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Demystifying Asbestos Regulation: Updates and Emerging Issues

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Introduction

Asbestos is the name for a group of naturally occurring silicate minerals that can be separated into fibers. The fibers are strong, durable, and resistant to heat and fire. There are several types of asbestos fibers, three of which are used for commercial applications: (1) chrysotile, or white asbestos, comes mainly from Canada, and has been very widely used in the United States—it is white-gray in color and found in serpentine rock; (2) amosite, or brown asbestos, comes from southern Africa; (3) crocidolite, or blue asbestos, comes from southern Africa and Australia. Amosite and crocidolite are called amphiboles. This term refers to the nature of their geologic formation. Other asbestos fibers that have not been used commercially are tremolite, actinolite, and anthophyllite, although they are sometimes contaminants in asbestos-containing products. In addition to asbestos mines, asbestos is found as a contaminant mineral in the host rock in non-asbestos mining operations.

Asbestos has long been recognized as a human carcinogen. (Refer to the U.S. Department of Health and Human Services, Public Health Service, the National Toxicology Program report of December 2002, "10th Report on Carcinogens," at http://ehp.niehs.nih.gov/roc/tenth/profiles/s016asbe.pdf .) OSHA estimates that 1.3 million employees in construction and general industry have significant asbestos exposure on the job—those workers involved in construction, renovation, and demolition have the most risk of exposure. Other high-risk jobs include manufacture of asbestos products (such as building materials and insulation) and performing automotive brake and clutch repair. Of particular utility is a list of suspected asbestos-containing materials prepared by the Environmental Protection Agency (EPA), which can be found in Table 3 of this chapter and at http://www.epa.gov/Region06/6pd/asbestos/asbmatl.htm. Construction employers whose projects involve materials of the types listed should anticipate potential asbestos exposure and carefully review their obligations under applicable OSHA, EPA, and/or state standards.

Asbestos, or fibrous dust, is created and released into the ambient air by the breaking, crushing, grinding, drilling, or general abrasive handling of a solid material that has fibrous components.

Chrysotile is the type of asbestos most commonly found in commercial products. Amosite and crocidolite are generally considered to be the most toxic. Fibrous dust particles do not readily settle out of the air, but can remain suspended for long periods of time. As a result, accumulations of fibrous dust can continue to present an inhalation hazard when they are stirred up by vehicular traffic, by persons walking through them, or by the wind. Overexposure to asbestos can result in development of asbestosis (a type of pneumoconiosis that results from the inhalation of asbestos fibers); cancers of the lung, larynx, and gastrointestinal tract; and mesothelioma, another cancer associated with asbestos exposure.

Asbestos Regulations

General Concepts of Asbestos Regulations: OSHA, EPA, and State/Local Authorities

Asbestos is typically regulated at three different levels for three different purposes: by OSHA for worker protection, by EPA for pollution control, and by state and local authorities for public protection.

- OSHA for worker protection: OSHA requires that employees know where asbestos is located so they can avoid disturbing it. OSHA also mandates special work practices if asbestos will be disturbed, for example, when a member of the building maintenance staff removes an asbestos-containing gasket while repairing a valve. Disturbances also occur when workers drill through asbestos-containing materials such as flooring, plaster walls and ceilings, and asbestos cement panels. Workers who disturb asbestos must wear respirators, and hygiene facilities (showers) must be available at the work site so workers can decontaminate. Whenever asbestos is disturbed, air monitoring is mandatory to determine the workers' exposure to airborne particles.
- EPA for pollution control: The EPA, on the other hand, is concerned with the air and land pollution that can occur when asbestos is disturbed. The EPA requires inspections to identify asbestos locations prior to performing demolition or renovation activities that could disturb asbestos and release it into the air. Prior to any building demolition or renovation activities, most forms of asbestos must be removed by methods that do not release asbestos fibers into the air. The EPA also has regulations governing the proper disposal of regulated asbestos materials.
- State/Local authorities for public protection: State and local regulations usually are designed to protect the public. These regulations, which require individuals and companies involved in asbestos-related activities to be licensed, specify methods and procedures for removing and disposing of asbestos in a safe manner. State and local agencies can also require the acquisition and posting of special notifications and permits when asbestos is disturbed or removed. Finally, state and local regulations usually require air sampling at the completion of all asbestos-removal projects to ensure that the air is sufficiently clean for the re-entry of building occupants.

The asbestos regulations of OSHA and the EPA are somewhat intertwined, and both should be carefully reviewed by safety and health professionals who are developing an asbestos compliance program.

