Problems Associated with Removal of Asbestos

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Abstract: Asbestos has been a very useful construction material, and because of this has had widespread use. However, it can be harmful if not handled correctly or removed in a safe manner. The health hazards associated with asbestos exposure have been known since the early 1900s, however, it has only been within the past 10 yrs that serious consideration has been given to the removal of asbestos from buildings. Asbestos removal has been fraught with numerous problems. Some of these include the high cost of removal, changing and nonspecific regulations, various agencies claiming jurisdiction over the substance, lack of information about the seriousness of asbestos-related diseases, and insurance-liability considerations. This paper outlines some of the problems associated with asbestos removal and provides recommendations to ameliorate the situation.

Introduction

Asbestos has been known to mankind for over 2,000 yrs (1,2,14). This naturally occurring mineral is most abundant in Canada, Russia, and China. Significant amounts are also found in the United States, South Africa, and Europe (1,12). Asbestos has several beneficial properties. The most widely known is its resistance to high temperatures. In fact, the name "asbestos" is derived from the Greek word for noncombustible. Other characteristics include its high tensile strength, which is comparable to steel; its flexibility, which permits it to be made into cloth and textiles; and its chemical stability. Because of these desirable properties, asbestos began to be widely used in the last 80 yrs (1,21). It is estimated that over 3,000 common items have been made with asbestos (2,14,21). These products include siding, roofing shingles, asbestos-cement pipe, welding gloves, gaskets, battery boxes, brake shoes, heat shields, drapes, pipe insulations, fireproofing, synthetic logs, etc. (20).

Asbestos is a common product and most consumers are aware of some of its properties and uses. Its widespread use has only recently started to decline. The curtailment of its use is particularly pronounced for fireproofing. In 1973, the Environmental Protection Agency (EPA) banned the use of sprayed products (fireproofing, sound control, condensation control) that contain more than 1% asbestos. This stemmed from the hazardous effects noted to result from breathing the fibers. The asbestos fibers were noted to become airborne when the binder in the sprayed asbestos broke down. This could occur when water damaged the sprayed material or whenever the material was physically disturbed as might occur when performing maintenance work (1). It is the airborne fibers that are of a primary concern, i.e., with the proper binder to contain the

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fibers, asbestos poses no known major threat to health (13,21). Asbestos can become airborne most easily when it is in a friable (crumbly) state.

The airborne fibers are of a variety of sizes. The larger fibers settle out of aerial suspension more quickly. However, many of the fibers are small enough to remain in suspension for many hours. When breathing the asbestos-laden air, some of the larger fibers (larger than five microns in length) will be filtered by the respiratory system. However, the smaller fibers will be taken deep into the lungs, perhaps to be permanently lodged there (14). Since the fibers are chemically inert, they will not be dissolved by the biological mechanisms that work on other foreign substances in the body.

Much is known about the health hazards associated with exposure to airborne asbestos fibers (5,15,16). Since the turn of the century, there have been many well-documented accounts of health ailments noted in workers who have been exposed to asbestos fibers (3,4,6,7,9,10). In fact, as early as 1918 life insurance companies were refusing to insure asbestos workers, because of obvious associated health risks (6). The inhalation of the fibers can lead to fatalities. Three serious ailments have been associated directly with the inhalation of asbestos fibers. These are asbestosis (a hardening and thickening of the lung tissue), lung cancer, and mesothelioma (a rare form of cancer) all of which can be fatal. Cancer of the larnyx, stomach, and rectum have also been linked with asbestos exposure, but the incidence is not as frequent and the causal nature is not as definitive. There is a serious health risk to those who breathe asbestos-contaminated air.

Because of the previously noted ailments associated with asbestos, serious concerns have developed regarding the human occupation of buildings sprayed with asbestos-containing materials. This concern is most pronounced in school buildings. Although accurate counts do not exist of the actual number of school buildings containing asbestos, the number is estimated to be quite large. Most of the schools built in the 1950s and 1960s are good candidates for containing asbestos.

This is not to suggest that all schools containing some form of asbestos pose a danger to the students. Asbestos is only a health threat when the fibers are airborne (13). Unfortunately, there is no known safe level of exposure to airborne asbestos. As a result, many schools have begun to remove the material from their buildings. This concern has spread to other owners of buildings that contain asbestos. Many manufacturing facilities and high-rise office buildings contain large amounts of the sprayed asbestos. These owners have also begun the process of removing or containing the hazardous material.

