ALASKA LEGISLATURE COMMITTEE FILES 1985-1986 8672

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I. ASBESTOS--ITS TYPES, ORIGIN, AND CHARACTERISTICS

Asbestos is a name given to a number of naturally-occurring fibrous silicates, the word asbestos being derived from the Greek word similarly spelled, meaning inextinguishable. There are two main varieties of asbestos; the serpentine form, which is characterized by long, soft, flexible, and finely-polished strands, which may be woven into a cloth, of which chrysotile is the primary representative, and the amphiboles, which occur as straight, needle-like fibers, of which crocidolite, amosite, and anthophyllite, tremolite, and actinolite are the primary examples.

Chrysotile makes up approximately 70% of the world production of asbestos and is mined primarily in Quebec, Canada, which produces 95% of the world production of chrysotile. Chrysotile is also produced in Vermont, the Union of South Africa, Russia, and to a lesser extent, in certain parts of Europe. Its unique characteristic is the fact that the long, white, silky fibers can be woven into cloth, whereas the other types of asbestos do not have this capability. All types of asbestos have the outstanding characteristics of being almost indestructible on exposure to body fluids, highly resistant to heat, and extremely resistant to acid erosion. Chrysotile is especially resistant to heat, being able to withstand 500 degrees centigrade, but is less resistant to acid erosion, and in bodily tissues, for example, the magnesium gradually tends to be leached out over many years.

Crocidolite is blue asbestos is produced primarily in the Cape of South Africa, especially since 1910, and makes up approximately 3.5% of the world production of asbestos. It is more acid resistant and hence is used often in marine insulation and aboard ship, is less resistant to heat, being able to withstand only 200 degrees Centigrade. Its needle-like morphology enable it to penetrate further and deeper than the other types of asbestos in body tissues.

Amosite is produced largely in Transvaal South Africa, primarily since 1907; and has somewhat coarser brownish fibers which have the outstanding characteristic of being more acid-resistant and hence is used primarily in marine insulation and shipbuilding. It was also widely used in pipe and boiler lagging in buildings.

Anthophyllite is mined predominatly in Finland, is the coarsest of the asbestos silicates, is less heat resistant, being able to withstand only 200 degrees Centigrade, and has an inherent tensile strength much less than crocidolite. It is not flexible, and is used primarily in the chemical industry. Its exposure is associated with greater incidence of pleural plaques and rarely, if ever, is mesothelioma seen in men exposed to this type of asbestos. Anthophyllite makes up less than 1% of world usage of asbestos. It is only rarely found in building insulation.

The other two little-used types of asbestos are tremolite and actinolite. Tremolite is a more brittle asbestos, has a fairly good heat resistance, and it, as well as actinolite make up each less than 1% of world asbestos production. Actinolite is rarely used, although it is very acid and heat resistant. Tremolite has been found in some talc mines causing asbestos contamination of certain talc products.

Table 1. Varieties of asbestos[1]

Variety	Colour	Major components (%)			Approximate formulae
		Si	Mg	Fe	
Chrysotile	white	40	38	2	$3MgO.2SiO_2.2H_2O$
Amphiboles					
Amosite	grey brown	50	2	40	$5.5FeO.1.5MgO.8SiO_2.H_2O$
Anthophyllite	white	58	29	6	$7MgO.8SiO_2.H_2O$
Crocidolite	blue	50	-	40	$Na_2O.Fe_2O_3.3FeO.8SiO_2.H_2O$
Tremolite	white	55	15	2	$2CaO.5MgO.8SiO_2.H_2O$
Actinolite	white				$2CaO.4MgO.FeO.8SiO_2.H_2O$

[1] From Hodgson A. A. (1965) *Fibrous silicates*. Lecture Series No. 4. The Royal Institute of Chemistry and the Asbestos Information Committee, London.

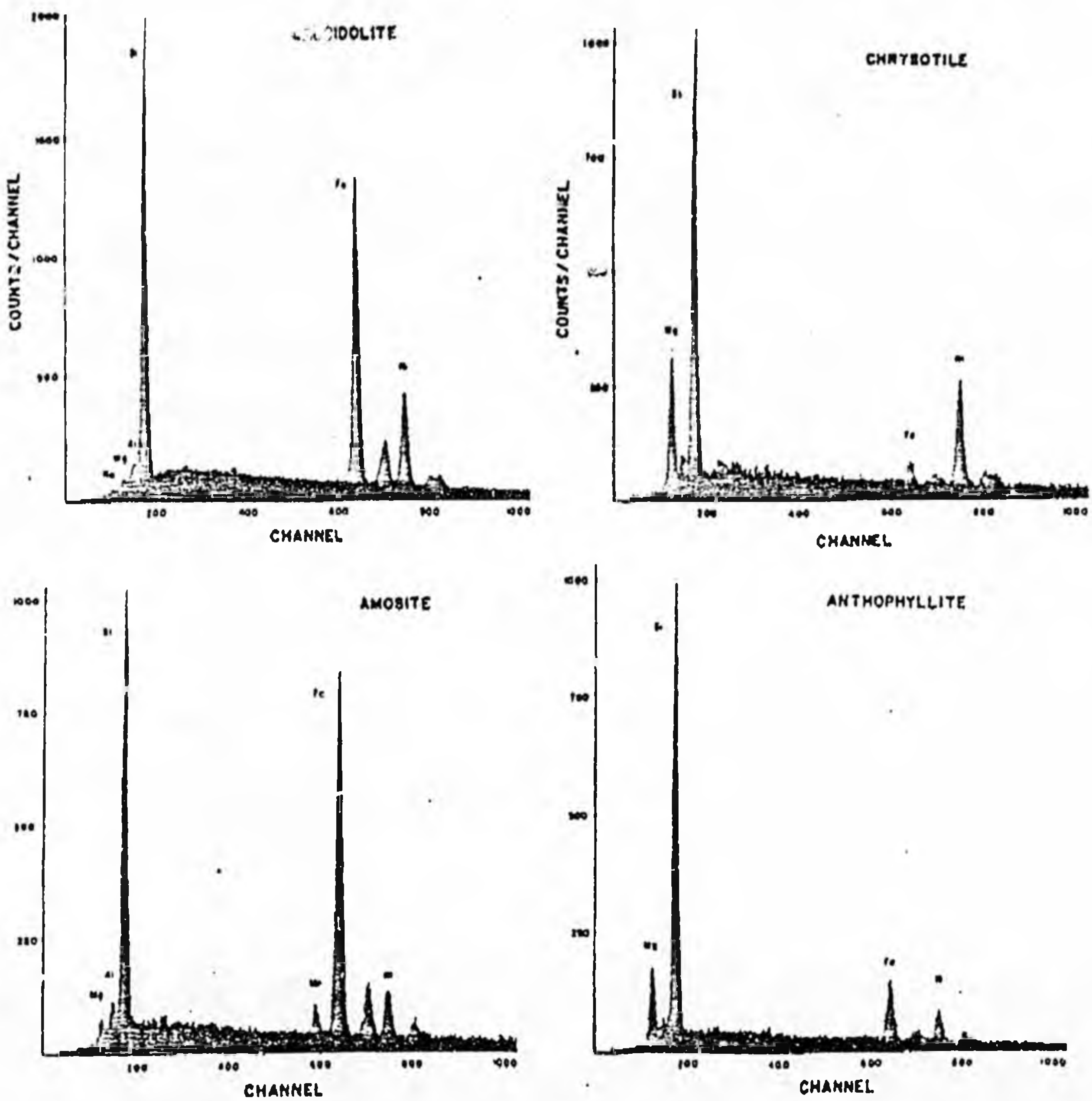


FIGURE 7. Examples of typical spectra from different types of asbestos: amosite; crocidolite; chrysotile; anthophyllite. (The nickel lines are present due to the specimen support.)

Reprinted from: Ivan B. Rubin and Carl J. Maggiore, "Elemental Analysis of Asbestos Fibers by Means of Electron Probe Techniques". Environmental Health Perspectives. Vol. 9, December 1974.

II. THE USES OF ASBESTOS

The United States used over 5 million tons of asbestos yearly in 1974, most of which came from the Quebec mines. Most was used for fire-proofing and insulating materials, especially in the construction industry where it was incorporated into cements, tiles, felts, and garments. In the textile industry, uses are fire-proof draperies and floor tiles, the former as used on theater curtains, asbestos sheets, and in the use of asbestos building boards. Plasterers applied an asbestos mix on steel foundations in order to prevent the steel from buckling in case of fire; this asbestos mix hardened within 8 hours without cracking or shrinking and without interrupting other construction activities. Boats and ships were similarly treated. Formerly, over 3 million pounds of fire-proofing mixture, which contains 30% chrysotile asbestos were used annually, and when sprayed, approximately 25% of the material goes directly into the air rather than being applied to building surfaces, and hence, workers may inhale as much as 50 million fibers in an eight-hour day. For this reason the use of a wet mixture of asbestos applied by trowelling was the preferred method of application. The practice of spraying asbestos-containing insulation in buildings was banned by the EPA in the 70s. In 1982, the United States used less than one-half million tons of asbestos, a significant decrease from the 1974 level referred to above.

Asbestos products resist heat and withstand abrasive forces. Chrysotile makes up 50% of the brake-lining material in brakes, and hence, workers exposed to this use of asbestos in repairing brake linings, are exposed to asbestos dust themselves. If not properly controlled, clouds of the asbestos dust appear in the air in this and other circumstances. Asbestos is also used in certain papers, paints, and plastics, where the positives charge of the chrysotile combines with the filler in pigment to form a more durable product. Similar friction products are used on railroad cars, airplanes, and industrial machinery. The ship-building industry has been a major user of asbestos because the substance is good for insulating boilers, steam pipes, hot water pipes, nuclear reactors in ships, both in initial fitting and in repairs and refittings. Various sealants and patching tape compounds contain asbestos, and both floor and ceiling insulating tiles in the past often used asbestos.

It is apparent, therefore, that a large number of workers are exposed to asbestos; indeed, somewhere between 18 and 11 million U.S. workmen have been exposed to asbstos dusts during their lifetime in the past 40 years, including approximately 4½ million shipyard workers, 300,000 textile workers, 100,000 insulation workers, and perhaps another 3 to 5 million workers who handle asbestos at some course during its manufacture. It is apparent that individuals exposed include those who mine the asbestos, those who work in the mills in which asbestos is crushed, and those who manufacture the asbestos products-are all at risk in varying degrees. Those who load and truck the asbestos ore as in using it for rock filler on roads, as is the case in at least one area in Maryland are at risk, as well as the people who drive on this particular road. Carpenters are exposed when they cut asbestos board, or when they work in the presences of insulators or other workers working with the asbestos products themselves. Any worker aboard ship or working in shipyards is similarly exposed to asbestos dust, and indeed even families of workers who work in the vicinity of a shipyard or mine are at similar risk, including the families, for example, of shipyard workers, where asbestos dust may be brought home on the clothes of the workers, if proper precautions are not taken. The demolition of buildings containing old asbestos exposes such workers, as well as passers-by, to varying degrees of exposure to the asbestos dust. During the past 15 years it has become increasingly apparent that indirect family exposure, workers and family living near a mine, mill, or shipyard, represent a secondary risk not previously appreciated. It has been demonstrated beyond a doubt that a period of time as short as one month's exposure to asbestos dust results in a significant risk to the individual from asbestos-associated diseases.

III. FATE AND BIOLOGIC EFFECTS OF INHALED ASBESTOS PARTICLES

It has been shown that the aerodynamic behavior of asbestos particles is a function primarily of the diameter of the fiber. It has been shown that fibers larger than 5 microns in diameter are precipitated out primarily in the nose and bronchi or upper parts of the bronchial tree, while fibers between 1 and 5 microns are capable of descending into the lower portions of the bronchial tree into the respiratory bronchioles. Only fibers less than 1 micron in diameter are capable of entering the air spaces or alveoli, where they may more readily penetrate the lung tissue. It is also apparent with asbestosis that gravity must play a part in the deposition of asbestos particles, as lung scarring is m e prominent in the lower lung field suggesting that the weight of the particles tends to allow them to be deposited in the lower lung fields primarily. Once the asbestos fibers enter lung tissue approximately 25% of them become coated or walled off by macrophages, the scavengers of the lung, which try to wall off foreign particles to prevent tissue injury. At least 75% of the smaller fibers are not similarly walled off and remain uncoated and more difficult to see by usual light microscopy, and can only be seen with the higher magnification of electron microscopy.

The coated asbestos fibers, are called asbestos bodies, may be seen by regular light microscopy. These asbestos bodies are probably better called ferruginous bodies, as it has been demonstrated that other foreign particulates in the lung, primarily talc and probably zeolite, as found in certain towns in Turkish Anatolia, also have the capability of forming a similar-appearing coated fiber. The ferrugionous body is a long, beaded, rod-shaped particle of asbestos or talc having clubbed ends, staining darkly with iron stain and very easily picked up, when present, by the light microscope. This coating contains ferritin or iron granules with some amorphous material of up to 5 microns in diameter, the latter apparently representing the breakdown process of macrophages and containing acid mucopolysaccharide with hemosiderin content. In most instances, however, the ferruginous body is diagnostic of asbestos exposure, while the presence of uncoated asbestos fibers can be confirmed by electron microscopy when necessary, by lung tissue obtained by either open lung biopsy, needle biopsy, or transbronchial biopsy. It is theorized that the physical characteristics of each asbestos fiber plays a distinct part in the type of disease produced in man.

IV. CELLULAR EFFECTS OF ASBESTOS

Once the asbestos fibril has penetrated lung tissue, local irritation there causes increased permeability of cellular membranes and as a result of this over a long period of time the particles are surrounded by macrophages, some chemical leaching or digestion of the magnesium, especially in chrysotile, occurs, macrophage death occurs, and fibrosis or scarring of the lung is stimulated in an effort to wall off these particles and prevent further lung damage. Chrysotile is probably the most potent in causing asbestosis than are the other types of asbestos. It is probable that the degree of the reaction is definitely related to the number of fibers inhaled into the lung as well as the individual's inherent biologic susceptibility or reactivity. It has been shown that both the total years of exposure, the dustiness of the job, account for the cumulative dust exposure, and that these exposures are directly related to patient's symptoms, lung function tests, x-ray changes, the development of lung cancer, as well as mortality statistics. It is apparent, however, that mesothelioma needs much less exposure to the asbestos dust than the other diseases associated with asbestos.

In analyzing the presence of coated and uncoated fibers in the lung, it has been demonstrated that in carefully conducted studies almost 98% of all urban dwellers have asbestos fibrils or bodies in their lungs, this being in a higher percentage of men, in a greater number of older people, and in a greater percentage of individuals who work with shipping or docking areas or in industrial sites. The longer one lives in an urban area the higher the percentage and the greater the number of asbestos fibrils and ferruginous bodies have been found. Interestingly, ferruginous bodies are rarely found in the hilar lymph nodes or beyond the lung itself.

