Asbestos General Awareness Training for School Custodial and Maintenance Staff

The Maine Department of Environmental Protection wishes to thank Tim Gallant, Director Buildings, Grounds & Transportation Director for MSAD #43 for permission to print and reproduce this document developed by Mr. Gallant to inform public school employees about the hazards associated with asbestos containing materials in their schools.

This training guide was prepared with information found in "How to Manage Asbestos in School Buildings: The AHERA Designated Person's Self Study Guide", EPA, 1996, the Environmental Safety and Health Online, and OSHA. This document has been reviewed, edited for content and reformatted by the Maine Department of Environmental Protection.

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Section 1: What is Asbestos?

Asbestos is the name applied to six naturally occurring minerals that are mined from the earth. Unlike other minerals, however, the crystals of asbestos form long, thin fibers. Asbestos deposits are found throughout the world, but the primary sites of commercial asbestos production are Canada, Russia, and South Africa. Commercial mining of asbestos in the United States was halted in the 1980s.

- Naturally occurring minerals that form long, thin fibers
- Asbestos fibers are virtually indestructible
- Resistant to chemicals and heat
- Chrysotile is most common type of asbestos found in building materials; known as "white asbestos"

Once extracted from the earth, asbestos-containing rock is crushed, milled (or ground), and graded. This produces long, thread-like fibers of material. What appears to the naked eye as a single fiber is actually a bundle of hundreds or thousands of fibers, each of which can be divided even further into tiny fibers (fibrils), invisible without the aid of a microscope.

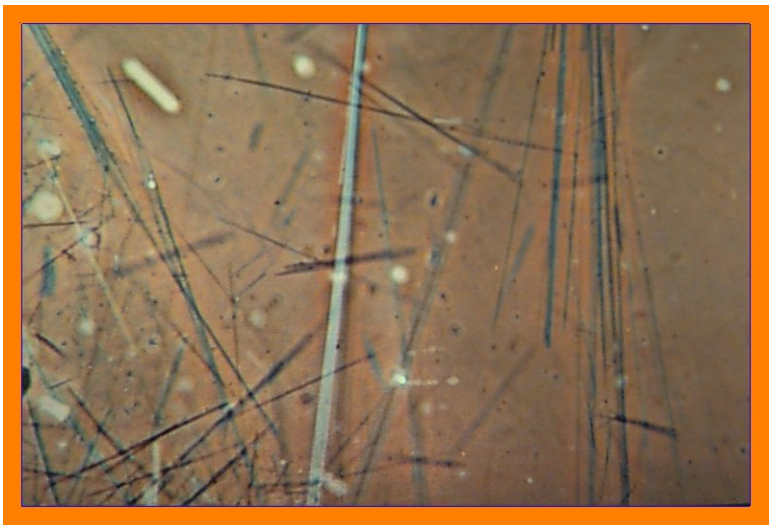
All types of asbestos tend to break into very tiny fibers. These individual fibers are so small that many must be identified using a microscope. In fact, some individual fibers may be up to 700 times smaller than a human hair. Because asbestos fibers are so small, once released into the air, they may stay suspended there for hours or even days.

Asbestos fibers are also virtually indestructible. They are resistant to chemicals and heat, and they are very stable in the environment. They do not evaporate into air or dissolve in water, and they are not broken down over time. Asbestos is probably the best insulator known to man. Because asbestos has so many useful properties, it has been used in over 3,000 different products.

Usually asbestos is mixed with other materials to actually form the products. Floor tiles, for example, may contain only a small percentage of asbestos. Depending on what the product is, the amount of asbestos in asbestos containing materials (ACM) may vary from 1%-100%. Unfortunately, all the characteristics listed above are what makes asbestos a health and environmental problem today.

Unmilled mineral asbestos (chrysotile).

Asbestos materials are divided into two groups -- serpentine and amphibole. Amphibole asbestos fibers are straight and needle-like. Sepentine asbestos fibers are silky in texture, and curly. All asbestos in the serpentine group is called Chrysotile. This is the most common type of asbestos found in buildings in the United States, accounting for approximately 95 percent of the asbestos found in the nation's buildings. It is commonly known as "white asbestos" because of its natural color.



A single asbestos fiber

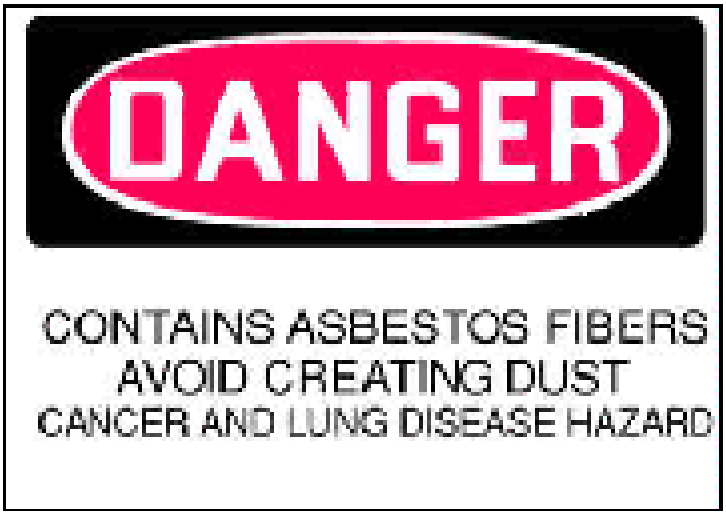
The amphibole group contains five types of asbestos. Amosite, the second most common type of asbestos found in buildings in the United States, is often referred to as "brown asbestos" for the color of the natural mineral. Crocidolite, or "blue asbestos" has been used in high-temperature insulation products and on chemical resistant surfaces, such as laboratory tables for chemistry and biology classes (upon occasion, the custodial staff will drill holes in table tops for new fixtures without realizing that the material may contain crocidolite). The remaining three types of asbestos in the amphibole group -- Anthophyllite, Tremolite, and Actinolite -- are rare and have little commercial value. They are occasionally found as contaminants or minor constituents in asbestos-containing materials.

Section 2: History of Asbestos

Asbestos has been used for over 2,000 years. The word asbestos comes from the ancient Greek's and means "Nonburnable." The Greeks admired the "miracle mineral" because of its softness and flexibility and its ability to withstand heat. The Greeks used asbestos much like cotton, spinning and weaving it into cloth. The nonburnable quality of asbestos and its flexibility made it useful for several ancient products. Ancient Greeks used asbestos for lamp wicks and blacksmith gloves. Ancient Egyptians used asbestos cloth to prepare bodies for burial. Romans collected ashes of the dead by wrapping bodies in asbestos before cremation.

- Asbestos has been used for over 2,000 years
- Early uses include lamp wicks, blacksmith gloves and burials
- Later uses include thermal insulation, fireproofing and reinforcement materials

The unique characteristics of asbestos made it perfect for use in machinery during the industrial revolution. Asbestos was not widely available anywhere in the world until the late 1800s, when major deposits were found in Canada. Thereafter, asbestos was used to make thermal insulation for boilers, pipes, and other high temperature applications, and was also used as a fireproofing and reinforcement material. During World Wars I and II, the military used asbestos extensively in ships and other applications. Commercial usages of asbestos in buildings increased greatly thereafter. Half of all multi-story buildings built in the U.S. from 1950-1970 contain some form of asbestos: Cement Products; Acoustical Plaster; Fireproofing; Wallboard; Ceiling Tile; Vinyl Asbestos Floor Tile; Insulation; Etc. Growing concerns about the health risks associated with asbestos exposure resulted in a voluntary reduction in the use of asbestos beginning in the 1970s.



Section 3: Where is Asbestos Found?

Asbestos has been used in thousands of products, largely because it is plentiful, readily available, cheap, strong, does not burn, conducts heat and electricity poorly, and is resistant to chemical corrosion. Products made with asbestos are often referred to as asbestos-containing materials (ACM). Asbestos proved particularly useful in the construction industry. Building materials that contain asbestos are referred to as asbestos-containing building materials (ACBM). Commercial usage of asbestos products in the construction industry was most common from about 1945 to 1980.

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- Commercial usage of asbestos products in the construction industry was most common from about 1945 to 1980

EPA identifies three categories of ACBM (See the definitions appearing in § 763.83 of the AHERA Rule):

1. **Surfacing Materials** -- Interior ACBM that has been sprayed on, troweled on, or otherwise applied to surfaces (structural members, walls, ceilings, etc.) for acoustical, decorative, fireproofing, or other purposes. This includes acoustical plaster, hard plasters (wall or ceiling), fireproofing insulation, spray-applied or blown-in thermal material, joint or patching compound (wall or ceiling), and textured paints or plasters.

2. **Thermal System Insulation** -- Insulation used to control heat transfer or prevent condensation on pipes and pipe fittings, boilers, breeching, tanks, ducts, and other parts of hot and cold water systems; heating, ventilation, and air conditioning (HVAC) systems; or other mechanical systems. These insulation materials include pipe lagging, pipe wrap, HVAC duct insulation, block insulation, cements and muds, and a variety of other products such as gaskets and ropes.

