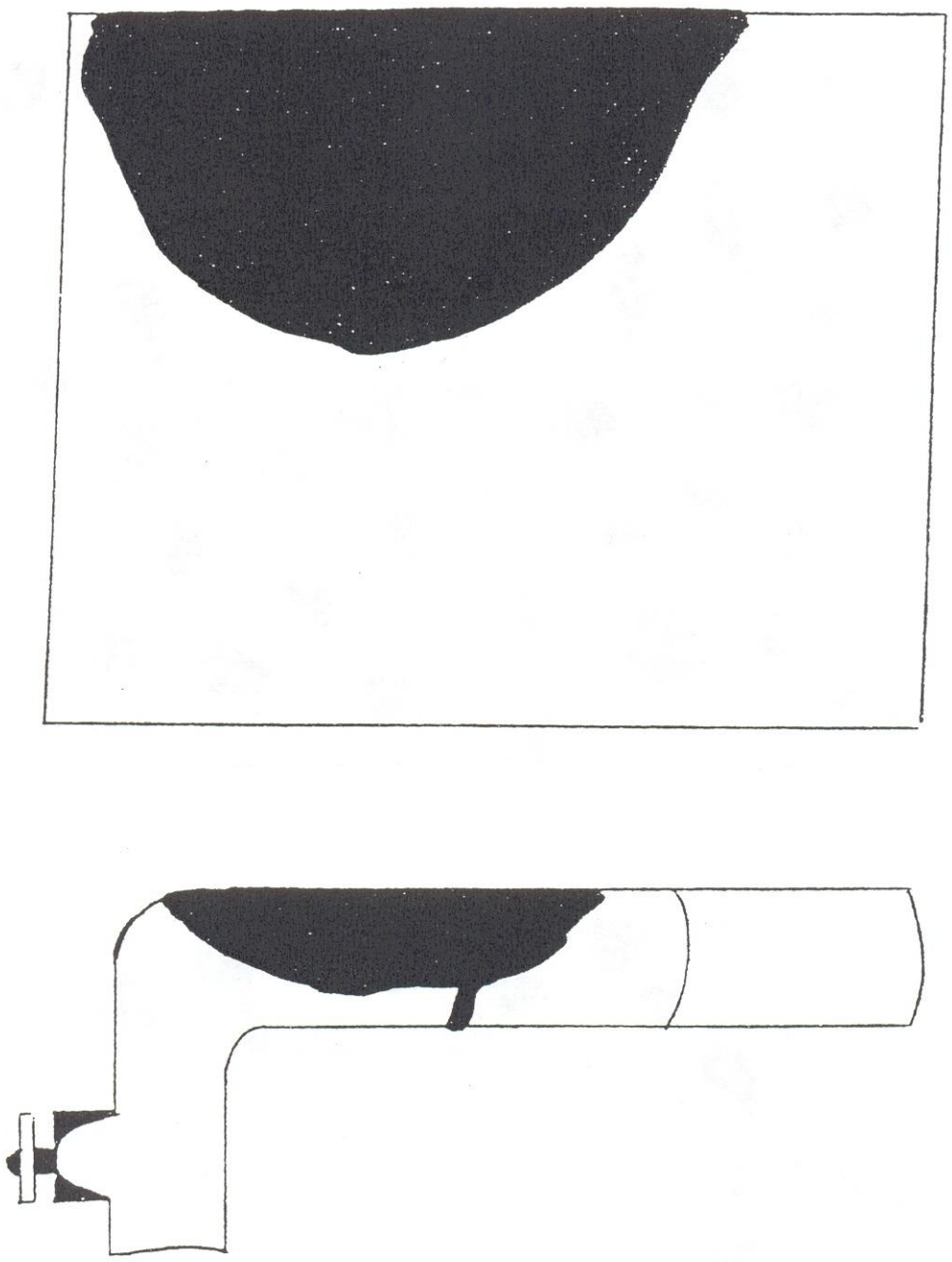


EXHIBIT I
SURFACING MATERIAL CONDITION CLASSIFICATION

Poor Condition (EPA) /Significantly Damaged (AHERA)

Material with one or more of the following characteristics:

- The surface crumbling or blistered over at least one tenth of the surface if the damage is evenly distributed (one quarter if the damage is localized).
- One tenth (one quarter, if localized) of material hanging from the surface, deteriorated, or showing adhesive failure.
- Water stains, gouges, or mars over at least one tenth of the surface if the damage is evenly distributed (one quarter if the damage is localized).

Accumulation of powder, dust, or debris similar in appearance to the suspect material on surfaces beneath the material can be used as confirmatory evidence.

The precise AHERA definition of significantly damaged friable surfacing ACM is "finable surfacing ACM in a functional space where damage is extensive and severe". The Preamble to the AHERA Rule makes reference to 10 to 25 percent damage as a means of distinguishing significantly damaged from damaged ACBM.

Fair Condition (EPA) / Damaged (AHERA)

Material with the following characteristics:

- The surface is crumbling, blistered, water-stained, gouged, marred, or otherwise abraded over less than one tenth of the surface if the damage is evenly distributed (one quarter if the damage is localized).

Accumulation of powder, dust, or debris similar in appearance to the suspect material on surfaces beneath the material can be used as confirmatory evidence.

The precise AHERA definition of damaged friable surfacing ACM is "friable surfacing ACM which has deteriorated or sustained physical injury such that the internal structure (cohesion) of the material is inadequate or, if applicable, which has delaminated such that the bond to the substrate (adhesion) is inadequate or which for any other reason lacks fiber cohesion or adhesion qualities. Such damage or deterioration may be illustrated by the separation of ACM into layers; separation of ACM from the substrate; flaking, blistering, or crumbling of ACM surface; water damage; significant or repeated water stains, scrapes, gouges, mars, or other signs of physical injury on the ACM. Asbestos debris originating from the ACBM in question may also indicate damage".

Good Condition (EPA)

Material with no visible damage or deterioration, or showing only very limited damage or deterioration.

EXHIBIT 2
THERMAL SYSTEM INSULATION CONDITION CLASSIFICATION

Poor Condition (EPA) / Significantly Damaged (AHERA)

Material with one or more of the following characteristics:

- Missing jackets on at least one tenth of the piping or equipment.
- Crushed or heavily gouged or punctured insulation on at least one tenth of pipe runs/risers, boiler, tank, duct, etc., if the damage is evenly distributed (one quarter if the damage is localized).

Accumulation of powder, dust, or debris similar in appearance to the suspect material on surfaces beneath the pipe/boiler/tank/duct, etc., can be used as confirmatory evidence.

The precise AHERA definition of damaged or significantly damaged thermal system insulation is "thermal system insulation on pipes, boilers, tanks, ducts, and other thermal system equipment on which the insulation has lost its structural integrity, or its covering, in whole or in part, is crushed, water-stained, gouged, punctured, missing, or not intact such that it is not able to contain fibers. Damage may be further illustrated by occasional punctures, gouges, or other signs of physical injury to ACM; occasional water damage on the protective coverings/jackets; or exposed ACM ends or joints. Asbestos debris originating from the ACBM in question may also indicate damage.

Note: the AHERA Rule only has one category of damage; "damaged or significantly damaged".

Fair Condition (EPA) /Damaged (AHERA)

Material with one or more of the following characteristics:

- A few water stains or less than one tenth of the insulation with missing jackets.
- Crushed insulation or water stains, gouges, punctures, or mars on up to one tenth of the insulation if the damage is evenly distributed (up to one quarter if the damage is localized).

Accumulation of powder, dust, or debris similar in appearance to the suspect material on surfaces beneath the pipe/boiler/tank/duct, etc., can be used as confirmatory evidence.

Good Condition (EPA)

Material with no visible damage or deterioration, or showing only very limited damage or deterioration.

EXHIBIT 3
RECORDING FORM FOR PHYSICAL ASSESSMENT DATA

Building: _____

Functional Space Number: _____Functional Space Type: _____

Type of Suspect Material: _____Surfacing, _____TSI _____Other: _____

Location: _____ Friable _____Non Friable _____

Description : _____

Approximate Amount of Material (linear or square feet: _____

Condition

Percent Damage: _____0% _____<10% _____<25% _____> 25%

Extent of Damage: _____ Localized, _____Distributed

Type of Damage: _____ Deterioration, _____ Water, _____ Physical

Description of Damage: _____

Potential for Disturbance

Accessibility: _____Accessible, _____Inaccessible

Description: _____

Frequency of Contact: _____High, _____Moderate, _____Low

Description: _____

Influence of Vibration: _____High, _____Moderate, _____Low

Description: _____

Potential for Air Erosion: _____High, _____Moderate, _____Low

Description: _____

Overall Rating: _____Good, _____Fair, _____Poor

Comments: _____

Signed: _____ Date: _____

EXHIBIT 4
FORMAT FOR SUMMARIZING INSPECTION AND ASSESSMENT RESULTS

ACBM LOCATION		ACBM CHARACTERISTICS				ASSESSMENT RESULTS			
Homogeneous Area	Functional Space Number/ID	Type	Friable or Non-Friable	% Asbestos (or Assumed)	Amount of Material	Condition	Potential for Disturbance	AHERA Category	Reason for Damage

TABLE 19-1
FACTORS TO BE USED TO DETERMINE THE POTENTIAL FOR DISTURBANCE OF SUSPECT MATERIAL

Potential for Contact with the Material

HIGH:	Service workers work in the vicinity of the material more than once per week, **OR** The material is in a public area (e.g., hallway, corridor, auditorium) and accessible building occupants.
MODERATE:	Service workers work in the vicinity of the material once per month to once per week, **OR** The material is in a room or office and accessible to the occupants.
LOW:	Service workers in the vicinity of the materials less than once per month, **OR** The material is visible within reach of building occupants.

Influence of Vibration

HIGH:	Loud motors or engines present (e.g. some fan rooms), **OR** Intrusive noises or easily sensed vibrations (e.g., major airports, a major highway).
MODERATE:	Motors or engines present but not obtrusive (e.g. ducts vibrating but no fan in the area).
LOW:	None of the above.

Potential for Air Erosion

HIGH:	High velocity air (e.g. elevator shaft, fan room).
MODERATE:	Noticeable movement of air (e.g. air shaft, ventilator air stream).
LOW:	None of the above.

TABLE 19-2
CLASSIFICATION OF THE POTENTIAL FOR DISTURBANCE

Potential for Disturbance	Frequency of Potential Contact	Influence of Vibration	Potential for Air Erosion
High Potential (Potential for Significant Damage)	Any High Value		
Moderate Potential (Potential for Damage)	Any Moderate Value		
Low Potential	All Low Values		

AHERA DEFINITIONS

Potential for Damage

1. Friable ACBM is in an area regularly used by building occupants, including maintenance personnel, in the course of their normal duties.

2. There are indications that there is a reasonable likelihood that the material or its covering will become damaged, deteriorated, or delaminated due to factors such as changes in building use, changes in O&M practices, changes in occupancy, or recurrent damage.

Potential for Significant Damage

Same as potential for damage, plus:

3. The material is subject to major or continuing disturbance, due to factors including but not limited to, accessibility or, under certain circumstances, vibration or air erosion.

SECTION 26
OCCUPIED BUILDINGS

Most asbestos abatement these days occurs in conjunction or, technically, in advance of renovation or demolition activities. State and Federal codes require an asbestos survey whenever ACM may be disturbed. This requirement provides the current basis for the industry, in that, asbestos materials must be removed before renovation or demolition can occur, unless a State variance is applied. In any event, asbestos abatement, whether performed as a result of pending renovations, or in response to requirements for advance removal, often is scheduled and associated with building renovation activities.

It no longer is unusual for asbestos projects to be performed in buildings, which remain partially occupied during the work. On the one hand, a generally increasing number of projects have made this a near-necessity. On the other hand, a growing public awareness and acceptance of asbestos remediation has all but voided the "political" need to evacuate everyone from a building in which an asbestos project begins. Since there may be possibly embarrassing individual exceptions to the public attitude, every such project should be carefully set up, monitored and closed with full information provided to all building occupants.

When possible, work should be staged during off-hours, holiday breaks or scheduled shutdowns. Most school abatement activity takes place during the summer or holidays, in conjunction with breaks and coordinated with renovation activities. Industrial facilities also prefer that abatement work be performed off-hours or during scheduled shutdowns. During renovation activities, additional consideration needs to be given to workers in the building from other trades who may be concerned about exposure. Procedures described below should be followed in any instance where the building will be occupied by anyone.

If abatement must take place when the building is occupied, first consideration should be given to providing good advance notice to all building occupants that an asbestos project is to be conducted. The notice should provide sufficient detail to clearly indicate where, when and for how long the asbestos work is to occur. It should describe the safety measures which will be taken to protect all building occupants from any potential exposure to the asbestos being disturbed and should tell what is to be accomplished by the work to make the building even safer. It also should contain some responsible individual's name and telephone number who will be available to respond to concerns and questions about the project. NYS provisions require a building and occupant notification ten (10) days in advance of start date. This notification must be posted at all entrances to the floor(s) where work is taking place and must be posted one floor above and below (where applicable). In instances, where contracts for abatement are not signed ten (10) days in advance, State code requires three (3) day notification.

SECTION 27
PUBLIC/EMPLOYEE/BUILDING OCCUPANT RELATIONS & MEDIA COMMUNICATIONS

INTRODUCTION

The Building Inspector and Management Planner can each play a vital role in assisting the Building Owner's development of a public relations program and OSHA required hazard communication program for building occupants. During the inspection, the Inspector is likely to have contact with building occupants and workers, and should be prepared to explain his/her activities in an accurate and acceptable manner. This task will be made much easier and more acceptable to the building owner, if a notification has been made to building occupants prior to the initiation of the inspection process.

PRE-INSPECTION NOTIFICATION

The Inspector and/or Management Planner can facilitate the smooth and uninterrupted progress of a building inspection by assisting the Owner in preparing the building occupants for the inspection. Information provided by the Owner either in meetings, notices or memorandums would answer many questions and put occupants at ease regarding the purpose and nature of the inspection. The Inspector and Management Planner should provide guidance to the Owner in making this notification. The information that should be transmitted to building occupants includes the following:

- Inspection date (s).
- Access needs.
- Inspection purpose.
- Availability of results (including presence, location and quantity of ACM).
- Concern for employee safe working environment.
- Need for cooperation.
- Person to contact for additional information.

The Inspector must also reach agreement with the Building Owner as to how questions from building occupants and employees are to be handled. The Inspector may be authorized to explain the survey purpose or may be requested to refer all questions to a designated representative of the Building Owner. An informational handout may also be provided for the Inspector in the event questions are asked.

Examples of notification letters and press releases are included at the end of this section.

LOW PROFILE INSPECTION APPROACH

One inspection approach that may be considered can best be summarized as a "low profile inspection". This inspection approach is intended to minimize Inspector contact with building occupants before, during and after the inspection process. This type of inspection typically would be performed after business hours to minimize disruption of normal building activities. Working after hours has an additional advantage of reducing the time usually necessary to complete the survey. Often, this type of inspection will be requested in connection sensitive issues such as real estate transactions, corporate acquisitions and bank financing.

For school inspections, this type of inspection may be performed during evenings, weekends or school holidays.

When this method is agreed upon, the Building Owner, and not the Inspector, assumes full responsibility for providing any information regarding the inspection. It should be noted that it is not mandatory that employee organizations or employees be notified that an inspection is scheduled or being conducted, although it is recommended. It is mandatory under OSHA regulations, that the results of inspections (where ACM is found or presumed to be present) be available or disseminated to relevant parties as described below.

EMPLOYEE/OCCUPANT TRAINING AND NOTIFICATION

EPA Recommendations

The Environmental Protection Agency (EPA) recommends that building owners inform employees and occupants of the presence and location of asbestos containing materials even if fiber levels are below the OSHA PEL.
The EPA's reasoning for this is:

- Building occupants should be informed of any potential hazard in the building.
- Building occupants who are informed and instructed in the locations of ACM and the potential health hazards are less likely to disturb these materials causing a fiber release.
- Early and full disclosure may reduce liabilities and the likelihood of future litigation.

EPA Notification Requirements

The EPA requires administrators of primary and secondary schools to inform employees and parent-teacher groups about the presence of any friable asbestos in their schools. In addition, administrators are required to distribute specific instructions on handling ACM to custodial staff and maintenance workers.

OSHA Notification Requirements

Under the OSHA Asbestos Standard, building owners and employers must either presume that suspect materials are ACM or conduct a sampling and analysis program (described elsewhere in this manual) to verify or rebut this presumption. If ACM or PACM exists in a building, OSHA requires that occupants be notified of the presence, condition, location and quantity of ACM or PACM. Employees engaged in work on multi-employer work sites (such as HVAC, telephone or mechanical maintenance workers) shall also be appraised of ACM hazard communication information for each building they must work in.