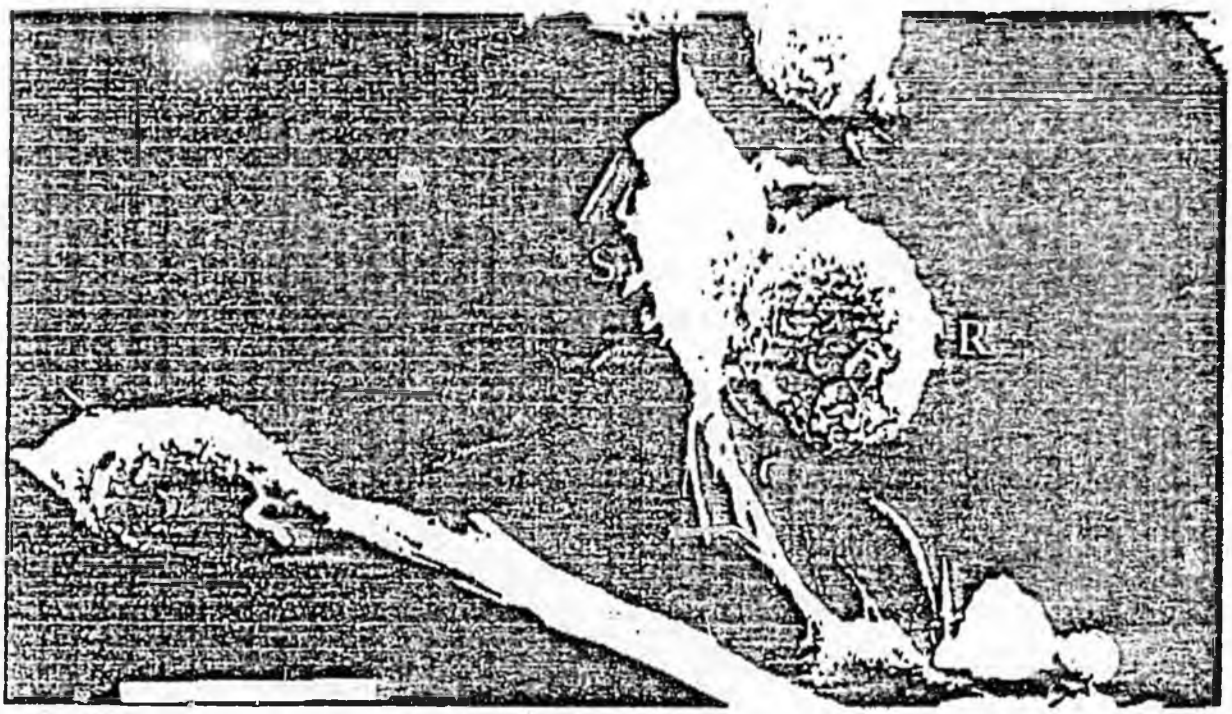


FIGURE 6. Scanning electron micrograph of untreated UICC chrysotile asbestos fibers associated with bovine alveolar macrophages: cells(S) were often observed spread along asbestos fibers with additional rounded macrophages (R) nearby (1940 x, bar = 10 µm).

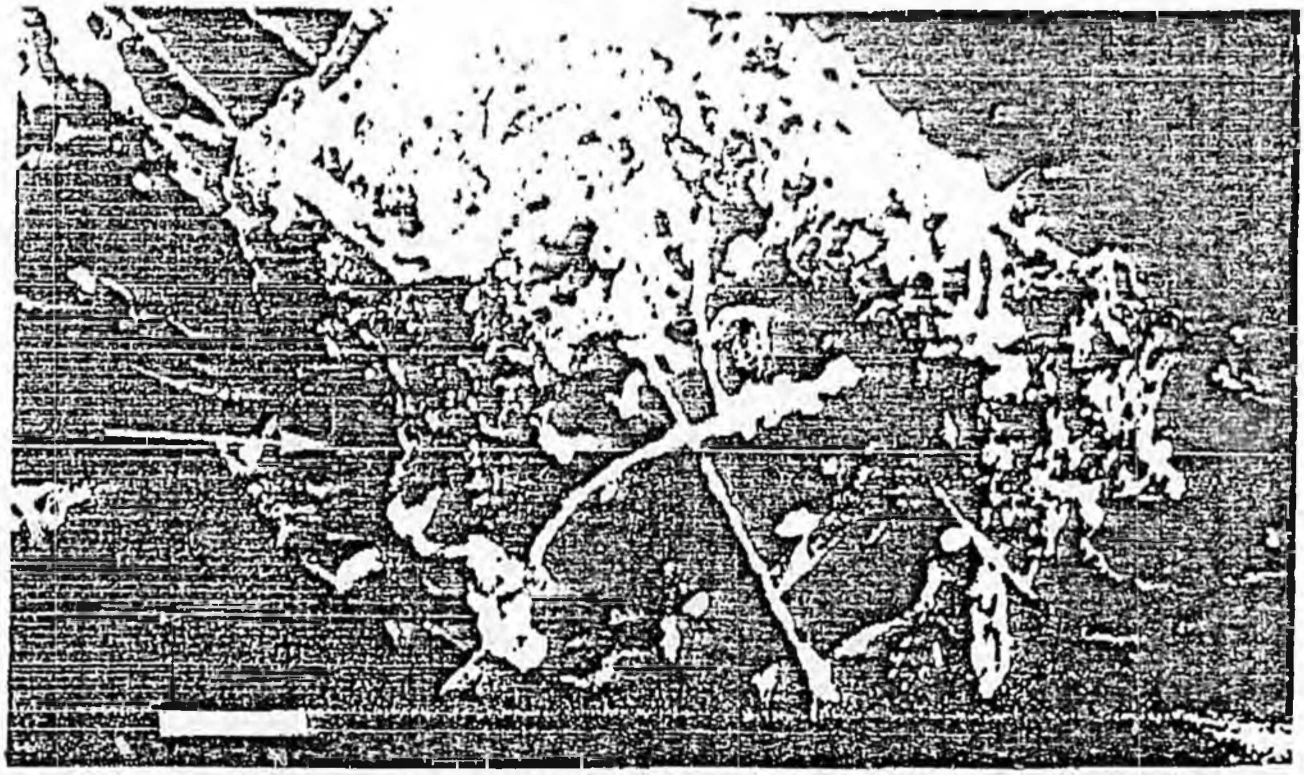


FIGURE 7. Some macrophages appeared mottled with numerous holes and a loss of typical membrane surface features. Fibers, previously X-ray irradiated, are visible (arrow) on such cells (9,700 x, bar = 1 µm).

Micrographs reprinted from: R. Valentine, et. al., "Thermal Modification of Chrysotile Asbestos: Evidence for Decreased Cytotoxicity". Environmental Health Perspectives. Vol. 51, September 1983.

V. ASBESTOS INDUCED OR ASSOCIATED DISEASES

There are six general areas of human disease caused by or at least strongly associated with exposure to asbestos dust. Most important, certainly historically, is that of diffuse interstitial pulmonary fibrosis or asbestosis. In previous years before adequate control of asbestos dust in the air was obtained, approximately 20%, or 1 out of 5 miners, would develop significant pulmonary fibrosis with the characteristic gradually progressive exertional dyspnea or shortness of breath, characteristic of this entity. With better precautions used in the handling of asbestos during more recent years, it is already noted that perhaps up to only 10% or 1 out of 10 miners have been afflicted with interstitial fibrosis of the lungs. Chest x-rays made over the years in a group of asbestos insulation workers have shown a gradually increasing number of abnormal chest x-rays with the passage of time, there being approximately 10% abnormal within 10 years, 44% abnormal within 20 years, 73% abnormal within 30 years, 87% abnormal within 40 years, and practically 94% of all chest x-rays show some abnormality secondary to asbestos dust inhalation in workers who have been exposed for over 40 years. The peak age for the development of disability in asbestos workers occurs after 20 years of exposures, in other words, after the worker has been exposed from 15-25 years. He may indeed have worked only 1-3 years in asbestos dust, and yet, 15-20 years later, full-blown asbestosis of the lung becomes apparent, indicating that the scarring in the lung progresses even after exposure to the asbestos dust per se has stopped. It is also interesting that the progression to moderate or severe pulmonary fibrosis is not related entirely to dosage, but perhaps to some genetic factors not fully understood at this time.

Examination of the lungs of the man who has died of asbestosis shows that there is diffuse fine fibrotic scarring scattered throughout primarily the lower halves of both lung fields, frequently but not usually associated with some degree of centrilobular or bullous emphysema, and with relative retraction or generalized decrease in size of the lung in the involved areas. X-ray changes of these same lungs demonstrate a ground-glass appearance of linear scarring or fibrosis with partial obliteration of the diaphragmatic and heart borders primarily in the lower lung fields. During the worker's lifetime, pulmonary function studies show what is called a restrictive defect, characterized by a decreased vital capacity, diffusing capacity, and arterial oxygen content secondary to the diffuse scarring throughout the lower lung fields. One of the earliest changes that can be discovered, in fact, is that of the decreased vital capacity which can be recognized by doing pulmonary function studies. There are occasions when more complicated pulmonary function tests such as the use of the diffusion capacity, measurement of alveolocapillary oxygen gradients and exercise blood gas tests will show an abnormality before pulmonary function studies, but this is the exception rather than the rule. The use of the chest x-ray coupled with pulmonary function studies, as is required now by OSHA, are reasonable and practical means of measuring and picking up these changes as early as they can in general be.

On occasion, it is desirable or even necessary to prove that a patient or worker has pulmonary asbestosis, and this nowadays can be done without an open lung biopsy which requires a major chest operation. The abbreviated procedure being that of transbronchial bronchoscopy with biopsy of a tiny bit of lung tissue. This tissue, if carefully examined by electron microscopy for uncoated fibers, and for coated fibers or ferruginous bodies by light microscopy can frequently give unequivocal evidence of underlying asbestosis. It must be mentioned, however, that efficient evaluation of electron microscopy requires the full day of a trained microscopist or pathologist in order to adequately examine a single specimen. Exposure to crocidolite probably accounts for more fibrosis than chrysotile exposurs. Although we do not know what the actal fiber level is insofar as the threshold for human disease, in this instance (pulmonary fibrosis) workers are currently living longer, are having less disability due to pulmonary fibrosis, and their disease entities are picked up sooner.

The second most common disease entity related to asbestos dust exposure is that of the pleural plaque. This is a hyalinized and often calcified discrete parietal pleural plaque, not located on the wall of the lung, but on the pleura lining the chest wall and never on the lung itself. These plques are extrapleural and occur most commonly in workers exposed to anthophyllite fibers. The hyaline or calcified plaque is picked up often on routine chest x-ray as an ill-defined modular density along the margin of the lung which is almost pathognomonic of asbestos exposure. Interestingly, only 15% of the plaques are found on chest x-rays that are actually identified at autopsy, illustrating that multiple chest x-rays would need to be done in order to pick up all or most of these densities.

Clinically these plaques are rarely, if ever, symptomatic, and if a plaque is found on the chest x-ray, one can anticipate that individuals with the plaque will have a higher than expected incidence of bronchogenic carcinoma, otherwise they have little significance except for that of a signpost which calls out "asbestos". Another rare and more recently recognized disease apparently induced by asbestos fibers is that of the exudative reaction or pleural effusion of which there have been approximately 70 cases described in the medical literature. These cases are diagnosed partly by exclusion, that is, by ruling out all other causes for pleurisy with effusion, and in some instances, by parietal pleural biopsy in which asbestos bodies and fibers are found in areas of pleural thickening and associated local pneumonitis or pneumonia. The development of this benign pleural effusion in the worker may occur in as little as 1 or as long as 5 years after exposure to asbestos. There is no specific treatment for this entity.

The malignant mesothelioma of the pleura or peritoneum, which was first described in a case reported in 1946, has become increasingly more common during the past 30 years, primarily in workers exposed to asbestos to the exclusion of other people generally. It is now well accepted that malignant mesothelioma can be induced by asbestos dust inhalation for as short a period of time as 1 or 2 months primarily to crocidolite fibers, less frequently with amosite fibers and least with chrysotile fibers, while anthophyllite fibers have not been known to produce this entity. It is interesting to speculate that the size of the fibers is the most important aspect in explaining this variation, as the crocidolite fibers are the tiniest and most needle-like of all, and therefore can penetrate deep into the tissues lining the lung and the peritoneum in order to produce this cancerogenic effect. It is also interesting that more cases are produced in those workers who are the furthest along the line in the processing of the asbestos ore, the fewest cases of mesothelioma occurring in the workers with the heaviest of the ore exposure. This implies that processing breaks down the asbestos into finer particles which are better able to penetrate deep into the tissues of the lungs. Mesothelioma is more often found, therefore, in industries which use crocidolite and amosite asbestos, as in the shipyard workers, and in workers exposed to manufactured products using these types of asbestos fibers. During the past 10 years, it has become apparent that the wives, sons and daughters of asbestos workers and individuals who live in the vicinity of shipyards where asbestos dust is used, are often the ones who, though they have no direct exposure to asbestos in their work, inhale the particles brought home by their husbands in their work clothes or breathe in the particles from the air blown from the shipyards where asbestos is being used. Among the seventeen thousand insulation workers in America at this time, approximately one worker every two weeks dies of mesothelioma. This is in contrast to the general association among people at large of only one case of mesothelioma per million persons in the United States.

The mesothelioma usually develops in the pleural or peritoneal surfaces and spreads diffusely around and into the lung or abdominal cavity with death generally occurring within 1 year after the tumor is recognized. Pulmonary fibrosis or asbestosis is usually associated with mesothelioma in varying degrees, and ferruginous bodies are generally found in the lung, although they are not generally found in the mesothelioma itself. Uncoated fibers of asbestos can usually be found by electron microscopy.

The clinical features of mesothelioma are generally insidious with weight loss, lassitude, chest or shoulder pain, abdominal swelling or obstruction of the intestine, with generally rapid progression of the disease with average survival being less than one year. Adequate treatment is not yet available but appropriate chemotherapy is currently being evaluated. The amount of asbestos fibers needed to produce mesothelioma is apparently much less than that necessary to produce asbestosis or pulmonary fibrosis.

Carcinoma of the lung has been associated with asbestos exposure since the early 1930's, definitely confirmed by 1947. During the past ten years it is anticipated that from 15 to 20% of men having significant asbestos exposure die of carcinoma of the lung. There is a greater incidence of adenocarcinoma of the lung in asbestos workers, probably related to the fact that asbestos dust pervades every part of the lung especially in the periphery where the cells which develop into the adenocarcinoma are more plentiful. The worker's likelihood of developing carcinoma of the lung is slightly greater in the worker who has pleural plaques noted on chest x-ray. Cancer of the lung can be more effectively treated than mesothelioma of the pleura or peritoneum, and for this reason, early diagnosis by chest x-ray or in cetain instances by Pap smears of sputum may be helpful in effecting palliative relief of symptoms and indeed cures in some patients, if they are discovered early enough in their clinical course. For this reason, annual chest x-rays in every asbestos-exposed individual should be carried out for their lifetime. The longer the duration of the asbestos-exposed worker's employment the greater the risk of developing lung cancer. Even 1 month of working with asbestos was enough to increase the instance of bronchogenic carcinoma, in that the instance of cancer was twice as much in such a worker, as in one who has no asbestos exposure. After two years of exposure the instance of lung cancer increases to six times that of the normal person, and after ten years rises markedly. The smaller the dose of asbestos, it has been found, the longer the induction period before the cancer deevelops. In general, when cancer of the lung is first diagosed, 75% of them are inoperable at that time. If the lung cancer can be found as a small peripheral nodule resected by lobectomy, 40 to 50% will survive for as long as 5 years.

The final area of asbestos-associated disease, mainly where the relationship is less positive as to the etiologic agent being asbestos, includes other tumors or cancers which are found to be of greater incidence in workers or people exposed to asbestos. At this time, cancer of the esophagus, larynx, stomach, colon, and more recently the pancrease, are definitely in increased numbers as compared with the general population, and hence pose added risk to the asbestos worker. These entities are, in general, two to five times more common in asbestos workers than in the general populace.

VI. RELATIONSHIP OF SMOKING TO ASBESTOS INDUCED DISEASES

In August 1978, Johns-Manville, the biggest producer of asbestos products in the United States, not only had banned smoking entirely in the company work area, but has since established a policy that no person who smokes will be hired by the company for any operation where there is a possibility of exposure to asbestos, and that applies to the entire plant, including the officers. Even visitors to the plant are prohibited from smoking inside the plant itself. This action is to be strongly commended, and yet it was not enforced without considerable controversy. What in fact are the effects of smoking or not smoking on the health of the asbestos worker?

Insofar as pulmonary fibrosis or asbestosis of the lung, there is little or no effect on the scarring in the lung insofar as whether the worker smokes or does not smoke. There is no question, however, that smoking aggravates and causes to develop a significantly greater obstructive defect in the lung, which further increases the worker's shortness of breath, and especially his amount of cough and expectoration, as compared with the non-smoking worker who develops asbestosis. There is also no apparent statistical role in the development of mesothelioma of the pleura or of the peritoneum in asbestos workers, and the same probably applies to the development of the asymptomatic pleural plaque and the benign pleural effusion. There is, however, a greater incidence of cancer of the stomach and larynx associated with smoking, but it may not have a significant effect insofar as the asbestos worker is concerned.

Wherein, therefore, is the data for forbidding smoking in an asbestos plant? Statistically it has been shown that the non-smoking asbestos worker will develop cancer of the lung approximately five times more commonly than the non-smoking, non-asbestos worker. This proportion, in itself is relatively mild, but significant. In the smoking asbestos worker, however, there is a multiplicative or synergistic effect in that there is a fifty-four times greater rate of cancer of the lung than in the non-smoking, non-asbestos-exposed individual, and these facts are borne out that approximately 15-20% of all asbestos-exposed workers in previous years will develop carcinoma of the lung, almost one of every five workers. This is in sharp contrast to the one or two out of each hundred to one hundred fifty workers who do not smoke. In other words, the worker's chance of developing cancer of the lung is 20 times greater if he smokes while working in an asbestos environment than if he does not smoke. Unfortunately, banning smoking on company premises does not stop the person from smoking, but an adequate educational program by management, backed up by labor, is the best approach towards reducing the high incidence of lung cancer in these individuals.