3. **Miscellaneous Materials** -- Other, mostly nonfriable products and materials found on structural components, structural members or fixtures, such as floor tile, ceiling tile, construction mastic for floor and ceiling materials, sheet flooring, fire doors, asbestos cement pipe and board, wallboard, acoustical wall tile, and vibration damping cloth. "Miscellaneous materials" do not include thermal system insulation or surfacing materials.

Examples of the more common ACBM found in schools are: floor tiles, 9 inch especially, vinyl base, mastic (adhesive), roofing materials, gaskets in heating and air-conditioning equipment, ceiling panels and tiles, wallboard, joint compound, plaster, pipe insulation, boiler insulation, duct-wrap insulation, duct joint tape, and duct vibration dampening cloth, fireproofing on structural members, fire brick for boilers, and fire doors, acoustical spray-on, cement pipes, and panels, thermal insulating papers. Buildings that have asbestos-containing materials in them will have that information contained in the district Asbestos Management Plan, located in the Central Office. Pipe and boiler insulation that contains asbestos will be labeled with identifying stickers and placards. Asbestos-containing ceiling tiles will not be labeled or marked. These tiles cannot be differentiated from other tile by visual means - they must be analyzed by a laboratory test.

Friable vs. Nonfriable ACBM

Friable ACBM will release fibers into the air more readily than nonfriable ACBM. Therefore, the AHERA Rule (Asbestos Hazard Emergency Response Act) differentiates between friable and nonfriable ACBM. The regulations define friable ACBM as material that may be crumbled, pulverized, or reduced to powder by hand pressure when dry. Friable ACBM also includes previously nonfriable material when it becomes damaged to the extent that when dry it may be crumbled, pulverized, or reduced to powder by hand pressure. Undamaged non-friable ACBM should be treated as friable if any action performed on the material will make them friable.

Section 4: Health Effects Associated with Asbestos Exposure

The health effects associated with asbestos exposure have been studied for many years. Results of these studies show that inhalation (breathing in) of asbestos fibers leads to increased risk of developing several diseases. Exactly why some people develop these diseases remains a mystery, but it has been well demonstrated that most asbestos-related illnesses are dose-response related (i.e., the greater the exposure to airborne asbestos fibers, the greater the risk of developing an illness).

- Inhalation of asbestos fibers leads to increased risk of developing several diseases
- People most at risk are maintenance and construction workers who disturb asbestos in buildings
- The majority of people who have developed diseases because of asbestos exposures are former asbestos workers

Relative Hazards of Asbestos Exposure

Almost daily, we are exposed to some prevailing level of asbestos fibers in buildings or experience some existing level in the outdoor air. Some fibers that are inhaled remain in the lungs. Brief "bursts" of exposure, when added to the background level, increase the potential to cause or trigger the development of an asbestos related disease. These brief bursts of exposure occur in many ways. For example, when a carpenter drills a hole in an asbestos fire door without taking any precautions, an increased amount of asbestos may be released into the air. The more often these bursts of exposure occur, the greater the risk of breathing asbestos fibers.

People most at risk for this additional exposure are maintenance and construction workers who work on and disturb asbestos in buildings. This clearly demonstrates the need for an active asbestos policy and an ongoing operations and maintenance (O&M) plan for buildings that contain ACBM.

It is important to recognize that the majority of people who have developed diseases because of asbestos exposures are former asbestos workers. These workers were frequently exposed to high levels of asbestos fibers each working day, with little or no protection. Today's asbestos maintenance workers and AHERA-trained asbestos abatement workers are trained to follow specific work practices and wear appropriate protection, including respirators, to minimize the risk of exposure. However, increased risk may occur when a worker who does not use a respirator or follow specific work practices disturbs any ACBM.

The Respiratory System

The effects of asbestos exposure most often involve the lungs. Air breathed into the body passes through the mouth and nose, continuing into the windpipe. The windpipe divides into smaller and smaller tubes that end up in the lungs as air sacs called alveoli. It is in these air sacs that respiration occurs. Oxygen is absorbed into tiny blood vessels (or capillaries), and waste gases, such as carbon dioxide, pass out of the blood and are exhaled.

The body has several mechanisms to "filter" the air it breathes. First, large particles are removed in the nose and mouth. Many smaller particles are caught on the mucus-coated walls of the airway tubes. These airways have "hairy" linings (ciliate cells) that constantly propel mucus upward. Particles caught in the mucus are swept up into the back of the mouth. From here they are swallowed or expelled (spit out). Unfortunately, cigarette smoking temporarily paralyzes these hair-like cells, disabling one of the body's natural defenses against unwanted dust or fibers.

Despite natural bodily defenses, some dust particles inevitably reach the tiny air sacs in the lungs. When this occurs the human immune system dispatches large cells called macrophages to engulf the particles and "digest" them. These cells deposit a coating on the particles and may begin forming scar tissue around them. This is just another natural defense mechanism the body uses against unwanted debris in the lungs.

- Asbestos-related diseases include asbestosis, lung cancer, mesothelioma, and other cancers
- Asbestosis is most common among workers who have been exposed to large amounts of asbestos fibers over a period of time
- The risk of contracting lung cancer as a result of asbestos exposure increases if the worker is a cigarette smoker

Asbestos-Related Diseases

If the body's defenses fail to control or remove asbestos fibers that enter the lungs, the risk of developing an asbestos-related disease increases. Asbestos-related diseases include asbestosis, lung cancer, mesothelioma, and other cancers.

Asbestosis -- Asbestosis is a disease characterized by lung scarring. It reduces lung elasticity -- the ability to inhale and exhale in response to muscular contractions of the diaphragm -- and makes breathing very difficult. Asbestosis is most common among workers who have been exposed to large amounts of asbestos fibers over a period of time. It is a serious disease and, in those persons exposed to high levels of asbestos, can eventually lead to disability or death. All forms of asbestos are suspected to have the potential to cause asbestosis. Like all diseases associated with asbestos exposure, it may take many years for the disease to show up. The typical latency period for asbestosis is 15 to 30 years. Available data indicate that the frequency of occurrence of asbestosis rises and the disease worsens with increasing dust exposure. The Occupational Safety and Health Administration (OSHA) Asbestos Standards were developed to minimize the incidence of asbestosis among asbestos workers by reducing their exposure to asbestos.

Macrophage on Asbestos--Macrophages normally engulf small particles in the lung. Asbestos particles, however, tend to rupture the macrophage on contact, releasing its contents into the surrounding lung tissue. This condition is characteristic of people suffering from asbestosis, a disease caused by the inhalation of asbestos fibers. Since asbestos was used extensively as an insulating material in private homes and public buildings, its removal and subsequent dispersal into the air can cause severe environmental problems for those living and working nearby. The inhalation of asbestos fibers has been linked to lung cancer.

Lung Cancer -- As with asbestosis, there appears to be a dose-response relationship between asbestos exposure and lung cancer. In addition, lung cancer arising from asbestos exposure also has a latency period before development -- typically 30 years or longer. The risk of contracting lung cancer as a result of exposure to asbestos increases if the worker is a cigarette smoker. Cigarette smokers who are exposed to asbestos are over 50 times more likely to develop lung cancer than the normal, non-smoking population. As a result, a program to help workers stop smoking and an asbestos operations and maintenance program will help reduce the risk of lung cancer among asbestos maintenance workers.

Mesothelioma -- Mesothelioma is a cancer that occurs in the chest cavity lining or in the lining of the abdominal (stomach) lining. This type of cancer spreads rapidly and is always fatal. Cases of mesothelioma have been found in people who have had a limited exposure to asbestos. The onset of this disease appears to be independent of smoking behavior but related to dose and to time from first known asbestos exposure. Mesothelioma tends to have a long latency period -- usually 30 to 40 years.

Other Diseases -- Several other diseases seem to occur more frequently among people who have been exposed to asbestos. These include cancer of the esophagus, stomach, colon, and pancreas; pleural (fibrous) plaques; pleural thickening; and pleural effusion.

- The most common way for asbestos fibers to enter the body is through breathing
- Asbestos is most hazardous when it is "friable"
- Friable means that the asbestos is easily crumbled by hand pressure, releasing fibers into the air

The risks of contracting any of these diseases make it extremely important that asbestos maintenance workers utilize proper work practices and respiratory protection.

Risks Associated with Low Exposure

While studies of asbestos workers and laboratory animals clearly reveal that asbestos is hazardous, the risks associated with low-level, non-occupational exposure (i.e., an occupant of a building who is not actually disturbing the asbestos) have not been directly demonstrated. Estimating low-level risks from exposure data is not a straightforward process, and the validity of current methodologies is questionable.

Based on a thorough review of the literature available on the health effects of asbestos, the National Institute for Occupational Safety and Health (NIOSH) has concluded that there is no level below which the risks of contracting an asbestos-related disease is zero. This means that there is no established safe level of exposure to asbestos.