State Requirements

Some states also have specific Right-to-Know laws, which require building owners and employers to notify employees, occupants and visitors of the presence of asbestos in their buildings. In some cases, these laws may be more comprehensive than the OSHA requirements, for instance, requiring notifications in languages other than English.

Initial Notification

As previously mentioned, under the OSHA asbestos standard, occupants of buildings in which asbestos containing materials have been identified, must be informed of the existence of the material even if exposure levels are below the PEL. This initial notification should include the following information:

- Materials identified.
- Location(s) of materials.
- Condition.
- Health hazards.
- Planned action(s).
- Precautions to be taken.
- Name, location and phone number of the Asbestos Coordinator.

Initial notification is vital to the implementation of a successful management plan. People who have been informed of the presence, location and condition of ACM within their building can greatly assist the Asbestos Coordinator in effectively managing the ACM. Awareness of the presence of ACM in floor and ceiling tiles, for instance, is essential if occupants are to be prevented from damaging these materials in such a way as to result in fiber release.

Building occupants can also serve as an early warning system for the Asbestos Coordinator. Once they are aware of the location of the ACM, building occupants will be able to advise the Coordinator of any noticeable damage or change in condition, which may occur between, scheduled surveillance inspections.

Finally, open communication with occupants and employees should be a desirable goal for all employers and building owners.

Notification of building occupants and other affected individuals can be accomplished in several ways.

Two common techniques are:

- Distributing or posting notices.
- Holding awareness or informational meetings.

It is recommended that both of the above methods be used to initially inform employees of:

1. What asbestos is.
2. What types of ACM exist within the facility.
3. The exact location of all ACM within the facility.
4. The conditions) of the ACM.
5. The potential health hazards which may result from disturbing the ACM.
6. The existence of the management plan to safely manage the ACM until such time as it is removed.
7. The cooperation requested from the building occupants in implementing this management plan.
8. The appropriate names and telephone numbers of persons responsible for Asbestos related activities in the facility.

For liability purposes, a record should be made of all employee notifications and awareness meetings. Every effort should be made to ensure that all employees have attended or received notification and that this has been documented.

New employees should be given information equivalent to that provided by the above initial notification program. Contractors, visitors and other occupants who may come into contact with ACM within the building should also receive information as necessary to prevent any unintentional disturbance of ACM.

The Management Planner or Inspector may be called on to coordinate, develop or assist in presenting this information to the employees or building occupants.

Periodic Notifications

During periodic surveillance inspections, damaged ACM may be found which has resulted from the activities of building occupants. When this type of damage has been detected, notification of inspection results and recommendations to building occupants of work practices, which have resulted in damage to asbestos, may be issued. This notification is essential if a re-occurrence of similar damage is to be avoided.

Training programs, safety meetings or similar meetings may be used to periodically re-fresh building occupants on the status of ACM within the building as well as update them on new procedures, regulations or planned abatement.

In the event that removal operations are scheduled, a notification of the proposed work should be made to building occupants. This will help prevent rumors and false fears among occupants.

Labeling

Labeling, as opposed to notification, is not intended as general information. It serves as a final line of defense to prevent unprotected individuals from disturbing ACM. In areas where labels can be attached, such as pipe runs and boilers, ACM should be clearly identified by standardized, permanently affixed warning labels. Similarly, non-asbestos containing thermal system insulation may be labeled as such to avoid confusion and unnecessary expense during maintenance operations.

Areas such as boiler rooms may have warning signs placed on entrance doors. These areas may be designated as restricted to untrained or unprotected personnel. Under the OSHA standard, any area in which the level of airborne fibers may reasonably be expected to exceed the PEL must be designated as a *regulated area,* clearly marked as such and restricted only to trained personnel equipped with protective clothing and respiratory protection.

SIGNS AND NOTICES

AHERA Facilities

Under AHERA, signs containing the words:

CAUTION - ASBESTOS - HAZARDOUS
DO NOT DISTURB WITHOUT PROPER
TRAINING AND EQUIPMENT

must be placed immediately adjacent to any friable and non-friable ACM as well as suspected ACM located in routine maintenance areas. Such signs are required. All signs must be prominently displayed in clearly visible locations. They must remain posted until the material is removed.

Non-AHERA Facilities

The specific working of notices and signs is important. From a legal perspective, the presentation may affect the building owner's liability if building occupants are exposed to asbestos.

To be effective communication devices, warning signs or notices should:

- Be tailored to the people and the environment in which they are used.
- Communicate in a language understood by the target audience.
- Be practical; they cannot prohibit activities necessary for individuals to perform in their assigned jobs.

- Attract attention.
- Be durable and be replaced as necessary.

REGULATED AREAS

OSHA WORKERS PROTECTION RULES

Included in the OSHA standard are requirements for notification, warning signs and labels as well as educational and informational programs on the part of employers whose employees are exposed to asbestos fiber levels above established exposure limits. The current permissible exposure limit (PEL) is 0.1 fibers per cubic centimeter (f/cc) of air averaged over an 8-hour workday. If the PEL is exceeded, employers must begin additional compliance activities including employee notification of exposure levels, personal air monitoring, employee training, engineering controls, respiratory protection and medical monitoring.

In addition, the OSHA standard requires the establishment of regulated areas where airborne concentrations of asbestos are expected to exceed the PEL. Warning signs must be displayed at each approach/entrance to regulated areas. The information contained on these warning signs as prescribed by OSHA must include the following:

DANGER -- ASBESTOS CANCER AND
LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING
ARE REQUIRED IN THIS AREA

MEDIA COMMUNICATIONS

People are increasingly aware and concerned about potential threats to their well being from industrial and transportation accidents, routine occupational exposures and hazards in homes and schools. The hazards in a particular facility, and what the facility owner, consultants, and regulators are doing to minimize the risks and manage the hazards, must be made known clearly and explicitly to the public through the media when, or preferably, before an incident occurs.

The perception of an incident or condition and the truth, sometimes seem the same to the public. In addition, people may react differently to the same risk, depending on their backgrounds and their level of risk acceptance. Voluntarily assumed risks such as smoking or not wearing seat belts are often accepted, whereas the involuntary risks of exposure to asbestos, for example, are not. Health risks, especially those that are long-term, are of primary concern to those who resent exposure to risks not of their own choosing. While risk comparison may be a valid approach when discussing the risks of asbestos exposure, it is better to focus discussion on preventative measures, containment and remediation procedures.

It is important to understand that the public gets most of its information through the media. Therefore, when interacting with the media, the key is to present essential factual information positively, in readily understood terms (without technical jargon or exponential numbers).

Designated Spokesperson

Inspectors, Management Planners, Project Designers and Building Owners are often called on to deal with the media in the event of a major abatement project, fiber release episode or other unusual event. In any incident or situation in which the media is involved, the first priority for the organization involved is to designate a media liaison or spokesperson. This will serve two functions. First, this process will justify limiting media interference and contact with others on-site such as managers, consultants, etc. Secondly, the spokesperson, by serving as the funnel for information flowing to the media, can present the best view of the incident and limit the flow of inaccurate or conflicting information and speculation.

Providing a spokesperson also indicates the desire not to stonewall the media and can be looked on in a positive light by the media and public. Hiding behind "no comment" frequently leads to negative reporting and speculation. The spokesperson should be prepared in advance to answer a range of questions, although certain issues may be deferred to others or require investigation prior to answering. Where this is the case, a statement to this effect is sufficient to table a specific question for the time being. Thus, the spokesperson will never be seen to refuse to answer a question, nor will it appear that the question is being "dodged". However, if answers are promised, they must be delivered or this approach will backfire and the spokesperson's credibility will be destroyed in the eyes of the media and the public.

The Message

If an honest answer to a specific question is not possible because the situation is not clear, say so and avoid making blanket statements, which may later turn out to be incorrect.

Television and radio interviews require a different approach than print interviews. Television and radio require "sound bites". To get the message you want across to the public, you must present short, concise non-technical statements, each of which summarizes one thought or addresses one issue.

The Initial Report

This should be a quick assessment of the situation or incident. It should be made clear that this assessment is based on limited information. Don't speculate, but rather, provide only those facts, which are known to you at this time. A serious mistake often made by spokespersons is to attempt to minimize the size or consequences of an incident only to have to revise these statements later, and in the process, loosing credibility.

Make sure that the media understands that you will update and clarify the information provided as soon as possible.

Updates

Summarize and clarify the information provided in the initial report based on new information. Provide information regarding actions or steps taken since the initial report, any public advisories and describe plans for additional steps. Avoid making projections regarding the conclusion of the incident unless these projections are soundly based.

After Action Summary

Following the conclusion of an incident, provide a summary report, including emphasis on what we (the whole team) did right and who deserves special thanks and credit. A nod to the media at this time for their role in assisting in reporting the situation to the public will improve the chances that this positive summary message will be transmitted.

SUMMARY

The image of your organization, the facility owner and/or site management, depends just as much on perception as reality. In other words, even if you do an excellent job, if the public perception is negative because of communication problems, your hard work will go unnoticed.

Effective communication techniques with building occupants, employees and the media can make the difference between a positive and negative image being created. Always remember to work with, not against these groups, and they will be your allies in getting your job done safely and successfully.

EXHIBIT 27-1

SAMPLE INSPECTOR HANDOUT
SURVEY OF BUILDING MATERIALS

_____ is undertaking a survey of our building(s) to determine if any of the building materials contain asbestos. Asbestos was historically used in many types of materials in building construction. Under the OSHA Asbestos Standard, owners of all buildings built before 1980 must either assume certain materials are asbestos containing or conduct a survey to identify which, if any, materials actually contain asbestos. We believe that a complete survey of all facilities is the most prudent approach to assure protection to all personnel and building occupants.

During the next few weeks, certified inspectors will be visiting this building to inspect for suspect materials. To determine whether suspect materials contain asbestos, samples will be collected and submitted for laboratory analysis. Please cooperate with the inspectors in every way. In the unlikely event that asbestos is discovered in any building materials, action will be taken to maintain safe conditions.

You may see inspectors wearing protective clothing and respirators during the course of their inspection. This is a precautionary measure designed to provide the inspectors with protection from any exposure that they may accumulate during the many inspections and sampling operations that they perform. They have been thoroughly trained in the techniques necessary to collect samples with minimum disturbance of the materials sampled. Be assured that their activities will not present any increased risk of exposure to building occupants.

If you have any questions about the survey, please contact

_____

Thank you for your cooperation

Sincerely,

EXHIBIT 27-2
SAMPLE INFORMATIONAL LETTER TO EMPLOYEES

ACME INSURANCE COMPANY
ONE ALTO PLACE
BUSINESS CITY, NY 00111

October 15, 2005

Ms Merry M. Ployee
222 Workhorse Road
Business City, NY
00111

Dear Ms. Ployee:

An important matter has been brought to my attention that I feel requires personal communication to all of our employees. As you may know, plans have been underway for several months for a major renovation of the space on the first floor into a new and expanded computer facility. At the initial stages of the renovation planning, it was determined that some potential asbestos containing material was found behind the existing walls. Samples were collected by certified asbestos inspection personnel and analyzed by an independent laboratory, which found the material to contain asbestos.

After extensive discussion with the Board of Directors, our architects and asbestos consultants, the decision was reached to inspect the remainder of our facility for the presence of asbestos.

I have instructed each department to appoint a representative to attend the first of a number of meetings of an Asbestos Task Force. This meeting will be held in conference room 110 at 4 p.m. on Tuesday, October 20, 2005. This Task Force will receive briefings from departments already involved with the upcoming survey, including Environmental Services, Security and Building Services. I will be present to deliver my own thoughts as well as to represent the Board of Directors. We will also have Dr. L. E. Mentary, Chief of Pulmonary Medicine for General Hospital; Mr. I. M. Brief, Esq. , Senior Partner of Short, Sweet and Brief, P.C., our corporate attorneys; and Ms. Ellie Ectron, an experienced asbestos and air quality analyst with the consulting firm of AAA Asbestos. These individuals will provide a knowledgeable and experienced panel to answer any questions you might have.

One of the most important elements of sampling material suspected of containing asbestos is the use of protective equipment. For a survey, the inspector will be wearing a respirator. This is the required protection for those people who actually handle the materials in order to remove a small sample for analysis. Please do not be alarmed when you see these individuals using personal protective equipment and clothing. These individuals are trained to use extreme caution when collecting samples to prevent release of any fibers. When and inspector is in your area, allow him/her free access to any area necessary. It is to our benefit as building occupants to assure that the survey is as complete as possible. The results of laboratory tests on these samples will be communicated through your department's task force representative.

I appreciate this opportunity to discuss this very important matter with each of our employees. If you have any questions or concerns, please telephone me personally. My office extension is x-1111, or send correspondence through interoffice mail or E-mail addressed to my attention. Thank you.

Yours truly,

Charles M. Gee
Vice-President

EXHIBIT 27-3
MODEL PRESS RELEASE

The following model press release covers the situation in a hypothetical county office building. The building houses several county administrative offices - including some which are visited daily by large numbers of the general public - and also houses some tenant agencies which are not directly under the control of the county administrative official.

AMOSITE COUNTY ADMINISTRATOR
CHRYSOTILE, NY - MARCH 26,1996

IMMEDIATE RELEASE

The chairman of the Amosite County Council announced today that asbestos containing insulation materials have been found to be present in the County Administration Building, as a result of recent renovation work involving the heating plant. The materials are used to insulate hot water piping and forced air ductwork. All of the asbestos is now enclosed by impregnated wrappings designed to prevent fiber release.

"We have had a certified industrial hygienist monitor the air quality in the building for several days" said Council Chairman Verne T. Hicks, "and the levels of asbestos fibers found were well below current Federal workplace standards. We believe that there is simply no cause for concern about the health of employees, tenants, or the general public, because the levels are not substantially different from those found outside the building in similar sampling."

According to Hicks, the Occupational Safety and Health Administration (OSHA) requires that levels of asbestos fibers in the workplace not exceed a concentration of 0.1 fibers per cubic centimeter of air based on an 8-hour time weighted average. The highest levels measured in the county Administration Building were below 0.01 fibers per cubic centimeter. It should be noted that the sampling method used is not specific for asbestos fibers and counts other fibers such as carpet fibers, which may also be present. "And even that figure is speculative," added Hicks, "because of practical limits of measurement employed by the hygienist. We feel that there should be no worry by anyone using our building."

Exposure to asbestos fibers has been linked to a variety of diseases, including cancer. Asbestos was heavily used in the construction and shipbuilding industries from Would War **II** through the early 1970's because of its excellent properties related to thermal insulation. In recent years, Federal programs have called for asbestos inspections in the nation's schools because school age

children are the most at risk of developing asbestos related diseases as a result of occupancy in buildings in which asbestos is present.

County Administrator, Charles A. Lessing, announced that the Assistant Public Services Director, John Smallwood, would assume the additional responsibility of "Asbestos Coordinator". According to Lessing, Smallwood's duties in this capacity will include acting as the central point of all information about the presence of asbestos in any county building and will also direct any plans regarding the material.

"Currently, building maintenance personnel are the only individuals likely to come into contact with asbestos" said Smallwood. He noted that some of the pipes and ducts wrapped with the materials are visible in general office areas and corridors, but a person would have to get up on a chair and willfully damage the wrapping to cause any potential contamination. Smallwood has implemented a special "Operations and Maintenance Plan" for the protection of the maintenance workers and building occupants. This plan was prepared in conjunction with the county's asbestos consultant. As part of the plan, all maintenance and custodial workers will receive training presented by a New York State Certified Asbestos Safety and Health training provider. Certain members of the staff will actually receive certification by the State as asbestos handlers and will be authorized to perform minor repair work on the asbestos insulated pipes.

Council Chairman Hicks said that some asbestos containing material in occupied areas of the building would be removed and replaced with other insulation as funding becomes available and time permits. Asbestos in the boiler room will be entirely removed and replaced with non-asbestos insulation as soon as bids are received on a contract now being developed.

Briefings have been held for occupants of the building, including county employees and tenant personnel. Smallwood said "an information brochure has been written for the general public using the building, and this brochure is available at the main lobby and all normal places of contact with county employees." A special letter is being mailed to each service and utility contractor who has occasion to work in the building, such as the telephone company. In addition to the industrial hygiene consultant, whom conducted air monitoring and analyzed samples of the suspect materials, the county has retained the firm of A-l Engineers to prepare specifications for the boiler room removal project. Any questions concerning the asbestos containing material in the county Administration Building should be referred to the Asbestos Coordinator, John Smallwood.