VII. DURATION OF EXPOSURE AS RELATED TO DISEASE DEVELOPMENT

TABLE I

ROENTGENOLOGIC CHANGES IN ASBESTOS INSULATION WORKERS

Years of Exposure (yr).	No.	Percent Normal	Percent Abnormal	Asbestosis 1	Asbestosis 2	Asbestosis 3
40+	121	5.8	94.2	35	51	28
30-39	194	12.9	87.1	102	49	18
20-29	77	27.2	72.8	35	17	4
10-19	379	55.9	44.1	158	9	0
0-9	346	89.6	10.4	36	0	0
	1,117	51.5	48.5	366	126	50

Selikoff et. al.

In general, the initial exposure of the asbestos worker to asbestos dust may be measured in decades for convenience in categorization. For example, in the fibrosis induced by asbestos dust there are few changes noted during the first ten years, but during the second ten years, mild changes occur. These changes moderate from ten to twenty-nine years after the initial exposure, and result in a greater degree of pulmonary scarring during the fourth decade. As shown in Table I, pulmonary fibrosis, as evidenced by x-ray changes, becomes increasingly more prominent the longer the time from initial onset of exposure. Practically every asbestos worker who has worked for over forty years or has had forty years from the initial exposure has some evidence by chest x-ray of lung or pleural abnormality not found in the normal individual. The same applies to the development of disability in these workers, in that the average person who develops asbestosis or pulmonary fibrosis becomes disabled somewhere between the fifteenth and the twenty-fifth year peaking at the twentieth year following initial exposure to the dust.

28 8 30

The same findings are similarly true with mesothelioma and lung cancer, as is shown by the accompanying Figure 2 (below).

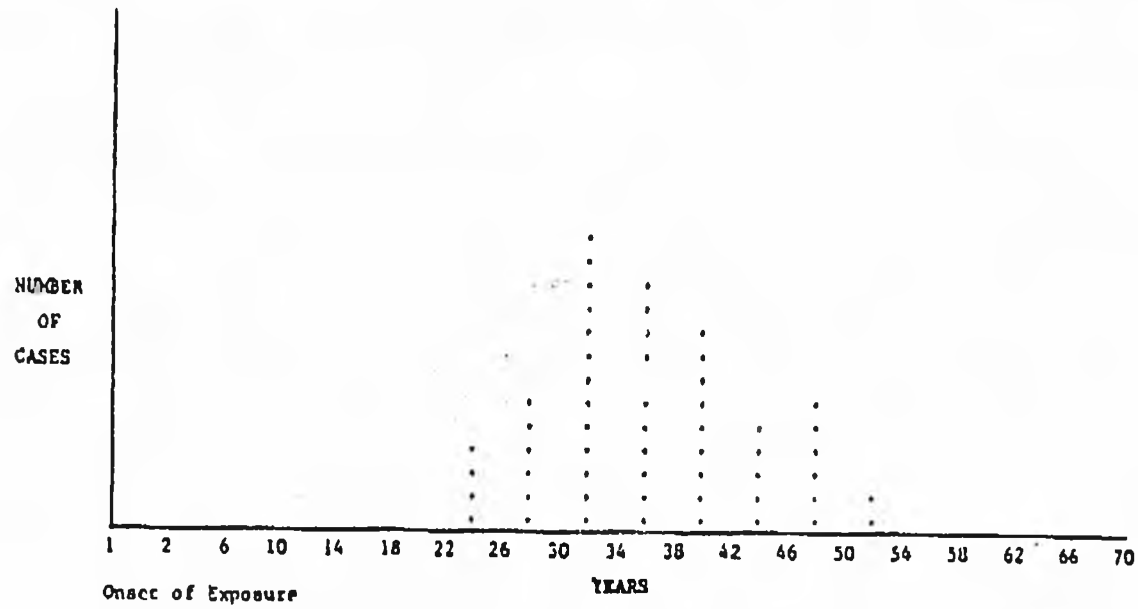


Figure II. Fifty-six cases of neoplasm of the lung or pleura (each case represented by a dot). The elapsed time from onset of exposure is shown on the base line.

The individual exposed to asbestos dust will develop cancer in approximately eight or ten out of every hundred workers rarely before twenty years from the date of initial exposure, and usually over thirty years after the initial exposure, which indeed may not be more than one or two months total exposure time for this entity to develop. The average age of development is approximately 31.8 years for mesothelioma, while for lung cancer, which rarely occurs before thirteen years after initial exposure, the average age of development from date of onset of initial exposure to asbestos dust is approximately 30.7 years. As mesothelioma and lung cancer are relatively late-developing asbestos-induced diseases, it is quite likely that an even greater percentages or workers will develop these cancers as they become older.

29 & 30

The primary importance of recognizing the time lag between initial exposure and the development of the disease is many current laws concerning Workmans' Compensation, Social Security benefits, and Workers' Pension Plans, contain a statute of limitations which states that the person is not liable for a company-induced disease, if the disease is discovered or diagnosed more than two, five, or perhaps seven years from the date the worker left the company's employment. State, federal and company rules or laws need to be modified in order to accept the medical facts related above. Each of these three major disability diseases; pulmonary fibrosis, mesothelioma, and lung cancer, all may develop twenty to thirty-five years or longer after the exposure to the asbestos dust has terminated.

Asbestos

EVALUATION BASED ON TYPE OF FIBER REFUTED BY THREE FEDERAL HEALTH GROUPS

The Environmental Protection Agency's policy of regulating asbestos uniformly, rather than by the type of asbestos fiber, was endorsed recently by three federal health groups after the policy was challenged in a House Appropriations Committee report and by U.S. Geological Survey officials.

The House report and Geological Survey officials maintained that chrysotile or "white" asbestos is less of a health hazard than other forms of the substance, and should not be regulated as stringently.

That position, however, was disputed by the Centers for Disease Control, the National Toxicology Program, and the National Institute for Occupational Safety and Health. The groups said scientific evidence clearly links chrysotile asbestos exposure to increased incidences of human cancer.

Their opinions came in letters sent in response to an inquiry from Sen. Robert T. Stafford (R-Vt), chairman of the Senate Environment and Public Works Committee, and committee member Sen. James Abdnor (R-SD).

Stafford and Abdnor said they sought to clear up the confusion created by a Geological Survey mineralogist who briefed committee staff members on the human health risks associated with chrysotile asbestos fibers.

Support of Chrysotile Asbestos

The mineralogist, Malcolm Ross, cited a study of Canadian chrysotile asbestos miners that Ross said demonstrated that inhaled white asbestos does not present a significant health risk.

After receiving a similar briefing, the House Appropriations Committee said in its Ma 23 report on fiscal 1985 funding for HUD-Independent Agencies that EPA should study chrysotile asbestos before taking any further regulatory action restricting asbestos use.

The House report concluded "there is no conclusive evidence of measurable adverse health effects produced by the inhalation of 'white' asbestos at low nonoccupational exposure or from ingestion even at high concentrations."

EPA is seeking to control asbestos exposure in schools and other public buildings, and has included the substance among its top agency regulatory priorities for fiscal 1984 (Current Report, Feb. 24, p. 1678; Jan. 13, p. 1518).

Most of the asbestos used in this country is the chrysotile variety, according to the House report.

Health Groups' Responses

Citing a number of health effects studies, the Centers for Disease Control said current data "have shown that chrysotile asbestos is carcinogenic and fibrogenic."

CDC officials said t conclusions by the Geological Survey that white asbestos is not as hazardous as other forms of the substance were "made using many statistical manipulations that are highly inappropriate." The USGS also failed to "consider the period of time from first exposure to disease manifestation," which can be up over 30 years, according to CDC.

David Rall, director of the National Toxicology Program, said that, while early reports on Canadian miners "suggested that chrysotile was less carcinogenic than other forms of asbestos," recent studies have shown "that chrysotile causes lung cancer and there is a linear dose response relationship between chrysotile fiber concentration and lung cancer. Further, there has been an increased incidence of mesothelioma related to chrysotile exposure."

Richard Lemen, director of NIOSH's Division of Standards Development and Technology Transfer, said that chrysotile asbestos "is as potent as the other types of asbestos " Lemen said current epidemiological studies demonstrate white asbestos' "ability to induce non-malignant respiratory disease and cancer in humans."

Premanufacture Notification

CONSENT ORDER LIMITS USE, EXPOSURE OF THREE CHEMICALS, ALLOWS MANUFACTURE

Workplace exposure controls, use limitations, and recordkeeping requirements for three premanufacture review chemicals were approved by the proposed manufacturer and the Environmental Protection Agency in a consent order which allows the firm to make the substances.

According to the Toxic Substances Control Act agreement, the controls are needed on PMN 84-105, 84-106, and 84-107 because the chemicals are similar to a substance shown to cause kidney, liver, and lung damage in test animals. Dermal, oral, and inhalation exposure was anticipated for the substances.

Exempted from the controls, however, is manufacture of the chemicals in small quantities for research and development purposes and manufacture solely for export.

Under the consent order, the company agreed to limit airborne concentrations of the chemicals, require respirators when the concentrations reach a certain level, require workers to use protective clothing and impervious gloves, and maintain records on the safety precautions. Exposure protection information must be distributed to all employees who might be exposed to the substances.

The agreement, developed under TSCA Section 5(e), also limits uses of the chemicals. PMN 84-105 was approved for use as a monomer, and 84-106 and 84-107 as intermediates.

Section 5(e) of the act allows the agency to limit or ban premanufacture review chemicals on which insufficient data are available. In this case, the company agreed to follow the exposure and use controls in return for being allowed to produce the substances.

Confidentiality Claims

Claimed as confidential business information on the premanufacture notices were the manufacturer's name and identification of the substances, exact use, and environmental release or disposal information. Generic names provided for the chemicals identified PMN 84-105 as halogenated alkene and 84-106 and 84-107 as halgenated alkanes.

Toxicity data indicated that 84-106 was a severe skin and eye irritant in animal studies and 84-105 and 84-107 were moderate skin and eye irritants, according to the consent agreement. The agreement was signed June 13 by John Moore, assistant EPA administrator for pesticides and toxic substances, and by the firm June .

The agency indicated that the substances have the potential for bioaccumulation, but noted that no significant releases are expected under the conditions of manufacture and use and no environmental effects are anticipated.

While not requiring further study of the three chemicals, the agency indicated it might modify or eliminate the exposure and use controls if certain recommended tests showed the substances are safe. Subchronic inhalation studies were recommended for all substances; a teratogenicity study was recommended for PMN 84-106.

0148-7973/84/$0+.50

FIELDNOTES

From The Arizona
Bureau Of Geology And Mineral Technology

Volume 13 No 1 | Earth Sciences and Mineral Resources in Arizona | Spring 1983

ASBESTOS

Toward A Perspective

by H. Wesley Peirce, Principal Geologist
and
Meliton M. Garcia, Industrial Hygienist

Director's Comment: Asbestos has achieved international notoriety largely because of its reported carcinogenic (cancer-causing) tendencies. A dilemma exists because of a conflict between two issues: 1) negative effects related to public health, and 2) positive public benefits derived from asbestos use. Although positions have already been taken on this subject by many, it is our belief that enough uncertainties exist to encourage further research and discussion. The purpose of this article is to put current knowledge into perspective and to encourage additional analysis. [W.P.C.]

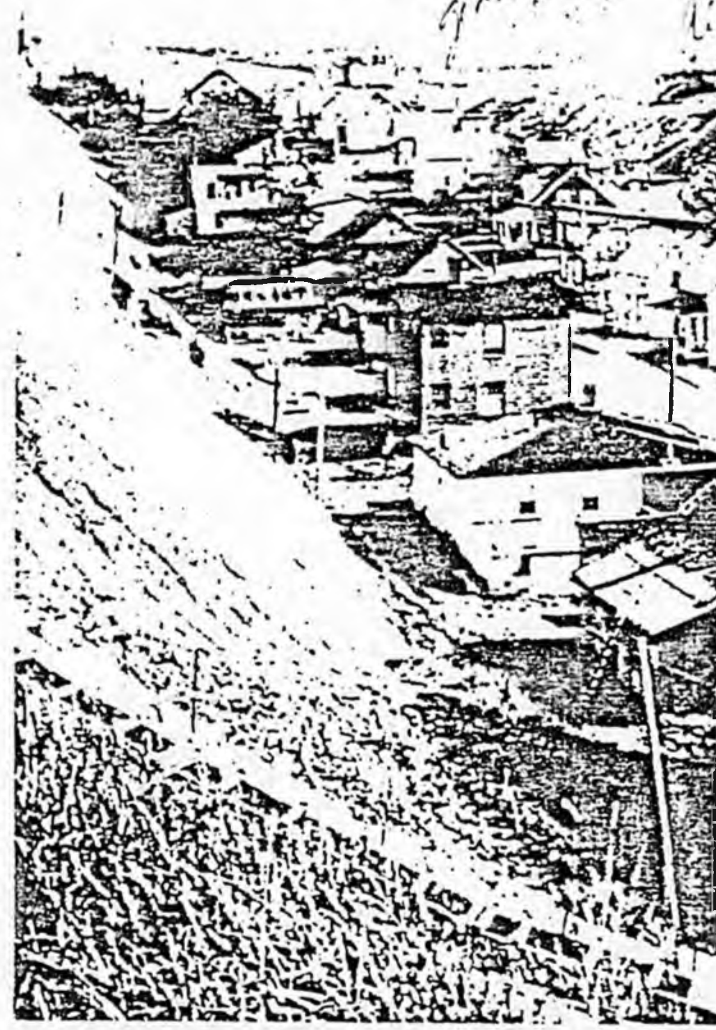
INTRODUCTION

Like the word "snakes", asbestos is not a scientific word. Both are lumping terms encompassing a group of similar, yet different species. Although such terms serve a useful purpose for general identification, they do not acknowledge component parts and, therefore, perpetuate misunderstanding of specific characteristics. Are all snakes identical? Are all fibrous (asbestiform) minerals under the label "asbestos" likely to be identical? Where data exist, is the cause of good science served by not differentiating species and their respective attributes? "No" seems the logical response to each of these queries.

A summary follows of: 1) the nature of the problems related to the use of asbestos, 2) the world-wide geologic distribution of economic deposits of asbestos minerals, 3) the scope and significance of the asbestos industry, 4) highlights of asbestos in Arizona, and 5) health-related considerations. The term "asbestos" will be used in this article to denote the family of commercially exploited mineral fibers.

NATURE OF THE PROBLEM

As civilizations increase in complexity, the number of technical issues projected into the arena of public debate and reaction, especially in democratic societies, also increases. In those technical issues that are delivered to the body politic through the news media (a dominant form of public education), rhetoric may quickly overrun the information base or selectively use data to focus on a specific idea or perceived problem. In such cases, choosing between legitimate concern and overreaction, though difficult at best, seems an essential pursuit, if truth is to be sought rather than emotional response.



Part of a Quebec, Canada mining town nestled among waste piles resulting from the mining and milling of chrysotile asbestos. Photo from *Resources Quebec*, 1980, v. 4, no. 1, p. 18.

The projection of asbestos into the forefront of public awareness over the past decade stems from two conflicting factors: 1) asbestos, a naturally occurring group of earth materials used in a myriad of industrial and domestic products, constitutes the base for an extensive, international mining, milling, and manufacturing industry, and 2) asbestos, under certain circumstances, is a contributing factor in the cause of cancer and other diseases. Thus, there is a diversity of interest in asbestos.