When is Asbestos Dangerous?

The most common way for asbestos fibers to enter the body is through breathing. In fact, asbestos containing material is not generally considered to be harmful unless it is releasing dust or fibers into the air where they can be inhaled or ingested. Many of the fibers will become trapped in the mucous membranes of the nose and throat where they can then be removed, but some may pass deep into the lungs, or, if swallowed, into the digestive tract. Once they are trapped in the body, the fibers can cause health problems.

Asbestos is most hazardous when it is friable. The term "friable" means that the asbestos is easily crumbled by hand, releasing fibers into the air. Sprayed on asbestos insulation is highly friable. Asbestos floor tile is not.

Asbestos-containing ceiling tiles, floor tiles, undamaged laboratory cabinet tops, shingles, fire doors, siding shingles, etc. will not release asbestos fibers unless they are disturbed or damaged in some way. If an asbestos ceiling tile is drilled or broken, for example, it may release fibers into the air. If it is left alone and not disturbed, it will not.

Asbestos pipe and boiler insulation does not present a hazard unless the protective canvas covering is cut or damaged in such a way that the asbestos underneath is actually exposed to the air. Damage and deterioration will increase the friability of asbestos containing materials. Water damage,

continual vibration, aging, and physical impact such as drilling, grinding, buffing, cutting, sawing, or striking can break the materials down making fiber release more likely.

Please Remember

Three things seem to determine your likelihood of developing one of these asbestos related diseases:

1. The amount and duration of exposure - the more you are exposed to asbestos and the more fibers that enter your body, the more likely you are to develop asbestos related problems. While there is no "safe level" of asbestos exposure, people who are exposed more frequently over a long period of time are more at risk.

2. Whether or not you smoke - if you smoke and you have been exposed to asbestos, you are far more likely to develop lung cancer than someone who does not smoke and who has not been exposed to asbestos. If you work with asbestos or have been exposed to it, the first thing you should do to reduce your chances of developing cancer is to stop smoking.

3. Age - cases of mesothelioma have occurred in the children of asbestos workers whose only exposures were from the dust brought home on the clothing of family members who worked with asbestos. The younger that people are when they inhale asbestos, the more likely they are to develop mesothelioma. This is why enormous efforts are being made to prevent school children from being exposed.

- ***The risk of asbestos-related disease depends upon exposure to airborne asbestos***
- ***The average airborne asbestos levels in buildings is very low***
- ***Removal is often not the best course of action to reduce asbestos exposure unless proper safeguards are applied***
- ***Asbestos removal is only required during building demolition or renovation projects***
- ***Management of asbestos in-place means having a program to ensure the day-to-day management*** of a building minimizes release of asbestos fibers into the air

Because each exposure to asbestos increases the body burden of asbestos fibers, it is very important to reduce and minimize your exposure.

To put the potential hazard and risk of asbestos exposure in proper perspective, the EPA published the following five facts, which they hope will help calm the unwarranted fears that a number of people seem to have about the mere presence of asbestos in buildings.

Fact One: Although asbestos is hazardous, the risk of asbestos-related disease depends upon exposure to airborne asbestos. In other words, an individual must breathe asbestos fibers in order to incur any chance of developing an asbestos-related disease. How many fibers a person must breathe to develop disease is uncertain. However, at very low exposure levels, the risk may be negligible or zero.

Fact Two: Based on available data, the average airborne asbestos levels in buildings seem to be very low. Accordingly, the health risk to most building occupants also appears to be very low.

Fact Three: Removal is often not a building owner's best course of action to reduce asbestos exposure. In fact, an improper removal can create a dangerous situation where none previously existed. By their nature, asbestos removals tend to elevate the airborne level of asbestos fibers. Unless safeguards are properly applied, a removal operation can actually increase rather than decrease the risk of asbestos related disease.

Fact Four: EPA only requires asbestos removal in order to prevent significant public exposure to airborne asbestos fibers during building demolition or renovation projects.

Fact Five: EPA and OSHA recommend a proactive, in-place management program whenever asbestos-containing material is discovered.

Management of asbestos in-place means having a program to ensure that the day-to-day management of the building minimizes release of asbestos fibers into the air, and ensures that if asbestos fibers are released, either accidentally or intentionally, proper control and cleanup procedures are implemented.

Section 5: Recognizing Asbestos Containing Building Material

While it is often possible to "suspect" that a material or product contains asbestos by visual inspection, actual identification can only be made by microscopic analysis. You can, however, learn what types of material could contain asbestos and use this information to avoid disturbing or damaging "suspect" material. Also learn what is asbestos in your building by reviewing the Asbestos Management plan. The plan is located in the main office of your building.

- It is often possible to "suspect" that a material contains asbestos by visual inspection
- Actual asbestos identification can only be made by microscopic analysis
- Learn what types of material could contain asbestos
- Avoid disturbing or damaging "suspect" material

As was learned earlier, the EPA places Asbestos Containing Building Material in three categories:

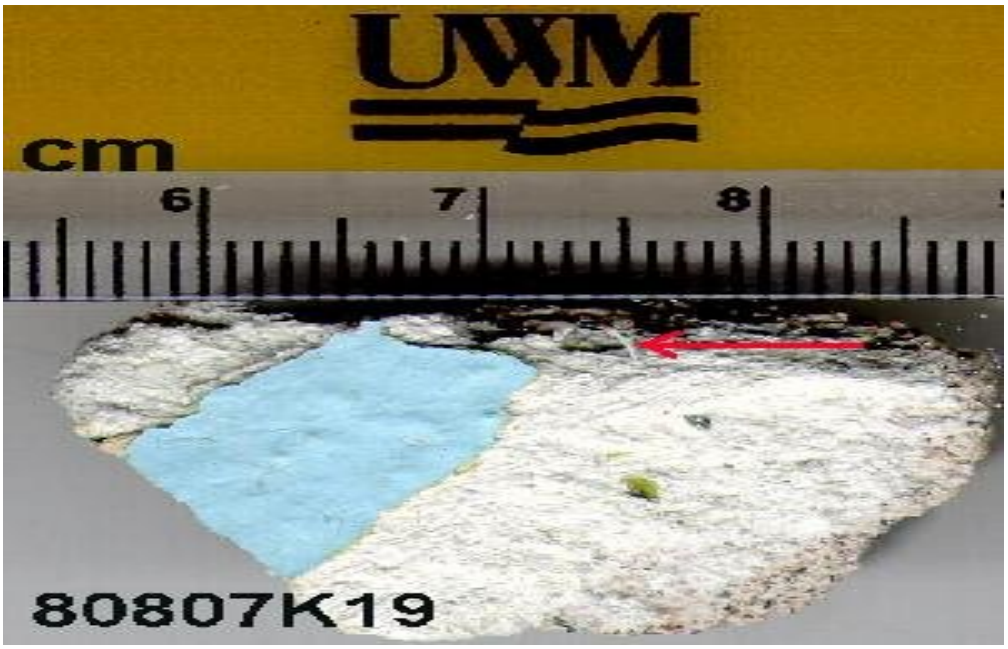
Surfacing Materials -- Interior ACBM that has been sprayed on, troweled on, or otherwise applied to surfaces (structural members, walls, ceilings, etc.) for acoustical, decorative, fireproofing, or other purposes. This includes acoustical plaster, hard plasters (wall or ceiling), fireproofing insulation, spray-applied or blown-in thermal material, joint or patching compound (wall or ceiling), and textured paints or plasters.

Thermal System Insulation -- Insulation used to control heat transfer or prevent condensation on pipes and pipe fittings, boilers, breeching, tanks, ducts, and other parts of hot and cold water systems; heating, ventilation, and air conditioning (HVAC) systems; or other mechanical systems. These insulation materials include pipe lagging, pipe wrap, HVAC duct insulation, block insulation, cements and muds, and a variety of other products such as gaskets and ropes.

