AN INTRODUCTION TO ASBESTOS FOR STAFF OF FACILITIES MANAGEMENT

Environmental Health & Safety Office
www.dal.ca/safety

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DALHOUSIE UNIVERSITY
Inspiring Minds

Preventing Asbestos Disease

1. Do not work with loose asbestos without training, authorization and without taking precautions to prevent release of fibres that might expose you or others to airborne fibres.

2. Do not damage or remove any pipe wrapping without authorization from your supervisor.

3. Do not cut, sand, drill or break products that contain asbestos including asbestos cement insulation, asbestos cement board, asbestos cement tiles, vinyl asbestos tiles, or plaster in some Dalhousie buildings.

4. To clean up in areas where asbestos dust may be present, use a wet mop to prevent the fibre from becoming airborne or use a HEPA vacuum cleaner. HEPA filters are high efficiency filters that trap even the fine particles that pass through the filter of a normal vacuum.

5. Exercise care in areas where asbestos is (or is likely to be) present including:

   : boiler or furnace rooms, around boilers, furnaces or heating pipes or other heating equipment
   : above the drop ceiling or on the steel beams in CSB
   : in electrical workshops, laboratory fume hoods or walls in Tupper

6. If you unexpectedly encounter asbestos or an asbestos containing material, avoid any work that could create an airborne dust. Report the situation to your supervisor immediately.

7. Wear protective clothing and a respirator in situations where asbestos exposure can be expected.

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INTRODUCTION

Asbestos is the name of a family of naturally occurring minerals that consist of silicates (chemical fragments of silicon and oxygen - a very common component of many minerals) and varying amounts of aluminum, calcium, iron, magnesium, manganese, potassium, and sodium. Each asbestos mineral forms long, thin needle-like fibres.

1. Types of Asbestos

There are three members of the asbestos family that are commercially important.

1.1 CHRYSOTILE - WHITE ASBESTOS

Canada has a long history as a major producer of chrysotile asbestos. The fibres of this type of asbestos are long and thin and tend to splinter to form progressively thinner fibres. Fibres are usually white but sometimes they show a greenish tinge. Chrysotile asbestos often has a waxy texture.

Chrysotile fibres are strong and flexible. Although they resist chemical attack by caustics, white asbestos fibres are not as resistant to acids as some other types of asbestos. White asbestos fibres do not conduct electricity or heat and are unaffected by temperatures up to 500°C.

1.2 CROCIDOLITE - BLUE ASBESTOS

South Africa is a leading producer of crocidolite. Fibres are long and tend to be thicker and more brittle than chrysolite. Because blue asbestos is quite resistant to acids, it has been used in making acid-resistant water pipe and battery cases and other applications where acid resistance is important.

1.3 AMOSTITE - BROWN ASBESTOS

Amosite asbestos has a noticeable brown colour. The fibres are more brittle than white or blue asbestos and working with brown asbestos is often dusty. Consequently, work with brown asbestos can be particularly hazardous. Amosite's primary use is insulation.

Other members of the asbestos family include several forms of talc.

2. Properties of Asbestos

Asbestos has many properties that have made it very attractive in many industrial applications. Generally asbestos is:

: stable,
: unaffected by heat and does not burn,
: mechanically strong,
: resistant to chemicals including acids and caustics,
: an electrical and thermal insulator,
: flexible (some forms can be spun into yarn or cord or woven into fabrics), and
: available in large quantities at low prices.

With the discovery that exposure can cause disease, the use of asbestos has declined dramatically over the past forty years. Not only has there been a decrease in the volume of it in present use, asbestos is no longer used in many of its former applications that provided opportunities for asbestos exposure. However, asbestos is still present in products that present low exposure risks.

However, because the mineral is indefinitely stable and has been widely used, problems can arise because of asbestos usage that took place years ago.

3. Hazards of Asbestos

Asbestos is only a concern when the fibres become airborne. It is only when the fibres are present in the air that people can inhale them.

Although there have been concerns raised about taking in asbestos fibres in food or water, there is no evidence that ingestion exposure to asbestos poses any risk. Neither is skin contact a concern. Some types of asbestos can cause skin irritation. But skin contact with asbestos is not a direct cause of serious illness.

Only inhalation of asbestos fibre presents a health hazard. If asbestos fibre is loose or you can crush it by hand, the risk is high that the fibre can get in the air. In such cases, a serious health risk might be present particularly if a person were to be exposed to a lot of dust or be exposed over a period of years. Asbestos that can be easily broken or crushed is called friable asbestos. In contrast, when asbestos is present in products where the fibres are effectively bound, there is normally no hazard. However, drilling or cutting can free fibres even from these bound products. Under such situations, even tightly bonded asbestos-containing materials can present a hazard.