The lack of agreement on what constitutes an asbestos material is a continuing problem. Much disagreement exists over the definition of asbestos, especially as it pertains to occupational health and safety regulations. Defintions vary depending upon those concerned–medical interests, occupational health and safety enforcement agents, mineralogists, lawyers, industrial users, economists, etc. The occupational health and safety standards derive their definition from governmental agencies (U.S. Department of Health and Human Services, NIOSH-OSHA Work Group, 1980).*

The question before the world's health and regulatory establishments is the extent to which the hazards of asbestos outweigh the benefits. On this subject, the Office of Technical Assessment stated in 1981: "Because the Federal Government does not accept a threshhold level for carcinogens, a strict interpretation of these laws would require that risk be entirely eliminated." Obviously, this kind of interpretation creates a dilemma of large proportions. To what extent, as a practical matter, should such laws be enforced? Is there no room for flexibility? Actually, some flexibility is provided to regulatory agencies by Congress through the use of expressions like "unreasonable risks". However, who is to judge what constitutes a reasonable risk? The ideal is to balance risks, costs, and benefits, at the same time being sensitive to equity considerations (i.e., risks may be disproportionately borne by some in order to provide benefits for others).

Can a condition of reasonable risk be attained without debilitating the entire asbestos industry for all time? The answer to this question is encouraged by epidemiological data coming to light which indicate that chrysotile, the principal mineral of the asbestos industry, does not present the degree of risk that attends some of the other commercial fibrous materials.

MINERALOGY AND USAGE

Although there are many naturally occurring elongated minerals that are referred to variously as fibrous, asbestiform, acicular, filiform or prismatic, few occur in deposits suitable for commercial exploitation. Commercial asbestos is generally considered to occur naturally in six forms (see footnote on page 1). It is important to recognize that these six commercial fibrous minerals are not identical in crystal structure, chemical composition, abundance, geologic occurrence, degree of exploitation, etc. Furthermore, human epidemiological data (i.e., incidence, occurrence, and control of disease in a population) suggest that they also are not identical in their disease-causing potential. These commercial fiber types not only differ between species, but also somewhat within species as well. Differences exist in fiber dimension, flexibility, tensile strength, resistance to heat, electrical conductance, specific gravity, and other properties (Shride, 1969).

Each mineral locality tends to have its own set of fiber characteristics suitable for certain, but not all, possible uses. In other words, all occurrences of the same mineral species are not necessarily suited for identical uses. As examples, fiber length is a major factor in grading asbestos for commercial purposes–the longer lengths being more valuable, with the soft fibers worth more than harsh fibers. The longer fibers are valuable because they can be spun or woven into fabrics. Most of the spinning fibers are chrysotile asbestos. Amosite fibers are shorter and are used for various felted insulation products. Lighter weight products can be made with amosite for use in aircraft and ships. Crocidolite has high tensile strength and is acid resistant. Spun or woven crocidolite fibers are used in making fiber cement pipe because they allow free and rapid filtration of fluids that speeds up manufacturing processes (Bowles, 1959).

OCCURRENCE

Major sources of amphibole fibers have been the amosite and crocidolite deposits of South Africa, the crocidolite of western Australia, and the anthophyllite of East Finland (Ross, 1981). Minor occurrences of amphibole-type fibers in the U.S. that have had some production include anthophyllite in Georgia, North Carolina, Idaho, Maryland, and Massachusetts. Tremolite has been mined only in a small way from deposits in South Africa and Maryland. Commercial mining of actinolite is practically unknown. Today, mining of amphibole asbestos is essentially confined to South Africa.

By far, the most important commercial mineral fiber comes from the serpentine type known as *chrysotile*. The two most important world sources of this fiber are the Ural Mountains of Russia and the Appalachian Mountains portion of Quebec, Canada (Table 1), and northern Vermont, U.S.A.

Fiber Type	Continent/Source	Amount Produced
Chrysotile (5,317,000 MT)	Europe	2,775,000
	North America	1,713,000
	Africa	377,000
	Asia	293,000
	South America	101,000
	Australia	58,000
Crocidolite (210,000 MT)	Republic of So. Africa	210,000
Amosite (71,000 MT)	Republic of So. Africa	71,000
	World Total	5,598,000 MT

Table 1. Estimated world asbestos production by fiber type (metric tons), 1978 (data from U.S. Bureau of Mines).

Sixty years ago Arizona led the nation in the production of chrysotile. At that time Arizona chrysotile, formed about 1.2 billion years ago, contained about half as much iron as did the known Canadian (Quebec) chrysotile, a valuable asset

*At present, a widely used definition of asbestos in the United States is included in the proposed regulations and guidelines of "Occupational Exposure To Asbestos", published in the Federal Register by the Occupational Safety and Health Administration (OSHA). In this notice, the naturally occurring amphibole minerals (amosite, crocidolite, anthophyllite, tremolite, and actinolite) and the serpentine mineral (chrysotile) are classified as asbestos if the individual crystal fragments have the following dimensions: length greater than 5 micrometers (microns), maximum diameter less than 5 micrometers, and length-to-diameter ratio of 3 or greater. Any product containing any of these minerals in this size range is also defined as asbestos. [1 meter = 1,000,000 microns; 5 microns = .0002 inches].

A joint National Institute for Occupational Safety and Health and OSHA committee published the following in 1980: "Definition of Asbestos. Having considered the many factors involved in specifying which substances should be regulated as asbestos, the committee recommends the following definition: *Asbestos is defined to be chrysotile, crocidolite, and fibrous cumingtonite-grunerite, including amosite, fibrous tremolite, fibrous actinolite, and fibrous anthophyllite. The fibrosity of the above minerals is ascertained on a microscopic level with fibers defined to be particles with an aspect ratio of 3 to 1 or larger.*"

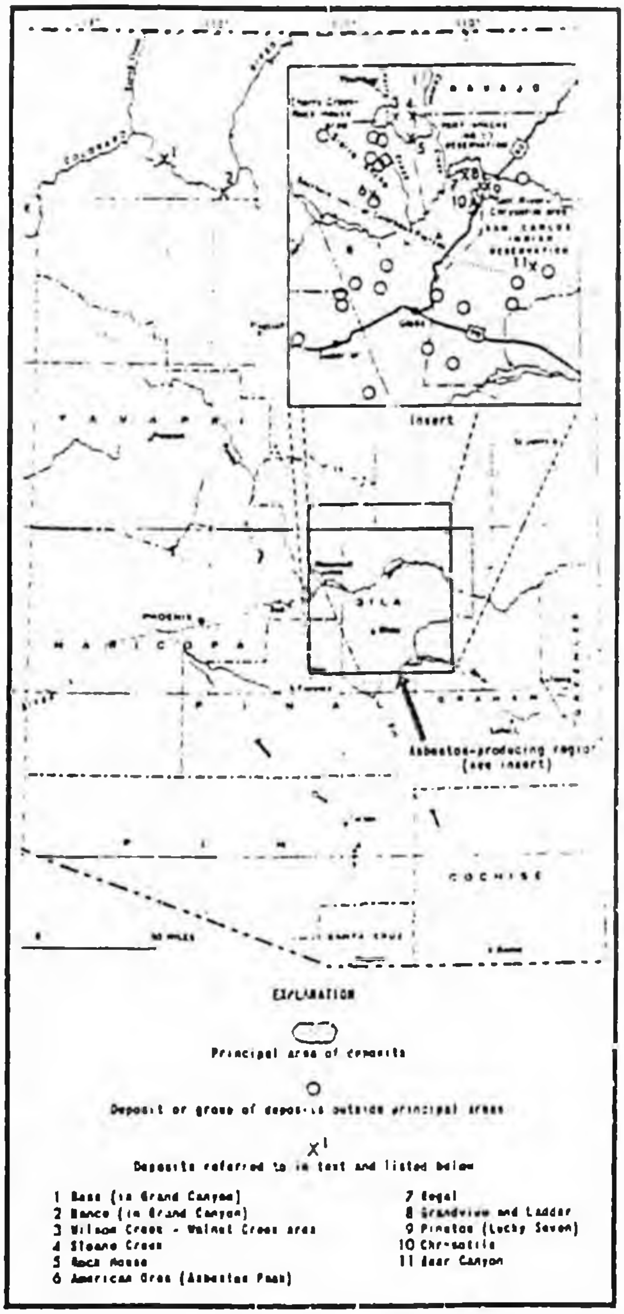


Figure 1. Map of major chrysotile asbestos occurrences in Arizona (from Arizona Bureau of Mines Bulletin 180).

for certain electrical applications. As recently as the 1950s, Arizona chrysotile was the only domestic source of low-iron chrysotile spinning fiber (used in covering electric cables) that met Navy asbestos specifications (Stewart, 1955). The filter market has been the principal outlet for high-grade Arizona chrysotile.

Chrysotile fiber is reported to have been seen in 1869 in the Grand Canyon by members of the Powell expedition (Wilson, 1928). Claims were filed about the year 1900 and a small amount of fiber was mined in 1903. The first of the more famous Gila County occurrences was recognized in 1872. However, additional discoveries were made and the first claims filed in 1913 (Stewart, 1955). In 1914 the Johns-Manville Company acquired the claims and soon became the leading producer in Arizona. Because of this early success, prospecting increased and hundreds of locations were made along the Salt River, Cherry Creek, and in the Sierra Ancha region of east-central Arizona. After World War I, the highest price for the best grade crude chrysotile reached $3,000 per ton, resulting in much early prospecting. In response to this early interest, the Arizona Bureau of Mines published a bulletin called *Asbestos* (Allen and Butler, 1921). Because of a continuing demand for information, another bulletin about Arizona asbestos followed (Wilson, 1928). Major Arizona occurrences of chrysotile asbestos are shown in Figure 1.

PRODUCTION

Although asbestos had been mined as far back as Roman times, the modern industry did not start until the late 1800s. By 1890 the asbestos industry was going strong, with hundreds of commercial applications for fibrous material. Northern Italy was the first region to come into production. However, by 1900 the large South African crocidolite deposits had been opened and the Russian deposits in the Ural Mountains were being mined in large quantity. A few years later, mining of amosite deposits of South Africa was initiated. By 1980 about 100 million MT (metric tons) of asbestos fiber had been mined throughout the world. More than 90 percent of this was chrysotile and about 5 percent amosite and crocidolite (Ross, 1982). The remaining few percent is attributed to the other amphibole fibers, principally anthophyllite.

Amosite from South Africa, crocidolite from Australia, and anthophyllite from East Finland all come from rocks about two billion years in age. South African fiber production presently amounts to about 200,000 MT per year. The production of Australian crocidolite was terminated in 1966 after 138,000 MT had been shipped. The anthophyllite deposits of East Finland were operated continuously between 1918 and 1975, when mining terminated for economic reasons; approximately 350,000 MT of fiber was produced, 230,000 MT of which was exported.

The Quebec chrysotile deposits were discovered in 1877. By 1900 Quebec had already supplied 150,000 MT of fiber; by 1980 nearly 40 million MT had been mined–approximately 40 percent of the world's total mineral fiber production (Ross, 1981). Russia is the world's largest producer of chrysotile today, the Ural area contributing about 2.4 million MT per year.

Other exploited chrysotile deposits are located in the Italian Alps (160,000 MT per year), Cyprus (40,000 MT per year), South Africa (113,000 MT in 1978), Swaziland (43,000 MT in 1978), Zimbabwe (210,000 MT in 1978), and in the Coalinga area of California. Although the California deposits include large near-surface reserves, mining has lagged because of short fiber length and environmental controls (Ross, 1981).

In 1978 Russia produced 2,582,000 MT of chrysotile fiber, 46.1 percent of the world's total fiber output. Canada produced 1,620,000 MT of chrysotile fiber, 28.9 percent of the world total. Thus, in 1978, 75 percent of the world's asbestos production came from just these two regions. In contrast, the U.S. produced 93,000 MT of fiber (chrysotile), less than 1.7 percent of the total. South African amosite and crocidolite production amounted to 281,000 MT or 5 percent of the world fiber output. The remaining 18.3 percent, all chrysotile, is attributed to 15 other countries, the largest shares assigned equally (3.7 percent) to China and Zimbabwe. Only three firms, operating in Vermont and California, are now producing asbestos (chrysotile) in the U.S. Table 1 shows the estimated world production for 1978.

Shride (1969) states that chrysotile asbestos was mined from about 160 deposits in Arizona and that perhaps another 60-70 occurrences are known. In terms of production, Arizona asbestos has, overall, been a small contributor. Shride estimates that total production through 1966 of at least 82,000 MT was valued at about $17 million at the time of sale. Today, the Arizona asbestos industry is inoperative.

CONSUMPTION

The following excerpts about the asbestos industry, as it once was, are taken from Bowles (1959):

> Asbestos furnishes a major raw material for a great variety of essential products, the manufacture of which constitutes a vast industry . . . the United States has developed the greatest asbestos-products industry in the world . . . Domestic mines furnish (in the form of chrysotile fiber) only 6-8 percent of all grades and an even smaller percentage of the important strategic grades.
>
> The procurement of necessary supplies is a problem of world-wide scope, and in every war emergency asbestos assumes top priority among strategic minerals. It is of paramount importance, therefore, that a thorough knowledge should be gained of the composition and properties of asbestos, its uses and requirements for each use, grades and specifications, the degree of essentiality of each application, the nature and extent of sources of supply throughout the world, mine and mill capacity, reserves, transportation, facilities, political and commercial control, world requirements by countries, import and export data, allocation of supplies, fiber beneficiation, possibilities of synthetic asbestos manufacture, use of substitute materials, past war controls, war history, and various other problems that may appear.

The U.S.S.R. has supplanted the United States as the largest consumer of asbestos fiber (Clifton, 1979). U.S. consumption for the years 1977-1982 is shown in Figure 2. Whereas the use of asbestos in developing countries is expanding, Figure 2 indicates a continuous decline in U.S. asbestos consumption since 1977. Clifton (1983) states that the 1982 domestic consumption of about 250,000 MT (over 90 percent supplied by Canada) is the lowest since 1940. He estimates that about 400 firms, centered in the eastern states, are manufacturing asbestos products. In 1982 U.S. commercial uses of fiber included asbestos-cement pipe (37 percent), flooring products (20 percent), friction products (14 percent), roofing products (9 percent), packing and gaskets (6 percent), asbestos-cement sheet (6 percent), and other uses (8 percent). Clifton also suggests that certain domestic market segments may have been permanently lost to substitutes. Although no wholly satisfactory substitutes are available for asbestos in many applications, such as friction needs, much research is underway to evaluate possible alternatives.

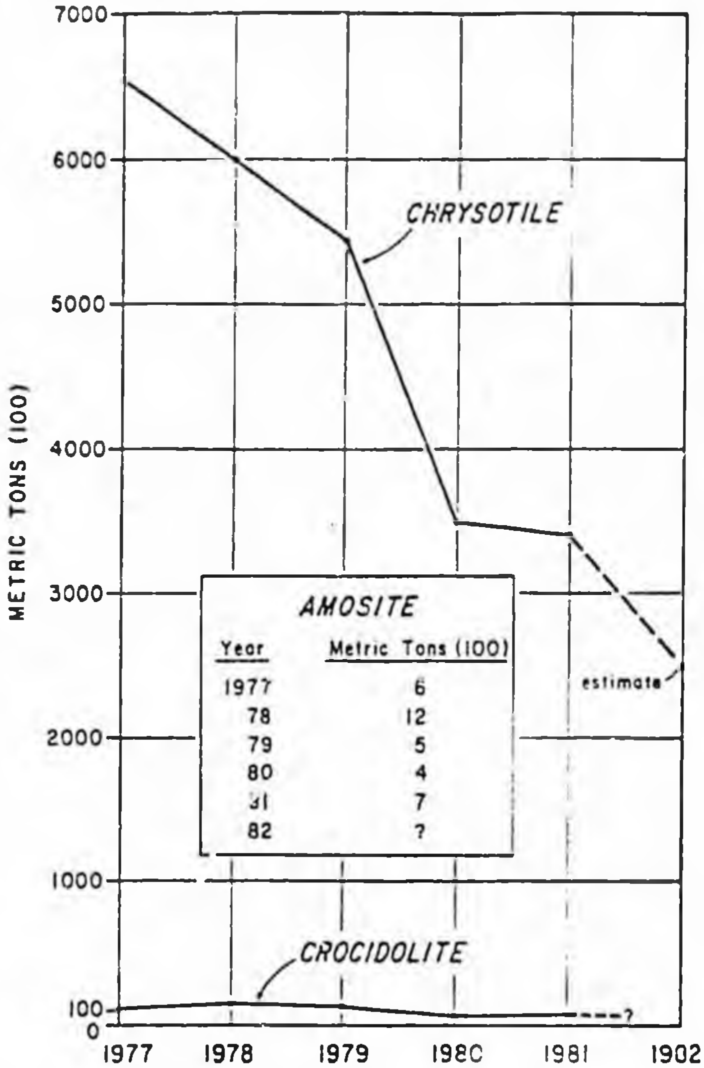


Figure 2. U.S. asbestos consumption by fiber type (100 metric tons), 1977-1982.