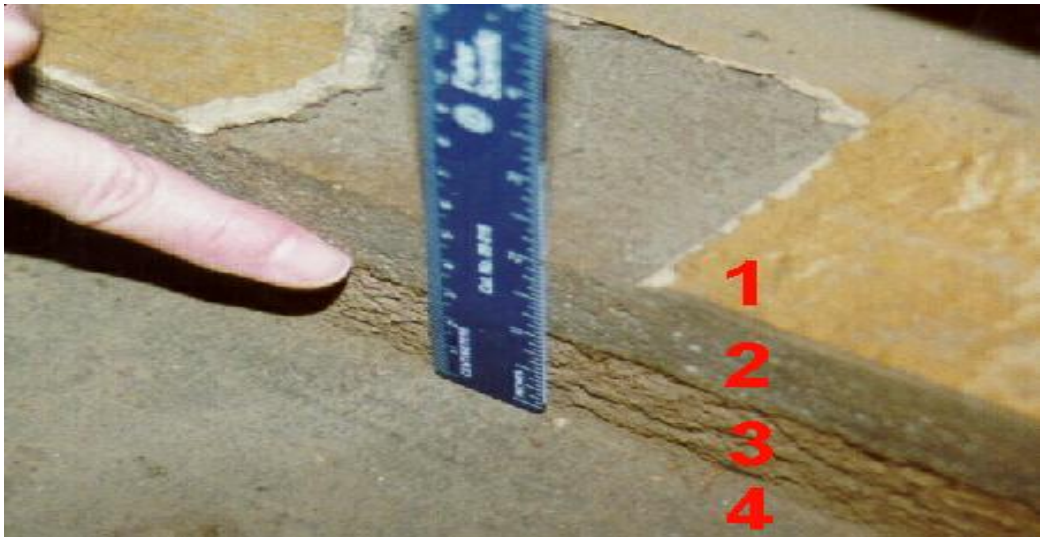
Miscellaneous Materials -- Other, mostly nonfriable products and materials found on structural components, structural members or fixtures, such as floor tile, ceiling tile, construction mastic for floor and ceiling materials, sheet flooring, fire doors, asbestos cement pipe and board, wallboard, acoustical wall tile, and vibration damping cloth. "Miscellaneous materials" do not include thermal system insulation or surfacing materials.

ACBM Examples

Pictured is plaster sample, white finish coat over brown/base coat applied to wire lathe. This 1920s vintage plaster meets the definition of asbestos containing material (ACM), and becomes friable if it is disturbed. Note the visible fiber bundle at 7.5 mm. Many acoustical plasters are also ACM.

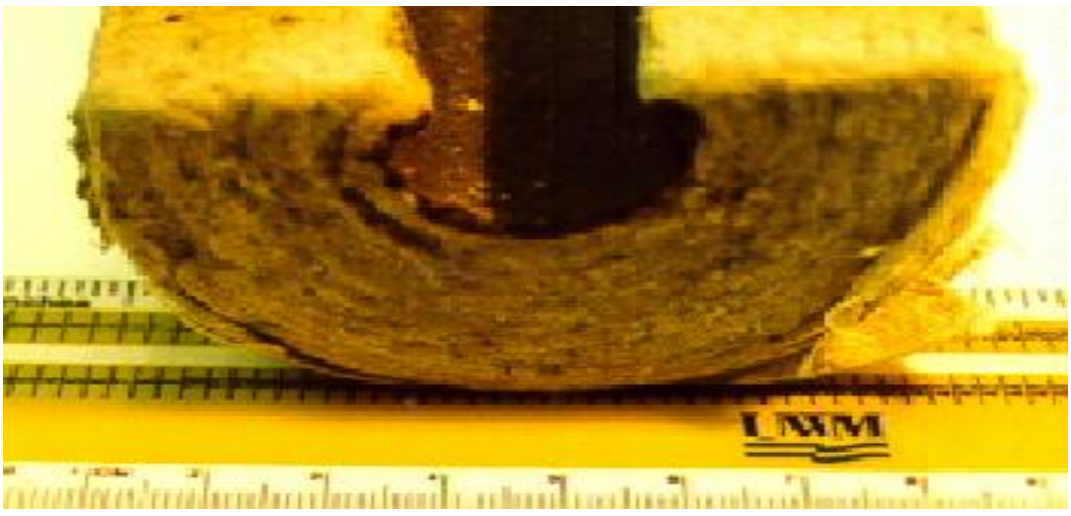


Here is an example of industrial sand floor underlayment and nine-inch asbestos composite floor tile. We believe the purpose of the underlayment was for vibration dampening and noise reduction in this former factory building, built 1914, by the Ford Motor Company. The underlayment is approximately 1" thick. This material contains approximately 10% chrysotile asbestos and is applied directly over concrete. Asbestos floor tile is applied over the underlayment.

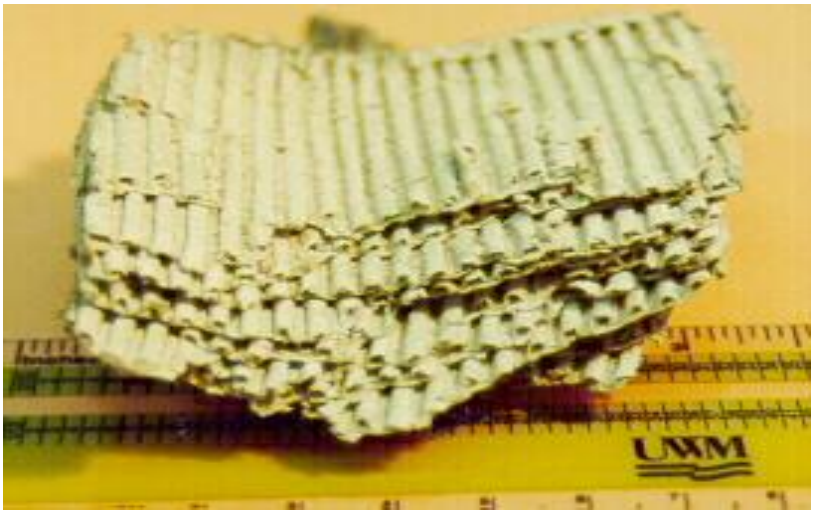


This is an example of highly friable thermal system insulation (TSI). This particular type, often called "mag" insulation, was used to insulate pipes. We normally find mag on high-temperature utilities such as steam or condensate lines. This sample contains both chrysotile and amosite asbestos. This particular sample has long visible fibers, but some mag insulation doesn't. As seen in this photo, mag insulation is highly friable and can result in significant exposure if disturbed.

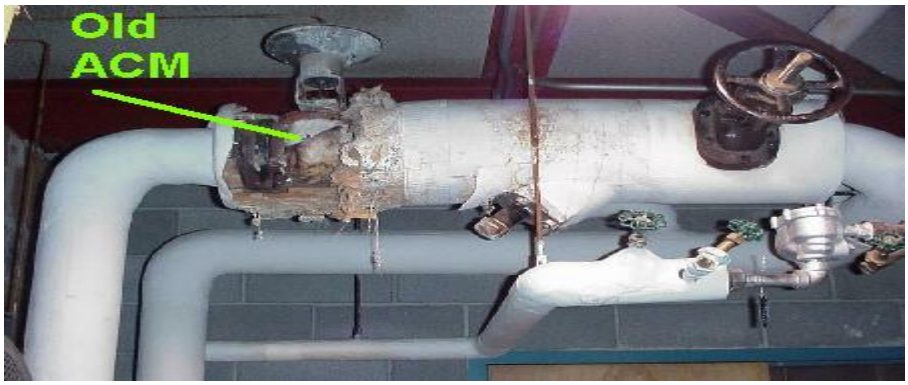
Here is an example of common asbestos thermal system insulation (TSI), similar in appearance to gray, wrapped paper or cardboard.



The gray corrugated, cardboard-like material pictured below is AirCell (or Air-O-Cell) asbestos insulation.



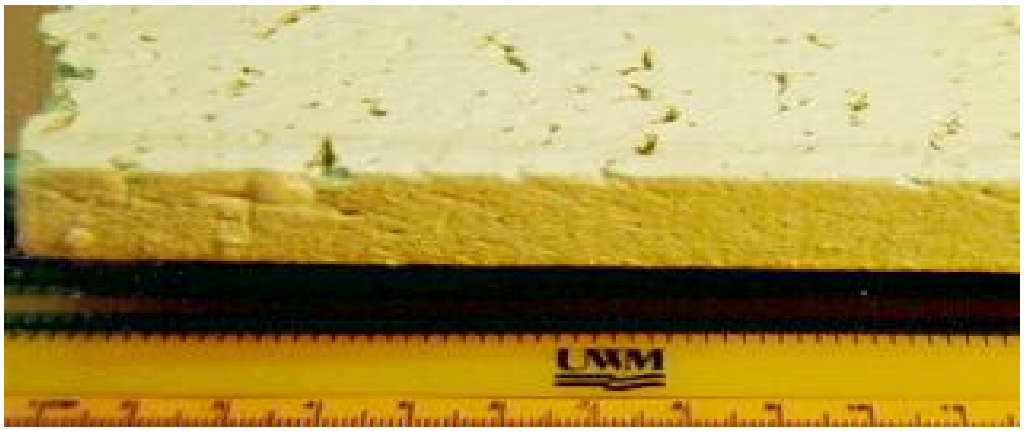
An Instance where new fiberglass insulation was applied directly over existing asbestos insulation. Use caution when working on any unlabeled material, particularly in areas where we have both ACM insulation side-by-side with new insulation. If in doubt, assume the material is ACM.