The removal of asbestos is not an easy or inexpensive procedure, nor is it a simple task. To that extent, the writers have been involved in the training of workers, contractors, owners, and architects who will be involved in such operations. This training effort has occurred for the past three years during which over 1,000 people have been trained in the safe removal of asbestos. It is through that involvement that the following problem areas have been identified.

Removal Procedure

The removal of asbestos involves several aspects that will be new to

many contractors. When removing asbestos from a building, such as from a ceiling, the first step is to seal off the contaminated areas from noncontaminated areas. This is accomplished with the use of 4-mil plastic sheets that are attached to the walls and similar sheets of plastic (preferably 2 layers of 6-mil thickness) placed on the floor. This is to contain any asbestos fibers that might become airborne during the removal (13). After it has been properly wetted, the asbestos is then scraped, peeled, etc., to remove it from the surface. The asbestos is placed in bags that can be sealed to prevent the distribution of asbestos fibers as the waste materials are taken to a sanitary landfill. All of the handling of the asbestos fibers should be done while the workers are fully protected by the proper personal protective equipment, including the wearing of respirators. These steps of the removal process are not intended to be a full description of the operation but merely to give the reader an overview of what is involved.

Problems Associated with Asbestos Removal Cost

One of the most formidable aspects of asbestos removal is that it is quite expensive. The process, as previously described, is specialized and is only performed by a limited number of contracting firms. Both of these aspects contribute to the high cost of removing asbestos. Estimates on some projects for removing asbestos have been as high as $10.00/sq ft of surface. In fact, the removal of asbestos from the ceiling of one school building built in the late 1960s was estimated to cost more than the initial cost of construction of the building. This cost has a profound impact on the owners of buildings. Many owners may elect to defer the removal as long as possible in order to delay the large expenditures that would be entailed. This is particularly unfortunate when school officials make such decisions when the cost of lives are being balanced against the costs of removal. Many owners of buildings containing asbestos do not have adequate resources with which to finance the removal operations. There have been rumors of "super funds" being set up to finance the removal of asbestos, but sufficient funds will not be available to finance all removal projects. The existence of state or federal funds to assist the owners of asbestos-laden facilities could encourage the removal of the hazard rather than delay any action. To date, most removal of asbestos is funded directly by the facility owners.

Where funds are limited, owners may naturally decide to delay the removal. If removal is imminent, however, the owner will certainly be inclined to award the removal contract to the lowest bidder. This is not a guarantee that the work will be done in a manner that leaves the facility completely void of asbestos materials. The knowledge of the proper procedures for removing asbestos is not universal and is certainly not uniformly practiced. A careless or unknowing contractor could easily remove the bulk of the asbestos from a building but perform the work in such a poor manner that the facility is more contaminated after the removal has occurred. In fact, if the area is not contained and cleaned properly the original contaminated area and even adjoining areas could end up having higher levels of airborne asbestos. Failure to use proper safeguards in isolation or removal areas could result in asbestos fibers

being "broadcast" through the air ventilation system of a facility. Inappropriate containment of asbestos removal waste water is another mechanism by which subsequent contamination could result. That is, the removal procedures may have been inadequate to recover all of the fibers that may have been generated or released by the operation.

Latency of Ailments

In spite of the costs, however, many owners decide to remove the asbestos. The problem then is to have full compliance with the proper safety procedures. This is often a problem. Firstly, workers are not generally comfortable wearing respirators and other safety attire. Neither are they fully sensitive to the hazards associated with the work place. Workers tend to become complacent about the hazards since the ailments associated with asbestos exposure are not immediate. The latency period for the onset of the ailments may be anywhere from 3 to 55 yrs, with the mean period being over 20 yrs (14). With such a long latency period, it is difficult for workers to fully appreciate the need for the safety measures. At the same time, employers may not be inclined to enforce full compliance with the safety procedures since a brief exposure of workers to asbestos may not be positively linked, in terms of liability, to an ailment that materializes many years later.

Weak and Nonspecific Regulations

Two federal agencies are involved where asbestos removal is concerned. They are the EPA and the Occupational Safety and Health Administration (OSHA). The EPA has mandated that all schools check their facilities for friable asbestos and that if such materials are found they must notify the employees and the parent-teacher associations of the presence of the friable materials. The law does not mandate that the asbestos be removed or that the conditions in the school be corrected. Apparently this regulation was devised so the parents of the students and the teachers would generate pressure to have the asbestos removed.

