Working Safely with Asbestos Cement

By Janet McKenna*

ABSTRACT

Over the last hundred years, asbestos has been incorporated into thousands of products, including consumer products and building materials. One particular use of asbestos was cement pipe that became a staple for potable water, sanitary sewer and storm drain applications. However, over the decades, these asbestos cement pipes ("AC pipes") are showing signs of age, requiring replacement or extensive repairs. This paper will explore the best practices for accessing, removing and repairing AC pipes to minimize asbestos exposure to workers who must come in contact with these pipes.

Although its health hazards are well documented, asbestos products can be imported, and are found in a variety of applications. When left undisturbed, asbestos containing materials ("ACMs") pose very little risk. However, there are situations when disturbance of ACM is unavoidable, particularly in unforeseen circumstances or when emergency maintenance or repair is necessary.

One common asbestos containing material is the cement pipe that constitutes a large portion of our utilities infrastructure. Many municipalities have hundreds of miles of asbestos containing pipes that carry our drinking water, and serve as conduits for electrical and cable wiring. AC pipes were used extensively during the 1940s, and the majority of them are still in service, although nearing the end of their useful life. Inevitably these AC pipes will need repairs or replacement with new non-asbestos containing pipes to keep municipal water and sewer systems operating effectively. The repair or removal of AC pipes will require disturbance or contact with this asbestos containing material.

This piece will discuss why asbestos poses a health hazard, how to work safely with AC pipes, and the regulatory requirement established by the Massachusetts Department of Labor Standards ("DLS") and the MA Department of Environmental Protection ("DEP") to protect workers, the public and the environment from asbestos exposure.

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An Introduction to Asbestos

Whenever possible, it is best to leave asbestos materials alone and avoid disturbance, whether in a residential, commercial or industrial setting. Asbestos that is firmly bound and intact, and remains undisturbed, poses very little risk to humans and the environment. However, when ACM is disturbed, fibers may be released through the creation of asbestos containing dust. Asbestos fibers, once released into the air, can be inhaled, which ultimately can cause adverse health effects.

Asbestos is a naturally occurring fibrous mineral this is mined and milled to extract the fibers from the ore.

Asbestos has long been called the "wonder mineral", and was valued for its many useful properties, including heat resistance, electrical insulation, sound absorbency, high tensile strength and

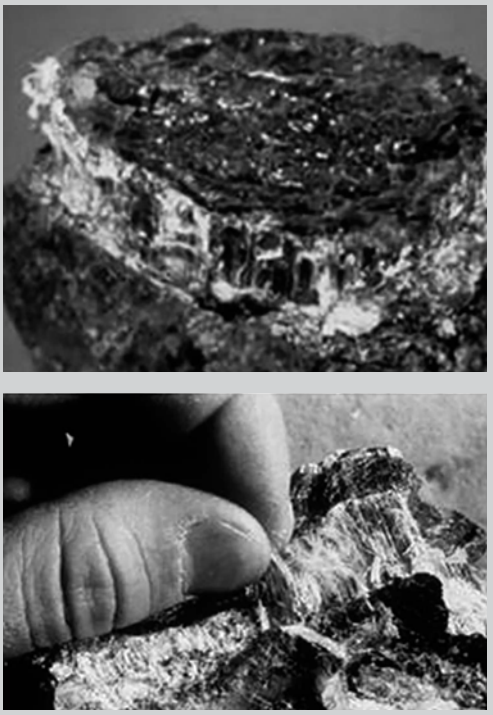


Figure 1: Asbestos is a naturally occurring fibrous mineral that was highly acclaimed and widely used because of its many advantageous properties.