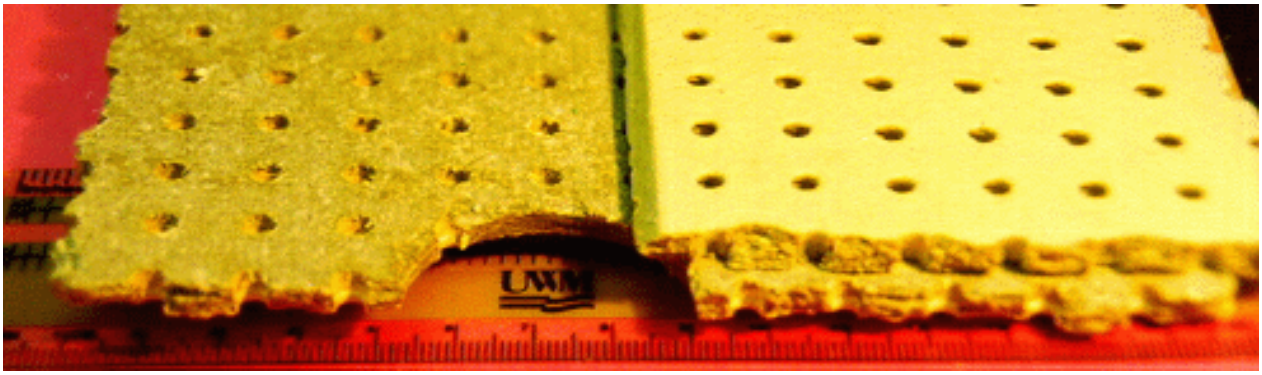
Laboratory ovens, like this muffle furnace, often have asbestos insulation. For example, this small oven has both non-friable transite board and friable ACM insulated electrical wiring (both materials are chrysotile asbestos).

An example of asbestos in a laboratory incubator (door gasket and body insulation).

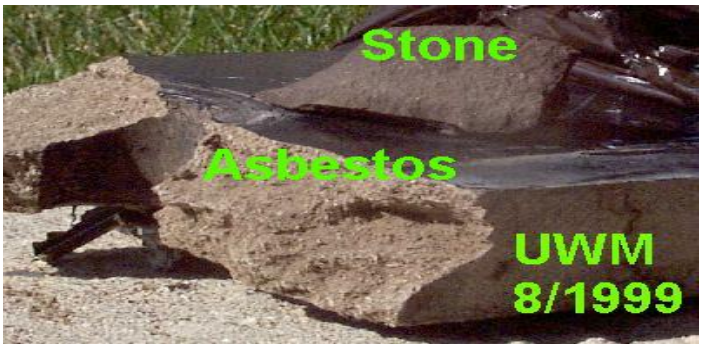
Although rare ceiling tile may also contain asbestos. This tile has both chrysotile and amosite fibers.



This is an example of transite board. This variety is similar in appearance to common pegboard, except transite is usually gray and very dense. The perforated variety is often used in acoustical applications such as in music rooms and auditoriums.



A laboratory bench top (transite) with black laminate surface. Note the visible fibers in the asbestos bench sample. The small sample on top is from a stone bench top. Transite is a Category II waste. Superficially, the transite and stone bench tops look identical due to the black laminate surface.



Recognizing damaged asbestos containing material.

- ***Fallout is the result of aging and degradation of the bonding agents that holds the asbestos product together***
- Impact is the contact of asbestos materials through striking, cutting or penetration
- Reentrainment results from the physical disturbance of settled fibers

There are three conditions that result in asbestos becoming airborne. They are fallout, impact and reentrainment.

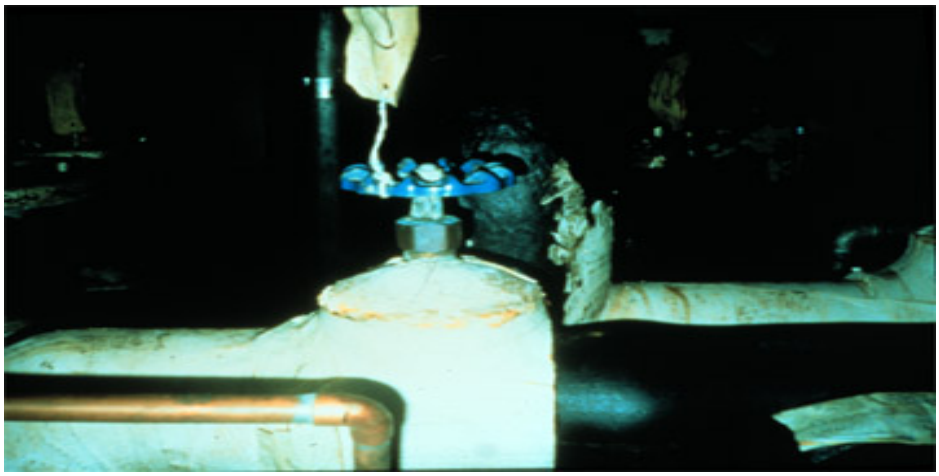
Fallout is the result of aging and degradation of the bonding agents that hold the asbestos product together. Fiber release from fallout is usually low level, continuous, and may increase as the structure ages. Fallout can be a source of fibers, which accumulate on horizontal surfaces overtime.

Impact is the contact of asbestos materials through actions such as striking, cutting or penetration. These actions disturb the integrity of the material, resulting in fiber release. Highly friable forms of asbestos are especially susceptible to impact. Activities such as spraying with adhesives and paints can cause fiber release. Impact causes occasional, but high, concentrations of fiber release.

Reentrainment results from the physical disturbance of settled fibers, causing them to become airborne again. Sweeping; dusting, and other normal building activities can result in reentrainment of fallen asbestos fibers. Reentrainment can result in fiber release that may vary from low to high airborne concentrations. If water damage, physical damage or delamination of the material is observed, then fiber release has occurred, is occurring or will likely occur in the future. Fibers that are released into an air stream, such as in an air plenum or near a forced air stream are likely to be transported to other parts of the building. Materials subjected to noise or vibration such as those located in gymnasiums, band rooms or in buildings near highways or airports may have a higher potential to release asbestos fibers.

Examples of Damaged ACBM:

Pipe Mud Packing. Asbestos was used in this instance and it has begun to crack and release fibers. ***Unless you have received the full 16-hour O&M course training you cannot clean up or repair material and only less than 3 linear feet of material that contains asbestos.***



This picture shows a significantly damaged pipe joint on a steam pipe. The pipe is also insulated with asbestos air cell insulation that looks like corrugated cardboard on the edges. Asbestos insulation on heating pipes is often held in place by metal bands as seen in the picture below.

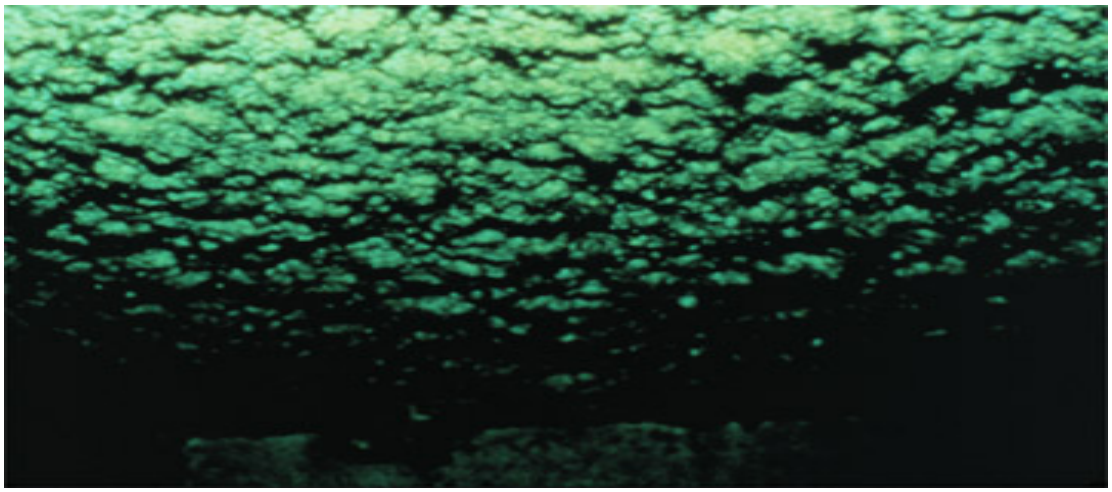
This picture also shows asbestos mud joints that are significantly damaged. This pipe is also insulated with asbestos air cell insulation. Most pipes wrapped in asbestos also have asbestos containing joints.

Paper Insulation. If you find material in this condition, and pieces of asbestos paper on the floor, immediately leave the area and report it to a supervisor. Most of this pipe covering is in good condition, but there are some damaged areas. When these areas are repaired, the pipe is then considered to be in good condition, and there should not be any release of fibers. While the pipe is still damaged, only those personnel with the appropriate training will be allowed to repair or clean up around the pipe.

AHERA Classification: Damaged Thermal Insulation.