HEALTH HAZARDS

That asbestos fibers, under certain conditions of exposure, may cause disabling diseases in humans appears to be well established. Three principal diseases have been attributed to excessive exposure to asbestos fibers: 1) asbestosis, a fibrosis of the lung tissue which reduces the elasticity and function of the lungs, 2) lung cancer, and 3) mesothelioma, a rare cancer of the pleural and peritoneal membranes. Nearly all of the asbestos-related diseases have occurred in occupational groups–those concerned with mining and milling of asbestos, the manufacture of asbestos-containing products, and the application and removal of insulation materials containing asbestos fibers. However, some non-occupational asbestos-related disease has been documented and is summarized later.

During the turn of the century when the use of asbestos fibers was increasing due to rapid expansion of product lines, the control of dust created by certain operations was not perfected. It is known that in some textile manufacturing operations, such as carding, spinning, and weaving of asbestos fibers, dust concentrations were so high that a person could not see beyond an arm's length. After many years of this type of exposure, some employees developed a pulmonary disease that was named asbestosis. Upon recognition of this affliction, dust control measures were initiated that significantly reduced the incidence of asbestosis.

The first suggestion of a causal relationship of exposure to asbestos fibers and lung cancer was proposed in the mid-1930s (Lynch and Smith, 1935). It was also recognized that there was a long time lag between first exposure and onset of disease. As with asbestosis, the control of exposure resulted in a marked decrease in the incidence of lung cancer.

The association of exposure to asbestos fibers and mesothelioma was not given serious consideration until after

1960 when 33 cases of mesothelial malignancies were reported in a crocidolite mining population in South Africa (Wagner and others, 1960). This disease appeared many years after initial exposure.

Generally, asbestos-related diseases appear in asbestos workers only after many years have elapsed since first exposure. A significant increase in the lung cancer death rate appears 10-14 years after first exposure and peaks at 30-35 years. The mesothelioma death rate becomes significant 20 years after first exposure, but continues to climb even after 45 years have elapsed. The asbestosis death rate becomes significant 15-20 years after first exposure and apparently peaks at 40-45 years (Selikoff and others, 1980). It is to be emphasized that these cited, generalized statistics are based upon studies of workers who were exposed daily to various fiber types as part of their work environment. The significance of exposure levels of the different fiber types, over time, needs to be addressed if precision and a guiding perspective are to be gained.

Risk

The determination of asbestos risk can be approached in two ways: 1) tests on animals, and 2) observations on humans exposed to asbestos dusts in mines and mills, and various plants and workplaces where these particular fibers are involved. The argument is made that animal studies are essential because the time required to study humans renders most direct studies impractical. The only reliable study of humans involves case histories with statistical data assemblages. A result is said to be positive when it reveals an *excess* of mortality that is caused by the agent under study. (An excess is that amount beyond what is statistically expected in a population not exposed to the risk.) Positive epidemiological results are taken by agencies as strong evidence of carcinogenicity, whereas a positive bioassay (animal test) is taken as evidence that a substance is a *potential* human carcinogen. Apparently, agencies specify stringent requirements with which to weigh negative epidemiological data against positive animal information.

Carcinogenicity of asbestos fibers has been studied by exposing laboratory animals to fibers by the following methods: intratracheal injection, intraperitoneal injection, intrapleural injection, ingestion, and inhalation. With the exception of inhalation, and ingestion to some extent, the foregoing routes of exposure are not likely in humans. In addition, the quantity of asbestos required to produce these effects in laboratory animals, by any of these routes of exposure, is high relative to dosages experienced by humans in occupational environments.

A report dealing with airborne asbestos was prepared by the Committee on Biological Effects of Atmospheric Pollutants (National Research Council, 1971), and information derived from their assessment of animal studies may be worth noting:

> Asbestotic pulmonary fibrosis has been produced experimentally in various species of animals, including rats, guinea pigs, hamsters, rabbits and monkeys. In many of the studies, the disease resembled early asbestotic development in man . . . Diffuse fibrosis has also been produced, but to do so it was necessary to use very high concentrations of asbestos dust and long periods of exposure or observation after exposure . . . Lung cancer from chrysotile dust has been produced experimentally in rats and in mouse lung implants. Other investigators who used different methods for introducing the dust did not find lung cancer in animals they studied... Rats whose lung clearance had been artifically impaired had twice the lung cancer rate of animals with normal clearance... cancer of the pleural surface (mesothelioma) has been reported in rats and hamsters that received intrapleural injections of the three most common types of asbestos. The amounts of asbestos dust introduced into the thoracic cavity were very large, and translation of results to human inhalation of asbestos is uncertain.

As already indicated, disease incidence increases significantly among various asbestos trades workers. Most of these are men who most likely handled several types of asbestos fibers during their working careers. In contrast, miners and millers tend to be exposed to only one form of fiber. This latter category, then, provides some opportunity to isolate the effects of individual fiber forms on health. More about this later.

Lungs of persons in urban and rural non-occupational settings have been shown to contain "asbestos" fibers. Many of these fibers, or bodies, are probably derived from the burning of leaves and from plant products, such as paper, wood, and coal, man-made fibers, talc used generously as a body dusting powder (which may contain tremolite), graphite, hornblende, diatomaceous earth and carborundum (National Research Council, 1971; Cooper, 1967). That thousands or even millions of fibers are present in most human lungs has been recognized since the turn of the century. Although many urban areas contain measurable asbestos fiber counts in the ambient air, epidemiological study indicates that there are no unusual health problems attributed to breathing chrysotile fiber in a non-occupational setting (Ross, 1982).

In many epidemiological studies, "asbestos" is the common denominator and specific fiber types are not considered. Some feel strongly that such lumping serves to mask the probability that the various fibers differ in their disease-causing tendencies in humans (Ross, 1982; Rutstein, 1982). This distinction, if valid, should be viewed with the knowledge that chrysotile fiber is the overwhelming contributor to asbestos production the world over, besides being the only fiber mined commercially in the U.S. However, amosite and crocidolite, though normally minor contributors, were heavily used in certain war-related industries during World War II.

Malcom Ross (1982), a physical chemist and geologist-mineralogist with the U.S. Geological Survey, has reviewed and analyzed asbestos-related data from 110 published sources from around the world. His primary interest was to survey asbestos-related disease in all aspects of the industry and assess *non-occupational* risks of fibrous minerals. Following are some of Ross' conclusions:

> 1) Non-occupational exposure to chrysotile asbestos, despite its wide dissemination in urban environments throughout the world, has been shown by epidemiological studies to be of no recognized health significance. If chrysotile asbestos were hazardous to health, the women of Thetford Mines, Quebec (where over 20 million MT of chrysotile asbestos has been mined), would be dying of asbestos-related diseases; yet this has not occurred (see cover photo). The health studies completed in Canada suggest that populations

can safely breathe air and drink water that contain significant amounts of chrysotile fiber.

2) Crocidolite asbestos shows an entirely different fiber-dose disease-response relationship from that observed for chrysotile asbestos. Health studies of those exposed only to crocidolite show that it is much more hazardous than chrysotile, perhaps 100-200 times more hazardous with respect to mesothelioma. The danger of crocidolite dust is particularly emphasized by the many mesothelioma deaths occurring among the residents of the crocidolite mining districts of the Cape Province, South Africa, where the exposure occurred in a non-occupational setting. Such mortality is practically unknown among residents of the chrysotile mining localities of Quebec. Control of crocidolite dust, particularly in mines and mills, presents a considerable engineering problem in that dust levels at or below the 1969 British Standard of 0.2 fibers/cm³ (1 cm³ = one cubic centimeter or one milliliter) virtually cannot be achieved (Simpson, 1979, p.74).

3) The hazards of amosite asbestos are more difficult to assess. The amosite factory employees of Paterson, New Jersey, who worked under very dusty conditions during World War II, have experienced excess mortality due to lung cancer, asbestosis, and mesothelioma. In contrast to these factory workers, amosite miners, and millers elsewhere in the world, at least with regard to mesothelioma, do not appear to be at much risk. This suggests that dust controls are possible which can greatly reduce or prevent the occurrences of asbestos-related diseases in amosite workers.

4) The fear caused by statements and implications to the effect that "one fiber can kill" and by the apparently exaggerated predictions of the amount of asbestos-related mortality expected in the next 20 or 30 years, has generated much political pressure to remove asbestos from our environment and to greatly reduce or even stop its use. An example of this is the concerted effort in several industrial nations, including the United States, to remove asbestos from schools, public buildings, homes, ships, appliances, etc. This is being done, even though most asbestos in the U.S. is of the chrysotile variety, and even though asbestos dust levels in schools, public buildings, and city streets are much lower than dust levels found in chrysotile mining communities where no asbestos-related disease has been reported in the non-occupationally exposed residents. The impetus for these costly removals and appliance recalls (hair dryers, for example) apparently comes from capitalizing on the "one fiber can kill" concept. Not only is this program costly–it could be dangerous if the removal of crocidolite asbestos is not accomplished with great care. In most cases, asbestos coatings and insulation, where necessary, can be repaired at no risk and at a fraction of the cost of complete removal.

Rutstein (1982) comments on relative health hazards of the various fiber types:

> Outside the U.S., particularly in Great Britain, it is widely believed that crocidolite is much more dangerous than chrysotile, and, further, that much of the data suggesting that asbestos is harmful is based on the effects of crocidolite, and perhaps, amosite, but not on the much more widespread chrysotile . . . Let us now consider why there was an asbestos scare. Irving Selikoff of the Mount Sinai School of Medicine continues to lead in advocating the dangers of asbestos. His classic studies (1973) of the asbestos-insulation workers of New Jersey show quite clearly that they were indeed much more susceptible to asbestosis and various cancers. Lung cancer was prevalent, especially if the workers smoked cigarettes. Most of the asbestos workers in Selikoff's studies were probably exposed to more than just the chrysotile variety of asbestos. Crocidolite was particularly favored for insulation on ships. However, the interpretation of the epidemiological data did not stress distinguishing between health effects attributable to different mineral species, but only to "asbestos".

Why should these fiber types act differently? Perhaps because they have contrasting physical and chemical attributes. For instance, chrysotile fibers curl into spirals, whereas the amphiboles (crocidolite and amosite) develop straighter, more needle-like fibers, and appear to penetrate more deeply into the terminal air sacs of the lungs (Figure 3). Chrysotile is a magnesium silicate, amosite is an iron-magnesium silicate, and crocidolite is a sodium-iron-magnesium silicate. Their solubilities and resistance to chemicals are known to differ.

Recently, the authors attended a talk (January 21, 1983) about asbestos-related disease, presented by Margaret Becklake, M.D. (McGill University, Canada) at the University of Arizona medical center. She restated her belief that chrysotile eventually dissolves in the lungs and therefore does not continue to accumulate like the amphibole fibers do. Previously, she had reported the following (Becklake, 1982):

> Subsequent studies have also strengthened the evidence that fibers dissolve out of the lungs over time, the loss occurring preferentially in chrysotile fibers. Thus, though chrysotile accounts for the bulk of commercial use and hence human exposure, it is the amphiboles that constitute the core of the majority of asbestos bodies found in human lungs, even in those known to have had occupational exposure to chrysotile (Warnock, 1979; 1980; 1981) . . . All these findings strengthen the evidence that chrysotile is cleared more readily from the lungs than other fibers . . .

Perhaps the best available information on chrysotile fiber exposure-risk levels comes from studies in Canada, the source of much of the chrysotile fiber used in the U.S. As an example, Ross (1982) reports:

> Epidemiological studies of the chrysotile asbestos miners and millers of Quebec, undertaken by medical researchers in Canada, show that for 3,105 men exposed for more than 20 years to chrysotile dust averaging 20 fibers/cm³, the total mortality was less than expected (620 observed deaths, compared to 659 expected deaths). Risk to lung cancer was slightly increased—48 deaths observed and 42 deaths expected. Exposures to 20 fibers/cm³ are an order of magnitude greater than those experienced now (generally less than 2 fibers/cm³); thus chrysotile miners working a lifetime under these present dust levels should not be expected to suffer any measurable excess cancer.

How much is 20 fibers/cm³? According to Rutstein, at an allowable limit of 2 fibers/cm³ of air (over an 8-hour industrial environment workday), the average worker could easily inhale 7 million fibers per day. Thus, he too questions the incon-

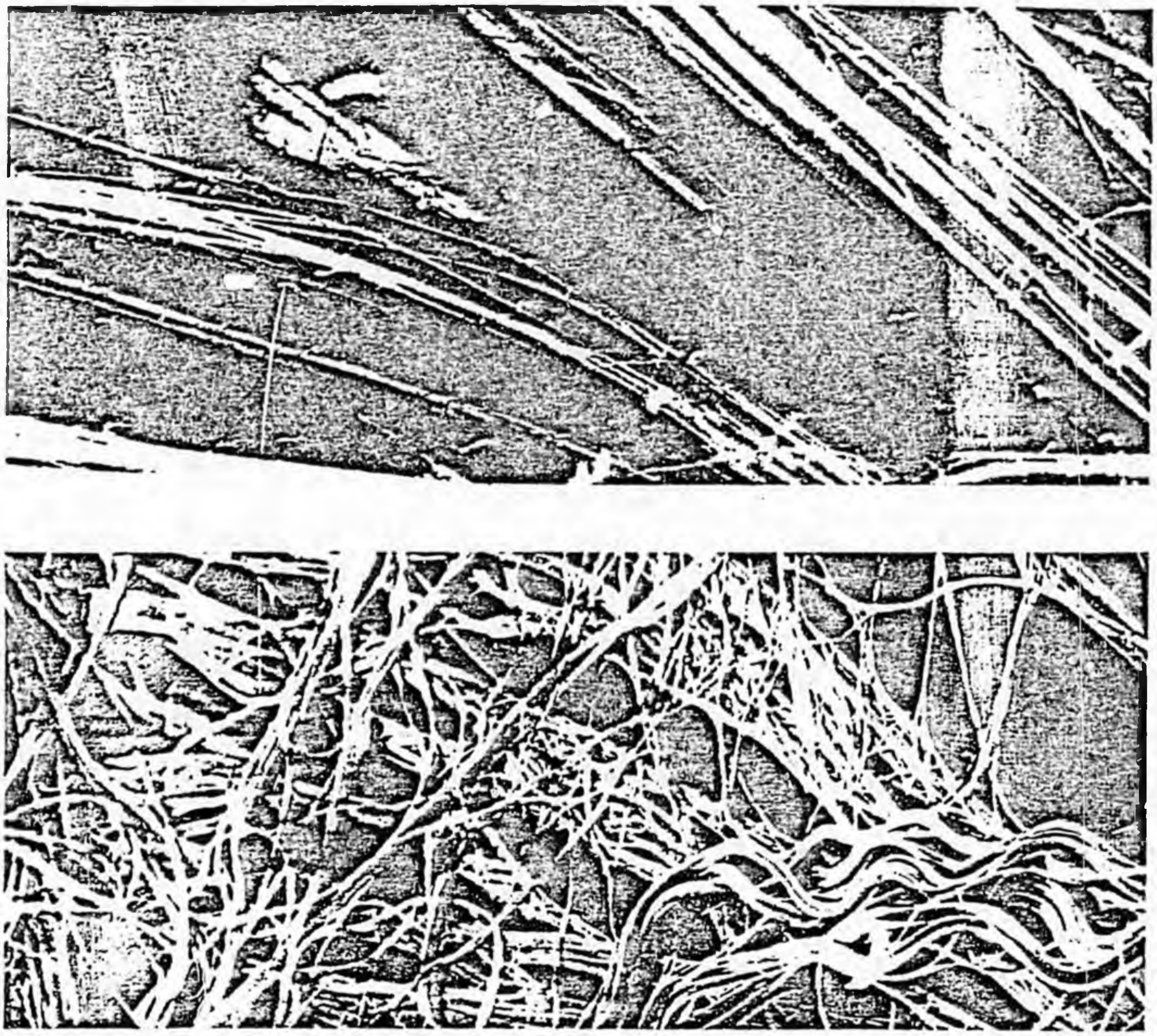


Figure 3. Crocidolite (straight fibers) from South Africa and chrysotile (wavy fibers) from Globe, Arizona, viewed through a scanning electron microscope. The thinner fibers are less than .0004 inches thick. Photos courtesy of the U.S. Geological Survey.

sistency revealed in permitting the inhalation of several million fibers on the one hand and promoting the "one fiber can kill" concept on the other hand.