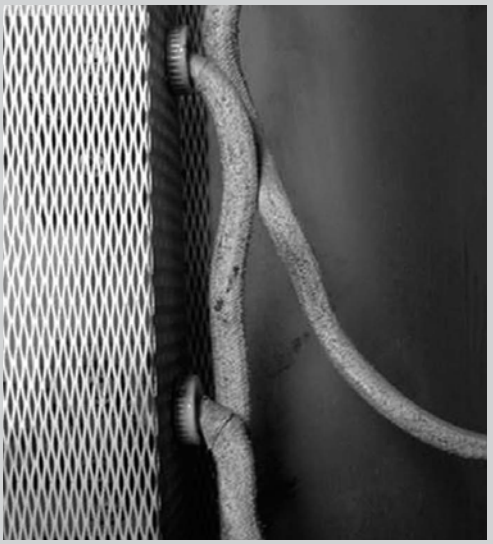


Figure 2: Asbestos fibers were mixed into thousands of products, notably those involved in construction, such as siding and flooring.

chemical resistance. The prolific use of asbestos can be attributed, in large part, to its affordability and worldwide availability, making it a staple in construction applications, vehicle components and consumer products. The asbestos fibers were mixed into a vast array of products, including:

- Spray applied fireproofing
- Plaster and wallboard
- Cement shingles and pipes
- Adhesives
- Ceiling tiles
- Chalkboards
- Vibration dampening cloth
- Textured paints and coatings
- Pipe insulation
- Roofing shingles and felts
- Floor tiles and linoleum
- Boiler gaskets and packing
- Fire door insulation
- Joint compound

In spite of the unique benefits of asbestos fibers, medical researchers established a link between the inhalation of asbestos particles and lung-related ailments. Asbestos is now considered a carcinogen that is responsible for various cancers, including mesothelioma. The hidden dangers of asbestos are twofold: 1) people are unaware of the diverse products that can contain asbestos, and disturb them without proper training and equipment; 2) asbestos has no sensory trigger for exposure because the fibers cannot be seen with the naked eye, emit no odor, have no taste and are not irritating to the skin. Asbestos fibers are microscopic and are measured in micrometers, with tens of thousands of fibers measuring up to one grain of rice.

People can still be exposed to asbestos through avenues that range from direct occupational exposure to ambient exposure from demolition, improper disposal, and natural disasters. A popular misconception is that asbestos products are no longer produced or available. Asbestos containing products can be imported into the US, and often make their way into consumer products, such as art clay and crayons, as well as building materials like wallboard, joint compound and dry plumber's putty. Asbestos related diseases are subject to a latency period, and do not typically manifest themselves for 10 to 40 years after exposure.

Based on 2014 estimates, approximately 2000 tons of asbestos were released into the air during the World Trade Center disaster on September 11,

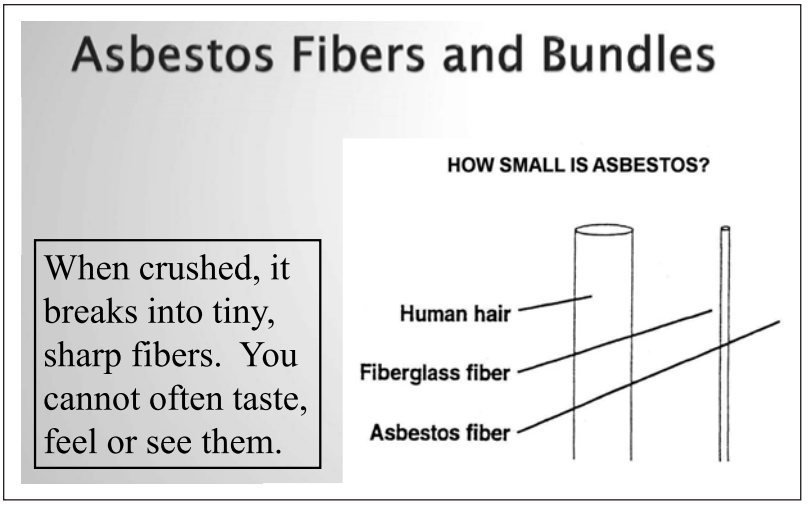


Figure 3: Asbestos fibers are microscopic and invisible to the naked eye. They are smaller than a human hair and a fiberglass fiber.