The EPA regulations require that asbestos be buried within 24 hrs in a sanitary landfill. Notice of this disposal of asbestos must be given to the EPA 10 days prior to its removal. This requirement is waived if the amount being removed is less than 260 linear feet of asbestos on insulated pipes or if the asbestos surface is less than 160 sq ft. These criteria appear straightforward, but can become confusing when local conditions are considered. Some landfills require notification whenever any amount of asbestos is placed in the landfill. In some states, however, state agencies have the authority to administer the EPA regulations. In such instances the state agencies may enforce the requirements more rigidly to satisfy more stringent state regulations.

Problems with OSHA Regulations

To protect the workers involved in the removal of asbestos, employers must comply with the regulations set forth by OSHA. The remaining comments will focus on various problems noted with compliance of these regulations.

One of the regulations mandates that if the workers are exposed to asbestos at the workplace, the employer must make medical examinations available to the employee. The first examination must be made available within the first 30 days of such exposure. If the exposure is of an ongoing nature, the medical examinations are to be made available each year and it must also be made available within 30 days of the termination of employment. Although these criteria may seem clear, there are two shortcomings. The first is that a medical examination will probably not determine if a worker's lungs have been contaminated with asbestos. This echoes the problem noted earlier with the long latency period for the onset of the symptoms of the ailments associated with asbestos exposure. The second problem is that the regulations state that the medical examinations are to be "made available" to the workers. This is not a definite requirement. In fact, some union leaders openly admonish their union members to refuse to submit to the medical examinations in order to avoid being "blacklisted" in the event that an x-ray revealed a health problem. Another problem noted with the medical examinations is that the chest x-rays could be a health risk if repeated each year over a long duration.

Another measure required by OSHA is that the air must be monitored for the concentration of asbestos fibers. OSHA regulations focus only on fibers that are longer than five microns in length. OSHA currently requires that the air-monitoring samples be analyzed by a technique known as phase contrast light microscopy. This test has an inherent problem in that it does not differentiate between the types of fibers in the air, i.e., the test does not specifically identify asbestos as being present (14). Fortunately, this problem causes one to err on the side of safety. That is, the test might reveal that the concentrations of fibers are above two fibers per cc when in fact none of the fibers are asbestos fibers. This test is presumably required because the alternative test would be electron microscopy which is about 10 to 20 times more expensive. Although the maximum level of exposure without respiratory protection is stated in the regulations as being two fibers per cc, the OSHA field manual designates that the "trigger" level is 0.1 fibers per cc. This trigger level means that workers must have medical examinations made available to them if that level is exceeded. Unfortunately, the trigger level that is well known by the OSHA compliance officers is not mentioned in the regulations.

The regulations state that the safe level of asbestos exposure before a respirator must be worn is two fibers per cc. This level of exposure has two questionable aspects to it. Firstly, a fiber is defined as being longer than five microns in length. This size may have been determined by the technology that is currently available. However, it should be recognized that it is most likely the very small fibers, specifically those less than five microns in length, that may result in most of the asbestos ailments. Secondly, the safe level is set at two fibers per cc. It is not clear how this number has evolved. In the early 1970s the safe level was set at 12 fibers per cc. That level has steadily declined as the industry resistance to lower levels has given way to public pressure for more stringent standards (14). The current level is generally assumed to be inadequate to prevent lung cancer and mesothelioma, i.e., it may afford protection from asbestosis. The National Institute of Occupational Safety and Health has

stated that there is no known safe level of exposure to asbestos. Efforts were begun during the early 1930s to reduce the levels of asbestos fibers in the workplace (2,8). In a similar fashion, efforts have continued to reduce the levels below the current values (11,17,19). A proposed regulation would reduce the level to 0.1, 0.2, or 0.5 fibers per cc (17).

Clearly, the air monitoring required by OSHA is an expensive component of the asbestos removal operation. Contractors often hire industrial hygienists or professional testing laboratories to perform this task for them. Although this is expensive, contractors are not given clear guidance in the regulations as to how the air monitoring is to be performed. For example, the regulations are not clear on how many air samples are required or how often they are to be taken. The regulations simply state that the "level of asbestos exposure is to be reasonably determined." Compliance with the regulations is open to interpretation, which may vary widely.