The human respiratory system has evolved ways to deal with inhaled dusts. The body can remove the large dust particles that become trapped in the upper parts of the respiratory system. And in addition, the body has other ways to capture and remove the very finest dust particles that can reach well down into the lungs. Unfortunately, the body's systems that clear dust from deep within the lungs do not work very well with asbestos. This poor performance of our deep lung dust clearing systems may be partially responsible for the illnesses that asbestos fibres cause.

As with almost any disease, individuals have differing sensitivities. So it is not possible to predict who will develop an asbestos disease and who will not. But we know that the risk of contracting an asbestos-related disease increases as the exposure increases. So on average, high dust levels are more hazardous than lower dust levels. And prolonged exposure is more dangerous than brief exposure. Some asbestos diseases do not appear until many years after the first exposure.

The principal asbestos diseases are:

3.1 ASBESTOSIS

When asbestos fibres penetrate deeply into the lung, they produce a scar-like condition called fibrosis. Once the condition advances

sufficiently, the lung scarring shows up on chest X-rays. Asbestos is not the only material that causes fibrosis. Quartz (or crystalline silica), coal dust, cotton and several other dusts also cause similar effects. If the person showing the signs and symptoms of fibrosis also has a work history that shows appreciable asbestos exposure, a specialist may diagnose the condition as asbestosis.

The scarred lung tissue is less flexible than normal, healthy tissue. As a result, the asbestos-damaged lung is less able than a healthy lung to exchange oxygen and carbon dioxide. Once the scaring begins, the disease is irreversible and progressive. Even if the asbestos exposure stops, the disease will progress.

Symptoms of asbestosis include lung "tightness", shortness of breath and fatigue. People with severe cases may even experience shortness of breath when at rest. Victims of asbestosis often develop other problems related to the deficient respiration.

Asbestosis usually only occurs in people with a work history of quite heavy asbestos dust exposure that lasted over a period of years. So asbestosis has been a risk for people who work in:

- asbestos mining and milling industry,
- mining or quarrying of asbestos or rock that contained asbestos present in the rock as a contaminant,
- manufacturing asbestos cloth, brake linings and other asbestos products, and
- installation of asbestos insulation.

Others, whose work disturbed asbestos in confined and poorly ventilated spaces, such as inside the holds of ships, have also been at risk of developing asbestosis.

Governments have set regulations that limit the amount of asbestos in air to which a worker may be exposed over an 8 hour day and a 40 hour week. Until 10 or 15 years ago, these limits were set to protect people from asbestosis. More recently, government agencies have reduced the allowable levels to try to protect people from other asbestos-related diseases. Specialists believe that current exposure limits are low enough to prevent asbestosis.

3.2 LUNG CANCER

Health studies have shown that people, whose work exposes them to asbestos fibre in air, run a higher than normal risk of developing lung cancer. Many of these studies were done on groups of people who worked with asbestos during the early and middle years of the 20th century. During these years, asbestos levels were often well above current levels. So as a result, our knowledge of the lung cancer risks presented by today's exposure levels is somewhat limited. However, it is clear that together smoking and inhaling asbestos carry a serious lung cancer risk. Lung cancer rates, among asbestos workers who smoke, are much higher than predicted by simply adding up the lung cancer rates for smoking and for asbestos exposure.

3.3 MESOTHELIOMA

Mesothelioma is a very rare cancer of the membranes that line the chest or the abdominal cavity. Although there may be some cases of mesothelioma that are caused by other chemicals, many people believe that fibrous minerals are the most common cause of the disease.

In part, because of the rarity of mesothelioma, we probably have an even poorer understanding of how much asbestos fibre inhalation is necessary to produce mesothelioma than we do for lung cancer. Although quite rare, mesothelioma is clearly a concern among people whose work exposes them to asbestos. But mesothelioma has developed in people who have never worked with the asbestos. These people probably never received the large doses of asbestos that sometimes occurred at work. The appearance of the disease, in people who have only had very low exposures to asbestos fibre, is cause for serious concern. Fortunately, mesothelioma is a very rare disease.

Mesothelioma usually has a very long latency period - the time between initial exposure and development of the disease. Sometimes mesothelioma does not appear until 40 years after first exposure.

Although not all specialists agree, many feel that blue asbestos is a much greater mesothelioma risk than are either white or brown asbestos.

3.4 OTHER CANCERS

Studies, of people exposed to asbestos at work, have shown slightly higher than normal rates of some cancers of the lips, larynx and the digestive system. Although any occupational cancer is cause for concern, because they seem to occur infrequently, the cancer concern regarding asbestos has focussed on lung cancer and mesothelioma.

4. Occupational Exposure Limits

The Nova Scotia Government has adopted limits for the amount of asbestos and other contaminants that may be present in the air in workplaces in the Province. The N.S. exposure limit for all forms of asbestos is 0.2 fibres per cubic centimetre (f/cc) and is generally in line with the limits set in other provinces, the U.S. and Europe. But regardless of the numerical limit, exposure to asbestos - or any material that causes cancer- should be kept as low as is practical.