SECTION 28
EVALUATION AND INTERPRETATION OF SURVEY RESULTS

OBJECTIVES:

1. To know the AHERA requirement for inspection reports and management plans.
2. To understand the need for a systematic approach to review
3. To be able to prepare and format survey data for use in hazard assessment
4. To know the necessary records from the inspection report to include in the management plan

SECTION 28: EVALUATION AND INTERPRETATION OF SURVEY RESULTS

INTRODUCTION

As specified in the AHERA Rule, the building inspection and management plans are designed to complement each other. Information on the presence or absence of ACM, its condition, and its location on the building becomes the input data for the management plan. The Management Planner uses the inspection data to determine (1) the relative degree of hazard posed by the various ACM in the building, (2) recommended response actions together with the timing of those actions, and (3) recommended management practices (the operations and maintenance program) for any friable ACBM in the building.

SUMMARY OF INSPECTION REPORT AND MANAGEMENT PLAN

The AHERA Rule requires that the following key items of information be included in the Inspection Report:

- A list of identified homogeneous areas classified by type of material (surfacing material, thermal system insulation or miscellaneous material)

- The location (Through blueprint, diagram or written description) of homogeneous sampling areas and individual sampling locations, the location of friable suspect materials assumed to be ACBM, and the location of non-friable suspected materials assumed to be ACBM, The dates of sampling should also included.

- Approximate square or linear footage of any homogeneous or sampling area where material was sampled for ACM.

- A copy of the laboratory analyses for each bulk sample and designation of each homogenous area as ACM or Non-ACM. The dates of sample analyses should also be included.

- The physical assessment of ACBM and suspect ACBM and placement into one of the following categories:

    1. Damaged or significantly damaged thermal system insulation ACBM.
    2. Damaged friable surfacing ACBM.
    3. Significantly damaged friable surfacing ACBM.
    4. Damaged or significantly damaged friable miscellaneous ACBM.
    5. ACBM with potential for damage.
    6. ACBM with potential for significant damage.
    7. Any remaining friable ACBM or friable suspect ACBM.

- The name and signature of each accredited inspector collecting samples, the state of accreditation, and if applicable, his or her accreditation number.

According to AHERA, the following key elements comprise the Management Plan:

- General building description and a summary of the Inspection Report.
- Descriptions of hazard assessments for all the ACBM and all suspect material assumed to be ACBM.
- Recommended preventative measures (operations and management program) and/or response action for any friable ACBM.
    1. Location where preventative measures and response actions are to be implemented.
    2. Reason for selecting the measures and actions.
    3. Scheduled for implementation.
- Identification of ACBM which remains after response actions are taken.
- Plan for periodically re-inspecting ACBM.
- Program for informing workers and building occupants.
- Evaluations of resources needed to implement the management plan.

REVIEW OF SURVEY DATA

The building inspection will produce three types of survey data: (1) filed data on building characteristics, homogeneous sampling areas, areas where assessments were performed (functional areas), and suspect materials assumed to be ACBM but not sampled, (2) results of laboratory analyses of bulk samples for asbestos, and (3) physical assessment data on suspect ACBM. Exhibit B-1 contains a list and copies of all Building Inspector data forms that are discussed in the Building Inspector training course.

Field Data

The Management Planner should first review the Building Inspector's field data to (1) become familiar with the building and the suspect, assumed, and confirmed ACBM, and (2) check for obvious errors in the characterization of the building and suspect ACBM. All of the inspector's data sheets (floor plans or sketches, maps or sketches of homogeneous areas, assumed ACBM location forms) should be reviewed during a building walk-through. The Management Planner should also be certain the inspection was performed by an accredited inspector.

Laboratory Analyses

The Building Inspector's bulk sample data forms should be compared with the laboratory reports to verify which samples and which homogeneous areas contain asbestos. The inspector's summary describing the type of location of ACBM, the type of asbestos, and the extent of each homogenous areas should then be checked for accuracy during the building walk-through.

Physical Assessment Data

Finally, the Building inspector's reports on the physical assessment of friable ACBM should be examined. Spot checks of friable ACBM should be made during the building walk-through to verify the assessments. Discrepancies between the Building inspector's and the Management Planner's assessments should be noted. Any significant difference (i.e., a change in damage or potential for damage category) should trigger a complete reassessment of all functional areas by the Management Planner.

SUMMARIZING THE INSPECTION DATA

The Building Inspector's Summary Sheet (Exhibit B-1c) provides a useful starting point for the next step in the development of a management plan – the hazard assessment. If this sheet is not available from the Building Inspector, a summary should be prepared from the Building Inspector's data forms

EXHIBIT B-1: BUILDING INSPECTOR'S DATA FORMS

- Assumed ACBM Location Form (Exhibit B-1a)
- Recording Form for Physical Assessment Data (Exhibit B-1b)
- Example Format for Summarizing inspection and Assessment Results (Exhibit B-1c)

EXHIBIT B-1b: RECORDING FORM PHYSICAL ASSESSMENT DATA

Building: _____

Functional Space No. _____ Type: _____ Location: _____
Type of Suspect Material: _____ Surfacing, _____ TSI, _____ Misc.

Description: _____
_____

Approximate Amount of Material (linear or square ft.): _____

Condition

Percentage: ____>0%, ____ ≤ 10%, ____> 10%, ≤ 25% ____>25%

Extent of Damage: _____ Localized, _____ Distributed

Type of Damage: _____ Deterioration, _____ Water, _____ Physical

Description: _____
_____
_____

Overall Rating: _____ Significantly Damaged, _____ Damaged, _____ Good

Potential for Disturbance

Frequency of Potential Contact: Low, _____ Moderate, _____ High _____
Description: _____
_____

Influence of Vibration: Low, _____ Moderate, _____ High _____
Description: _____
_____

Potential for Air Erosion: Low, _____ Moderate, _____ High _____
Description: _____
_____

Overall Rating: Potential for Significant Damage _____ Potential for Damage, _____ Low Potential _____

Comments: _____
_____

Signed: _____ Date: _____

SECTION 29
EVALUATION AND SELECTION OF CONTROL OPTIONS

OBJECTIVES:

1. To be able to distinguish between the five main AHERA response actions
2. To be able to recognize the advantages/disadvantages of alternative response actions.
3. To be able to select appropriate response actions for specific applications.

SECTION 29: EVALUATION AND SELECTION OF CONTROL OPTIONS

INTRODUCTION

This section provides information on technical and operational aspects of alternatives for controlling the release of fibers from ACBM. The information will assist Management Planners in recommending response actions among those allowed by AHERA. (See Section C for a description of allowable response actions for ACM in various hazard categories.)

OVERVIEW

AHERA refers to actions taken by LEAs in buildings with ACM as "response actions" or "control options." Response action alternatives, as defined by the AHERA Rule, fall into five main categories:

1. Operations and Maintenance Program - a program of training, cleaning, work practices, and periodic surveillance to maintain friable ACM in good condition, ensure cleanup of asbestos fibers previously released, and prevent further release by minimizing and controlling friable ACM disturbance.
2. Repair - returning damaged ACM to an undamaged condition or to an intact state through limited replacement and patching.
3. Encapsulation - treating ACM with a liquid that, after proper application, surrounds or embeds asbestos fibers in an adhesive matrix to prevent fiber release. The material may be a penetrate, which adds cohesion by penetrating the asbestos material, or a bridging encapsulant, which covers the surface of the material with a protective coating. Both are applied to the surface of the material using airless spray equipment at low pressure in order to reduce fiber release during applications. The specific language in AHERA is:

   "Encapsulation means the treatment of ACBM with a material that surrounds or embeds asbestos fibers in an adhesive matrix to prevent the release of fibers, as the encapsulant creates a membrane over the surface (bridging encapsulant) or penetrates the material and binds its components together (penetrating encapsulant)."

4. Enclosure - an air-tight (or as close to air-tight as is possible to construct) barrier installed between the friable asbestos and the building environment. They are typically constructed by mechanical attachment or spray application. For example, materials such as PVC or corrugated metal may be fastened around insulated piping, or a barrier may be constructed around asbestos fireproofing on structural members by spraying material which cures into a hard-shell. According to AHERA:

   "Enclosure means an air-tight, impermeable, permanent barrier around ACBM to prevent the release of asbestos fibers into the air."

5. Removal - stripping ACM from its substrate. Asbestos material is separated from the underlying surface, collected, and placed in containers for burial in an approved disposal site.

Appropriate applications and advantages/disadvantages of each alternative are described below. Information on the cost of these alternatives and on conducting a cost-effectiveness evaluation is provided in Section K.

TECHNICAL DESCRIPTIONS

Operations and Maintenance (O&M) Program

As long as friable ACM remains in the building, an O&M program is required by AHERA:

"The local educational agency shall implement operations, maintenance, and repair program ... whenever any friable ACBM is present or assumed to be present in a building that it leases, owns, or otherwise uses as a school building. Any material identified as non-friable ACBM or non-friable assumed ACBM must be treated as friable ACBM ... when the material is about to become friable as a result of activities performed in the building."

A more comprehensive approach will include all ACM in the O&M program, whether friable or not, and whether it is located inside or outside the building. The purpose of an O&M program is to prevent exposure to asbestos, whenever it may occur.

An O&M program includes protection of workers, worker training, scheduling of periodic surveillance, initial cleaning, and other necessary O&M activities. Proper maintenance, re-inspection, and periodic monitoring are often the most cost effective solutions for managing asbestos hazards. A detailed discussion of the elements of an effective O&M plan is presented in Section G.

An O&M program will probably have the lowest initial costs of the alternatives, although annual costs will continue until all the ACM is removed. On the other hand, a poorly enforced O&M program will increase the risk of asbestos exposure.

Encapsulation

Encapsulants are often viewed as a relatively inexpensive approach to ACM abatement. However, encapsulants are limited in their applicability and may make eventual removal of ACM more difficult and costly. They are best viewed as enhancing an O&M program when applied to appropriate ACM.

Since the act of applying encapsulants will dislodge fibers from the surface of the ACM, encapsulation should be considered equivalent to removal from a work practice perspective. All of the same protective measures should be taken. In addition, any encapsulant should be field tested before use to assure compatibility with the ACM.

Penetrating Encapsulants

Penetrating encapsulants are typically water-based compounds that are spray applied over ACM and are designed to penetrate through the ACM matrix to the substrate. The objective is to coat the asbestos fibers to prevent fiber release. Following is a list of unsuitable applications of penetrating encapsulants:

- Not suitable over cementitious *ACM* since penetration is not possible.
- Not generally suitable over friable, fluffy or fibrous ACM since it is difficult to evenly and adequately distribute the encapsulant throughout the ACM.
- Not generally suitable over ACM that is greater than inch thick since penetration greater than one inch is usually not achieved.
- Not generally suitable over ACM that is poorly adhered to the substrate or is delaminating since extra weight of the encapsulant can cause further delamination.
- Not suitable over ACM that has been painted since the paint interfered with adequate penetration.
- Not suitable where ACM has significant water damage because the possibility of delamination is high.
- Not generally suitable where encapsulated ACM is subject to abrasions impact or renovation activities since asbestos fibers can be released.
- May not be suitable over ACM used as fireproofing since density of fireproofing is increased, resulting in reduced fire ratings.

Because of these numerous limitations, penetrating encapsulants are generally not suitable for most applications of ACM.

Bridging Encapsulants

Bridging encapsulants are typically water-based compounds that are spray applied on the surface of ACM and are designed to put a homogeneous coating over the ACM. The objective is to provide a void-free surface over the ACM to prevent fiber release.

Following is a list of suitable and unsuitable applications:

- Generally suitable over cementitious forms of ACM
- Not generally suitable over friable, fluffy or fibrous ACM since it is difficult to get a homogeneous, void-free surface.
- Generally suitability of application is not directly a function of ACM thickness.
- Not generally suitable over ACM that is poorly adhered to the substrate or is delaminating, since extra weight can cause further delamination.

- Generally suitable over painted ACM.
- Not suitable where ACM is subject to water damage since water-can pool Behind the encapsulant and ACM can partially or completely delaminate.
- Often not suitable where encapsulated ACM is subject to abrasion or direct impact since asbestos fibers can be released. Some products have significantly better performance in this regard than others.
- Some materials have flame spread ratings. Effects on fireproofing not documented.

Enclosures

Enclosures are of two types:

1. Mechanical systems (e.g., metal, gypsum board, plywood, plastic), materials which are mechanically fastened to the building structure or substrate between the ACM and the building's ambient air space.

2. Spray-applied enclosures which are also called encasement systems**.**

Mechanical Systems

These enclosure systems have been used primarily to enclose cementitious ACM on ceilings and to protect fireproofing applied to structural steel columns. Gypsum board is used to assure the fire resistance of the fireproofing is not reduced. Plastic, steel, and aluminum are used to enclose pipe insulation. To be effective, all seams and joints must be sealed.

Construction of enclosures can disturb the ACM and should be considered the same as a removal project. Full protection should be provided for abatement workers and for the building outside the work area.

Following is a list of suitable and unsuitable applications:

- Generally suitable with all forms and thicknesses of ACM.

- Generally suitable for ACM with some damage since materials are mechanically fastened into the building structure or substrate and do not
  place weight on the ACM.

- Not suitable over ACM in locations expected to receive significant water
  damage since water could collect behind the enclosure unless suitable venting is provided.

- Generally suitable where enclosed ACM is subject to impact and abrasion, depending on the thickness and durability of enclosure materials.

- May not be suitable where future renovation is planned since asbestos fibers will be released when boards or sheets are removed. However, the enclosure may provide interim protection.

- Generally no suitable when demolition is planned in the near future since enclosure materials will need to b removed

Spray-Applied Enclosures

Spray-applied enclosures are often called encasement system since the ACM is encased behind a hard surface. The material is applied by airless spray equipment and cures rapidly. The sealant can be applied in a range of thicknesses, usually one-eighth to four inches. At present, there are at least two encasement systems on the market. These enclosures consist of a structural shell which is sprayed ever the ACM in one or two layers. The systems are mechanically fastened in a manner similar to mechanical enclosures to assure they stay in place. Structural strength of the encasement system is high, although it must be applied by trained applicators and according to the manufacturer's specifications. A field test should be conducted to assure suitability and proper application. Following is a list of suitable and unsuitable applications:

- Generally suitable for all forms and thicknesses of ACM
- May be suitable for ACM with some damage since materials are mechanically fastened into the building or substrate and do not place weight on the ACM.
- Not suitable over ACM in locations expected to receive significant water damage since water could collect behind the enclosure unless suitable venting is provided.
- Generally suitable where enclosure ACM is subject to impact and abrasion, depending on thickness and durability of enclosure materials.
- May be suitable for some situation where future renovation is planned since system designs can include mechanical fasteners and hangers to accommodations installation items such as piping, electrical conduit and partition headers.
- Generally suitable over ACM fireproofing since one of the present spray-applied enclosure systems has fire resistance comparable to gypsum wallboard and, therefore, is not detrimental to the fire rating of the fireproofing.

<u>Repair</u>

Repair of ACBM is discussed in the AHERA Rule, both as a separate response action, and as part of an ongoing O&M program. Repair can be accomplished with a variety of materials and procedures. Small areas of surfacing ACM could be patched with asbestos-free spackling compound, caulk, or plaster. However, any loose materials must be dislodged prior to patching. In addition, the cause of the damage must be identified and eliminated. Thermal system insulation can be repaired with caulk, asbestos

substitutes such as fibrous glass, Styrofoam, rubber, or new jackets. (New jackets may be considered a form of enclosure.

Removal

Removal is often described as the only permanent solution to ACM problems since all friable ACM must be removed before a building is renovated or demolished, as per NESHAP regulations. (Exceptions are buildings with only small quantities of ACM.) However, removal that is poorly performed may actually raise fiber levels in a building after the project is completed. In addition, removal and replacement of ACM frequently had the highest initial cost of the alternatives.

Removal of ACM requires complete isolation of the work site from the rest of the building. Ideally, removal would only be undertaken in unoccupied buildings. This is frequently possible for school buildings by scheduling removal during school vacations, but very difficult for other types of buildings. In addition to work-site isolation, measures are taken to reduce fiber levels during the removal operation. These include wetting the ACM with amended water (water and a surfactant) and filtering the air with high efficiency particulate air (HEPA) filters. Abatement workers must wear appropriate protective clothing and respirators, and must pass through decontamination chambers upon entering or exiting the work-site. Details on protective measures and work practices for removal projects can be found in Chapter 5 of EPA's "Purple Book",

The actual removal of ACM is usually accomplished by scraping it off the substrate. Vacuum systems have occasionally been used both alone and in conjunction with manual methods. High pressure water also has been employed blast off ACM off the substrate; results have been mixed. Water under high pressure (at least several hundred pounds per square inch) can be effective in removing ACM from rough or uneven surfaces. However, it can also be dangerous for workers who are struck by the water stream, and large amounts of water in the worksite are difficult to contain.