Clifton (1983) reports that the United Kingdom Health and Safety Commission decided to implement tighter controls over asbestos exposure. The new limits, which were effective January 1, 1983, are: chrysotile, one fiber per milliliter of air (1 f/ml); amosite, 0.5 f/ml; and crocidolite, 0.2 f/ml. [chrysotile was lowered by 1 f/ml and the others are unchanged.]

What is known of the asbestos-related mortality rate in the U.S. and what are the estimates for the future? If one looks over the data, it becomes obvious that firm numbers do not exist. Ross points out that former Secretary of the U.S. Department of Health, Education and Welfare, Joseph A. Califano, reported figures in a 1978 speech that translate into 76,000 cancer deaths per year due to asbestos. The data came from medical scientists associated with the National Institutes of Health. In 1980, Dr. Irving Selikoff stated at a press conference that 20,000 U.S. asbestos workers would die each year for the next 40 years of "excess disease". Subsequently, in 1981 Dr. Selikoff, through a press release to the Associated Press, stated that 10,000 American workers are dying each year because of asbestos exposure. He did not supply a data source for these estimates.

Ross asks if any of these numbers are correct. Using existing statistics from Vital Statistics of the United States dealing with mortality factors, asbestosis deaths in the nation for the period 1967-1977 are seen to average 41 per year. However, Ross cites data indicating that deaths due to this cause are underreported, therefore adjusts the average figure to 88. Using this number in combination with asbestos-related epidemiological statistics, Ross estimates the likely annual mortality due to lung cancer and mesothelioma. Combining these, his estimates for total annual asbestos-related mortality range from 522-587. Furthermore, he thinks that asbestos-related mortality will peak between 1980 and 1985, 35 to 40 years after the large World War II shipyard employment.

In regard to the estimation of risk in human non-occupational exposure to asbestos, the National Research Council's

Committee on Biological Effects of Atmospheric Pollutants (1971) wrote:

> The most important question in the case of persons with non-occupational exposures to asbestos is whether there is an increased risk of malignancies. Industrial experience indicates that there is no likelihood of significant asbestosis in non-occupational exposure. The major potential for risk appears to lie in those with indirect occupational contacts, household contacts, or residence in the immediate neighborhood of asbestos sources; and even there, the actual risk is poorly defined. But the fact that there appears to be a gradient of effect in such groups suggests that there are levels of inhaled asbestos without detectable risk. It is not known what range of respirable airborne asbestos fibers will ultimately be found to have no measurable effects on health. At present, there is no evidence that the small numbers of fibers found in most members of the general population affect health or longevity.

More recently, in response to a question concerning non-occupational exposure to chrysotile asbestos in Canada (see cover photo), Dr. Becklake stated the following (personal communication, 1983): "A mortality study has been carried out referring to residents of the asbestos mining towns of Quebec. No significant excess general mortality was shown in women. The excess in men was thought to be related to occupational exposure." Asked if society should ban all forms of asbestos use, Dr. Becklake commented, "We humans live with many dangerous materials and are able to control others; why not this one?"

Globe, Arizona, has been in the news periodically, most recently because of its association with EPA's Superfund. A mobile home park is situated on land, parts of which were once dedicated to the processing of chrysotile asbestos. At question is the health risk. A dilemma prevails because there are no factual scientific data that clearly define the relationship between all possible exposure levels of chrysotile asbestos and risk. As already pointed out, high *occupational* exposure levels can be risky, whereas there is no evidence of significant risk at levels frequently characterized as *non-occupational*. However, how should the possible exposure levels at the mobile home park be characterized? Might they be high, low or intermediate, depending upon several variables? Is living there likely to be more or less hazardous than living in the chrysotile mining and milling centers of Quebec, Canada? Because of a paucity of accurate, scientific data, and in spite of efforts to gather more, answers to such questions remain largely subjective and somewhat arbitrary. Although this is the nature of the problem that confronts the various state and federal agencies, decisions must nevertheless be made. In the absence of definitive, scientific health-risk data, decisions on final actions will inevitably be based upon economic-political considerations.

Substitutes

In a report of the Advisory Committee on Asbestos, Health and Safety Commission of Great Britain, the following statement is made regarding substitutes for asbestos (Simpson, 1979, v.1, p.69):

> As a general principle we take the view that control of any useful but hazardous material is preferable to the ultimate sanction of prohibition. It is very easy to say that a dangerous substance or process should be banned and to hope that that will solve the problem. In our view, this is a gross over-simplification of a complex equation of interlinked factors. It ignores the possibility that prohibition of a particular substance may directly result in an increase in health or safety risks, for example from fire, which the use of that substance currently prevents or reduces. It also ignores the implications of statutorily enforcing substitution by materials or substances that presently appear to be suitable but may at a later date be found to constitute a risk to health. The social and economic consequences of the possible closure of factories using the original material or process need be taken into account.

Until recently, the U.S. has been the largest producer of asbestos products, mostly from imported fiber. The three principal natural fibers that enter into commerce–crocidolite, amosite, and chrysotile–have physical and chemical characteristics that are difficult to duplicate by substitution. As a consequence, substitutes tend to perform in an inferior way. The costs (including health and safety), imposed on society because of inferior performance, are not yet known.

CONCLUSIONS

The mining, milling, processing, and fabrication of a family of naturally occurring fibrous asbestos minerals, especially chrysotile, is world-wide in scope. The overall benefits of asbestos products to society at large are incalculable. Because of adverse publicity, the "hazards" of asbestos seem to preclude benefits derived from its use.

The specter of disease, especially cancer, has been attached by some to the exploitation, processing, use, and even general occurrence of asbestos. How serious is the asbestos-related disease threat? Judging from the data cited in this perspective-seeking report, the hazard seems to depend principally on two points: 1) the specific mineral, and 2) exposure level.

The nature of the asbestos problem is recognized and it is believed that present technology is capable of controlling occupational chrysotile exposures to levels that are not anticipated to result in excess disease. Studies of the non-occupational health risk of chrysotile suggest no detectable excess disease; therefore, the prevailing generalization that *any* non-zero exposure to chrysotile can cause serious medical problems should be questioned.

These data, though not finally definitive, nevertheless support the contention that failure to discriminate between the various fiber types and exposure levels is scientifically and practically inappropriate. Thus chrysotile may have become the victim of "guilt by association", having been lumped with the more dangerous minerals, crocidolite and amosite, under the general term, "asbestos".

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ERRATA

Two figures in the Technical Report prepared by Reynolds and Keith, *Geochemistry and Mineral Potential of Peraluminous Granitoids* (December 1982, v. 12, no. 4, p. 5), were mislabeled. Figures 1 and 3, reprinted below, have been corrected. The positions of the labels "alkaline" and "subalkaline" have been reversed, as shown here.

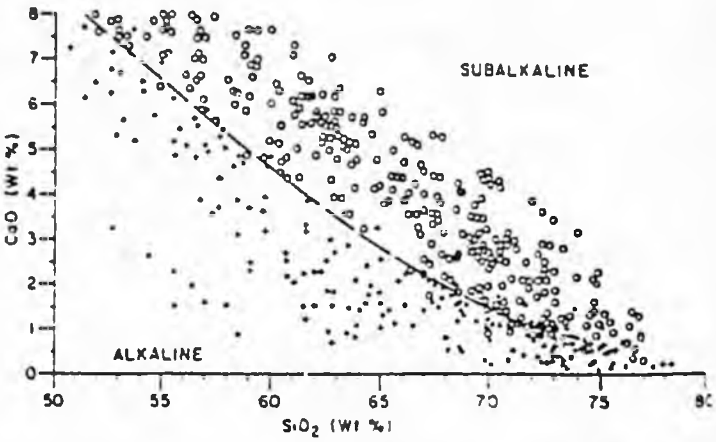


Figure 1. SiO_2 versus CaO variation diagram for metaluminous-suite igneous rocks of known alkalinity. Dots represent calc-alkalic and calcic rocks; crosses indicate alkali-calcic and alkalic rocks (classifications according to Peacock, 1931).

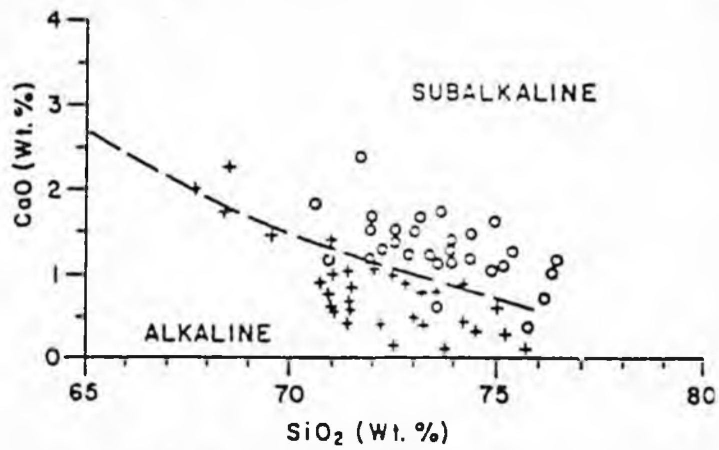


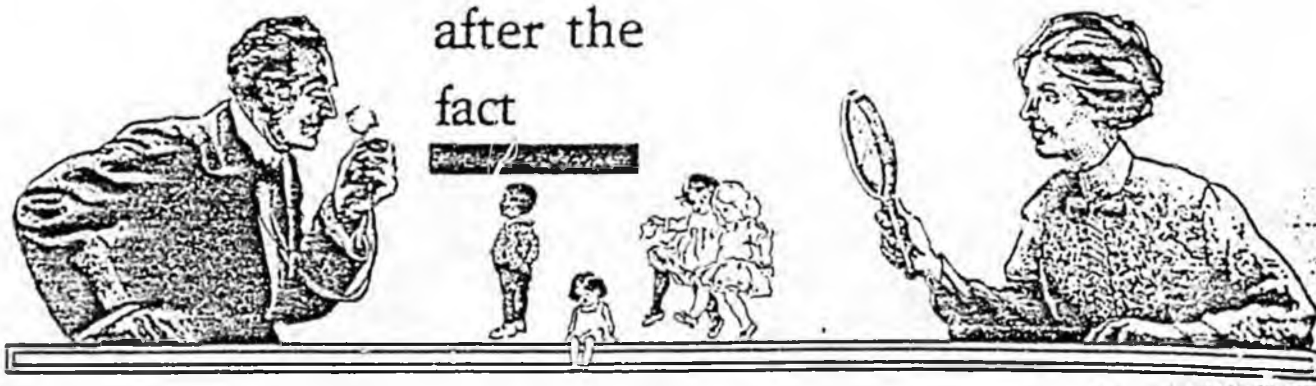
Figure 3. SiO_2 versus CaO variation diagram for peraluminous granitoids of Arizona (o) and the Hercynian belt of Europe (+).

NEW PUBLICATIONS

Roadside Geology of Arizona, by Halka Chronic; Mountain Press Publishing Co. (Box 2399, Missoula, MT 59806; 406/728-1900), 1983, 314 p. Aspects of Arizona's geology and diverse landscapes that can be seen from the highways are presented in this "guidebook" as an introduction to those with little or no geologic training. $9.95

Checklist of Arizona Minerals, by Raymond W. Grant, Mineralogical Society of America (PO Box 902, Phoenix, AZ 85001), 1982, 78 p. Describes physical properties of 640 known minerals in Arizona; lists the state's minerals according to Dana's system. ($6 + shipping) $7.0

journal after the fact



Asbestos: Decide your legal strategy now

If your schools contain hazardous asbestos—or if your board already has removed the harmful substance—your school system stands to benefit from a nationwide class action suit currently under way. Early this fall, a federal district court in Pennsylvania approved a suit against 55 asbestos manufacturers on behalf of *all* U.S. elementary and secondary schools that contain hazardous asbestos.

It's an unprecedented, massive legal effort marking the first time a nationwide class action suit has been approved for property damage arising from a question of product liability. Your school system automatically is included unless you decide to "opt out" and sue asbestos manufacturers on your own. Moreover, if your school system already has spent money to remove harmful asbestos materials, you will be able to use the class action to recover costs. And as other school systems incur removal expenses, your system, too, will be able to seek compensation.

Under a special exclusionary provision in the ruling, your school system may decide to "opt out" and sue asbestos manufacturers on your own for *actual* damages (cost of removal). If you wish to seek *punitive* damages from asbestos companies, however, you must remain in the class action suit. This provision is to ensure that one or more school systems that sue separately won't receive the lion's share of any awards for punitive damages.

The pivotal ruling, which came September 28, requires that all school systems be notified of the class action suit and of their option to be excluded. So in the next few weeks, watch for notification, probably by letter, explaining the terms of the suit and specifying the date by which you must let the court know if you wish to be excluded.

Whether your schools should initiate their own suit against asbestos manufacturers depends on several considerations, such as the total cost of removing asbestos from your schools and whether your board can afford the litigation costs. Gwen Gregory, deputy legal counsel for the National School Boards Association, advises school board members to "sit down with your attorney right away and decide whether it's best to stay in the class action or opt out."

Staying in the suit could save your schools plenty in litigation costs. According to the presiding judge in the case, Judge James McGirr Kelly of the U.S. District Court for eastern Pennsylvania, "Instead of hundreds of thousands of school asbestos cases in separate forums, the litigation would be concentrated in a single forum, thereby economizing litigation expenses."

The court's decision to allow the class action has advantages for both small and large school systems. Wrote Judge Kelly: "Many of the larger school districts, such as Los Angeles and Chicago, have a significant interest in pursuing their own actions. However, many more thousands of districts will be benefited by being relieved of the onerous decision of bringing a complex action which could consume in costs more than the recovery anticipated."

Before the class action ruling, approximately 50 cases had been filed in state and federal courts on behalf of school systems attempting to recover asbestos removal costs from manufacturers. Only one had proceeded to judgment: On April 9, 1984, the Lexington (South Carolina) schools won $675,000 from U.S. Gypsum Co. for a damage claim of $375,000 in asbestos removal costs. All other cases had been held up in the courts, awaiting Judge Kelly's decision in the mandatory class action.

For the four school systems (three in Pennsylvania and one in South Carolina) that initiated the class action—and potentially, for thousands of others—the ruling is a victory. "From a legal standpoint, it's a landmark decision," says Al Lewis, a partner in the Lancaster (Pennsylvania) law firm of Hartman, Underhill, and Brubaker, attorneys for the Pennsylvania school systems. "From a practical standpoint," he says, "[the class action] represents the only real opportunity for school boards to obtain something close to adequate reimbursement for the asbestos problem."

Some school systems objected to being included automatically in the class action. Attorneys representing the school systems of Anchorage, Los Angeles, Chicago, and Clifton, N.J., as well as some 50 other school systems and states represented by the National School Boards Association, view their option to be excluded from the suit as a victory.

"There's no question but that we can recover costs better on our own," explains Pat English, an attorney representing the Clifton schools. "Any large school district is in the same shape. And even the smaller districts, depending on the amount they would spend to remove asbestos, could come out ahead" by pursuing their own legal actions.

To qualify for a class action suit under

Rule 23 of the Federal Rules of Civil Procedure, the plaintiffs in the case had to meet four "threshold requirements": numerosity, commonality, typicality, and adequacy of representation. Judge Kelly found that attorneys for the four school systems indeed had established (1) that with an estimated 8,500 public school systems and private schools facing asbestos abatement problems, numerous individual lawsuits against manufacturers would be impractical; (2) that the questions of law and fact, such as the health hazards posed by asbestos, are common to all school systems in the class; (3) that the claims made by the representative school systems are typical of claims that would be made by other school systems; and (4) that attorneys for the representative school systems fairly and adequately would protect the interests of all school systems that wish to recover asbestos removal costs from manufacturers.

"In my view," wrote Judge Kelly, "the school asbestos litigation is uniquely suitable to class action treatment." The court and the public at large, he wrote, "are only too well aware of the staggering costs that the asbestos personal injury litigation has generated." □

Here's curriculum help from the experts

Defining—and redefining—the core curriculum for your schools is an ambitious but appealing task: How do you determine whether your curriculum is up to par? How do you decide which courses are necessary and which are outdated? Are the courses your schools offer tough enough? Will they adequately prepare students for college? Or for life? Getting the chance to pose and answer such questions probably is part of the reason you sought a school board seat to begin with. But how does your board go about the process?