To measure the amount of asbestos in air, a portable air sampling pump draws air at a pre-determined rate through a very fine filter. Knowing the air flow rate and the duration of the sampling allows the laboratory to calculate the volume of air tested. After the sampling period, the filter is taken to a laboratory and the number of fibres present are counted using a special microscope. Dividing the number of fibres counted by the volume of air tested produces the result in fibres per cubic centimetre (f/cc).

5. Where You Might Encounter Asbestos at Dalhousie

5.1 IN LABORATORIES

5.1.1 Asbestos Cement Board

Laboratories have long used asbestos cement board where its strength and chemical and heat resistance made it a popular choice for the interior walls and backs of older style fume hoods. It is usually easy to decide if a fume hood contains asbestos cement board. The board is a very hard and smooth, with a medium grey,

low lustre finish. Newer fume hoods use plastic or stainless steel panels, and it is easy to distinguish these materials from asbestos cement board.

The same asbestos board was sometimes used as a counter top in laboratories or workshops to protect the cabinet from chemicals or heat.

In an unusual application, asbestos board is also present beneath the gyproc walls of some laboratories in Tupper. The asbestos board was presumably added to the walls to increase the fire separation between laboratories.

5.1.2 Asbestos Mats

Asbestos mats were used in laboratories where high temperatures or open flames where being used. These are no longer as commonly used in Dalhousie laboratories. However, there are probably still some in drawers and cupboards in older laboratories.

5.1.3 Asbestos Fabric

Asbestos fabric was long used in fire blankets. These blankets would be wrapped around a person to extinguish burning clothing. Many of these blankets have been removed but it is possible that a few may remain in storage in some Dalhousie laboratories.

5.2 ON BUILDING EXTERIORS

5.2.1 Asbestos Cement Tiles

Asbestos cement tiles were used until the late 1960's on building exteriors in the way that we use now use vinyl or aluminum siding on many buildings. The tiles come in various sizes but again, the tile is very hard and it sometimes has a textured surface. Because they are usually painted, colour is not usually helpful in identifying asbestos cement tiles. Prior to its demolition, asbestos cement tiles covered the exterior of Hancock Hall. Until it was refurbished during the summer of 1997, Studley House was also covered with painted asbestos tiles.

Occasionally, asbestos mixed with cement to form asbestos mortar was used as an exterior decorative finish on buildings. The mixture was trowelled or sprayed to form a continuous textured surface.

5.3 IN FURNACE AND BOILER ROOMS

5.3.1 Furnace Insulation

Furnace insulation often contains asbestos. Any white or off-white material present on the outside, around the fire box door or on the furnace interior likely contains asbestos. The asbestos may be present as an asbestos-containing cement, asbestos fabric, or even loose asbestos covered with wrapping. Similarly, any white, fibrous or cement-like material around the connection between the flue pipe and the chimney likely contains asbestos.

5.3.2 Pipe Insulation

Heating pipes are usually covered with pipe insulation to prevent heat loss. In Dalhousie buildings, glass fibre insulation normally insulates straight runs of heating pipe. However, asbestos is often present at elbows and around joints and valves. Both fibreglass and asbestos pipe insulation were invariably covered with a paper or a fabric covering. In turn, the covering is often painted. It is fairly easy to assess whether pipe insulation is fibreglass or asbestos. Fibreglass pipe insulation is fairly pliable and "gives" slightly when squeezed. In contrast, the asbestos insulation, which is applied to elbows and joints, is very firm.

5.3.3 Ceilings and Walls

Ceilings and walls in older boiler rooms were often covered with a sprayed-on asbestos cement to reduce the transfer of heat and to improve fire resistance. Before removal by outside contractors, the boiler rooms in the A&A and Howe Hall were treated in this fashion. As long as the insulation is in good shape and the fibre is firmly held in place the insulation does not present a serious inhalation hazard. But it is difficult to work in these areas without disturbing the insulation and possibly releasing asbestos fibre. At Dalhousie, we usually remove this type of asbestos as part of any renovations to boiler or furnace rooms.

5.4 BUILDING INTERIORS

5.4.1 Asbestos Tile

Asbestos was commonly added to vinyl floor tile. It is not usually possible to decide from a visual inspection whether a tile contains asbestos or not. As the fibre is usually well embedded in the tile, release of fibres is only a worry if the tile is broken, drilled or sanded.