Special techniques are often needed to remove amosite-containing material. Amosite is difficult to wet, even with amended water. (Some commercial surfactants are more effective than others.) The resulting high levels of airborne fibers should be addressed with airline respirators and a great number of air exchanges in the work area.

Work-site cleanup is accomplished by either wet wiping or vacuuming all surfaces, including the plastic barriers. (The cleaned substrate is sometimes first sprayed with encapsulant to bind and residual fibers.) The air is then sampled for fibers and the work-site is recleaned until a specified clearance level is met. See Chapter 6 of EPA's "Purple Book".

Removal operations are often specific to the type of application:

1. Asbestos in a final plaster coat on a browncoat is the most common asbestos ceiling construction arrangement found in schools and many other buildings. (A three-coat plaster system is very common: a final coat on top of a browncoat on top of a scratch coat, which is applied to metal.) The least complex and inexpensive removal effort involves ceilings with smooth browncoat and soft asbestos. The asbestos is easily "skinned" from the browncoat after wetting with amended water. If the browncoat surface is heavily abraded, the asbestos covering must be removed and the browncoat nylon brushed to remove additional material within the abrasions. If the browncoat itself contains asbestos, this material will require removal or the application of encapsulants before reapplication of the final coat. Note: If the browncoat ACM is encapsulated rather than removed, the ACM will be nonfusible but still present.)

2. ACM directly sprayed on wire lathes presents an expensive, time-consuming, and tedious removal task. The ceiling must be removed and the entire space above the ceiling will require decontamination.

3. Some buildings have concrete slabs sprayed with ACM for noise abatement. Because of the porous nature of the concrete, it is very difficult to remove all of the ACM. Similarly, removal of materials from concrete and cinderblock foundations is also difficult. These surfaces will probably require encapsulation after removal is complete to bind residual fibers.

4. Corrugated steel decking sprayed with ACM is sometimes found in modern buildings. The ACM is especially difficult to remove. Meticulous hand cleaning with scrapers and brushes is required for these situations, and special care must be given to the seams.

5. Structural steel beams sprayed with asbestos fireproofing may be found in larger facilities. The ACM may have been on such structures either before or after the utilities were installed. In either case, the removal will be complex and the cost higher than usual.

6. Asbestos-containing boiler and pipe insulation, and insulating material on pipe elbows, flanges, valves, and other fittings can be removed with the glove-bag technique. The bag assembly is placed over a pipe section and the pipe insulation is then cut into manageable lengths using an appropriate cutting instrument. See the EPA publication: "Asbestos-in-Buildings Technical Bulletin: Abatement of Asbestos-Containing Pipe Insulation," 1986-2. Asbestos may also be found in valve packing and gaskets, and in rope used to close gaps, in pipe sleeves and other openings. These materials may be friable, if so, glove-bags should be used.

7. Removal of ACM from or near electrical equipment or from live steam pipes may require dry techniques. Special efforts will be needed to maintain airborne fibers at acceptably low levels, (e.g., by increased air exchange rates).

SUMMARY OF ADVANTAGES. DISADVANTAGES. AND APPROPRIATE UTILIZATION OF RESPONSE ACTIONS

Exhibit E-1 presents a general comparison of alternative response actions. The Management Planner must select appropriate actions based on:

1 AHERA requirements for response actions for each category of friable ACBM (i.e., the seven categories of current condition and potential for disturbance see page C-4).

2. The hazard ranking system described in Section (see Exhibits C-5 through C-7).

3. The technical suitability of the various alternatives (this section).

4. The costs of the alternatives (see Section K).

The information presented in this section can be used to evaluate the technical suitability of the alternative response actions. It should be used together with information on control costs to evaluate the cost-effectiveness of alternatives, as discussed in Section K.

The response actions described here are seldom used alone, but are part of a combination of corrective actions recommended for each area of ACM. For example, even if removal is urgently needed, it normally will take some time to obtain the services of a contractor. During this time, the area must be isolated from the public. This isolation, together with subsequent removal, would constitute a response action. Similarly, enclosure and encapsulation may reduce the potential for ACM disturbance in certain areas and thus be an important part of an O&M program.

STAGING AND PRIORITY OF WORK

- Once the most appropriate response action for each area of ACM has been identified, priorities for abatement and a schedule of projects must be developed. This then becomes the Management Planner's recommendations to the LEA and constitutes the major input to the Management plan.

- Exhibit C-7 in Section C provides information on judging areas for removal priority. In addition, occupants' activity patterns and plans for building maintenance and renovation should be taken into account.

- The proximity of areas needing immediate removal to lower priority areas.

For example, if immediate removal of surfacing ACM is required in a wing of a building, and the wing also contains piping with damaged insulation, consideration should be given to removing the ACM from the pipes at the same time. The additional cost of removing pipe insulation may be quite low compared to calling in a contractor next year just to work on the pipes. Given the fixed costs involved in ACM removal, substantial economies of scale may be realized by combining the work. See Section K for more information on costs.

- The occupancy patterns of the building

No matter how carefully an abatement job is carried out, there is still a potential for exposure of building occupants to airborne asbestos. In the case of schools, the best time of year for removal operations is summer. If removal cannot be postponed until summer vacation, the staging plan may require evacuation and isolation of the areas prior to starting the work. Isolation of the area means not only closing the area to students, teachers, the general public, and general custodial staff, but also assuring that the HVAC systems in the area are isolated from the building's general system.

Abatement projects in occupied buildings are usually more difficult and risky. To reduce the risks of accidental contamination of occupied spaces, additional barriers and protective systems should be engineered. For example, double barriers and additional air samples should be considered. This will raise the cost of the project.

In staging work, the Management Planner should take into account the disruption of normal building activity caused by isolating the work area. Isolating one or two classrooms for a few weeks may have a far different impact than closing down an entire floor for a semester.

The scheduling of work by wing and floor will aid in minimizing disruption. Scheduling work in areas that can be easily isolated in terms of HVAC systems should also be considered.

- Remaining life of the building.

Buildings with relatively short remaining life may not be candidates for large-scale removal before demolition. It may be less expensive to establish a comprehensive O&M and postpone major abatement actions as part of later demolition or a major renovation of the building.

- Planned renovation and maintenance

Economies may be achieved by combining renovation activities with abatement activities. For example, installation of a sprinkler system or removal of a suspended ceiling during remodeling in an area with fireproofing ACM sprayed on structural beams will disturb the ACM. By combining abatement with renovation, the cost of many common activities can be shared.

EXHIBIT E-1
COMPARISON OF ALTERNATIVE RESPONSE ACTIONS

ALTERNATIVE	ADVANTAGES	DISADVANTAGES
Long Term Use of Operations and Maintenance Plan	1. Usually lowest initial costs. 2. Good interim plan until funding becomes available for removal. 3. May avoid need for removal until renovation of demolition. 4. Allows asbestos removal to occur over a period of years, thus spreading expenditure. 5. Can be implemented quickly. 6. Can usually be done in-house.	1. Asbestos source remains. 2. Surveillance (O&M Pal) is required in occupied areas. 3. Cost of training and maintaining asbestos task air monitoring surveillance may be significant. 4. Long-term life cycle cost may be greater than that of removal. 5. May not be effective where control of worker/building occupant activities is difficult.
Encapsulation	1. May reduce asbestos fiber release from material. 2. Initial cost typically lower than removal or enclosure. 3. Fireproofing or insulation material may not need replacement. 4. Is also a quick, temporary corrective action for damage to insulation material on piping and associated mechanical equipment. 5. Allows opportunity for simultaneous improvement of architectural finishes on surfacing ACM.	1. Asbestos source remains and may have to be removed at a later date. Encapsulation may increase future removal cost. 2. Inappropriate encapsulating agent may cause asbestos material to delaminate from substrate, or may not prevent fiber release. 3. O&M Plan needs to be kept active; potential for damage may still exist. 4. All the preparation activities for asbestos removal need to be implemented during encapsulation.

EXHIBIT E-1
COMPARISON OF ALTERNATIVE RESPONSE ACTIONS
(Cont'd)

ALTERNATIIVE	ADVANTAGES	DISADVANTAGES
Enclosure	1. Reduces immediate exposure. 2. Initial cost is typically lower than removal. 3. Fireproofing and insulation materials would not need replacement. 4. Is also a quick, temporary corrective action for damage to insulation material on piping and associated mechanical equipment.	1. Asbestos source remains and may have to be removed at a later date. Enclosure will typically increase future removal cost. 2. Maintenance to systems behind enclosure would require the removal of enclosure, thereby exposing ACM. 3. O&M Plan still needed unless enclosure (or encasement) is impact-proof and effectively isolates ACM. Potential for damage may still exist. 4. Fibers will be released during construction of enclosure (or spray application of encasement) and will, therefore, require the same preparation as that of removal and encapsulation. 5. Long-term life cycle cost may be greater than removal.
Removal	1. Eliminates ACM. 2. Eliminates continued need for O&M Plan. 3. Live cycle cost may be lowest of alternatives. 4. Eliminates application of AHERA regulation to school (if all ACM is removed).	1. Re-fireproofing re-insulation will be needed. 2. Improper removal may increase airborne asbestos fiber concentration above prevalent levels. 3. Initial cost is usually highest of all methods.

4. Building operations may have to be shut down temporarily during removal.

SECTION 30
ROLE OF OTHER PROFESSIONALS IN THE MANAGEMENT PLANNING PROCESS

OBJECTIVES:

1. To understand the need to involve other professionals in the development of an asbestos management control program.

2. To recognize the specific contributions other professionals can make in developing a management plan.

SECTION 30: ROLE OF OTHER PROFESSIONALS IN THE MANAGEMENT PLANNING PROCESS

INTRODUCTION

The Management Planner must confer with and obtain assistance from a number of other professionals during the course of the development of a report. The Management Planner has to consider health, economic, engineering and administrative factors in developing recommendations for asbestos management and control. In order to accomplish this task, the Planner may need to confer with at least four types of other professionals while preparing a report: industrial hygienists, architects, maintenance engineers and school business officials.

RELEVANT PROFESSIONALS

Industrial Hygienist

The industrial hygienist plays a critical role in many phases of asbestos assessment and control activities. With respect to the Management Planners, consulting hygienists could provide assistance with regard to the hazard assessment and the prioritization of response actions. The hazard assessment requires the Planner to make judgments regarding fiber release potential under a variety of use, accessibility and ventilation situations. The assessment of future fiber release may consequently involve technical questions regarding re-entrainment of fibers, dispersion of fibers under specific air flow conditions, damage potential of asbestos covering under heat, or water related stress. In addition, if the building owner wishes to undertake air monitoring (not recommended by EPA for assessment, but might be used as a surveillance tool for an O&M program), an industrial hygienist could conduct the air sampling. Hygienists can provide valuable technical assistance on these issues.

A second area in which the industrial hygienist can aid the Planner is in prioritizing response options. From the hazard assessment the hygienist can offer guidance in ranking areas and drawing up a suggested time frame for implementing response actions.

A third form of interaction between the Management Planner and industrial hygienist might involve the hygienist as the LEA's or building owner's representative. In such a role, the hygienist will be interested in teaming with the Planner to ensure that he performs competently and in the best interests of the building owner.

Architect

The development of response action options may require the Management Planner to consult with architects. Although the management report is not meant to contain detailed specifications for proposed response actions, the feasibility of those responses, the sequencing of response actions, and approximate costs of some proposed actions may require the services of a consulting architect. Certain planned actions may require unique architectural solutions for purposes of removal or access, the design of special containment structures, or more funding than for a response under conventional

conditions.

Depending on local building codes, an architectural review may be needed on aspects of a management plan. This review may be required under the following circumstances:

1. Prior to submission of renovation or demolition plans to the local review and permitting agency.

2. By an architect doing subsequent renovation work at the building.

3. By the staff architect/facilities manager representing the building owner.

Building Engineer

The building engineer can provide the Management Planner with valuable information concerning building use (and abuse) patterns, history of damage and repair, and frequency of activities which may potentially result in fiber release episodes. These types of information will aid the Management Planner with the hazard assessment. In addition, it will be useful in the determination of response action priorities.

The Management Planner will develop an O&M program to optimize protection of building occupants from future fiber release from asbestos remaining in the building. In order to develop a feasible program, the Management Planner needs to know how operations and maintenance activities are presently carried out. Such items as the processing of work orders for repair jobs, work practices, and the use of contract services should be explored. In order to understand the present system and develop feasible approaches to changing the system, the Planner will need information and advice from custodial personnel.

School Administration

In developing a realistic response plan, the financial situation at the school and the LEA's preference for use of in-house custodial staff and/or contract workers should be taken into consideration. Creation of a plan without information on these factors may lead to confrontations and the submission of a plan that cannot be implemented. In developing the management plan, it is essential that the Planner confer with the relevant school officials to assess these factors and adapt the plan to suit conditions at the school.

SECTION 31
DEVELOPING AND IMPLEMENTING AN OPERATIONS AND MAINTENANCE PROGRAM

OBJECTIVES:

1. To understand the purpose of an operations and maintenance program.

2. To become aware of pertinent regulations which apply to operations and maintenance activities and incorporate these into the program.

3. To recognize the elements of an operations and maintenance program.

4. To be able to develop an operations and maintenance plan.

NOTE: Words underlined in the text can be found in the Glossary at the end of this notebook.

SECTION 31: DEVELOPING AND IMPLEMENTAING AN OPERATIONS AND MAINTENANCE PROGRAM

INTRODUCTION

The process of identifying ACM within a facility is the first step in controlling building occupant exposure to asbestos fibers. The next step is to develop a written operations and maintenance (O&M) program to minimize the potential hazard posed by the ACM.

The O&M program is a set of specific procedures and practices applied to building cleaning, maintenance, renovation and general operation to maintain the building as free of asbestos contamination as possible. The O&M program draws heavily on information generated during the building survey and becomes a key component of the management plan. The O&M program should remain in effect until all ACM is removed.

OBJECTIVE OF AN OPERATIONS AND MAINTENANCE PROGRAM

There are three primary objectives of the O&M program: (1) clean up existing contamination, (2) minimize future fiber release by controlling access to ACM, (3) maintain ACM until it is eventually removed. Properly prepared, this plan will document the building owner's prudence in dealing with asbestos in the building.

Since by law all but small quantities of ACM must be removed from buildings before demolition, the O&M program is not a permanent solution. It is implemented as part of an overall asbestos management plan that has as its goal the elimination of asbestos exposure within the facility. The O&M program likewise is not a means by which the full –scale asbestos abatement is accomplished. Rather, intentional disruption of ACM should be limited to repair or removal of small areas of significantly damaged ACM, or small areas where removal is necessary to facilitate maintenance/renovation activities. Large abatement projects that require extensive planning and technical expertise are beyond the scope of most O&M programs. On the other hand, limited encapsulation and enclosure could be used to enhance an O&M program, e.g., by reducing the likelihood for contact with this ACM.

ELEMENTS OF THE O&M PROGRAM

Specific features of an operations and maintenance program should be individually designed. However, each O&M program should include the following elements:

- Notification and labeling;
- Training (on several levels);
- Employee protection and medical surveillance programs;
- Specialized cleaning procedures;
- Maintenance/Renovation permit system;
- Special work practices for maintenance activities;
- Special work practices for renovation;
- Emergency response procedures;
- Periodic ACM surveillance; and
- Recordkeeping

Each of these elements will be discussed in the following sections.

Notification and Labeling

Once the presence of asbestos-containing materials has been established in a facility, a notification and warning program should be initiated. The notification and warning program serves two purposes; (1) it alerts affected parties to a potential hazard; and (2) it provides basic information on avoiding the hazard. Building occupants, employees and other who are aware of the presence of ACM are less likely to disturb the material and cause fiber release.

Notification

Notification of building occupants and other affected individuals can be accomplished several ways. Two common techniques are:

- Distributing notices; and
- Holding awareness or informational seminars

The distribution of notices is an effective means of alerting building occupants about the presence of asbestos. Memos or letters can be tailored to specific parties, and verification that notification was received is easily accomplished. For example, in a large multi-tenant facility, the building owner can send detailed reports to the management of the individual companies, while distributing similar information memos to building occupants.

Awareness or information seminars can be designed to follow written notification. They serve to expand on relevant information while allowing attendants to raise questions. These seminars can be developed at the same time as other training programs, and typically last no more than several hours.

Regardless of the notification format chosen, building occupants should be provided with the following information, at a minimum:

- What asbestos is and how it is typically used;
- Health effects associated with exposure;
- What type(s) of ACM are present in the facility;
- The exact location(s) of these materials;
- How individuals can avoid disturbing ACM;
- How to recognize and report damage;
- How custodial and maintenance personnel are dealing with these materials to prevent fiber release;
- What will be done periodically and over the long run to protect the health and safety of building occupant; and
- Name and telephone number of the person responsible for asbestos related activities in the family.