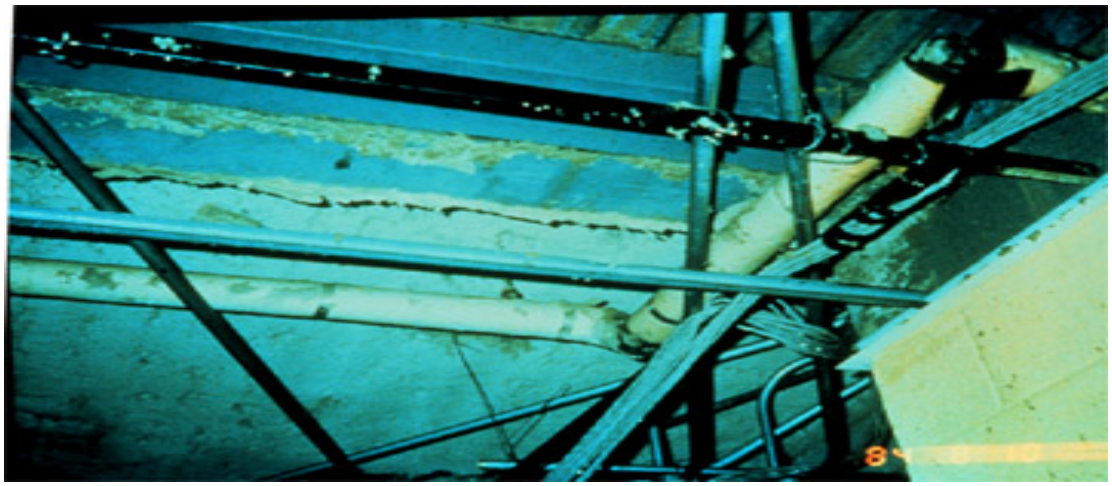
Sprayed-on Ceiling. Asbestos is often found on ceilings as a sprayed-on material. Generally, this material is friable. If it is encapsulated or has a hard coating, it does not represent a hazard unless disturbed. You may work around this type of material, however, do not hang displays or flower pots, etc. from it.

AHERA Classification: Potential for Significant Damage (because of occupancy and use.)



Sprayed-on Insulation. The ACBM sprayed on the pipes and ceiling in this slide shows water damage and delamination. ***Again, only personnel who have received the 16 hour O&M training may clean-up the disturbed asbestos containing building material debris.*** Instead, the LEA contact person should be notified immediately.

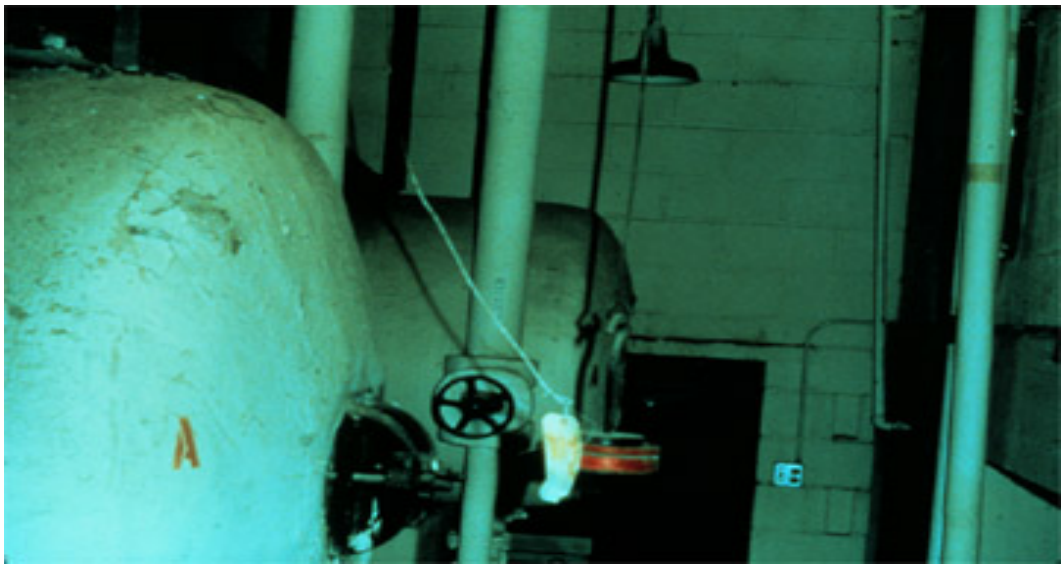
AHERA Classification: Significantly Damaged Surfacing Material.



Sprayed-on Insulation. Here is an example of friable asbestos sprayed-on ceiling beams as fireproofing. Notice where the asbestos is hanging loose. This is very friable.

Insulation on a Boiler .It has been estimated that one out of every four boilers installed before 1970 contains asbestos. Generally, if the boiler is coated with asbestos then so are the boiler pipes. Usually the insulation on boilers is two to six inches thick and contains chicken wire or some other for structural support. Repair of this material or the cleaning of ACM debris must be done by properly trained O&M personnel.

AHERA C1assification: Damaged Thermal Insulation.



Section 6: Six Month Periodic Inspections

- Know where the asbestos is in your building-refer to the Management Plan
- Check asbestos material condition every 6 months & document
- Take the right action to reduce your risk of asbestos exposure

A visual inspections of asbestos is required every six months. Custodial and maintenance personnel with the proper asbestos awareness training are qualified to conduct visual inspections. Please note, visual inspection means that you look carefully at the ACBM for any possible damage or deterioration, but you are not to repair or touch any damaged material. Damage ACBM should be reported to your supervisor.

During the inspection, look for materials that are deteriorating in condition. Evidence of debris on horizontal surfaces, hanging material, dislodged chunks, scrapings, indentations and cracking are indicators of poor material condition. Look for areas of accidental or deliberate physical damage where Asbestos Containing Building Materials (ACBM) have been disturbed such as: finger marks in the material, graffiti, pieces of missing or dislodged material, scrape marks from movable equipment or furniture, and an accumulation of friable materials on the floor, shelves or other horizontal surfaces.

Look for deterioration resulting in the accumulation of dust on the surface of the ACBM, delamination of the material, or an adhesive failure where it pulls away from the substrate. Inspect the materials for water damage, such as discoloration of or stains on the ACBM or the adjacent walls or floors. Look for buckling of the walls or floors and areas where pieces of ACBM may have separated into layers or may be failing down and exposing the substrate.

By taking the right action you can reduce the risk of exposure to asbestos. Know where the asbestos is in your building. If you find materials that could contain asbestos, recommend to your supervisor that they be tested. Ask your supervisor for training in proper ways to work around asbestos materials. If you see materials that have been disturbed, report the damage to your supervisor. If the cleaning or maintenance in your building is not being done properly, see that it is corrected. Maintenance personnel with the 16 hour training ought to keep on hand items that are useful for working on or around asbestos materials. These include: disposal bags, respirators, tools for working on insulation, disposable coveralls, water bottles for misting filters, etc., glove bags.

You can "suspect" that material contains asbestos but only through microanalysis can asbestos be identified. The best way to recognize ACBM is to: learn what material is most likely to contain asbestos, read the Asbestos Management Plan to learn where actual ACBM is located in your work place.

If you find damaged ACBM, do not attempt to repair or clean up the spill. Only maintenance personnel who have had the 16 hour O&M training may clean up or repair damaged asbestos material.

Section 7: How to Avoid Asbestos Exposure

In order to avoid being exposed to asbestos, you must be aware of the locations it is likely to be found. If you do not know whether something is asbestos or not, assume that it is until it is verified otherwise. Remember that you cannot tell if floor or ceiling tiles contain asbestos just by looking at them.

If you have reason to suspect that something is asbestos, either because it is labeled as such, or because it is something that is likely to contain asbestos (9" floor tile, for example) DO NOT DISTURB IT.

Never: drill, hammer, cut, saw, break, damage, move, disturb, or poke any asbestos-containing materials or suspected materials.

- Never drill, hammer, cut, saw, break, damage, move, disturb, or poke any asbestos-containing materials or suspected materials
- Train all custodial and maintenance workers to safely care for asbestos-containing floors

Survey all buildings for the presence of asbestos. If you need to do work that might involve asbestos (lifting ceiling tiles, repairing insulated pipelines, etc.), check with your supervisor to find out what can be done safely.

For example, before moving any ceiling tiles to perform maintenance work, it will be necessary to ensure they do not contain asbestos. If they do contain asbestos, they will need to be removed by licensed asbestos abatement workers before the work may be performed.

Custodial and maintenance personnel who are responsible for the care and maintenance of asbestos containing floor coverings should be thoroughly trained to safely and properly operate the machines, pads and floor care chemicals used at the facility. Stripping of vinyl asbestos floor coverings should be done as infrequently as possible (e.g., once per year maximum and preferably when the building is unoccupied). Excessive stripping of floors using aggressive techniques will result in increased levels of asbestos fibers in the air. Prior to machine operation, apply an emulsion of chemical stripper in water to the floor. Use a mop to soften the wax or finish coat.