Contractors must face another issue when they decide on how an asbestos removal operation is to take place. Strict compliance with the OSHA regulations, in the view of the writers, is substantially below the minimum procedures necessary to insure that the employees have a safe work environment. This places a conscientious contractor at a decided disadvantage when competitive bids are accepted. If a competing contractor bids a project with minimum compliance or less in mind, a distorted comparison will be made between the various bids.

Estimating the costs of removing asbestos is difficult. Most contractors have performed demolition projects or renovation projects, but their historical cost data will not be valid for asbestos removal. It might be possible to accurately determine the cost of purchasing plastic sheets, respirators, gloves, goggles, boot covers, specialized equipment, and other tools. The labor component will not be as easy to estimate. Some contractors have indicated that productivity may drop as much as 30% or more when a worker is using a respirator and utilizing other protective measures. These claims, however, have not been quantified or documented. Thus, it is very difficult for an inexperienced contractor to have a good idea of how to estimate the cost of removing the asbestos from a facility.

The regulations cannot always be followed to the letter. Maintenance personnel may be inclined to deviate from the regulations during emergency situations involving piping insulated with asbestos. Wet removal of piping insulation becomes more difficult when the pipe lagging is impervious to water or when the pipes are to remain heated. Wet removal may prove to be impractical in areas having expensive electronics equipment or in freezing environments. Warmer environments may cause serious discomfort for workers wearing the appropriate clothing and respirators. The proper procedures for the removal of asbestos located out-of-doors are less definitive. These are only a few of the physical problems faced by asbestos removers.

Summary

The problem of the safe removal of asbestos is indeed a complex one. This complexity is rooted in the high cost of the removal procedure, the

long latency period generally observed between exposure and onset of ailments, the inadequate regulations that have been promulgated by the different federal agencies, and the personal protection equipment that must be worn by workers not customarily wearing such attire. These factors affect owners, contractors, architect/engineers, workers, and regulatory agencies. Philosophically, these participants are not always in agreement. As a result, the problems must be resolved through a mechanism that does not generally exist.

Conclusion

If regulatory changes are not made concerning the problem of asbestos abatement, exposure in the workplace will increase. In addition, some of the efforts to remove asbestos will be done in a fashion that does not afford adequate protection for the workers or the environment. In the absence of appropriate legislation, the incidence of asbestos-related ailments will continue to be relatively common in this society for many years in the future.

Recommendations

A number of shortcomings have been examined concerning the current regulations on the safe removal of asbestos. Most of these problem areas could be reduced or eliminated if some specific actions were taken.

The first action that should be taken is to initiate clearer and more stringent regulations concerning the removal of asbestos. Perhaps OSHA should adopt the recommendations proposed by the National Institute for Occupational Safety and Health in 1976. Although revised regulations may not be able to address unique circumstances, specificity would provide more guidance to owners and contractors while providing additional protection for the workers. In like manner, more specific standards should be adopted by the EPA.

State involvement appears to be needed in order to resolve the immense problem of removing friable asbestos from all buildings. It is recognized that the encapsulation of asbestos can effectively neutralize the asbestos hazard, but it is not the ultimate solution, i.e., removal should be the final action taken. A super fund for asbestos removal may be one option that should be considered at the state or federal level. One of the problems noted was in the differing ways that contractors elect to interpret the regulations. The cost of removal could be quite varied depending on the care used in properly executing the work. The owners should not have to be placed in a position of choosing between contractors on the basis of their bids. Some form of certification of contractors is needed. With a formal certification procedure established, owners would have greater assurance that the work would be done properly. The certification process should consist of a thorough training program for the contractor in asbestos removal. Harsh penalties should be levied against any contractor violating the intent of the regulations.

Contractors should be required to have formal training programs for their workers in the safe removal of asbestos. Such programs should be in writing.

In order that owners fully understand the requirements for the removal of asbestos, a set of guidance specifications should be adopted as an industry standard. This consistency, applied whenever applicable, would greatly reduce the confusion of the owner's needs.

There are many problems associated with asbestos removal, most specifically, cost and vague regulations.

The promulgation of specific regulations and performance standards for removal contractors will help clarify and/or eliminate problem areas. The adherence to proper asbestos removal techniques is imperative to the safety of workers and the general population.

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