Labeling and Signs

Under AHERA, the posting of warning signs is mandatory adjacent to any friable and non-friable ACBM and suspected ACBM in routine maintenance areas (such as boiler rooms) at each school building. Labeling, as opposed to notification, is not intended as general information. It serves as a final line of defense to prevent unprotected individuals from disturbing ACM, or entering areas where repair or renovation activities involving ACM are underway. Labeling is usually in the form of posted signs or notices, which are often found either immediately adjacent to ACBM or at entrances

to areas where ACM is prevalent (e.g., boiler rooms). Warning signs used in conjunction with small renovation or repair that involves the disruption of ACM should be posted at entrances and around the perimeter of the project and in accordance with the OSHA Asbestos Standard for the Construction Industry (29 CFR 1926.1101).

Specific warning sign language (in areas where no regulatory requirement prevails) is a matter of extreme importance. Warning that is vaguely worded may not effectively express the potential danger involved. Warning or danger signs that come across too alarmist may create undue concern by building occupants. Also, the manner in which a warning sign is worded can affect the owner's liability. It is best to consult an attorney and seek advice from a communications and/or public relations expert prior to developing and posting ACM warning signs.

Training

Training of service (custodial and maintenance) workers is one of the most important aspects of an effective operations and maintenance program. Training serves to establish proper awareness and understanding of work practices that are vital to the success of the program. In those schools that contain friable ACM, training must be adequately developed and offered on two levels (per AHERA).

General Awareness

All service personnel who work in a building that contains friable ACM must receive two hours of awareness training. This training session should include, at a minimum, all the information outlined in the section on notification.

Cleaning and Custodial Work

Service personnel who conduct any activities that will result in the disturbance of ACM must receive the two hours of general awareness training and 14 hours of additional instruction (per AHERA). Information to be presented in this training session should include proper cleaning techniques, appropriate practices for handling ACM, proper use of respirators and other protective equipment, including hands-on training.

One of the main objectives of the O&M program is to clean the facility of existing asbestos contamination. This training program instructs participants in proper cleaning techniques that involve the use of wet methods, HEPA vacuuming, protective equipment, and proper waste disposal methods. Elements of specialized cleaning and re-cleaning are discussed later in this chapter.

Maintenance Work

Maintenance workers are often required to use specialized asbestos control procedures when working around ACM. Most maintenance work is conducted entirely by in-house staff, entirely by outside contracted help, or a combination of these two options.

If routine or even infrequent maintenance involves the possibility of significant disturbance of ACM, workers should be involved in a more extensive training program (16 hours total). Depending on the type and amount of material involved, maintenance workers will need to be trained in local isolation of the HVAC system, isolation of the work area from non-work areas (through the use of barriers and warning signs, etc.), HEPA vacuuming, the use of methods to reduce fiber release, HEPA and glovebag techniques for working around pipe insulation, clean-up and decontamination procedures, and ACM disposal procedures. In addition, maintenance workers in this category will need to be involved in respiratory protection and medical surveillance programs.

With respect to outside contractors (e.g., electrical, plumbing, and construction contractors), building owners should require evidence that the contractor is familiar with the O&M program, has experience and/or training in working around ACM, and has adequately trained work crews. It may be beneficial, and possibly required under NYS Code Rule 56, to have one member of the in-house staff trained as an asbestos contractor supervisor, to oversee all maintenance performed by inside personnel and/or outside contractors.

Medical Surveillance and Employee Protection Programs

According to 29 CFR 1926.1101, 29 CFR 1910.1001, and 29 CFR 1910.134, employees who conduct certain classes of work activities (for a combined total of 30 or more days per year) or who are or will be exposed to airborne concentrations of fibers of asbestos at or above the TWA and/or excursion limit must be involved in a medical surveillance program. The employer must implement a respiratory protection program in accordance with 29 CFR 1910.134 for each employee required to used a respirator.

The purpose of the medical surveillance program is to establish an employee's fitness to wear a respirator, and to detect any changes in the gastrointestinal and cardiopulmonary systems as a result of working in asbestos contaminated areas. Such changes may indicate the onset of an asbestos-related disease.

The main requirements of the medical surveillance program are initial and periodic examinations. The initial examination can be omitted if the employee had an equivalent exam within the last twelve months and must be performed before the employee is issued a respirator. Periodic examinations are required at least annually, and must be performed before the employee is issued a respirator.

Each examination must include, at a minimum:

- Completion of the mandatory medical questionnaires. There is one each for the initial and periodic examinations. These questionnaires also include sections on work history. Copies of both the initial and periodic questionnaires are included at the end of this section;
- A physical examination, with emphasis on the cardiovascular and gastrointestinal systems; and
- A pulmonary function test, which include the forced vital capacity (FVC) and the forced expiratory volume in one second (FEV).

The examining physician may also require other tests as part of the medical examination. The chest x-ray is now optional and is administered at the discretion of the physician. However it is recommended that an initial chest x-ray be used in order to establish baseline conditions for the employee.

Following the examination, the physician must provide the employer with the following:

- A written opinion as to whether the employee has any detected medical conditions that would place the employee at increased risk of health impairment from exposure to asbestos;

- Any recommended limitations on the employee or on the use of personal protective equipment, such as respirators; and

- A statement that the employee has been informed by the physician of the results of the medical examination, and of any medical conditions that may result from asbestos exposure.

The physician is not to reveal in the written opinion given to the employer any specific findings unrelated to asbestos exposure. Also, the employer must provide a copy of the physician's written statement to the employee within 30 days of receipt.

The employer must provide the examining physician with the following:

- A copy of the OSHA Asbestos Standard;

- A description of the employers duties as they relate to asbestos;

- The employee's actual or anticipated level of exposure;

- A description of any personal protective and respiratory equipment used or to be used; and

- Information from previous medical examinations of the employee that is not otherwise available to the examining physician.

Finally, the employer must maintain medical records for at least 30 years following termination of employment. If the employer goes out of business without a successor, OSHA must be notified at least 90 days prior to termination of business and provide for transfer of records to the secretary of OSHA, if requested.

With respect to a respiratory protection program, the elements of a comprehensive program are included in pages 25 through 34.

Specialized Cleaning Procedures

Cleaning up existing asbestos contamination within a facility is one of the primary objectives of the O&M program. Dry brooms, mops, dust cloths and standard vacuum cleaners simply re-suspend asbestos fibers into the air. Therefore, it is essential that specialized cleaning procedures be implemented.

Specially trained and properly equipped custodial workers should conduct a thorough initial cleaning in the building as soon as the O&M program is in place and before the initiation of any response action. These workers should be equipped with high efficiency air purifying respirators, at a minimum.

A combination of wet mopping/wiping and vacuuming should be used to clean all surfaces within the building. Irregular surfaces, such as curtains, books, furniture and carpeting should be cleaned using HEPA-equipped vacuum cleaners. Many manufacturers offer several "nozzles' to make HEPA vacuuming of irregular surfaces less difficult. Carpeting may also be cleaned using steam cleaners. Care should be taken to ensure that the liquid waste generated during steam cleaning is disposed of as asbestos contaminated waste (discussed late in this section).

Other surfaces, such as walls, non-carpeted floors, light fixtures, equipment housings, the exterior of air handling ducts, and file cabinets should be cleaned using mops and/or dust cloths and rags that are wetted with amended water. Amended water is a mixture of water and a non-sudsing surfactant. A dust suppressant could also be used on mops.

Periodic or routine cleaning is less rigorous than the initial cleaning and is implemented, when needed, on a regular schedule depending on the extent of the ACM within the facility and the level of contamination. Surfaces should be wet wiped and/or HEPA vacuumed. Respiratory protection may not be required for the custodial crew performing periodic cleaning. However, areas where ACM is frequently disturbed may warrant continued use of respiratory protection.

Under AHERA the accredited Management Planner should determine whether routine cleaning is needed. This determination should be based on the rate of dust buildup.

Maintenance/Renovation Permit System

Minimizing inadvertent disruption of ACM during maintenance and renovation operations is often one of the most difficult tasks faced by the asbestos program manager. Initiating a permit system, where all work orders or requests are funneled through the asbestos program manager ("designated person" as per AHERA), is a simple yet effective way of controlling disruption of ACM during these activities.

In the permit system, all requests for maintenance/renovation activities are given to the asbestos program manager prior to the issuance of a work order to proceed. (Exhibit G-I is an example permit request form.) The program manager then checks the building's asbestos records (files, computerized database, etc.) for information about the presence of ACM where work is to be performed. The manager should also physically inspect the area in question to ensure records reflect actual conditions. If no asbestos is present, the work order is issued and the planned actions can proceed. If ACM is found to be present in the area, the program manager will sign the permit application (Exhibit G-I) and either equip properly trained maintenance/renovation workers to deal with the ACM during the operation or dispatch an "emergency response" team to remove the ACM. In worst-case situations (e.g., large amounts of ACM), non-critical maintenance/renovation work should be deferred until the ACM in the area can be abated by an abatement contractor.

Disturbance of ACM Intended or Likely

Some maintenance and repair activities will unavoidably disturb the ACM. For example, installing new sprinkler or piping systems will necessitate hanging pipes from structural members or the ceiling. If the beams or ceilings are insulated with ACM, the ACM will be scraped away to install hangers. Likewise, pulling cables or wires through spaces with ACM or ACM debris is likely to dislodge pieces of the ACM or disturb ACM debris and dust. Furthermore, anytime tiles are moved to enter the space above a suspended ceiling, settled dust on top of the tiles will be re-suspended. If the beams or decking above the ceiling are covered with ACM, the dust is likely to contain asbestos fibers. All of these examples involve disturbance of ACM or asbestos dust and debris, and will likely result in elevated levels of airborne asbestos fibers.

Small Disturbances

The following procedures are appropriate for maintenance activities which involve small-scale (i.e. less than or equal to three (3) square feet of surfacing material or less than or equal to (3) three linear feet of thermal system insulation), or when disturbance of ACM dust and debris or unintentional contact with the ACM is likely.

- Approval should be obtained from the asbestos program manager

before beginning work, and the work should be supervised.

- The work should be scheduled after normal working hours (nights or weekends), if possible, or access to the work area should be controlled: doors should be locked from the inside and signs posted to prevent unauthorized persons from entering the work area (e.g., "MAINTENANCE WORK IN PROGRESS, DO NOT ENTER", or, if the asbestos levels are high enough to trigger the OSHA Rule (the PEL or higher), "DANGER - ASBESTOS: CANCER AND LUNG DISEASE HAZARD: AUTHORIZED PERSONNEL ONLY: RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA"). Note, emergency exits must remain in operation.

- The air handling system should be shut off or temporarily modified to prevent the distribution of fibers from the work site to other areas in the building.

- Workers should wear, at a minimum, full face negative air purifying respirators with HEPA filters or powered air purifying respirators with HEPA filters and protective clothing, including a body suit, hood, boots, and gloves.

- A 6-mil fire-retardant plastic drop cloth should be placed beneath the location of the maintenance work, extending at least 10 feet beyond all sides of the work site. (In the case of entry into the space above a suspended ceiling, the work site would be the area of the tiles removed to gain access.) Alternatively, a rectangular enclosure constructed of 6-mil plastic on a frame can be positioned underneath the maintenance area to inhibit the spread of fibers from fallen ACM. (Mobile enclosures of this type are available commercially.)

- If entry to the space above a suspended ceiling is necessary, the entry tile(s) should be removed carefully with as little jarring as possible. The air above the opening, the top of the removed tile, all tiles surrounding the opening, and the ACM likely to be disturbed should be misted with amended water. Use a mister with a very fine spray. A thorough misting in the air helps fibers to settle more quickly. Cleaning ceiling tiles with a HEPA vacuum cleaner is also effective as long as care is taken not to vibrate tiles and disturb the ACM.

- Selected workers must wear personal monitors as required by OSHA unless previous experience with the same ACM and similar operations indicates that fiber levels are likely to be less than the PEL

- During the course of the work, any ACM which is removed should be collected by the HEPA-vacuum. This is best accomplished by placing the vacuum hose just below the ACM being removed.

- Upon completion of the work, any visible debris on the top of the suspended ceiling, on the drop cloth, on the floor, or anywhere else should be collected by cleaning with a HEPA vacuum.

- All equipment and tools should be wiped with damp cloths or HEPA-vacuumed.

- The plastic sheet should be wiped with a damp cloth, folded, and discarded as asbestos waste.

- All debris, cloths, and vacuum bags/filters should be discarded in sealed and labeled plastic bags as asbestos waste.

- Workers should vacuum their disposable suits before leaving the work site (or remove and discard them as asbestos waste and put on a clean disposable suit), proceed to a shower room, shower with their respirators on, and clean their respirators while in the shower.

Large Disturbances

Any maintenance work which involves removal of 3 or more square feet of surfacing material (or 3 linear feet of thermal system insulation) should be considered a large-scale disturbance of ACM. For renovation activities, NESHAPS applies if there is disturbance of at least 260 linear feet of regulated asbestos-containing materials (RACM) on pipes, or 160 square feet of RACM on other facility components, or at least one cubic meter (35 cubic feet) of RACM off facility components where the amount of RACM previously removed from pipes and other facility components could not be measured previously.

Even if NESHAPs does not strictly apply, building owners should consider removing all ACM from that part of the building where this type of maintenance work is planned. Typically, an outside abatement contractor would be hired for the removal project before the maintenance work would begin.
If this approach is not deemed necessary or desirable, the maintenance workers should be fully trained in asbestos removal and the work should proceed as follows:

- All of the procedures for asbestos removal should be followed — construction of containment barriers and decontamination facilities; use of a negative pressure ventilation system; use of protective clothing and "type C" respirators by workers; proper disposal of asbestos debris; and proper cleanup of the work site followed by air testing. Most of these procedures except the use of "type C" respirators are required by OSHA. (See Chapters 5 and 6 of the Purple Book and the OSHA rule for the construction industry for a detailed discussion of these steps.) Personal air monitoring is also required by OSHA unless SCBA or "type C" or other positive pressure mode respirators are used.

- Once the work site has been adequately isolated and all precautionary measures have been taken, the maintenance work should begin. If the work involves cutting, drilling, grinding, or sanding the ACM, special tools equipped with HEPA vacuum attachments must be used (OSHA requirement). Where the ACM is simply scraped off the substrate, the hose from a HEPA vacuum cleaner should be placed just below the removal site to catch the ACM. Upon completion of the work, the vacuum bags and filters should be discarded as asbestos waste.

- Where the ACM was disturbed as part of the maintenance activity, it should be repaired with non-asbestos plaster or spackling compound or sprayed/painted with an encapsulant (see section 5.1.3. of the EPA Purple Book for specifications). This should be done before final cleanup of the work site. Per NYSDOL ICR 56-8.7(f), Latex paint shall not be used as a bridging encapsulant.

Thermal System Insulation

Maintenance activities affecting asbestos-containing thermal system insulation generally involve plumbing-type repairs, or repairs to the heating, ventilation and air conditioning (HVAC) system. Frequently, the ACM must be removed to provide access to the valve, flange, duct, or related system part needing maintenance.

Contact With ACM Unlikely

Maintenance activities or repairs which can be performed without contacting or disturbing the ACM require little more than normal care and good workmanship. (Respirators and a HEPA vacuum cleaner should be available if needed.) For example, valves which are either uncovered or covered with non-asbestos insulation can be repacked or repaired without disturbing asbestos insulation on nearby pipes. As with surfacing ACM, the only precautions necessary are to make sure that a HEPA vacuum cleaner and air-purifying respirators are available if needed.

Accidental Disturbance of ACM Possible

Even maintenance tasks that involve no direct contact with ACM may cause accidental disturbance. For example, vibrations created by maintenance activities in one part of piping network will be transmitted to other parts. Vibrations could then cause fibers to be released from insulation which is exposed (not covered with a protective jacket) or not in good condition. If in doubt about the possibility of fiber release, thoroughly inspect the thermal system insulation before undertaking the maintenance or repair work. Then, either correct the problem before starting, or assume that the maintenance work may cause accidental disturbance and fiber release. In this case, the following procedures should be used:

- Work approval and site preparation procedures as described under Surfacing Material should be followed.

- Plastic sheets (6-mil fire-retardant polyethylene) should be cut and taped around any insulation which might be accidentally disturbed. The plastic should be misted with amended water before taping it shut. If the locations where insulation could be disturbed are too numerous for isolation with plastic, workers should perform the maintenance work wearing air-purifying respirators, at a minimum, and protective clothing, including disposable suits and hoods.