Figure 4: Three commonly found forms of asbestos are chrysotile, amosite and crocidolite.

2001. In the aftermath, the lung cancer rate among the New York City Fire Department increased by 22 percent. Over 5 million asbestos related lawsuits have been filed by military personnel since World War II. Asbestos is heavily regulated in the United States, but no so in countries such as Russia, where the death toll from asbestos is approximately one half the deaths from asbestos worldwide.

There are six fibrous varieties of asbestos, with these three being the most commonly found in building products:

- Chrysotile, characterized by white, wavy fibers. Found in 90% of asbestos products.
- Amosite, characterized by short needle like fibers that break easily. Used largely in high heat applications.
- Crocidolite, a blue asbestos fiber, which is strong and stiff. Found in cement products where corrosion resistance is needed.

Not all asbestos products are inherently hazardous, such as the ones that are considered non-friable. This means that the product cannot be crushed, crumbled or reduced to powder by hand pressure. The risk of asbestos exposure increases when the fibers become airborne, such as through the creation of dust, when fibers can be inhaled. Some examples of non-friable materials include vinyl floor tiles, roofing shingles, cement pipes, and siding. It should be noted that non-friable materials can be rendered friable if enough force is exerted upon them, such as grinding, sanding, sawing or abrading the material.

A Brief History of Asbestos

The word "asbestos" is derived from the Greek language. 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. 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.

As early as 1906, the uncommonly high mortality rate of asbestos workers was reported. Although researchers were aware of the health effects of asbestos in the 1920s and 1930s, much of the research was suppressed. It was 1970 before the Occupational Health and Safety Administration ("OSHA") promulgated the first workplace standard for asbestos. Massachusetts Department of Labor Standards ("DLS") passed its first asbestos regulations in 1986. The US Environmental Protection Agency ("EPA") attempted to ban all uses of asbestos in 1989, known as the Ban and Phase Out Rule. The ban was overturned in in 1991, and now the ban is limited to certain asbestos uses and applications. Some examples of asbestos containing products that are not banned include: floor tiles, cement sheets, millboard, clothing, pipeline wrap and roofing felts.

Today, although regulated in the United States, a complete ban on asbestos products does not exist. The US no longer mines fibrous asbestos, and the imports have dropped to a fraction of earlier years. Asbestos remains a legal commodity, and may still be found in imported products. Of the estimated 2 million metric tons of asbestos mined worldwide, the US Geological Survey ("USGS") estimated that asbestos consumption in the US in 2012 was approximately 1,060 tons, and in 2014 dropped to 745 metric tons, based on asbestos imports. Statistics indicate that Russia is the top exporter of asbestos, and China is the top consumer.

According to the EPA and OSHA, asbestos containing materials are defined as any product containing greater than 1% asbestos. OSHA considers certain products to be presumed asbestos containing materials ("PACM"). The PACMs are suspect materials, such as floor tiles, that were installed prior to 1980. The only positive method to determine if a product contains asbestos is through laboratory testing.

Asbestos Cement Pipe: The Basics

Asbestos cement pipes, commonly known as "transite", were first manufactured in the US in the 1920s, and were extensively used between the 1940s and 1970s. Popular uses included potable water, sanitary sewer and storm drain pipes. Use of the AC pipes was largely discontinued in the 1980s.

AC pipe was typically made by adding chrysotile and/or crocidolite asbestos, ranging from 10 to 75 percent, to Portland cement, water and silica. The major manufacturers of AC pipe included the Cement-Asbestos Product Company, Certainteed Products, Flintkote Company and the Johns-Manville Company. Today many lawsuits have been filed against several of these companies, resulting in large settlements.