The OSHA Asbestos Regulations for Construction

OSHA last modified its asbestos standard in 1994 and lowered the permissible exposure limit and the excursion limit to reflect increased asbestos-related disease risk to asbestos-exposed workers. The OSHA asbestos standards include medical surveillance, exposure monitoring requirements, and employee training (29 CFR §1910.1001 and §1926.1101).

Section 1926.1101 covers construction work, including alteration, repair, renovation, and demolition of structures containing asbestos. Employee exposure to asbestos must not exceed 0.1 fibers per cubic centimeter (f/cc) of air, averaged over an 8¬hour work shift. Short-term exposure must also be limited to not more than 1 f/cc, averaged over 30 minutes. The administrative control of rotating employees to achieve compliance with either PEL is prohibited. In construction work, unless the employer is able to demonstrate that employee exposures will be below the PELs (a "negative exposure assessment"), it is generally required to conduct daily monitoring for workers in Class I and II regulated areas. For workers in other operations where exposures are expected to exceed one of the PELs, the employer must conduct periodic monitoring. In no case can periodic monitoring exceed intervals greater than 6 months for employees exposed above a PEL. (See the OSHA Fact Sheet,

"Asbestos," U.S. Department of Labor, 2002.)

The OSHA standard for the construction industry classifies the hazards of asbestos work activities and prescribes particular requirements for each classification. (There are equivalent regulations in states with OSHA-approved state plans.)

- Class I is the most potentially hazardous class of asbestos jobs and involves the removal of thermal system insulation and sprayed-on or toweled-on surfacing asbestos-containing materials or presumed asbestos-containing materials.
- Class II includes the removal of other types of asbestos-containing materials that are not thermal system insulation, such as resilient flooring and roofing materials containing asbestos.
- Class III focuses on repair and maintenance operations where asbestos-containing or presumed asbestos-containing materials are disturbed.
- Class IV pertains to custodial activities where employees clean up asbestos-containing waste and debris or enter regulated areas to perform non-asbestos disturbing work (such as removing scaffolding or equipment).

Construction employers and contractors must create controlled zones known as regulated areas that are designed to protect employees where certain work with asbestos is performed. Access must be limited to regulated areas by authorized persons who are wearing appropriate respiratory protection. Activities such as eating, smoking, drinking, chewing tobacco or gum, and applying cosmetics are prohibited in these controlled zones, and the employer must display warning signs at each regulated area. In construction, workers must perform Class I, II, and III asbestos work (and all other operations where asbestos concentrations might exceed a PEL) within highly regulated areas (OSHA Fact Sheet, "Asbestos").

OSHA favors engineering controls and work practices to control worker exposures to or below the applicable PEL. If, after using all feasible controls, levels still exceed the PEL, the employer must supplement these methods with respiratory protection. Generally, the level of exposure dictates which type of respirator must be used (see, for example, 29 CFR §1910.134). Employees who must wear respirators are required to be trained, have medical approval, and undergo fit testing. In addition, workers exposed to levels above the PEL must also use protective clothing (coveralls, gloves, foot covers, head covers, face shields, goggles, etc.). (OSHA is still considering rulemaking that would require employers to pay for personal protective equipment that workers must use on the job, pursuant to 29 CFR §1926.95 and §1910.132.) The work site must also have decontamination areas and established hygiene practices for exposed workers. OSHA's construction standard also requires training for workers exposed above the PEL, and for other employees, depending upon their specific work classification, as shown above.

Construction workers who are exposed to asbestos for 30 or more days per year, and who work in Class I, Class II, or Class III activities, must receive medical examinations. The employer is required to keep accurate records of:

- all air sampling or other measurements taken to monitor employee exposure (maintain for 30 years)
- medical records, including physician's written opinions (maintain for duration of worker's employment, plus 30 years)
- training records (maintain for 1 year past the last date of employment).

The Department of Labor's Inspector General has recommended that future asbestos regulations address take-home contamination from asbestos and utilize Transmission Electron Microscopy (TEM)

to analyze fiber samples that may contain asbestos, rather than the Phase Contrast Microscopy (PCM) method currently specified in the OSHA standard. TEM analysis is a much more sensitive method for identifying very small and thin asbestos fibers that may go undetected by the OSHA required PCM method.

Why OSHA's Asbestos Exposure Limits May Not Be Considered Protective of Health

Air monitoring is used to evaluate compliance with OSHA's asbestos exposure limits. A low volume air pump with an air monitoring cassette is placed near the worker's breathing zone to simulate airborne asbestos levels if the worker did not have on a respirator. This analytical method does not count all asbestos fibers workers are exposed to during work involving asbestos disturbance. OSHA only requires that employers count regulated fibers. Regulated fibers are defined as being >5 microns in length with a 3:1 length to width ratio. This analytical method is also limited in that it does not just count asbestos, but all other fibers meeting this criterion.