- Cleanup procedures, as described under **Surfacing Material**, should be followed. Special care should be taken when removing the plastic from the insulation to minimize disturbance of any ACM dust or debris that may have fallen from the insulation.

Disturbance of ACM Intended or Likely

Where asbestos-containing insulation must be removed to maintain or repair the thermal system, the ACM will obviously be disturbed. As with surfacing ACM, the amount to be removed or manipulated will determine the procedures to be used.

Small Disturbances

- Work approval and site preparation procedures as described for surfacing ACM, should be followed.

- Maintenance workers should wear at least air-purifying negative pressure respirators with HEPA filters and protective clothing (suit, hood, and boots) in case of a fiber release accident.

- The asbestos-containing insulation should be removed as necessary for the repairs, and the repairs made using standard glove bag techniques, where possible, (see the EPA publication: " Asbestos-in-Buildings Technical Bulletin: Abatement of Asbestos-Containing Pipe Insulation," 1986-2 and the OSHA construction industry rule). Glove bags are fastened around the part to be repaired, the insulation is removed with knives and saws to make the part accessible, and the repairs are made using tools contained in the glove bag tool pouch. The open faces of the remaining asbestos-containing insulation are then sealed with an encapsulant. All surfaces are wet-wiped or HEPA vacuumed, and all debris is sealed in the glove bag and removed, together with the bag.

- If a bag is ruptured during the course of repairs, work should stop, the area should be sealed off, and all procedures recommended for large-scale asbestos removal should be followed. Thorough clean-up of the work site, followed by air testing is, especially important to assure that fibers which may have escaped are removed. Sealing tape applied

quickly to a small puncture could prevent significant release of fibers to the room, provided the ACM inside the bag was thoroughly wet. In this case, sealing off the area followed by cleaning and air testing is probably not necessary.

- At the conclusion of the work, maintenance workers should clean their clothing as above (if fibers escaped from the glove bag), shower with their respirators on, and clean their respirators while in the shower.
- All glove bags and any other used materials (including disposable clothing) should be discarded as asbestos waste.
- Non-asbestos insulating material can be installed, as necessary, to replace insulation which was removed.

Large Disturbances

Maintenance activities which involve removal of more than 3 linear feet of asbestos-containing insulation (e.g., several valves need attention in a utility room or block insulation needs to be removed for boiler repair) should be considered large-scale disturbances. In some situations, glove bag techniques may be appropriate and the procedures described above under "small disturbances" should be followed. When glove bags are not feasible, the maintenance activities should be conducted using all the procedures recommended for large-scale asbestos removal. ACM removal is typically conducted by abatement contractors. If maintenance personnel are to conduct the removal, they must be thoroughly trained in removal techniques (OSHA requirement).

The choice between conducting multiple glove bag operations and isolating the entire work site is largely one of convenience and cost. However, it the maintenance activities are likely to cause disturbance of ACM on pipes, boilers, or ducts at sites other than just those undergoing repair (due to vibration, for example), then the entire room or area should be isolated and large-scale asbestos removal procedures employed. For demolition activities, notification always applies, but other NESHAPS requirements apply if there is at least 260 linear feet of regulated asbestos-containing material (RACM) on pipes, or 160 square feet of RACM on other facility components, or at least one cubic meter (35 cubic feet) of RACM off facility components where the amount of RACM previously removed from pipes and other facility components could not be measured previously. For renovation activities, NESHAPS applies if there will be disturbance of the quantities mentioned above.

Other ACM

Other types of ACM should also be addressed in the special O&M program. They include vinyl asbestos floor tiles, asbestos ceiling tiles, transite wall board and counter tops, asbestos roof tiles, and various textile products such as stage curtains. (ACBM as per the AHERA Rule does not include fabrics or exterior products.) Disturbance of these materials should be avoided. Where this is not possible, procedures should be used as described above for large-scale removal of ACM. Cutting, drilling, grinding, or sanding of ACM must be performed with tools equipped with HEPA-filtered vacuum systems

(OSHA requirement).

Other Measures

Whenever friable ACM is present in building, special procedures should be followed when changing filters in the HVAC system. The filters should be misted with amended water as they are removed, placed in plastic bags, sealed, and discarded as asbestos waste. Workers should wear at least an air-purifying respirator.

Special Work Practices for Renovation and Remodeling

Renovation

Building renovation or building system replacement can cause major disturbance of ACM. Moving walls, adding wings, and replacing heating or air conditioning systems involve breaking, cutting, or otherwise disturbing ACM that may be present. Prior removal of ACM is highly recommended in these situations, and is required by NESHAPs if the amount of ACM likely to be disturbed is greater than the threshold amounts (at least 160 square feet of surfacing material or at least 260 linear feet of thermal system insulation). If prior removal is not undertaken, the renovation project should be considered equivalent to an asbestos removal project. All the procedures and precautions for asbestos removal recommended by EPA and required by OSHA as previously discussed should be employed. A key step in considering a renovation project is checking on the location and type of ACM that may be affected. Clearance should be obtained from the asbestos program manager before serious project planning is begun.

Remodeling

Remodeling or redecorating implies less dramatic structural alteration. However, disturbances of ACM or materials contaminated with asbestos fibers is still possible. Where the remodeling involves direct contact with ACM (e.g., painting or wallpapering over ACM), all of the procedures and precautions recommended by EPA and required by OSHA for asbestos removal should be followed.

If "other" types of ACM have to be removed as part of the renovation project, the removal should be done with care to avoid breaking the material. For example, small sections of asbestos-containing floor tiles can be removed by applying dry ice or heat from a portable heater to the tops of the tiles and then prying them up. Glued carpet may require a mechanical chipper to separate the carpet from the floor. Before a chipper is employed, test the carpet adhesive for asbestos. If it contains asbestos, all workers should wear either SCBA or "type C" respirators and the project should be treated as an asbestos removal project.

Emergency Response Procedures

As long as ACM remains in the building, a fiber release episode could occur. Custodial and maintenance workers should report to the asbestos program manager the

presence of debris on the floor, water or physical damage to the ACM, or any other evidence of possible fiber release. Fiber release episodes can also occur during maintenance or renovation projects. The asbestos program manager should call an abatement contractor or assign a suitably trained in-house team to clean up debris and make repairs as soon as possible. If an outside contractor is to be used, a company should be selected and retained by contract for quick response action as needed.

Minor Fiber Release Episodes

- Minor fiber release episodes, such as a small section of insulation (less than or equal to 3 linear feet) falling from a pipe or a careless worker bumping into a beam and dislodging a small amount of fireproofing ACM (less than or equal to 3 square feet) are defined as such in the AHERA Rule. They can be treated with standard wet cleaning and HEPA-vacuum techniques:

- Workers should wear air-purifying respirators with HEPA filters, at a minimum.

- Workers should thoroughly saturate the debris with amended water using a mister with a very fine spray. The debris should then be placed in a labeled, 6-mil plastic bag for disposal and the floor should be cleaned with damp cloths or a mop. Alternatively, the debris can be collected with a HEPA vacuum cleaner.

- All debris and materials used in the cleanup should be discarded as asbestos waste.

- Workers should vacuum their disposable suits before leaving the work site (or remove them, discard them as asbestos waste, and put on clean, disposable suits), proceed to a shower room, shower with their respirators on, and clean their respirators while in the shower.

- The damaged ACM should be repaired with asbestos-free spackling, plaster, cement, or insulation, or an encapsulant.

Major Fiber Release Episodes

Major fiber release episodes are very serious events. Large amounts of ACM falling from heights of several feet may contaminate an entire building with asbestos fibers. If more than 3 square feet of surfacing material or more than 3 linear feet of thermal system insulation falls or is dislodged from its substrate, the episode should be considered major. A large breach in a containment barrier for a maintenance or abatement project should also be considered a major episode. AHERA requires that the response action for any major fiber release episode must be designed and conducted by accredited Project Designers. However, the following response procedures should form the basis for response actions.

- The area should be isolated as soon as possible after the ACM debris is

discovered. Where the area can be sealed by doors, they should be sealed with 6-ml fire retardant plastic sheeting and tape, and signs posted to prevent unauthorized personnel from entering the work area ("DANGER -ASBESTOS; CANCER AND LUNG DISEASE HAZARD; AUTHORIZED PERSONNEL ONLY; RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA").

- The air-handling system should be shut off or temporarily modified to prevent the distribution of fibers from the work site to other areas of the building. If possible, doors, windows, and air registers should be sealed with 6-mil fire retardant plastic sheets and tape.

- All the procedures recommended by EPA and required by OSHA for large- scale removal of ACM should then be used. These include containment barrier, negative pressure ventilation, personal respiratory protection and protective clothing, decontamination facilities, and air testing.

- Workers should wear either a SCBA or "type C" respirator (see discussion in Building Inspection Notebook or EPA's Purple Book on respirator programs) and protective clothing, including a body suit, hood, boots and gloves. Personal air monitoring may be conducted on representative workers, but is not required by OSHA when SCBA , "type C " or other positive pressure respirators are used.

- Fallen debris should be sprayed with amended water and placed in plastic bags for disposal. Shovels are useful for collecting the debris. The floor should be thoroughly cleaned with a HEPA vacuum cleaner.

- Walls, ceilings, pipes, boilers, or other surfaces where ACM was damaged or delaminated should be repaired temporarily. This might involve re-plastering with asbestos-free material, spraying with an encapsulant, or taping with duct tape. In some cases, ACM beyond the immediate area of damage may need to be removed to prevent additional episodes.

- The air should be tested for asbestos fibers before the plastic barriers are removed and the area reoccupied. Testing should follow guidelines in Chapter 6 of the Purple Book and Chapter 4 of the Silver Book. That is, air should be sampled at the specified number of locations and analyzed by either phase contrast microscopy or transmission electron microscopy. However, sampling should NOT be done aggressively since the use of blowers and fans may dislodge fibers from the remaining ACM.

- After the barriers have been taken down, a decontamination of the entire building or a portion of it should be considered. The need for this will depend on how rapidly the response team reacted to the episode and, in particular, how quickly the HVAC system was turned off. A thorough decontamination includes HEPA-vacuuming and/or wet wiping

all carpets, furniture, and other surfaces. Decontamination of the HVAC system would involve disassembling and cleaning (HEPA-vacuuming or wet wiping) ducts, ventilators, registers, and other system parts. System filters should also be removed and replaced.

- All equipment used in the cleanup operation should be washed or wiped with damp cloths. All disposable materials (e.g., cloths, mop heads, filters, coveralls) should be discarded as asbestos wastes.

Each fiber release episode should be documented. A report format is suggested in Exhibit G-2. These procedures should be employed whether the building owner uses in- house staff or an outside asbestos abatement contractor. If an outside contractor is used, the procedures should be thoroughly discussed and proper training of the contractor's crew assured before signing the contract.

Under AHERA, response actions including removal, encapsulation, enclosure, or repair other than small scale short duration activities, shall be designed and conducted by persons accredited to design and conduct response actions.

Periodic ACM Surveillance

Periodic review of the O&M program is essential to insure that the program objectives are being met. A key feature of the review is reinspection of all ACBM in the building. Combined with ongoing reports of changes in the condition of the ACBM made by services workers, the reinspection will insure that any damage or deterioration of the ACBM will be detected and corrective action taken reinspection should be conducted at least annually; more frequently if necessary AHERA requires reinspection every six months by the LEA, and every three years by an accredited Building Inspector.

The assessment factors described in Section 28 should be used to evaluate each homogeneous area of surfacing ACM and thermal system insulation. The assessment factors are: ACM condition (deterioration, physical damage, and water damage), and potential for disturbance (frequency of potential contact, sources of vibration near the ACM, and potential for air erosion). Either the asbestos program manager or someone trained or experienced in ACM assessment, should conduct the inspections. The results should be documented (see Exhibit G-3) and placed in the permanent asbestos file.

Air monitoring could supplement the physical inspection. If air monitoring is conducted, transmission electron microscopy (TEM), not phase contrast microscopy (PCM), should be used to count and identify the airborne fibers. Only TEM can detect the small asbestos fibers typically found in buildings with ACM. (Large-scale disturbance of ACM will release both small and large fibers.) Since analysis by TEM is expensive, air monitoring which employs TEM is typically used on a one-time basis and provides a "snap-shot" view of building conditions. Such a one-time view can be very misleading because airborne asbestos levels vary from day to day and from room to room. Low readings are, therefore, possible even when the ACM is in poor condition. For this reason, EPA does

not recommend air monitoring for the initial assessment of exposure potential (see Chapter 4 of the EPA Purple Book and Section 28 of this notebook). However, if the ACM is currently in good condition, increases in airborne asbestos levels may provide an early warning of deterioration or disturbance of the ACM.

To use air monitoring in an "early warning" context, a baseline asbestos level should be established soon after the O&M program is initiated. Periodic air monitoring (perhaps conducted simultaneously with the re-inspections) would then be used to determine if asbestos levels have changed relative to the baseline. Although this use of air monitoring is appropriate and useful in concept; it is ultimately still, very expensive.

If the air monitoring is used in the ACM surveillance component of the O&M program, the air sampling and sample analysis procedures described in EPA's Silver Book (Measuring Airborne Asbestos Following an Abatement Action, EPA 560) should be employed. At least five samples should be collected to establish a baseline, followed by at least five additional samples during each semi-annual re-inspection of the ACM. Sequential sets of five samples can be averaged and the averages compared statistically (as described in Chapters 3 and 4 of the Silver Book for clearance monitoring) to determine whether asbestos concentrations are increasing. Note that aggressive sampling should NOT be used in any area where ACM is present. Special training or expert advice is needed to design and operate an air-monitoring program.

Measuring dust accumulation for asbestos is another way to supplement physical re-inspection. A trend of increasing asbestos content in dust samples would be evidence for release of asbestos fibers in the building. Although dust measurement is becoming more popular, no standardized collection and analysis procedures are available. Some asbestos consultants use an air sampling pump to "vacuum" fibers from surfaces; others favor some sort of "wipe sample" method. EPA is currently evaluating several collection and analysis protocols for asbestos dust. Until this study is concluded, EPA does not recommend dust measurement as part of ACM surveillance in an O&M program. Additionally, wipe sampling is not a NYSDOH-ELAP approved method.

Recordkeeping

All written records discussed in this section should be maintained as part of a thorough recordkeeping process. To review, these include:

- The written O&M plan itself, including work practices
- Building plans and drawings
- Survey data
- Copies of notification and warning programs
- Descriptions, times, dates, and attendants of training programs
- Written respiratory protection program and Medical surveillance records
- Copies of all permits and documentation of custodial, maintenance, renovation, and emergency response actions performed

- Periodic ACM surveillance records

OSHA requires that each employee's record of exposure and medical surveillance be made available to the employee. EPA recommends that all written elements of the O&M program similarly be made available for inspection.

CASE STUDY

The Setting

East Lake is a high school in mid-America. The school consists of a central three-story, steel frame domed structure housing the mechanical plant, laboratories, lecture halls, a planetarium, and various special-purpose rooms. Classrooms are located in single story wings which surround the central structure in a U-shape. The gymnasium and associated athletic facilities are located in a separate structure.

ACBM consists of fireproofing sprayed on structural beams and columns in the central structure. The structural steel is located above the suspended ceilings, which form return air plenums on all floors. Fireproofing is also found on structural steel supporting the dome (above false ceilings in the lecture halls) and above the planetarium (it had been encapsulated in the planetarium area). Some debris and dust is found on ceiling tiles; large amounts are present in the utility space just below the dome. This space connects directly to janitor closets on the third floor of the central structure.

Thermal asbestos-containing insulation is found in the central boiler room and in two fan rooms in the central structure. Most is in good condition, with the exception of the fan rooms where accumulating dust and debris suggests deterioration of pipe insulation (and of fireproofing on exposed beams).

Vinyl asbestos floor tile has been installed in the single-story wings. Cement-asbestos wallboard was used in the boiler room.

Discovery of the Problem

Spurred by suspicions of some faculty and students (and the results of "secret testing"), the school administration hired a consultant to conduct a comprehensive building survey for ACM. The consultant recommended the following actions for the most hazardous areas:

- Access to the utility space just below the dome (and above the lecture halls) should be locked to control access until the fireproofing could be removed.

- Likewise, access to the janitors' closets which connect to this space should be locked.

- Two small equipment rooms in the athletic complex should also be locked since the fireproofing had been damaged and had fallen to the floor.

During the course of the investigation, the consultant spoke with representatives of the teacher's union. He discovered a general attitude of distrust toward the school administration ("they're covering up the problem") and several specific problems associated with school operating practices.

Specifically,

- Maintenance personnel were entering the air plenums on each floor without taking precautions.