AC pipes were the products of choice because they were lightweight, impermeable to water, easy to maintain, low coefficient of friction, and resistant to rot, termites, warping and corrosion. It is estimated that more than 600,000 miles of AC were installed throughout the United States and Canada. That accounts for roughly 15% of

Figure 5: AC pipes usually contain anywhere from 10 to 75 percent asbestos.

all infrastructure systems. However, in the early 1970s the production of AC pipe began to decline with then the health impact of asbestos exposure became widely publicized. Manufacturers of AC pipe halted production in the US, although AC pipe is still produces overseas, and can be imported and used. AC pipe is not a product that is banned in the US. Simply because production of AC pipes was discontinued domestically, it didn't result in the removal of these pipes from water, wastewater and storm drainage systems. Thousands of miles of AC pipe still exist throughout the country today. As they are nearing the end of their 50 year life spans, they will need to be replaced. Two viable means of doing so are the processes of pipe bursting and pipe reaming. However, both practices involve disturbing the product, which subject workers and others to the adverse health effects associated with inhaling or ingesting asbestos fibers if the proper precautions are not implements or if regulations are not followed.

Asbestos Cement Pipe Removal: What You Need to Know

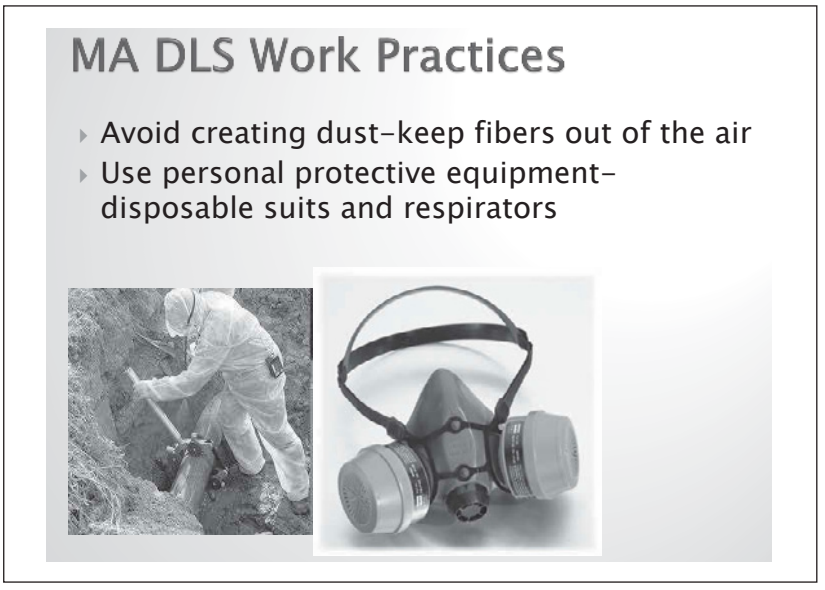
AC pipe removal is work that requires specialized training and work practices. It is classified as "Class II" work by OSHA, and is considered a miscellaneous material. Training classes have been developed that focus on the particular means and methods associated with the repair and/or removal of AC pipe. The training includes instruction on safe work practices, and how to operate specialized tools that are designed to minimize fiber release. In addition to training in how to use the proper tools to remove AC pipe correctly and effectively, workers performing such work in Massachusetts must also notify the Mass DEP, use the appropriate personal protective equipment ("PPE"), conduct air monitoring, and properly contain any asbestos waste.