Here's help: The Association for Supervision and Curriculum Development (A.S.C.D.) has published the results of an ambitious curriculum study project. But this report is different from others you might have read. *Redefining General Education in the American High School* is the result of a two-year curriculum-study project involving 17 high schools across the U.S. (Fourteen of the schools are discussed in the report.) Sponsored and guided by A.S.C.D., these schools conducted comprehensive reviews of their core curriculums and developed new definitions of more than 100 "common learnings" they think students should acquire. What's more, they undertook this Herculean task as a network—a support group, if you will.

The report from this project won't give you ready-made answers that you can plug into your community, but it offers its own kind of support for undertaking such a project in your school system. Between this book's covers, you'll find 14 case studies of schools representing various geographic regions and school system sizes. The network schools, according to the report, also represent many types of U.S. communities—affluent, middle class, and poor; large cities, small towns, and suburbs. In other words, you're likely to find several schools in the network that have a lot in common with those in your own system.

And if you're wondering how to start to review your school system's curriculum, the report offers a description of how network schools did it—how they appointed committee members, how they invited teachers and community members to participate in the curriculum discussions, how the process of review unfolded. Results are included, too. Not surprisingly, given the push following *A Nation At Risk* to require more academic courses, most schools in the network stiffened their graduation requirements, adding more science and mathematics courses as well as more credits in English and social studies.

If the report poses any drawback, it's that—as the report itself points out—merely hearing about the network is "a pale substitute for being there." The motivation the network offered its members might be difficult to duplicate in your system, without the support of other schools going through the same challenge. Nevertheless, *Redefining General Education* is a fine place to start for any review of curriculum.

To purchase copies of the report, send $8.50 per copy to A.S.C.D., 225 N. Washington St., Alexandria, Va. 22314. Taxes and mailing charges are included in the price. □

A conditional hosanna for test scores

The good news in recent months is that average scores on the Scholastic Aptitude Test (S.A.T.) have nudged up four points over marks posted last year—the largest increase in S.A.T. scores since 1963. The bad news, of course, is that everyone and his mother wants to tell you what the increase means.

Most every explanation refers to the fundamental reforms that have taken place in public education since board members and administrators first grew alarmed at sliding scores and other signs of weakness in the public schools. Statistics compiled by the federal and state governments tell us this reform cycle started well in advance of *A Nation At Risk*; since the early 1980s, in fact, U.S. high school students have been taking more academic classes, and kids of all ages generally have been buckling down to the difficult task of learning.

The rise in S.A.T. scores, then, is just one more indication local school boards successfully are attacking flabby curriculums, pushing for higher academic standards, and supporting legislative efforts to raise the level of public education in the U.S. It hasn't been an easy crusade. Status quo in education is hard to combat; among our readers, any number of veterans have bent more than one lance trying to slay the dragon of mediocrity in our schools.

Before we spend too much time thumping our chests in triumph, though, a word of caution is in order. As College Board President George Hanford says, "In the context of the decline in scores from 1963 to 1980, it would be naive to conclude that national attention to the quality of American education . . . is no longer

CSG Backgrounder

States Information Center
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Date: November, 1984

Topic: ASBESTOS

Infokey: Public Protection

ASBESTOS IN BUILDINGS

Asbestos: The Mineral and Its Uses

The term "asbestos" refers to a unique group of naturally-occurring, fibrous minerals useful because of their special properties. Asbestos is found in rock formations throughout the United States and other parts of the world. Air, wind and water erosion of these natural deposits, and mining, manufacture and use of some asbestos-containing products results in asbestos being found commonly in outside and indoor air, as well as in drinking water supplies.

The mineral's fire retardent and insulating qualities are among its most valuable characteristics. During World War II, asbestos use jumped dramatically in the United States because the U. S. Navy determined that it was essential for shipboard fire protection. Until the mid-70s, asbestos-containing products were used extensively in building construction. Asbestos is currently used in hundreds of products including vehicle brakes, roof shingles, building panels, water and sewer pipes, floor tiles, specialized thermal and electrical insulation, and textiles.

Asbestos and Health

Asbestos can separate into microscopic fibers that can be inhaled. Numerous studies of exposures in workplace environments, such as shipyards or mining and manufacturing facilities, have linked prolonged or heavy exposures with three diseases: asbestosis, a fibrotic lung condition; lung cancer; and mesothelioma, a rare cancer of the lining of the lung or abdominal cavity. The studies have also found that the lung cancer risk from asbestos exposure is

*This CSG Backgrounder was compiled by John F. Welch, President, Safe Buildings Alliance, Washington D.C. and Kevin J. Fay, Alcalde, Henderson and O'Bannon, Rosslyn, VA in cooperation with Jon Grand, Program Manager, CSG Environment and Natural Resources.

No risk occurs unless a significant number of asbestos fibers are released from the materials and enter the building air supply. As a result, most concern relates to certain materials that release fibers in large quantities.

Asbestos Exposure Levels in Buildings

While there is general agreement concerning the health risks to asbestos workers, the hazard posed by asbestos in buildings is less clear. Numerous studies, including those conducted by EPA, have determined that in many cases asbestos levels in buildings have been so low as to be indistinguishable from outside air. In some, measurements show levels that exceed outside air levels by small amounts, and in only a few, measurements have significantly exceeded outside levels. Even at the highest levels, exposure is substantially lower than OSHA standards and tens of thousands of times less than workplace exposures of the past. According to recent studies, the majority of exposures in buildings with substantial amounts of friable asbestos are less than 0.0001 f/cc with a few single readings as high as 0.01 f/cc.[3]

Independent experts believe that in most cases asbestos exposures can be properly controlled by a combination of improved custodial control, special maintenance procedures and minor patching and repairs. In those rare circumstances where these procedures cannot lower high airborne asbestos concentrations, other control techniques may be appropriate. These include encapsulation (use of penetrating sealants or coatings) and enclosure (construction of airtight enclosures around surfaces coated with asbestos-containing materials). Removal is the last resort. It is the most costly method in terms of meeting EPA and OSHA regulations, and, most importantly, often results in increased fiber release even when careful work practices are followed.

A number of expert governmental and scientific bodies have concluded the risk of disease from exposure to asbestos in buildings is not significant. These experts include Hans Weill, M.D. of Tulane University, Julian Peto of Oxford University, the Ontario Royal Commission on Asbestos and the United Kingdom Advisory Committee on Asbestos.[4] However, there is no consensus within the scientific community on this point nor on the issue of what the minimum standards ought to be. As noted earlier, OSHA standards for exposure provide some guidelines; however, these guidelines do not distinguish between exposure levels for normal healthy adults versus exposure levels for children or the elderly.

In September 1984, New Jersey's Asbestos Policy Committee concluded that the lifetime risk of cancer associated with nonoccupational exposures to asbestos is from 1,000 to 10,000 times less than the risk due to tobacco smoking alone.[5]

Emerging Problems: Unnecessary Removals, Unregulated Contractors

Many experts believe that removing asbestos-containing materials in buildings often does more harm than good. Very recently, the New Jersey Department of the Public Advocate cautioned that improper removal places workers, building occupants, teachers and children at serious risk and that containing asbestos. The survey also revealed that 67 percent of the schools have taken action to control asbestos in their buildings. While nearly all the country's schools have been inspected, the survey showed that 34 percent of the schools have complied with major requirements of the 1982 rule.

A comparable EPA survey of asbestos in public buildings found that friable, asbestos-containing materials may be present in 20 percent of 733,000 residential units, federal buildings and private structures. In the majority (563,000) of buildings, the products involved are pipe and boiler insulation; sprayed-on or troweled on materials may be in 192,000 structures. Both the CPSC and EPA are investigating the possible presence of asbestos-containing building materials in homes.

Many state health departments, local education agencies, employee and teacher unions, and the former manufacturers of asbestos-containing building materials all agree that the lack of uniform federal standards, particularly for hazard definiton and worker protection, is the fatal flaw on EPA's asbestos-in-schools program. This situation prompted the Service Employees International Union (SEIU) of AFL-CIO to petition EPA to set standards under authority of the Toxic Substances Control Act. After a year of Agency inaction, SEIU pressed further by filing suit against EPA. The Agency promised the court and SEIU that it would announce by November 30, 1984 a decision on what, if any rules or standards it will propose.

Without such standards, other federal and state agencies are jumping into the breach. In October, the New Jersey Asbestos Policy Committee issued its Interim Report to Governor Kean recommending an "action guideline" at 0.003 f/cc and a decision-making protocol for building owners. Rules are expected to be proposed in early 1985.[7]

The federal Centers for Disease Control (CDC) also issued recently a report critizing EPA for its lack of "sufficient guidance." CDC also proposed an "action level" -- 0.01 f/cc or 3 times higher than the proposed New Jersey standard -- as a guideline for monitoring buildings with asbestos-containing materials and for making risk-management decisions.[8]

In 1984, Congress passed the Asbestos School Hazard Abatement Act to provide loan and grant money to school districts seeking to abate friable asbestos-containing materials in schools. The act appropriated $50 million for fiscal 1984, authorized $50 million for fiscal 1985 and $100 million per year for five years thereafter. The law also requires EPA to promulgate comprehensive guidelines to classify and evaluate asbestos hazards and abatement options, as well as training and certification standards for contraccors.

The legislation created a number of deadlines for state authorities. By November 20, 1984, the Governor of each state was to submit a plan to the EPA Administrator addressing procedures to maintain records on the presence, detection and abatement of asbestos. EPA will extend to March 1, 1984 the original February 11 deadline for states to submit to the Administrator and the Secretary of Education a priority list of schools that are candidates for abatement. Financial assistance applications must be received at the same time. By May 11, 1984 and annually thereafter, governors also must submit reports describing activities in connection with record maintenance plans. By June 11, 1985, EPA must approve or disapprove state financial assistance applications.

Notes

1. Commission of European Communities, Public Health Risks of Exposure to Asbestos (1977); Consumer Product Safety Commission, Chronic Hazard Advisory Panel on Asbestos (July 1983); National Academy of Sciences-National Research Council, Nonoccupational Health Risks of Asbestiform Fibers (1984); United Kingdom Advisory Committee, Asbestos (1979).

2. R.N. Sawyer and C.M. Spooner, "Sprayed Asbestos-Containing Materials in Buildings: A Guidance Document, Part 2," Environmental Protection Agency, EPA-450/2-78-014 (March 1978).

3. D.J. Pinchin, "Asbestos in Buildings," Royal Commission on Asbestos Study Series, No. 8 (1982); Report of the Royal Commission on Matters of Health and Safety Arising from the Use of Asbestos in Ontario (1984).

4. Testimony of Dr. Hans Weill before the Ontario Royal Commission on Asbestos, Vol. 9 (1981); Testimony of Julian Peto, Ibid., Vol 25A; Report of the Royal Commission.

5. J. Richard Goldstein, Asbestos Policy Committee's Interim Report to the Governor [of New Jersey] (September 1984).

6. New Jersey Department of the Public Advocate, "Asbestos in the Schools: An Interim Report," testimony for presentation to the State Asbestos Policy Committee (Aug. 29, 1984).

7. Goldstein, Interim Report.

8. R.S. Bernstein, "A Review of the Scientific Basis for EPA's School Asbestos Hazard Program with Recommendations to State Health Officials" (1984).

Price -- $3.50

STATE ACTIONS ON ASBESTOS IN BUILDINGS

	Legislation Adopted	State Funding	State Assistance	Local Funding Option	Contractor Certification and Training	Encapsulation Allowed	EPA NC Citation
Alabama			*[5]				*
Alaska			*				
Arizona							
Arkansas							*
California	*	*				*	*
Colorado							
Connecticut		*	*			*	*
Delaware	*[1]						*
Florida							
Georgia		*	*				*
Hawaii							
Idaho				*			
Illinois	*		*	*			*
Indiana							*
Iowa	*			*	*	*	
Kansas							*
Kentucky	*[1]		*				*
Louisiana	*[7]						
Maine			*				
Maryland	*		*		*		
Massachusetts		*	*				*
Michigan							*
Minnesota	*	*		*		*	*
Mississippi							
Missouri							*
Montana							
Nebraska	*			*			
Nevada							
New Hampshire							*
New Jersey	*	*[4,2]	*		*		*
New Mexico			*				
New York	*	*	*		training	*	*
North Carolina		*[2]					*
North Dakota							
Ohio	*[1]						*
Oklahoma							
Oregon							*
Pennsylvania	*	*					*
Rhode Island							*
South Carolina	*[3]		*		*[6]		*
South Dakota							*
Tennessee	*[1]		*				
Texas							
Utah							
Vermont							
Virginia							*
Washington							*
West Virginia							
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Washington, D.C.	*[1]						*

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FAIRBANKS INFORMATION OFFICE

TO: JNO FOR: H. HESS Cmte PHONE:

FROM: Geo. Riley, UAF PHONE:

ADDITIONAL INSTRUCTIONS: Immediately deliver please

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FROM: George Riley
U.A.F.

(1

These will be my comments and presentation at the teleconference this afternoon. Call me if you think I should add anything.

Notes:

~~1. Regarding the comment about failure of an encapsulation program in Jefferson County, Missouri - I attempted to contact the people there and found there are 16 school districts in Jefferson County and I am not sure which one Mr. Freeman was referring to, however, the superintendent's office of the Fox School District in Jefferson County told me they had indeed encapsulated some material in there hallways and as far as they knew, there was no problem with their program.~~

2. I have put together a package of some material that I gathered on products available for encapsulation and sent them along to Rep. Pettyjohn and Rep. Koponen's office and would hope they would arrive by next week and I'm sure that they would be able to share that information with any interested parties.

3 I am very much in support of the certification provisions in House Bill 5

4 ~~3~~. I would like to relate to you an outline of an asbestos abatement program for the University of Alaska-Fairbanks.

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4. For those who might be interested, Dr. Cohen, a consultant who deals specifically with asbestos containing materials and their control, will be in Anchorage next week from Wednesday thru Friday. Anyone who may wish to speak to him directly, can call him at his California office at the following number - 619-579-6233. I spoke with him on the phone today and he said he would be happy to answer any questions which you might have on the subject.

1. Regarding the question of the encapsulation program in Jefferson County, Colorado that supposedly failed, I spoke with Bud Barber, the Director of the maintenance department for the school district. He told me that between 1982 and 1983 they did both a removal and encapsulation program in 90 schools within their district. A majority of this work was an encapsulation program. Mr. Barber states that there have been no problems with any of the encapsulated areas and in fact they have recently received a commendation from the EPA for there monitoring and record keeping system.

ASBESTOS RISK ABATEMENT PROGRAM FOR UNIVERSITY OF ALASKA-FAIRBANKS

The Fairbanks campus has 46 buildings, which translates into 2,168,000 square feet of functional space, along with a 20 megawatt coal and oil fired steam, heat and electric generating power plant and 5 miles of utilidor system, which provides utility support for the entire campus.

Much of the piping in the buildings, power plant and utilidor is covered with asbestos containing material. Additionally there is duct work in some buildings that is protected with rigid asbestos containing insulating board and several buildings have spray on fire protection material on steel beams and columns, much of which contains asbestos.

We are presently in the process of doing air and bulk sampling to determine the extent of our risk exposure. We know now that there are a number of areas that will need attention. We intend to address this in the following way:

1. Hire a qualified consultant with credentials in safety and health and hopefully a background in engineering and the sciences, to come to our campus and train a multi-disciplinary team of craft persons to be able to properly handle any small removal and replacement job dealing with asbestos material. In addition, begin on a program basis, the process of encapsulating, covering and protecting from mechanical damage the many miles of piping here on campus. It is our intention that the majority of the work in controlling asbestos contamination, will be by nature one or more methods of encapsulation. This is consistent with comments made to us by Dr. Kenneth Cohen, a consultant on the subject, that quotes a recent EPA statement that removal should be the last option in any asbestos hazard control program and they recommend strongly against it.

2. Where there is a large contaminated area beyond the ability of our staff to manage by removal or encapsulation, we would intend to select a qualified contractor to perform the job.

3. Our program will include the purchase of specialized equipment and materials utilizing the latest technology equipment, such as high efficiency filtered vacuum cleaners and specialized spray equipment along with complete personal protection and respiratory equipment for the workers along with the latest and most efficient products for encapsulation that also provide a safe method for eventual disposal and removal of asbestos containing materials when necessary. When insulated or fire protected material is removed it must be considered that the cost of a suitable and functional asbestos free replacement product and its installation be included in the project budget.