5.4.2 Ceiling Tiles

Asbestos was occasionally added to ceiling tiles. Asbestos tiles have recently been removed from the ceilings of the kitchens in Howe and Shirreff. The building designers may have been particularly concerned about fires spreading from the residence kitchens and thus added asbestos tile to kitchen ceilings. Although some may also have been used elsewhere in Dalhousie buildings, an inventory of Dalhousie buildings did not uncover any other asbestos containing ceiling tiles. Asbestos has not been used in the manufacture of ceiling tiles for years. Instead, today they are frequently made from glass or cellulose fibres.

Similarly, asbestos was sometimes used in wall board and the "putty" used to seal the seams between plaster board (gyproc). Again, there is likely some of this material in older Dalhousie buildings.

Many of Dalhousie's older buildings have plaster rather than gyproc interior walls. The plaster in some of those buildings contains low levels of asbestos fibre. In building's such as the Henry Hicks Arts & Administration Building and sections of the Chemistry Building's interior walls, are comprised of two plasters. The outer, surface plaster layer is relatively thin and very fine grained. Testing to-date has always shown this layer to be free of asbestos. The underlying layer is generally much thicker than the surface layer. And it is much coarser, sometimes containing visible aggregate. Testing has shown that this underlying layer may contain on the order of 1 to 2% asbestos.

5.4.3 Asbestos Cement

Asbestos cement was sometimes sprayed on ceilings and beams to improve fire resistance even in areas outside boiler rooms. The asbestos cement is usually painted and appears as a very irregular cement-like coating on the underside of concrete floor and steel beams. Asbestos cement covers most of the ceilings and beams in the Central Services Building. In many places, the dropped ceiling in the CSB hides this asbestos cement fireproofing. On the other hand, there is a material on the ceiling of the Tupper Loading Bay that closely resembles the asbestos cement present in CSB. But the Tupper insulation does not contain asbestos.

5.5 SUMMARY

Asbestos is a very versatile mineral. As covered above, it has been used in a wide range of applications. We know that asbestos was used in many of these applications in some Dalhousie buildings. It is possible and perhaps even likely that it has also been used in other ways or in yet to be discovered locations. Staff should not treat the above list as being complete or comprehensive. Before undertaking any job that could create an airborne dust, staff should consider the possibility of the presence of asbestos. If you have any doubts, take your concerns to your supervisor or the Safety Office.

6. Asbestos Removal

Removing asbestos is specialized work. Except for the occasional very small job, outside removal contractors do all asbestos removal at Dalhousie.

Large removal jobs require that the area be first sealed with plastic to contain any contaminated air. Fans move filtered air out of the work area. In this way, the removal area stays under reduced pressure so air leaks in into - rather than out of - the work area. Set up in this fashion,dusty air cannot leak into other areas of the building. This is very important since fine asbestos fibre suspended in air takes some time to settle.

Workers carrying out asbestos removal must observe many rules to ensure their own safety and that of other building occupants. Over the years, a series of widely accepted asbestos removal procedures have been developed. Contractors providing asbestos removal services to Dalhousie, use the same procedures followed across the continent.

Among the rules is the wearing of both protective clothing and respirators. Whenever possible, the asbestos is pre-treated with water so the work produces less dust.

After removal, the contractor places the asbestos and any contaminated material in sealed heavy-duty, labelled plastic bags. We sometimes need to store waste asbestos for a time until it can be shipped to a landfill site approved by the Province to accept asbestos waste.

7. Preventing Asbestos Disease

Only when inhaled is there any risk of an asbestos-related disease. The risk of developing a disease varies from person to person and the risk is higher if large amounts are inhaled or asbestos is inhaled over long periods of time. At Dalhousie, fully trained outside contractors do any work that could expose people to significant amounts of airborne asbestos fibre. For most other staff, observing the following rules will minimize the chances of a significant asbestos exposure.

1. Do not work with loose asbestos without training, authorization and without taking precautions to prevent release of fibres that might expose you or others to airborne fibres.

2. Do not damage or remove any pipe wrapping without authorization from your supervisor.

3. Do not cut, sand, drill or break products that contain asbestos including asbestos cement insulation, asbestos cement board, asbestos cement tiles, vinyl asbestos tiles or plaster in some Dalhousie buildings.

4. To clean up in areas where asbestos dust may be present, use a wet mop to prevent the fibre from becoming airborne or use a HEPA vacuum cleaner. HEPA filters are high efficiency filters that trap even the fine particles that pass through the filter of a normal vacuum.

5. Exercise care in areas where asbestos is (or is likely to be) present including:

   : boiler or furnace rooms, around boilers, furnaces or heating pipes or other heating equipment
   : above the drop ceiling or on the steel beams in CSB
   : in electrical workshops, laboratory fume hoods or walls in Tupper

6. Wear an appropriate respirator when undertaking any task when there is some likelihood that damaged or friable asbestos may be present.

7. If you unexpectedly encounter asbestos or an asbestos containing material, avoid any work that could create an airborne dust. Report the situation to your supervisor immediately.

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