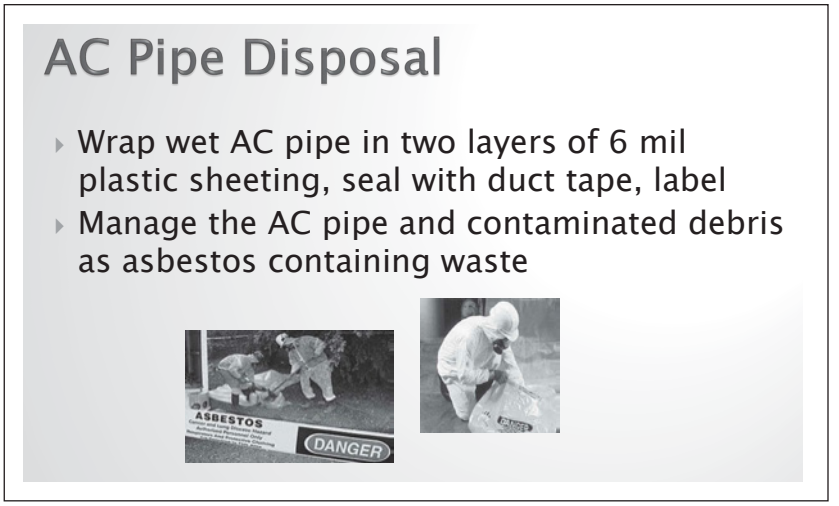
The approved method for AC pipe removal consists of keeping the pipes predominantly in whole pieces. By wetting the section that is going to be cut prior to cutting, the release of fibers will be minimized. Snap cutters and carbide-tipped blade cutters, along with manual field lathes, are the tools that can best accomplish ACM pipe removal without generating dust and small broken pieces. DLS regulations have allowances when working with non friable ACM, provided that the material does not become friable, and no dust is generated by the work procedures used.

Workers can protect themselves from asbestos exposure by using PPE such as respirators and full body disposable suits. Best management practices to follow when accessing AC pipe include:

- Step 1: Uncover the pipe without disturbing it.
- Step 2: Use safe excavation work practices.
- Step 3: Examine the pipe to determine if it is damaged or broken.
- Step 4: Set up a miniature containment system or employ HEPA –shrouded tools.

While this is just a brief overview of the mandated guidelines, complete instructions can be





downloaded by visiting the MassDEP website at www.mass.gov/dep.

After the AC pipe is accessed and analyzed, and a containment system is established to prevent the migration of fugitive dust, comes the task of actually removing it. To do so, 6-mil poly sheeting should first be placed underneath the section of pipe that is to be removed to prevent the potential for soil contamination. The pipe should then be adequately wetted with amended water in those areas where cutting or breaking will occur. As noted previously, wetting the pipe will help to reduce the release of asbestos fibers. A wet saw or shrouded cutting equipment should then be used to make the actual cut in the pipe.

Once the pipe has been accessed and cut, it needs to be removed safety. Disposal consists of wrapping the AC pipe in two layers of 6-mil plastic sheeting, sealing it with duct tape, and then labeling it as a "special waste". The MassDEP regulates which landfills in Massachusetts can accept asbestos containing waste.

It should also be noted that there are specifically prohibited practices when it comes to the disturbance and removal of AC pipe, such as:

- Sanding, sawing, grinding, chipping and crushing
- Crumbling, pulverizing or reducing to powder
- Creating dust or rendering friable
- Using power tools without dust collection
- Pipe bursting

According to a 1991 statement from the EPA, replacing AC pipe by using the pipe-bursting method actually involves the crushing of the cement pipe that would cause the material to become regulated asbestos containing material ("RACM"). This, in turn, would turn the work site into an active waste disposal site, per the EPA's standards and regulations.

Conclusion

While asbestos containing materials are currently regulated, they have not been completely banned. If a complete ban were to be imposed, it would not change the fact that thousands of miles of AC pipe are still in operation throughout municipal water systems, including New England. When the life span of these cement pipes expires, replacement may be the only option. It is imperative that each engineer, contractor and public official who is responsible for designing or planning the access and replacement of AC pipe know and abide by the established guidelines and policies that have been established. Failure to do so isn't just a matter of responsibility, but could result in severe health consequences to anyone who inhales or ingests asbestos fibers.

Resources

1. Massachusetts Department of Labor Standards, www.mass.gov/dols
2. Massachusetts Department of Environmental Protection, www.mass.gov/dep
3. Environmental Protection Agency, www.epa.gov/asbestos
4. Occupational Health and Safety Administration, www.osha.gov
5. Massachusetts Water Works Association, www.masswaterworks.org
6. American Water Works Association, www.awwwa.org