- The track team was practicing in a 2nd floor corridor causing significant structural vibrations.

- Although most occupied areas were well-maintained, cleaning was conducted using dry techniques.

Recommendations Regarding O&M

An O&M program was a feasible response option for all areas of the school except those with the highest hazard rating. The consultant prepared a detailed O&M plan similar in structure to the generic plan discussed above. That is, it was based on a work permit system, and specified appropriate work practices for cleaning, maintenance and repair, renovation and remodeling, and emergency response. It also described medical surveillance and respiratory protection programs and training programs for (1) service workers and (2) student teachers and administrative staff. Finally, a schedule of initial cleaning of the entire building was developed.

In terms of program implementation, an administrative structure was outlined. It focused on an appointed asbestos program manager, and included representatives from the supervisor's office, the facilities management department, and the faculty union. Union participation was critical, both to improve the school board's credibility and to provide critical input from people knowledgeable about the building operation.

The LEA's Response

The LEA was sensitized to the need for prompt and responsive action. A schedule to remove fireproofing from the most hazardous areas was quickly developed. A bond

election date was then set to raise money to pay for removal. The LEA also recognized that a strict O&M program was necessary (1) to minimize the risks to students and school personnel from ACM remaining in place, and (2) to assure parents and voters that the school board was taking the matter seriously.

The structure of the O&M team proved to be workable and effective. By including the teachers' union, a more effective program tailored to conditions of East Lake was developed, in addition, the teachers developed a deeper commitment to the program than otherwise might have been the case, and most helped enforce the program once it was established.

The LEA, on the other hand, quickly came to see O&M as a short-term solution at best. The extensive training, respiratory protection, and medical surveillance requirements were seen as onerous. Moreover, rearranging school activities (e.g., the track team was forced to find an alternative wintertime practice facility) and controlling student behavior was difficult. Preventing students from "popping" ceiling tiles was particularly problematic. As a result, the LEA proceeded to remove all of the fireproofing over a two year period. Thermal insulation was repaired in the short- term and removed in the final stage of the asbestos control program.

Lessons

The East Lake experience illustrates several important aspects of an O&M program:

1. Participation in designing the program by all affected parties is crucial. (Even student participation can be useful.)

2. A comprehensive and effective program can convince the community that the problem is significant and that the LEA is serious.

3. A comprehensive O&M program may be burdensome to some LEAs, and may drive them toward other response actions.

4. The weak part of any O&M program in a school is the need to control student behavior, especially in poorly supervised areas.

EXHIBIT G-1

PERMIT APPLICATION FOR PERFORMING MAINTENANCE/RENOVATION WORK

1. Exact location of area involved (including building number, room number, location within room, etc.) _____

_____

_____

2. Description of work involved _____

_____

_____

3. Starting Date _____ Anticipated Completion Date _____

4. *Approximate amount of asbestos present (linear feet, square feet, size of tank, etc.)

_____

_____

5. *Asbestos Control methods to be used (i.e., glovebag, HEPA vacuum, wet methods, etc.) _____

_____

6. *Protective equipment to be used (respirator, coveralls, etc.) _____

_____

_____

7. Name and telephone number/extension of supervisor _____

_____

TO BE FILLED OUT BY ASBESTOS PROGRAM MANAGER:

Permit _____ Accepted _____ Rejected _____

Signed _____ Print _____

Permit Number _____

Emergency contact _____

Please return this form to:
Name
Address or Mail Stop
Telephone or Extension

*NOTE: These items may have to be filled out by Asbestos Program Manager.

EXHIBIT G-2

FIBER RELEASE EPISODE REPORT

1. Address, building, and room number (s) (or description of area) where episode occurred: _____

2. The release episode was reported by _____

On (date)_____

3. Describe the episode: _____

4. The asbestos-containing material was _____ was not _____

Cleaned up according to the approved procedures. Describe the clean-up: _____

Signed: _____
(Asbestos Program Manager)

Date: _____

EXHIBIT G-3

REASSESSMENT OF ASBESTOS-CONTAINING MATERIALS

Location of asbestos-containing material(s) address, building, room(s), or general description: _____

_____

Type of asbestos-containing material (s):

1. Sprayed – or troweled – on ceilings or walls.
2. Sprayed – or troweled – on structural members.
3. Insulation on pipes, tanks, or boilers.
4. Other (describe): _____

_____

Abatement Status:

1. The material has been encapsulated _____, enclosed ____, neither _____.

Assessment:

1. Evidence of physical damage: _____

_____

2. Evidence of water damage: _____

_____

3. Evidence of delamination or other deterioration: _____

_____

4. Degree of accessibility of the material: _____

_____

5. Degree of activity near the material: _____

_____

6. Location in an air plenum, air shaft, or air stream: _____

_____

7. Other observations (including the condition of the encapsulant or enclosure, if any): _____

Signed: _____ Date: _____
(Evaluator)

From Federal Register/ Vol. 51, No. 119/Friday, June 20, 1986
Rules and Regulations

Part 1

INITIAL MEDICAL QUESTIONNAIRE

1. Name_____

2. Social Security # ___ ___ ___ ___ ___ ___ ___ ___ ___
   1 2 3 4 5 6 7 8 9

3. CLOCK NUMBER ___ ___ ___ ___ ___ ___
   10 11 12 13 14 15

4. PRESENT OCCUPATION _____

5. PLANT _____

6. ADDRESS _____

7. _____
   (Zip Code)

8. TELEPHONE NUMBER _____

9. INTERVIEWER _____

10. Date _____ ____ ____ ____ ____ ____ ____
    16 17 18 19 20 21

11. Date of Birth_____ ____ ____ ____ ____ ____ ____
    22 23 24 25 26 27

12. Place of Birth _____

13. Sex
    1. Male ____
    2. Female ____

14. What is your marital status? 1. Single ____ 3. Widowed ____
    2. Married ____ 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)

OCCUPATION HISTORY

17. A. 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 a 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 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"		
a. Epilepsy (or fits, seizures, convulsions?)	_____	_____
b. Rheumatic fever?	_____	_____
c. Kidney Disease?	_____	_____
d. Bladder Disease?	_____	_____
e. Diabetes?	_____	_____
f. Jaundice?	_____	_____

CHEST COLDS AND CHEST ILLNESS

19. A. If you get a cold, does it usually go to your chest? (Usually means more than half of the time? Yes_____ No_____

20. A. During the past 3 years, have you had any chest illnesses that have kept you of work, indoors at home, or in bed? Yes_____ No_____

IF YES TO A

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) Number if illnesses _____ No. of such illnesses _____

phlegm did you have which lasted a week or more?

21. Did you have any lung troubles 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 _____

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____

B. Was it confirmed by a doctor? 3. Does Not Apply ____

C. At what age did it start? Age in Years ____
Does Not Apply ____

23. A. 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 _____

24. A. 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 _____

25. A. Have you ever had asthma? 1. Yes_____ 2. No____
3. Does Not Apply ____

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 illnesses? 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_____

27. 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 past 10 year? 1. Yes_____ 2. No_____
3. Does Not Apply _____

28. A. Has a doctor ever told you that you have 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 ten 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			MOTHER		
	1. Yes	2. No	3. Don't Know	1. Yes	2. No	3.Don't Know
A. Chronic Bronchitis?	_____	_____	_____	_____	_____	_____
B. Emphysema?	_____	_____	_____	_____	_____	_____
C. Asthma?	_____	_____	_____	_____	_____	_____
D. Lung Cancer?	____	_____	_____	_____	_____	_____
E. Other chest Conditions?	_____	_____	_____	_____	_____	_____
F. 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	_____			_____		

COUGH

32. A. Do you usually have a cough? (Count a a cough with first smoke or first going out of 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 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 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 _____

33. A. Do you usually bring up phlegm from your Chest? (Count phlegm with the first smoke Or on first gong out doors. Exclude 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 during 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 years? 1. Yes____ 2. No_____

F. For how many years have you had trouble with phlegm? Number of Years_____ Does Not Apply _____

EPISODES OF COUGH AND PHLEGM

34. A. Have you had periods or episodes of 1. Yes____ 2. No_____

(increased*) cough and phlegm lasting for 3 weeks or more each year?
*(For persons who usually have cough and/or phlegm)

B. IF YES TO 34A:
For how long have you had at least 1 such Episode per year? Number of Years _____
Does Not Apply _____

WHEEZING

35. A. Does your chest ever sound wheezy or Whistling 1.Yes_____ 2. No_____
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_____

B. IF YES TO 1,2, OR 3 IN 35A:
For how many years has this been present? Number of Years_____
Does Not Apply _____

36. A. 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 have 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 and lung disease, please Describe and proceed to question 39A.
Nature of condition(s)_____

38. A. Are you troubled by shortness of breath when hurrying on the level because of breathlessness? 1.Yes_____ 2. No_____
3. Does Not Apply_____

IF YES TO 38A:
B. Do you have to walk slower than people 1.Yes_____ 2. No_____

		of your age on the level because of breathlessness?	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

39.	A.	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_____
	C.	How old were you when you first started regular cigarette smoking?	Age in Year _____ 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 per day?	Cigarettes per day_____ Does Not Apply _____
	G.	Do you or did you inhale the cigarette Smoke?	1. Does Not Apply____ 2. Not At All ____ 3. Slightly ____ 4. Moderately ____ 5. Deeply ____
40.	A.	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 completely stopped smoking a pipe completely, how old were you when stopped? Age Stopped ___
If still smoking ___
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. Does Not Apply____
2. Not At All ____
3. Slightly ____
4. Moderately ____
5. Deeply ____

41. A. Have you ever smoked cigars regularly? (Yes means more than 1 cigar per week for a year) 1. Yes_____ 2. No_____

IF YES TO 41A:
FOR PERSONS WHO HAVE EVER SMOKED CIGARS

B. 1. How old were you when you started smoking cigars regularly? Age_____

2. If you have stopped smoking cigars completely, how old where you when stopped? Age Stopped _____
If Still Smoking_____
Does Not Apply_____

D. On the average over the entire time you smoked cigars, how many cigars did you smoke per week? Cigars per Week____
Does Not Apply

E. Do you or did you in hale the cigar smoke?
1. Does Not Apply____
2. Not At All ____
3. Slightly ____
4. Moderately ____
5. Deeply ____

Date_____ Signature_____

SECTION 32
RECORD KEEPING FOR THE MANAGEMENT PLANNER

OBJECTIVES

1. To become familiar with requirement for record keeping in AHERA.
2. To recognize which documents and records need to be retained.
3. To understand the benefits of complete documentation

NOTE: Words underlined in the text can be found in the Glossary at the end of this notebook.

SECTION 32
RECORD KEEPING FOR THE MANAGEMENT PLANNER

INTRODUCTION

An effective management plan is key to a comprehensive record keeping system. The Management Planner develops a report which is submitted to the Local Education Agency (LEA). The report presents the results of the building inspection, the assessment of the ACBM found in the building, a discussion of recommended response options the LEA should implement to manage the ACBM, recommendations regarding prioritization of those response actions, and guidance concerning the cost of various options.

Upon receiving the Management Planner's report, the LEA is responsible for developing the asbestos management plan. The Planner's report essentially becomes the LEA's management plan and is submitted to the state for approval.

BENEFITS

The purpose of the record keeping process is to establish and maintain a standardized system which clearly documents implementation of an asbestos control program. The steps taken be the LEA/building owner identify asbestos materials and associated hazards, and minimize the potential exposure to employees and building occupants must be recorded for the future reference. AHERA is specific concerning the carious records and documentary information to be maintained. It is the LEA's responsibility to establish a recordkeeping system and maintain the required records as part of its management plan.

ELEMENTS OF RECORDKEEPING

In general, the recordkeeping system must track three types of data: data on the physical condition of the ACBM, actions taken on the ACBM, and the data associated with the personnel involved with the asbestos management program.

The tracking of the ACBM's may be thought of as the tracking of a business's physical inventory requiring that the condition of the materials be recorded at intervals (record of the surveillance), the recording of the substantive changes in material status (removal, enclosure, encapsulation, or repair), various required reports to governing bodies (notices of abatement and disposal actions to the EPA), and the recording of an up-to-date inventory on a periodic basis (re-inspections).

Required recordkeeping for personnel includes the identity, training, medical monitoring and exposure of persons. This information should be recorded in a form which will be available for a period of at least 30 years.

Despite the fact that the Management Planner does not set up, or maintain LEA records, (except in the instance that the LEA contracts for such services), the Planner should be certain that the LEA is aware of the AHERA recordkeeping requirements.

The various types of documents and records to be included in the recordkeeping system are outlined below.

1. For each preventative measure and/or response action taken:
   - Detailed written description of the measure or action
   - Methods used
   - Location
   - Justification for why a specific measure or action was selected
   - Start and completion of dates of all work
   - Names and addresses of all contractor involved and accreditation information
   - If ACM was removed, name and location of storage or disposal sites

2. For any air sampling conducted:
   - Name and signature of person collecting samples
   - Date and location where samples were collected
   - Name and address of laboratory analyzing samples
   - Date and method of analysis
   - Results of analysis
   - Name and signature of analyst

3. For persons required to be trained for maintenance and repair operations, training records must be maintained:
   - Employee's name and job title
   - Date training completed
   - Location of training and training organization's name
   - Number of hours of training

4. For each time periodic surveillance is performed:
   - Inspector's name
   - Date of the surveillance
   - Notation of changes (or lack of) in the condition of the ACBM

5. For each time that cleaning is performed:
   - Name of person(s) doing cleaning
   - Date of cleaning
   - Locations cleaned
   - Methods used in cleaning

6. For each time operations and maintenance activities are performed:
   - Name of person(s) performing activities
   - Start of completion dates of action
   - Locations
   - Description of activity, including preventative measures taken
   - If ACBM removed, name and location of storage/disposal site

7. Each time maintenance activities other than small-scale, short duration activities are undertaken.
    - Name, signature and state of accreditation for each person involved in activity
    - Start and completion date of project
    - Location(s)
    - Description of project, including preventative measures taken
    - If ACBM removed, name and location of storage/disposal site

8. For each fiber release episode:
    - Date of episode
    - Location
    - Method of repair
    - Preventative measures or response action taken
    - Name(s) of person(s) performing work
    - If ACBM is removed, name and location of storage/disposal site

9. Suggested documentation but not required:
    - Complete historical blueprint of facility, if available
    - Documentation on materials/products used in construction or renovation of the facility that may asbestos (include any correspondence with manufacturers)
    - Location and photographs of warning signs and barriers placed to prevent unauthorized access to areas of ACBM
    - Required state and federal forms dealing with notification and compliance
    - All correspondence pertaining to asbestos in the facility
    - Copies of notification statement, press releases, meeting agendas (with attendance rosters)

The reasons for maintaining complete and detailed records of asbestos management are many. Documentation can expedite response action and make future renovation in any facility easier. The legal liabilities involved with asbestos are another reason to maintain thorough records. The more thorough the documentation is, the more defensible the actions taken. Further, poor or sloppy recordkeeping could imply callousness toward employees, building occupants, and the public. In the case of LEA's, records are kept because they are required by AHERA.

Some forms which may assist the LEA in its recordkeeping task are discussed in Section 32 (Operations & Maintenance Plan) of this notebook.

SECTION 33
ASSEMBLING AND SUBMITTING A MANAGEMENT PLAN

OBJECTIVES:

1. To be able to recognize the components of a complete management plan.

2. To appreciate how the LEA will use a management plan.

NOTE: Words underlined in the text can be found in the Glossary at the end of this notebook.

SECTION 33: ASSEMBLING AND SUBMITTING A MANAGEMENT PLAN

INTRODUCTION

Each local educational agency (LEA) must develop an asbestos management plan for school buildings under its authority. This plan is to be submitted to the state Governor (or designee), no later than October 12, 1988. LEA's are required to begin implementation of their management plan by July 9, 1989 and to complete implementation in **a** timely fashion. LEA's may submit their management plan in stages. A copy of the plan must be available in the school administrative offices for viewing by the public.

A management plan should be used as a guidance document for asbestos control. A brief description of the elements of the plan as required by AHERA follows. Other sections of the notebook provide detailed information on the various components of the plan.

Management plans should be considered working documents. They set forth a framework for short and long-term actions to be taken by the LEA to protect building occupants. They must be kept up to date (e.g., response actions, dates and results of surveillance).

COMPONENTS OF A MANAGEMENT PLAN

The management plan is to be developed by an accredited Management Planner. It must include a list of schools covered by the plan and state whether the building contains friable ACBM, non-friable ACBM, and friable and non-friable suspected ACBM which has been assumed to be ACM.

The plan must provide the name and qualifications of the person named by the LEA to carry out the schools' responsibilities under AHERA.