When stripping floors becomes necessary, the machine used for stripping the finish should be equipped with the least abrasive pad as possible (black pads are usually the most abrasive and the white pads the least abrasive). Consult with your floor tile and floor finish product manufacturer for recommendations on which pad to use on a particular floor covering. Incorporate the manufacturer's recommendations into your floor maintenance work procedures. The machine used to remove the wax or finish coat should be run at a low rate of speed (i.e., ranging between 175-300 rpm) during the stripping operation. There is a direct correlation between machine speeds and the release of asbestos fibers from asbestos containing floor coverings. The higher the machine speed the greater the probability of asbestos fiber release. Never perform dry stripping. Always strip floors while wet. Do not operate a floor machine with an abrasive pad on unwaxed or unfinished floor containing-asbestos materials. Consult with floor tile and floor finish product manufacturers concerning specific or unique problem(s) on the maintenance of your floors.

After stripping and before application of a high solids floor finish, the floor should be thoroughly cleaned, while wet, preferably with a Wet-Vac HEPA filtration vacuum system.

Prior to applying a finish coat to a vinyl asbestos floor covering, apply 2 to 3 coats of sealer. Continue to finish the floor with a high percentage solids finish. It is an industry recommendation to apply several thin coats of a high percentage solid finish to obtain a good sealing of the floor's surface, thereby minimizing the release of asbestos fibers during finishing work.

When spray-buffing floors, always operate the floor machine at the lowest rates of speed possible and equip the floor machine with the least abrasive pad as possible. A recent EPA study indicated that spray-buffing with high-speed floor machines resulted in significantly higher airborne asbestos fiber concentrations than spray-buffing with low speed machines.

When dry-burnishing floors, always operate the floor machine at the lowest rate of speed possible to accomplish the task (i.e., 1200-1750 rpms), and equip the floor machine with the least abrasive pad as possible.

After stripping a floor and applying a new coat of sealer and finish, use a wet mop for routine cleaning whenever possible. When dry mopping, a petroleum-based mop treatment is not recommended for use.

During the winter months when sanding and/or salting of icy parking lots becomes necessary, it is an industry recommendation that matting be used at the entrance way to the school building and inside the doorway where feasible. This would significantly eliminate the scuffing of floors by abrasive sanding materials brought into the building on the shoes of building occupants. More frequent wet mopping and dry mopping of floors should be performed during the winter months to minimize damage to the floors.

Check to see if chair and desk glides are in good condition and replace where indicated. Worn glides can gouge the floor coverings and possibly cause asbestos fiber release.

During the winter months, have parking lots and walkways swept to avoid tracking salt and ice-melting compounds into the school by students. These materials can cause severe scuffing of floor coverings and lead to the release of asbestos fibers into the school building(s).

Where feasible, use mats at entrance ways to cafeterias, gymnasiums, libraries, etc., to protect against possible scuffing of floor covering(s), etc. from salt and ice-melting compounds and from ocean sand.

Broken and fallen ceiling tiles should be left in place until identified. Only after they have been identified as safe may they be removed. Asbestos tiles will be removed by asbestos abatement workers.

Broken and damaged asbestos floor tiles must also be removed by asbestos abatement workers.

It is important to report any damaged asbestos-containing materials to your supervisor immediately. If, for example, you discover some sprayed-on asbestos insulation has been knocked off a ceiling or wall, this would be considered a "spill." As such it would need to be cleaned up immediately by asbestos abatement workers. Do not attempt to clean up spills yourself! Disturb the material as little as possible. Also report any damaged pipe insulation, ceiling tile, 9" floor tile, fallen clumps of sprayed-on insulation, etc. Take measures to prevent others from disturbing the spill until the Asbestos Abatement crew arrives.

By knowing where asbestos is likely to be located and then taking measures not to disturb it, you will protect yourself and others from exposure to this hazardous substance.

PROTECTING YOURSELF FROM ASBESTOS

Some of the friable building materials in your school contain asbestos. Friable asbestos-containing materials crumble easily and release fibers into the air. Breathing these fibers may cause cancer and other diseases. The more asbestos you breathe the greater your chances are of getting disease. You can take precautions that will reduce or eliminate the risk of being exposed to asbestos.

- Custodians with the two hour training are not qualified to work on or cleanup asbestos
- Only licensed contractors can remove or disturb more than 3 square or 3 linear feet
- Always check with your Designated Person/supervisor before you do anything

Find out from your supervisor where these friable asbestos containing materials are in your building. Do not touch or disturb them unless you have to. If you must handle an asbestos-containing material, first lightly spray it with water. (EPA recommends using water which contains wetting agents, if they are available.) Wet asbestos-containing material will not release as many fibers.

Even if friable asbestos-containing materials are not disturbed, they may release asbestos fibers, which will fall slowly to the floor. If you are cleaning in areas which contain these materials, do not use a broom it will stir fibers into the air.

Do not use a vacuum cleaner unless it is equipped with a High Efficiency Particulate Air (HEPA) filter. The fibers are so small they can pass through an ordinary vacuum cleaner and out into the room.

When cleaning in areas which contain friable asbestos-containing material, use dampened mops and dustcloths. Dampened mops and dustcloths will hold the fibers much better than dry mops and dustcloths, and will reduce the number of fibers put back into the air. It is best to use mops with disposable heads and to throw away the mop head after use. Otherwise fibers will be released as the mop dries. Use either lightly dampened mops or cloths or a vacuum with a High Efficiency Particulate Air filter to clean areas where wet mopping cannot be used (such as carpeting or hardwood floors).

Clean tables and chairs in the area with damp cloths. Do not dust them with brushes or with dry cloths, and do not vacuum them. After you use the mop heads and cloths, put them in a plastic bag while they are still wet. Dislodged materials should also be placed in plastic bags for disposal.

A LIST OF IMPORTANT POINTS TO REMEMBER

1. Custodians with the two hour training are not qualified to work on or cleanup asbestos.

2. Do not handle or disturb friable asbestos-containing materials unless necessary.

3. If you must handle asbestos-containing materials, wet them first.

4. If you must disturb asbestos (for example, to repair a light), see your supervisor before starting work. Then:

- Place a plastic dropcloth below the work area
- Spray asbestos-containing material with water before you disturb it.
- Make sure that only those persons who are necessary for the job are in the area.
- Put all the asbestos you remove into a heavy plastic bag. Seal the bag and discard it.

- After the job, clean all the ladders and tools you used with a wet cloth.
- Roll up the drop cloth carefully and put it in a plastic bag. Discard the bag.
- Clean the floor below the work area with a wet mop.
- Put the mop head and the cloth used to clean the ladders in a plastic bag while they are still wet, seal the bag, and discard it.

If you must disturb or remove large sections of asbestos-containing material, see your supervisor before you begin. Only licensed asbestos abatement contractors can disturb or remove asbestos containing materials in amounts greater than 3 square/linear feet.

Section 8: Federal and State Regulations

Concerning asbestos, public and private schools in Maine are regulated by the Environmental Protection Agency and the State of Maine DEP. On October 22, 1986, Congress promulgated the Asbestos Hazard Emergency Response Act (AHERA), Public Law 99-519. AHERA mandated that EPA develop regulations to respond to asbestos in schools. On October 30, 1987, EPA promulgated the Asbestos-Containing Materials in Schools Rule (hereinafter referred to as the AHERA Rule), 40 CFR Part 763, Subpart E. This rule requires that all of the nation's nonprofit elementary and secondary schools, both public and private, inspect their school buildings for asbestos-containing building materials (ACBM), develop a plan to manage the asbestos for each school building, notify parents and staff regarding management plan availability, provide asbestos awareness training to school maintenance and custodial workers, and other requirements.

The governing authority responsible for AHERA compliance is the Local Education Agency (LEA). "Local Education Agency" means either any local educational agency as defined in Section 198 of the Elementary and Secondary Education Act of 1965 (often called school district), the owner of any private, non-profit elementary or secondary school building, or the governing authority of any school operated under the Defense Department's education system.

- AHERA applies to schools
- EPA Worker Protection Rule applies to school employees who repair, remove, or disturb friable asbestos as part of their work
- OSHA Asbestos Standard specifies how much asbestos a worker can be exposed to
- NESHAPS is designed to prevent visible emissions of asbestos when buildings are renovated or demolished
- MEDEP regulates asbestos abatement activities in Maine

We are regulated by AHERA, Workers Protection Rule, NESHAPS, and the Maine Department of Environmental Protection (MDEP). Below is a synopsis of what the varying regulations require.

EPA Asbestos Hazard Emergency Response Act (AHERA). AHERA applies only to schools. This law requires schools to:

1. Inspect buildings for asbestos by October 12, 1988:

    - EPA-accredited inspector must identify all asbestos and determine its condition.
    - EPA-accredited management planner must develop management plan with protective measures.
    - Repair or remove any asbestos that presents a health hazard, take steps to maintain any remaining asbestos in good condition.
    - Provide employee training.
    - Inform employees and parents of steps the school is taking to protect people from the asbestos.