OSHA found that significant risk remained at their 8-hour time weighted permissible exposure limit (PEL) of 0.1 f/cc. They found that lower levels of occupational exposure could be feasibly achieved. OSHA did not set a lower PEL when their standards were revised in 1994 and 1995 because lower levels of asbestos could not be reliably measured under workplace conditions. Instead of establishing a lower

PEL, OSHA took a different approach to reducing the risk that remained at the existing PEL of 0.1 f/cc. It mandated that employers who engage in operations that can generate airborne asbestos follow specific work practices, such as wetting the asbestos and using HEPA vacuums to clean up dust and debris, to minimize the release of asbestos fibers. The standards also require employers to take certain other precautions, such as training employees who work with or near asbestos and using respirators during certain operations, which will further reduce the risk to employees.

In their 1994 preamble to the revised asbestos standards OSHA stated, "There would be remaining risk at this new 0.1 f/cc exposure limit if there were not other provisions to these standards. However, the exposure limit is accompanied by mandated work practice controls and requirements for hazard communication, training and other provisions. Together these will very substantially reduce that remaining significant risk, although the exact amount of that reduction cannot be quantified. In addition, it would be difficult to measure accurately in the industrial setting levels lower than those in these standards. OSHA believes its approach of setting a PEL which is reliably measurable, yet, imposing work practices and ancillary provisions for operations regardless of measured fiber levels will result in risk reduction well below that expected from just enforcing the 0.1 f/cc PEL (59 FR 40981-82; Aug. 10, 1994). Therefore, the OSHA PEL by itself is admittedly not protective of health. These findings also apply to non-occupational asbestos exposures where public safety is often times measured and defined as being in compliance with the potentially non-protective OSHA PELs.

OSHA Clarification on Materials Containing <1% Asbestos

The OSHA asbestos standard contains numerous work practice requirements and prohibitions that apply, regardless of the exposure levels. However, only two of the requirements and three of the prohibitions must be observed in the case of work activities involving installed construction materials that do not contain >1% asbestos. Those work practice requirements and prohibitions that must be observed regardless of the exposure levels and of the percentage of asbestos in the installed construction materials are:

- 29 CFR 1926.1101(g)(1)(ii), which requires: wet methods, or wetting agents, to control employee exposures during asbestos disturbance and cleanup;
- 29 CFR 1926.1101(g)(1)(iii), which requires: prompt clean-up and disposal of wastes and debris

contaminated with asbestos in leak-tight containers except in roofing operations, where the procedures specified in paragraph (g)(8)(ii) ;
- 29 CFR 1926.1101(g)(3)(i), which prohibits: high-speed abrasive disc saws not equipped with point-of-cut ventilator or enclosures with HEPA filtered exhaust air;
- 29 CFR 1926.1101(g)(3)(ii), which prohibits: compressed air used to remove asbestos, or materials containing asbestos, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud; and
- 29 CFR 1926.1101(g)(3)(iv), which prohibits: employee rotation as a means of reducing employee exposure to asbestos.

There are also some other provisions that apply to work activities involving installed construction materials even where the material does not contain >1% asbestos. However, if neither asbestos PEL is exceeded, only the following few provisions apply:

- 29 CFR 1926.1101(f)(2)(i), the provision for establishing that neither asbestos PEL is exceeded: Each employer who has a workplace or work operation covered by this standard shall ensure that a "competent person" conducts an exposure assessment immediately before or at the initiation of the operation to ascertain expected exposures during that operation or workplace;
- 29 CFR 1926.1101(f)(6)(i), a provision covering the observation of monitoring: The employer shall provide affected employees and their designated representatives an opportunity to observe any monitoring of employee exposure to asbestos conducted in accordance with this section;
- 29 CFR 1926.1101(f)(5)(i), a provision covering employee notification of monitoring results: The employer shall notify affected employees of the monitoring results that represent that employee's exposure as soon as possible following receipt of monitoring results;
- 29 CFR 1926.1101(f)(5)(ii), another provision covering employee notification of monitoring results: The employer shall notify affected employees of the results of monitoring representing the employee's exposure in writing either individually or by posting at a centrally located place that is accessible to affected employees; and
- 29 CFR 1926.1101(n)(2)(i)-(iii), a set of provisions covering recordkeeping for measurements of exposures to airborne asbestos.