Inspection Statement

An inspection statement is to be included which describes all inspection and response action activities that were carried out before the new regulations became effective on October 17, 1987.

Inspection Results

A copy of the inspection report filed by an accredited Building Inspector

accompanies the management plan. The material to be covered in this report was detailed in Section K of the Building Inspector's course.

Response Actions

All recommended response actions for friable ACM need to be addressed. Information that should be included is: the type of action planned, the location where the action is to take place and the timetable for completion of the specific response actions.

Remaining Asbestos

If any asbestos will remain in the school after response actions are taken, it needs to be documented. Detailed information on what type is present, its location, the measures taken to ensure its integrity, and the potential for exposures are all to be covered in the management plan.

Re-inspection and Other Activities

A plan and timetable for reinspection and long-term surveillance activities needs to be specified. This may be in the form of statements, such as the building will be checked semi-annually. Or, the actions may be presented in the form of a chart with specific dates for particular activities. Whichever form, it must include the following:

- Plans for surveillance and periodic re-inspections of friable and non-friable asbestos in a school building under the authority of an LEA

- Plans for informing and educating school employees (school service and maintenance personnel), building occupants, or their guardians, about the location, response actions, safety procedures are to be observed with respect to friable and non-friable asbestos

Financial Resources

An evaluation of the resources needed to fully implement the plan is to be included in the management plan. This includes the expenses associated with response actions and the expenses to carry out re-inspection, surveillance and operations and maintenance activities.

Operations and Maintenance (O&M)

An operation/maintenance and repair program needs to be addressed. Details regarding O&M plans can be found in Section G of this course notebook.

CONCLUSION

The management plan should provide elaboration on all aspects of the plan. For example, in selecting a response action, justification is necessary for the particular choice, rationale for its prioritization, and explanation of the resources required to implement the response should appear in the plan.

The management plan is viewed as a planning, or working, document. It not only sets out a course of action for the LEA, but it becomes documentary evidence of progress in implementing asbestos control options. Given the cost and financing information contained in the plan, it provides guidance on matters such as annual and long-term school budgeting and community tax and bond issues. In addition, the management plan will help school administrators identify potential funding sources to implement their asbestos control program.

GLOSSARY

Abatement	Procedures to control fiber release from asbestos containing materials. Includes *Removal Encapsulation, Enclosure and and Repair.*
ABIH	American Board of Industrial Hygiene.
ACBM	Asbestos Containing Building Material.
ACGIH	American Conference of Governmental Industrial Hygienists.
ACM	Asbestos Containing Material. Any material containing more than 1% asbestos.
Acoustical Insulation	The general application or use of asbestos for the control of sound due to its lack of reverberant surfaces.
Acoustical Tile	A finishing material in a building usually found in the ceiling or walls for the purpose of noise control.
Actinolite	Amphibole asbestos type, typically found as a contaminant with other *asbestiform minerals*.
Acute	Health effects which show up a short time after exposure.
Aerosols	Liquid droplets or solid particles dispersed in air, that are of a fine enough particle size (0.01 – 100 microns) to remain dispersed for a significant period of time.
Aggressive Sampling	Air sampling which takes place after final clean-up while the air is being physically agitated to produce a “worst case” situation.
AHERA	Asbestos Hazard Emergency Response Act.
AIA	American Institute of Architects**.**
AIHA	American Industrial Hygiene Association**.**
Air Lock	A system of *enclosures* consisting of two *polyethylene* curtained doorways at least three feet apart that does not permit air movement between clean and contaminate areas.

Air Monitoring	The process of measuring the airborne fiber concentration of a specific quantity of air over a given amount of time.
Air Plenum	Any space used to convey air in a building or structure. The space above a suspended ceiling is often used as an air plenum.
Alveoli	Located in cluster around the respiratory *bronchioles* of the lungs, this is the aera in which true respiration takes place.
Ambient Air	The surrounding air or atmosphere in a given area under normal conditions.
Amended Water	Water to which a chemical wetting agent *(surfactant)* has been added to improve penetration into asbestos-containing materials that are being removed.
Amosite	An *asbestiform mineral* of the *amphibole group* containing Approximately 50% silicon and 40% iron (ii) oxide, and is made up of straight, brittle fiber, light gray to pale brown in color. Also known as *brown asbestos.*
Amphibole	One of the two major groups of minerals from which the *Asbesiform minerals* are derived, distinguished by their chain-like crystal structure and chemical composition**.**
Anoxia	Inadequate oxygen to the brain.
ANSI	American National Standards Institute.
Anthophyllite Asbestos	An *asbestiform mineral* of the *amphibole group*.
Approved Landfill	A site for the disposal; of asbestos-containing and other hazardous wastes that has been given EPA approval to accept such waste.
APRs	Air purifying respirators**.**
Asbestiform Minerals	Minerals, which, due to their crystal structure chemical composition, tend to be separated into fibers and can be classified as a form of *asbestos*.
Asbestosis	A non-malignant (non-cancerous), progressive, irreversible lung disease caused by the inhalation of asbestos dust and characterized by diffuse *fibrosis.*

Asbestos Standard	The OSHA asbestos regulations for general industry construction and marine industries.
Asphyxiant	A gas that deprives the body tissues of oxygen either by displacing oxygen (simple asphyxiant). Or by preventing oxygen uptake by the tissues (chemical asphyxiant).
Breach	A break, tear, split or shatter of a container, allowing contents to be released.
Bridging Encapsulant	A sealant placed over the surfaces of asbestos-containing material to prevent the release of asbestos fibers.
Bronchi	The primary branches of the trachea (airway).
Bronchioles	Small air passages in the lungs which terminate in the *alveoli***.**
Brown Asbestos	*Amosite* asbestos.
CAA	Clean Air Act.
Cancer	An uncontrolled growth of abnormal cells.
Carbon Monoxide	A toxic, odorless and colorless gas (chemical *asphyxiant*). Produced during combustion.
Carcinogen	A substance which is known to cause cancer in animals or humans.
Cementitious	"Cement-like" materials that are densely packed.
CFM	Cubic feet per minute.
CFR	Code of Federal Regulations.
Chronic	Persistent, prolonged or repeated
Chrysotile	*"White Asbestos"*, the only *asbestiform mineral* of the serpentine group which contains approximately 40% each of silica and magnesium oxide. It is the most common form of asbestos used in buildings.
CIH	Certified Industrial Hygienist.

Cilia	Tiny hair-like structures in the windpipe and *bronchi* of the lung passages that help force undesirable particles and liquids up and out of the lungs.
Claustrophobia	The fear of being in enclosed or narrow spaces. experienced by some persons when wearing respirators.
Clean Area	The first stage of the decontamination enclosure system in which workers prepare to enter the work area**.**
CNS	Central Nervous System.
Contaminated	Any objects that have been exposed to airborne asbestos Fiber without being sealed off or isolated.
Crocidolite Asbestos	An *asbestiform mineral* of the *amphibole group*, also known as Blue Asbestos and Riebeckite Asbestos.
Cyanosis	Blue appearance of the skin, indicating lack of sufficient oxygen in the blood.
Decibel (db)	A unit of measurement for expressing the relative intensity of sound.
Decontamination	The removal or destruction of potentially harmful chemicals.
Dirty Area	Any area in which the concentration of airborne asbestos fibers exceeds 0.01 f/cc, or where there is visible asbestos residue.
Disinfect	To destroy, neutralize or inhibit the growth of micro-Organisms.
DOH	Department of Health.
DOL	Department of Labor.
DOT	Department of Transportation.
DOH	Department of Health.

Encapsulation	The coating or asbestos-containing material with a bonding or sealing agent to prevent the release of airborne fibers.
Encapsulant	A substance applied to asbestos-containing material which Controls the release of airborne asbestos fibers.
Enclosure	An isolated area that is sealed from other building areas where asbestos abatement activities take place. Also a method of *abatement* which involves building an air tight enclosure around an ACM such as a pipe run.
EPA	The United States Environmental Protection Agency.
Epidemiology	The study of occurrence and distribution of disease throughout a population.
Equipment Room	The last stage or room of the worker decontamination system before entering the work area.
Excursion Limit	1 fiber per cubic centimeter, averaged over a sampling period of 30 minutes.
f/cc	Fibers per cubic centimeters of air.
Fiber	A particulate form of asbestos, 5 micrometers or longer, with a length to diameter ratio of at least 3 to 1.
Fibrosis	A condition of the lungs caused by the inhalation of excessive amounts of fibrous dust marked by the presence of scar tissue.
Fireproofing	A sprayed or trowel-applied fire resistant materials typically applied to structural steel in buildings.
Friable	Can be crumbled, pulverized, or reduced to *powder by* hand pressure when dry.
Fumes	Airborne particulate formed by the vaporization of a solid material during welding and the subsequent condensation of the vapor formed.
FVC	Forced Vital Capacity. The measured quantity of air that can be forcibly exhaled from a person's lungs after full inhalation.

GFCI	Ground Fault Circuit Interrupter. A circuit breaker sensitive to very low levels of current leakage from a fault in the electrical circuit.
Glovebag	Plastic bag-type enclosure with attached gloves, placed around asbestos-containing pipe lagging so that it may be removed generating airborne fibers into the atmosphere.
Grade D Air	Air meeting the minimum standards for breathing.
Heat Cramps	Painful spasms of heavily used skeletal muscles such as hands, arms, legs, and abdomen which are sometimes accompanied by dilated pupils and weak pulse resulting from depletion of the salt content of the body.
Heat Exhaustion	A condition resulting from dehydration and/ or salt depletion, or lack of blood circulation, which is usually accompanied by fatigue, nausea, headache, giddiness, clammy skin, and excessive heat.
Heat Stress	A general term used to describe a bodily disorder associated with exposure to excessive heat.
Heat Stroke	The most severe of the heat stress disorders resulting from the loss of the body's ability to sweat, which is characterized by hot dry skin, dizziness, nausea, severe headache, confusion, delirium, loss of consciousness, convulsion, and coma.
HEPA	High Efficiency Particulate Air (air filter).
Holding Area	The airlock between the shower room and the clean room in a worker decontamination system.
Homogeneous	Evenly mixed and similar in appearance and texture throughout.
HVAC System	Heating, Ventilating, and Air Conditioning system.
IDLH	Immediately Dangerous to Life and Health. Any atmosphere which poses immediate hazard to life or produces immediate or irreversible health effects.

Industrial Hygienist	A professional qualified by education, training, and experience to recognize, evaluate, and develop controls for occupational health hazards.
Inerting	The introduction of an inert or non-flammable gas to a container, vault, tank or pipeline to remove oxygen and prevent explosions.
Joists	The structural building component which the flooring or roof rests on.
Latency Period	Length of time between exposure to a toxic substance and the onset or appearance of symptoms or signs of disease.
Local Exhaust Ventilation	The mechanical removal of air contaminants from a point of operation.
Log Book	An official record of all activities which occurred during an abatement project.
LPM	Liters Per Minute.
Lung Cancer	An uncontrolled growth of abnormal cells in the lungs which normally results in the death of the host.
Make-up Air	Supplied or recirculated air to offset that which has already been exhausted from an area.
Mastic	Adhesive or glue.
MCEF	Mixed Cellulose Ester Filter which is one of several different types of *media* used to collect asbestos air samples.
Media	A material used to collect samples of air contaminants. Media used in industrial hygiene applications include filter discs of cellulose ester, glass fiber and Polycarbonate for the collection of various types of dust.
Management Plan	A written plan prepared to direct the management of asbestos in buildings through training and work practices, as well as prioritized the *abatement* of asbestos hazards through *removal, enclosure, encapsulation* and repair.
Mesothelioma	A relatively rare form of cancer which develops in the lining of the *pleura* or *peritoneum* with no known cure.

Micron	One millionth of a meter.
Mil	Prefix meaning one-thousandth.
Millimeter	One thousandth of a meter.
Mineral Wool	A fibrous material made of rock and slag which is a commonly used substitute for asbestos.
Miscellaneous Material	Interior building material on structural components, structural members or fixtures, including floor and ceiling tiles.
MSDS	Material Safety Data Sheet.
MSHA	Mine Safety and Health Administration.
MUC	Maximum Use Concentration.
Negative Pressure	Air pressure lower than the surrounding atmosphere, as created in a work area to prevent asbestos fibers from leaking out of the area.
NESHAP	National Emissions Standards for Hazardous Air Pollutants.
NIOSH	The National Institute for Occupational Safety and Health. The agency which tests and certifies respirators.
NIST	National Institute for Standards and Technology, formerly the National Bureau of Standards, which is one accreditation organization for laboratories performing analysis of asbestos bulk samples.
NOB	Non-friable, Organically Bound material. Includes floor tiles, roofing and *mastics*.
Non-Friable	Asbestos material that may not be crumbled, pulverized or reduced to powder by hand pressure when dry.
O&M	Operations and Maintenance. A program of work practices to maintain *friable* and *non-friable ACM* in good condition, ensure clean-up of asbestos fibers previously released, and prevent further release by maintaining and controlling ACM disturbance or damage.
OSHA	The Occupational Safety and Health Administration.

Oxygen Deficient Atmosphere	The atmosphere containing less than 19.5% oxygen.
PAPR	Powered Air Purifying Respirator
.	
PAT Samples	Proficiency Analytical Testing of asbestos samples conducted through NIOSH for laboratories involved with the analysis of asbestos samples.
PCM	Phase Contrast Microscopy. Used for air samples analysis. this method is not specific for asbestos, and instead counts all fibers.
PEL	Permissible Exposure Limit. Set by OSHA based on a time weighted average *(TWA)* exposure of 8 hours per day, five days per week. (0.1 f/cc for asbestos).
Penetrating Encapsulant	A liquid material applied to asbestos containing material to control airborne fiber release by penetrating into the material and binding its components together.
Peritoneum	The thin membrane that lines the surface of the abdominal cavity.
Pers**onal Sample**	An air sample collected with a battery powered sampling pump in the worker's breathing zone.
Pleura	The thin membrane surrounding the lungs, and which lines the internal surface of the chest cavity.
PLM	Polarized Light Microscopy. Used to analyze bulk samples of suspect *ACM.*
PF	Protection Factor.
Polyethylene	A type of plastic which, among other things, is used in sheet form to seal off areas in which asbestos *abatement* is taking place.

PPE	Personal Protective Equipment. Any material or device worn to protect a worker from exposure to, or contact with, any harmful substance or force.
Pulmonary	Pertaining to, or affecting the lungs, or some portion thereof.
Qualitative Fit Test	A method of testing a respirator's face-to-facepiece seal by exposing the wearer to a test atmosphere, such as irritant smoke or banana oil and determining if the wearer detects the presence of the test atmosphere inside the facepiece.
Quantitative Fit Test	A method of testing a respirator's face-to-facepiece seal by measuring the level of dust or test atmosphere both within and outside a respirator and calculating a protection factor for the individual. A quantitative fit test device must be used.
RCRA	Resource Conservation and Recovery Act.
Regulated Area	An area where it is expected that airborne asbestos fiber levels will exceed the *PEL*, and to which access must be limited to trained personnel wearing appropriate *PPE.*
Removal	A form of *abatement* in which the ACM is permanently removed from the building.
Respirable	Breathable particles of a size range which is likely to be drawn into the lower lung.
Response Action	*Removal, encapsulation, enclosure*, repair or other actions dictated by *a management plan* to bate an asbestos hazard.
SAR	Supplied Air Respirator. A respirator which has a central source of breathing air supplied to the wearer by way of an airline.
SCBA	Self Contained Breathing Apparatus.
SEM	Scanning Electron Microscopy.
Serpentine	One of the two major groups of minerals from which the *asbestiform minerals* are derived, distinguished by their tubular structure and chemical composition, *Chrysotile* asbestos is the only asbestiform mineral in this group.

Shower Room	A room between the clean room and the equipment room in a worker decontamination system in which workers take showers when leaving the work area.
STEL	Short Term Exposure Limit
Substrate	The material or existing surface located under or behind the asbestos containing material.
Surfacing Material	Material in a building that is sprayed on, troweled on, or otherwise applied to surfaces, such as acoustical plaster on a ceiling and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, or other purposes.
Surfactant	An acronym for Surface Acting Agent. A chemical wetting agent added to water to improve its penetrating abilities into asbestos containing materials.
TEM	Transmission Electron Microscopy. A method of microscopic analysis which utilizes an electron beam focused on an air sample or bulk sample of suspect *ACM.* The method is specific for asbestos.
TLVs	Threshold Limit Values. Contaminant levels established by the *ACGIH* to which it is believed that nearly all workers can be exposed to with minimal adverse health effects.
Tremolite Asbestos	An *asbestiform mineral* of the *amphibole group*.
TWA	Time-Weighted Average.
White Asbestos	*Chrysotile* Asbestos.