2. Reinspections every 3 years since original management plan went into effect (July 9, 1989):

    - Inspector must re-inspect all known and assumed asbestos and determine its condition.

- Management planner must recommend protective measures.

3. Management Plan & Response Actions:

- Schools must make the management plan available for public inspection and implement protective measures in a timely manner. Protective measures include: removal, encapsulation, enclosure, repair and develop an Operations & Maintenance Plan

4. Annual Notification:

- School must notify employees and parents annually that the management plan is available for inspection and whether any asbestos related activities are planned for the year.

5. Short-Term Worker Notification:

- School must notify short-term workers (utility repairmen, contractors, etc.) of the location of asbestos in buildings.

6. LEA Designated Person:

- School must designate an employee to be responsible for implementing the management plan.
- Designated Person must receive adequate training to perform the duties required under AHERA

7. Training:

- School must provide 2-hr asbestos training to custodial and maintenance employees who work in buildings that contain asbestos, and an additional 14-hr training to employees who will disturb asbestos.
- Training for custodial & maintenance staff shall include the location of ACBM identified throughout each school building in which they work

8. Periodic Surveillance:

- Every 6 months, school must check condition and document all known and assumed asbestos.

9. Record keeping:

- School must maintain detailed records of asbestos-related activities.

10. Warning Labels:

- School must attach warning labels adjacent to asbestos in routine maintenance areas (such as boiler rooms).

EPA Worker Protection Rule 40 CFR 763.121 (App. B to Subpart E for small-scale, short duration). This law is based on OSHA regulations. This law specifies how much asbestos a worker can be exposed to; various workplace practices; medical monitoring; worker protection and training requirements. The law only applies to school employees who repair, remove, or otherwise disturb friable asbestos as part of their work. It does not apply to custodial employees who only clean or work in the vicinity of asbestos.

1. Permissible Exposure Limits. Specifies how many asbestos fibers an employee can be exposed to, based on samples of air at the worksite. Current PEL is 0.2 fibers per cubic centimeter of air, based on measurements taken over an 8 hour time period. What does this mean? If you are working at a moderate pace and have healthy lungs, you are breathing about 25 liters of air per minute. If you are exposed to the PEL of 0.2 f/cc for 8 hours, you will inhale over 2 million asbestos fibers. SAME SIZE AS A DROP OF WATER.

2. Respiratory Protection, Medical Monitoring, Training, Know Your Rights. EPA enforces strict procedures to protect employees when they disturb asbestos: Employees must wear respirators and protective clothing when disturbing asbestos. School must enclose and restrict access to areas where asbestos work is taking place. Employees must follow special work practices and use various controls when performing asbestos work. Employees must follow special decontamination procedures before leaving an asbestos work area. The asbestos work area must be cleaned using special procedures after the work is finished. School must provide special training to employees who disturb asbestos. Employees must be provided with annual medical examinations. Schools must keep detailed records of asbestos repair and removal jobs. There are certain exemptions to these rules depending on the amount of asbestos being disturbed (< 3 ft.).

National Emissions Standards for Hazardous Air Pollutants (NESHAPS). NESHAPS is designed to prevent "visible emissions" of asbestos when buildings are renovated or demolished. This law applies to state and local government, private businesses, etc. Before a building is renovated or demolished, it must be inspected for asbestos.

EPA and state agencies (**MDEP**)must be notified before a building is demolished (whether or not asbestos is present) or renovated (if friable asbestos is present). Asbestos must be removed according to special methods. For instance, asbestos is usually wetted to control the release of fibers during demolition and renovation. Asbestos must be disposed in leak tight containers while wet. Containers must be marked with special EPA labels. Waste must be buried within 24 hours.

Section 9: Asbestos Awareness Test

In order to get credit for taking the Asbestos Awareness Training you must:
1. Complete this quiz and give a copy to your when complete for approved 2 hour training class
2. Have your supervisor show you where asbestos (ACBM) is located in your building

Name:_____ Building Assigned:_____

Date:_____

Asbestos Awareness

1. Most older buildings will contain some asbestos. List three places it is likely to be found.

2. If you suspect a material contains asbestos, you should NEVER:

   A. Sand it

   B. Cut it

   C. Drill through it

   D. All of the above

3. Asbestos fibers are so small they may stay suspended in air for hours or even days.

   A. True

   B. False

4. Which source of asbestos is the most friable?

   A. Sprayed-on insulation

   B. Undamaged ceiling tiles

   C. Floor tiles

   D. Lab counter top

5. Given moderate exposure to asbestos, smokers have the same chance of developing an asbestos related disease as non-smokers.

A. True

B. False

6. Asbestos-containing ceiling tiles, floor tiles, shingles, and siding will not release asbestos fibers unless disturbed or damaged in some way.

A. True

B. False

7. If you accidentally knock off a chunk of sprayed-on asbestos insulation, you should:

A. Carefully sweep it into a ziplock bag

B. Leave it for the Head Custodian to clean up

C. Report it to your supervisor immediately

D. Get a HEPA vacuum and clean it up

8. Name two asbestos related diseases.

A.

B.

9. Three things seem to be important in determining your likelihood of developing an asbestos related disease. These are:

A. Smoking / amount and duration of exposure / sex

B. Type of asbestos mineral to which you are exposed / smoking / age

C. Age / smoking / amount and duration of exposure

D. None of the above

10. There is no evidence to suggest that working with asbestos is harmful.

A. True

B. False

Answer Key

1. Yes older building may contain asbestos' pipes, floor tiles, ceiling tiles, mastic, insulation, wall board, curtains

2. D all of the above

3. True

4. A sprayed on

5. False they have a higher chance

6. True

7. C Report it immediately

8. Asbestosis -- Asbestosis is a disease characterized by lung scarring, Macrophages normally engulf small particles in the lung. Lung Cancer -- As with asbestosis, there appears to be a dose-response relationship between asbestos exposure and lung cancer. Mesothelioma -- Mesothelioma is a cancer that occurs in the chest cavity lining or in the lining of the abdominal (stomach) lining.

9. C

10. B False

Guidelines for Maintenance of Floors with Asbestos-Containing Vinyl Tiles

Floor tiles often contain asbestos. Because of this, you must perform routine floor care very carefully so you don't cause asbestos fibers to get into the environment. Follow these guidelines to reduce the chance of releasing asbestos during your floor maintenance activities.

Stripping Vinyl Asbestos Floor Tiles

Strip the floor as few times as possible.

Only strip the floors when the building is not occupied (during the summer and other vacation periods).

Before you begin, make sure you thoroughly understand how to operate the machines. Know which pads are for which types of floor-care maintenance operations.

First, apply a compatible floor finish remover or stripper with a mop. Allow enough time for the stripper to liquefy the finish. (Make sure you know how to safely handle the different chemical products used in this activity. If you have any questions or problems, consult with your floor finish products manufacturer for advice.)

Always strip the floor wet. Scrub the floor using the least abrasive pad or brush possible. Generally the black pads are the most abrasive, the white pad the least abrasive. Run the machine at a low rate of speed (175-300 rpm's).

Use a wet vacuum, preferably one equipped with a HEPA filtration system, to thoroughly clean the floor and remove the old wax and finish.

If necessary, repeat this operation until all the existing finish is removed.

Thoroughly rinse the floor after all existing finish is removed.

Finishing Your Asbestos Floor Tile

Applying a Sealer

If you can, apply two or three layers of a good sealer to the tiles before you apply your finishing coat. This helps to keep contact with the floor tiles to a minimum during future floor maintenance activities.

Applying the Finisher

Again, apply several thin coats of a good finisher. Allow each coat enough time to cure and dry before applying the next coat.

Dry Buffing the Floor

Make sure your floors are well sealed and /or finished before you begin. Run the machine used to buff the floor at a lowest rate of speed possible (300-1100 rpm's).

Maintaining Your Floor Tiles

Routine Cleaning

Use a wet mop for routine cleaning whenever possible. If you do dry mop, don't use a petroleum-based mop - it eats away at the wax.

Spray Buffing

Whenever you spray buff with a polishing or rejuvenator liquid, use the least abrasive pad possible. Run the floor machine at a lowest rate of speed possible to get the job done (175-300 rpm's).

Wet Scrubbing
Whenever you wet scrub the floor with a neutral cleaner or water, use the least abrasive pad possible. Run the floor machine at a lowest rate of speed possible to get the job done (175-300 rpm's). Use a wet vacuum, preferably one equipped with a HEPA filtration system, to pick up the resulting liquid. After the floor is dry, re-coat it with a compatible finish.

The Three Main Points to Remember

- **Use the least abrasive pads you can.**
- **Operate the floor machine at the lowest rate of speed as possible.**
- **Use a wet vacuum equipped with a HEPA filter to pick up liquids resulting from floor maintenance activities.**

And finally…….Be sure to follow the manufacturer's recommendations when using any floor cleaning and finishing products.