There are numerous additional provisions of the standard that apply to work activities involving installed construction materials even where the material does not contain >1% asbestos if at least one of the asbestos PELs is exceeded.

Emerging Issues with Naturally Occurring Asbestos

Most asbestos regulations address the presence of the mineral in building products. Very few regulations apply to naturally occurring asbestos. Asbestos naturally occurs throughout the United States.

Libby, Montana and Contaminated Vermiculite from Zonolite Mountain

Vermiculite mining in and near the town of Libby, Montana began in the 1920s and was continued by the W.R. Grace Company from 1963 until 1990. The vermiculite ore mined in Libby was contaminated with tremolite asbestos. Vermiculite is a naturally occurring mineral and the largest known deposit in the world is in Libby. It has been estimated that before the closing of the mine in 1990, Libby contributed up to 80% of the world's supply of vermiculite. It is a unique mineral with the ability to exfoliate, or expand, upon heating. Exfoliated vermiculite has many commercial uses such as inclusion in concrete aggregates, loose-fill insulation, horticultural applications like soil conditioning, and as a bulk carrier for agricultural chemicals. The asbestos veins in the ore body have

contaminated most, if not all, of the material taken from the mine. Milling removed much of the asbestos from the finished product, but a significant amount remained. Because asbestos fibers are so small, this contamination is not evident with the naked eye. Not all vermiculite is contaminated. However, it is difficult to distinguish Libby vermiculite with the naked eye, and all vermiculite should be handled with care.

The vermiculite from the mine was found to be contaminated with asbestos and other amphibole minerals. Workers were allowed to leave the mine site covered in asbestos dust, residents were allowed to take waste vermiculite for use in their gardens and the company distributing vermiculite "tailings" to the Libby schools for use as foundations for running tracks and an outdoor ice skating rink. The asbestos and amphibole fibers found in Libby have been linked to high incidence of asbestos related diseases in mine workers, vermiculite processing workers, their families, and the surrounding community. Health studies on residents of the Libby area show increased incidence of many types of asbestos related disease, including a rate of lung cancer that is 30 percent higher than expected when compared with rates in other areas of Montana and the United States. The EPA has spent over $180 million in asbestos cleanup costs in Libby, and it estimates that the total cost of cleanup in Libby will be well over $200 million. If, however, the information from its toxicological study finds that the previous cleanup levels have not been sufficient to significantly reduce health risks, these costs will likely increase dramatically.

Other Areas Also Contain Naturally Occurring Asbestos Minerals

Asbestos can be found naturally in the air outdoors and in some drinkable water, including water from natural sources. Asbestos from natural geologic deposits is known as "Naturally Occurring Asbestos" (NOA). Many populated areas are in proximity to shallow, natural deposits which occur in 50 of 58 California counties and in 19 other U.S. states. Portions of El Dorado County, California are known to contain natural asbestos formations near the surface. The United States Geological Survey (USGS) studied amphiboles in rock and soil in the area in response to an EPA sampling study and subsequent criticism of the EPA study. The study found that many amphibole particles in the area meet the counting rule criteria used by the EPA for chemical and morphological limits, but do not meet morphological requirements for commercial-grade-asbestos. The executive summary pointed out that even particles that do not meet requirements for commercial-grade-asbestos may be a health threat and suggested a collaborative research effort to assess health risks associated with "Naturally Occurring Asbestos".

Large portions of Fairfax County, Virginia were also found to be underlain with tremolite. The county regulates the disturbance of these asbestos-contaminated soils. Iron mining tailings in Minnesota were also found to contain naturally occurring asbestos. Large quantities of these tailings were transported out of state and used as roadway base for super highways. The USGS has 331 natural asbestos occurrences of many sizes in the Eastern United States, using descriptions found in the geologic literature. These asbestos occurrences range in size from small veins to large ore bodies once mined for commercial and industrial uses. The mapping is being completed for the Midwest and western portions of the United States.

Evolving science regarding the increased risk of asbestos and other fibrous amphibole minerals has significantly impacted current regulations and past risk assessments. New risk methodologies, analytical protocols, and testing methodologies are needed to address these new risks for protecting workers and the general public from naturally occurring and man-made asbestos pollution. Contamination of building materials and soils with these highly toxic fibrous minerals has created doubt over the protectiveness of past remediation efforts. There is also potential liability associated with a new wave of potential diseases and expanded remediation in areas contaminated with asbestos and other fibrous amphibole minerals. The SHE professional will benefit from keeping an eye out for new asbestos developments regarding worker safety and regulatory updates.