4. It is our intention to work with others in the state and promote the development and utilization of more accurate air monitoring techniques, as we agree with Dr. Thorn that the present industrial based methods of air sampling are not adequate to address our concerns for a safe public environment. We would suggest then that we pursue a method of air testing that establishes a standard base background level in the environment, whether induced by natural levels or man made products and we use this standard base outdoor level as a minimum standard that

we hold ourselves to indoors. The concept is much the same as that used for monitoring, and setting standards for radiation exposure. We intend here at the University of Alaska-Fairbanks, that a monitoring program be a continuous one, and that regular visual and air monitoring checks be part of our ongoing maintenance. It should be understood that this kind of monitoring program will represent some greater costs than the kind of sampling routine we have been using in the past, however, it will be generating information on which we can make prudent and reasonable judgements.

We have been asked to come up with a rough estimate of the potential costs for this program and we believe that we should be able to accomplish all of the above and control the risk of asbestos containing materials here on the Fairbanks campus at an estimated cost of $1.5 million. It should be considered that although the Fairbanks campus is the oldest and largest campus in the University of Alaska system, we might anticipate that we would find some asbestos containing materials in buildings on other campuses and they too may be looking for some funding to abate the risk in their areas.

In the process of researching this matter, we have made some useful contacts and obtained data that may be of interest to others and we look forward to working together with other individuals and organizations in the State of Alaska for our mutual benefit.

Asbestos: Still a Danger in Schools

By Elaine S. Knapp, editor

For Phyliss Adams and Ann Gibbs the last year has been a frustrating one—trying to get their local school board to remove asbestos from the school their children attend.

"It's frustrating, our children are being poisoned and there's not anything we can do," Mrs. Gibbs declared. What the Lexington, Kentucky, housewife has done is work through the PTA, form a group of concerned parents, go door-to-door telling parents of the danger, gather hundreds of signatures on petitions, read volumes on asbestos, call and write federal agencies and confront the school administrator and board.

After a year of parental pressure being applied and at least a decade after school authorities knew of the asbestos hazard, Mrs. Gibbs said, "We don't think anything will be done until the government makes them (the school board)." School authorities maintain the asbestos will be cleaned up if money is available for renovation next year.

Ironically, the major government effort to control asbestos lies in Mrs. Gibbs and others like her. Telling parents and teachers that their school has asbestos and relying on them to pressure local action is the heart of the U.S. Environmental Protection Agency's (EPA) strategy to rectify the nationwide problem of asbestos in the schools.

No effective federal program exists to protect school children from asbestos, state efforts vary widely and local schools often ignore the danger due to the cost of cleanup.

Asbestos Dangers

Any exposure to asbestos involves some health risk, according to the Congress, the EPA and the scientific community. Children are especially vulnerable, according to the EPA guidance document on asbestos sent to schools. Their remaining life expectancy provides the 20 to 40 years it takes for disabling and fatal asbestos-related diseases to develop. Large numbers of children may be exposed in a contaminated school and exposure is continuous during the school year. Children are active and breathe more frequently than adults possibly inhaling more asbestos fibers. Smoking can increase the cancer risk due to asbestos exposure.

Most hazardous is friable asbestos that can be crumbled. It sends deadly fibers into the air which may lodge in the lungs indefinitely, according to EPA's guidance document. Asbestos workers often develop a chronic and debilitating lung disease called asbestosis. Lower and shorter exposures are linked to lung and other cancers. Even brief exposure can result in death many years later.

Asbestos diseases include: 1) asbestosis, a disease in which asbestos clogs the lungs, 2) pleural calcification, a deposit of calcium salts in the lung lining, 3) malignant tumors of the lung, 4) mesothelioma, a rapid and fatal cancer of the lung, and 5) intestinal and uterine cancers.

Where It Is, What to Do

Use of asbestos materials was common in schools and other buildings from the mid-1940s until EPA banned sprayed asbestos in 1973. Friable (or soft) asbestos-containing material was used for fireproofing, insulation or decoration. It was usually sprayed on overhead surfaces, steel beams, ceilings, walls and pipes.

As friable asbestos material ages, it breaks down and releases fibers into the air. School activities can damage or disturb asbestos, such as a ball hitting a gym ceiling. Asbestos material can be disturbed by maintenance activities, vandalism, water damage or vibration from people or machinery and release fibers into the air.

Many experts believe removal of asbestos is the only final and satisfactory solution to asbestos exposure. However, removal may cost more initially and be more complicated. Temporary measures include encapsulation by spraying asbestos with a sealant or enclosing the asbestos. EPA and other experts warn that such temporary measures make removal more difficult and dangerous later on, and must be constantly monitored.

The EPA guidelines call for asbestos work only after construction of sealed containment barriers and worker protection as mandated by OSHA. All but asbestos workers should be kept out of the sealed area and worker change rooms are required.

Hot Potato

Asbestos in the schools has been a "hot potato" tossed among various levels of government and federal agencies. One reason is that removal of asbestos can be quite expensive, especially if large areas of buildings are affected. Funding is basically up to local schools as is asbestos detection and control. No federal funds are available and state aid varies.

The U.S. EPA requires schools to inspect for asbestos and notify parents and employees of asbestos hazards. The EPA doesn't require removal or abatement. "The theory is that PTAs and employees would pressure local districts to take remedial action," said Terrell Hunt, assistant to EPA Deputy Administrator Alvin Alm.

However, a recent internal EPA report found that many schools did not meet EPA's June 1983 deadline for asbestos detection, record keeping and notification.

No Federal Funds

Federal funds of $172 million authorized by the Asbestos School Hazard Detection and Control Act of 1980 were never appropriated. Grants were promised for schools to identify asbestos hazards and loans for mitigation of asbestos hazards. But funds were never requested by the Department of Education, reported John Bennett, aide to U.S. Rep. George Miller, D-California, who sponsored the act. In 1983, a $50 million recommendation by the House was omitted in a House-Senate conference.

The U.S. Department of Education had a task force which set standards for state grants in 1980, according to W. Stanley Kruger, deputy director for state and local education programs. However, when the program wasn't funded the department "deferred to EPA," Kruger said.

Under pressure from Congress, the department reactivated its task force in October 1983 and is gathering information on asbestos to send to chief state school officials, Kruger said. The department also reactivated its requirement that states file plans for asbestos in the schools' programs and report on their progress every six months. All but two states have filed.

EPA's Program

The federal effort has largely been a requirement by the EPA that schools inspect for asbestos hazards, sample and analyze material to determine if asbestos is present, keep records of the inspection, post notices, and notify parents and employees if asbestos is found. Although schools were to comply with the rule by June 1983, the EPA doesn't know how many did. It does not require schools to report to it and must send federal inspectors to schools to check their records. EPA staff said when the EPA regulation was written that the administration opposed imposing a data reporting requirement. The EPA recently doubled its field force of inspectors by adding 16 people through a contract with the American Association of Retired Persons, Hunt said. These include retired architects and engineers. Primarily, EPA staff look at school records and physically inspect some schools. However, there's not enough inspectors to cover but a small portion of the nation's schools.

In providing technical advice, EPA can help schools determine the best strategy for evaluating the risk and responding to asbestos, Hunt said. He said that anything short of removal is considered a short-term solution.

Connie Derocco, environmental protection specialist with EPA, said that out of 1,527 schools inspected in 468 districts, some 60 percent did not comply with EPA rules. Most failed

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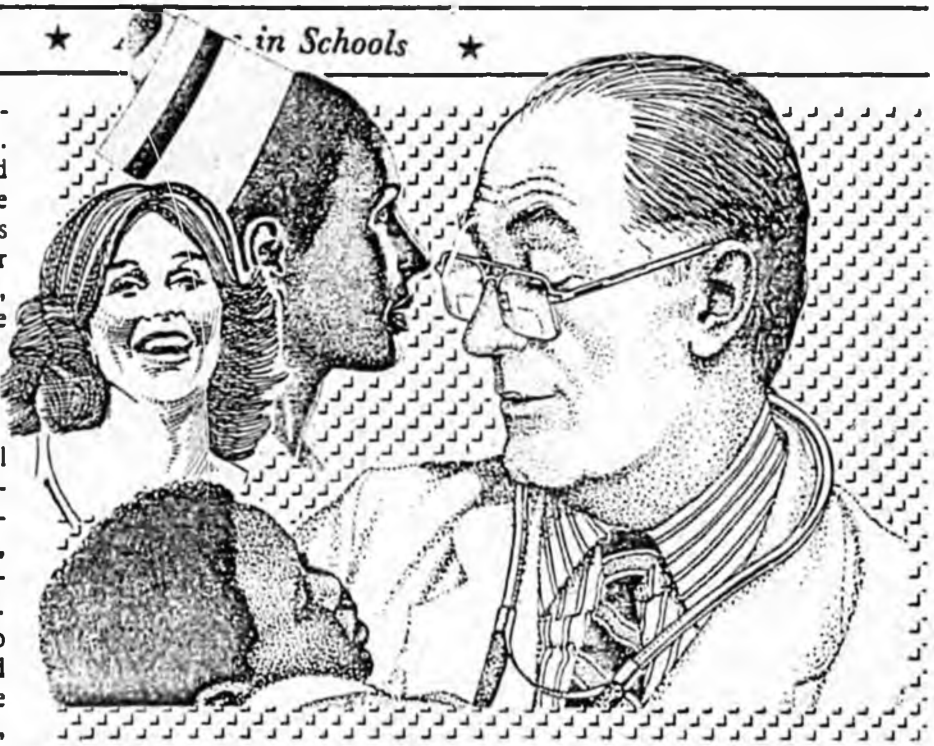

to notify and warn PTAs and employees of asbestos materials. Schools know they will be pressured once the word is out, and they are hesitant to deal with the asbestos problem, Derocco explained. After receiving a notice of noncompliance, schools have 30 days to act before the EPA files a civil complaint.

Labor Union Concern

An estimated 3.24 million school children and 648,000 school employees are potentially exposed to asbestos, according to Kitty Conlan, research analyst with the Service Employees International Union (SEIU).

The SEIU is lobbying Congress to fund the 1980 act for grants and loans to schools. Schools don't have the money to cleanup on their own, Conlan said. "It's definitely a federal responsibility," Conlan said. "It's a nationwide problem which affects the health of millions of people."

SEIU is suing the EPA to require schools to cleanup flaking asbestos. "Schools say if EPA thinks asbestos is so bad, then EPA would require them to get rid of it," Conlan commented.

EPA does give schools good technical advice on how to get rid of asbestos, Conlan noted. But some schools accept the lowest bid rather than follow EPA guidelines. If the cleanup is not done right, the asbestos danger can be worsened.

Conlan said SEIU doesn't think suing asbestos' manufacturers is worthwhile, citing lack of action on suits filed by asbestos workers. "We're hesitant to have our members litigate themselves to death," she said.

Conlan added that school districts can also be held responsible for asbestos. "They can face a big liability," she commented.

Lawsuits Filed

A number of lawsuits on behalf of school boards and building owners in Kentucky, Mississippi, New Hampshire, Florida, South Carolina, Alabama and Tennessee, have been filed by a South Carolina law firm.

Daniel Speights noted that legal theories available to school boards against manufacturers of asbestos include: contract (the products were not fit for the uses intended), negligence (the manufacturers were negligent in informing users of the risks associated with the products), strict liability (manufacturers should be strictly liable for failing to warn of asbestos hazards), and restitution (manufacturers have a duty to abate the hazard).

A civil action filed on behalf of the Barnwell, South Carolina, school district notes that school districts and public officials could be held liable for failing to abate a health hazard.

A September 1981 report by the U.S. attorney general to Congress recommended that school authorities seek to recover asbestos abatement expenses from asbestos manufacturers. The report said federal litigation would be inefficient unless Congress imposed liability on asbestos manufacturers.

Asbestos manufacturers are being sued by at least 20,000 people on the grounds that the companies knew of asbestos hazards and covered them up, according to a September article in the *National Journal.*

A 1983 report from the Rand Institute says that asbestos litigation and compensation has cost an estimated $1 billion over the past decade. Only 37 cents of every dollar went for actual compensation to plaintiffs. Estimates of the number of deaths due to asbestos over the next 30 years range from 74,000 to 265,000.

Future Problems

Generally, 15-40 years can elapse between asbestos exposure and manifestation of certain diseases. For instance, shipyard workers exposed during World War II may only now be filing claims, according to the Rand study. Despite this knowledge, no attempt is being made to monitor school children exposed to asbestos.

An internal EPA memo written in November 1978 called for long-term surveillance of children who are exposed. The memo noted that when they reach adulthood these children could then be informed and notified of their childhood exposure. They could be medically examined more frequently for respiratory diseases and cancer.

EPA Regions, States

Because no one tracks data on asbestos in the schools on a national basis, *State Government News* interviewed asbestos coordinators in five of the 10 EPA regions and several state asbestos coordinators.

Generally, the federal regional EPAs have switched their emphasis from providing technical assistance on identifying and dealing with asbestos in the schools to checking school records on asbestos inspections. Most found a high percentage of schools either had not inspected or had not notified parents and employees of asbestos in the schools as required by the EPA.

State programs differ widely in scope and authority. While a few states fund asbestos removal and cleanup, most simply help schools identify asbestos or provide other technical assistance.

Region I

"Compliance is terrible," said Paul Heffernan, asbestos coordinator for EPA Region I covering Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont.

Five full-time EPA inspectors have visited 160 districts covering 400 schools and issued 58 notices of noncompliance. Of the EPA violations, 37 percent had not even inspected and 53 percent had not notified parents or employees of asbestos found. Many school administrators didn't want to be "bothered," others had not read the regulation and others simply refused to post a warning in the building.

Oddly enough, schools in states which had asbestos programs in the late 1970s were most difficult to convince they needed to inspect for asbestos in ways not done in earlier years. For instance, the latest regulations require inspection of pipes and boiler rooms.

With 3,300 school districts in the region, there is no way EPA can inspect them all, Heffernan said. However, press releases announce schools found in violation, so the hope is that other schools will inspect rather than see themselves in the headlines.

Asbestos abatement efforts vary widely even in the same school district and among neighboring school districts, Heffernan said. He said West Haven, Connecticut, had an effective program while North Haven, next door, had none. While Hartford, Connecticut, spent $6 million on big problems in five schools, it had not tackled "mini-disasters" in 37 others. The same situation existed in Boston.

In the region, New Hampshire sent a checklist of EPA requirements plus abatement actions to help schools comply with the EPA.

Connecticut has granted $6.5 million since 1976 to localities for asbestos control in schools, reported Richard Krissinger, coordinator of school facilities, state Department of Education. State grants range from 40 to 80 percent of cost, depending on the aid formula the town qualifies for. If asbestos is found, the "chances are good it will be removed," Krissinger said. "We treat it as a health violation."

The state "accepts encapsulation" as an abatement measure, but doesn't encourage it. Krissinger said, "We believe removal is the only answer."

Al Siniscalchi, acting chief of the toxic hazard section of the Connecticut Department of Health Services and Education, noted that the state also provides technical assistance to schools. Schools were sent EPA guidelines and seminars were co-hosted by the state and EPA Region I.

A job freeze has reduced a former staff of nine to four and most inspec-

tions are now done by local health departments. Connecticut does follow-up inspections after asbestos removal to make sure the school is safe. Safe disposal of large amounts of asbestos is supervised by the state Department of Environmental Protection.

Maine is in good shape, according to Roy Nisbett, director of the Division of School Facilities. Most of the asbestos found was confined to pipe wrapping and boiler rooms. The state notified schools of the EPA rule and 90 percent complied with inspection requirements, Nisbett said. The Division of Industrial Safety trained school personnel to conduct asbestos inspections.

A proposed bill in Maine would authorize a bond issue to reimburse local schools for the cost of asbestos removal and repair.

In spite of the fiscal contraints caused by Proposition 2 1/2, public pressure has spurred asbestos abatement in Massachusetts, said Mike Malchik, assistant engineer, Division of Occupational Hygiene. "Parents and teachers are adamant about getting it (asbestos) down," Malchik said. The legislature allocated $2 million in 1983-84 to repay part of school removal costs if removal is recommended by the state.

Massachusetts inspects public buildings and schools, samples, analyzes samples and recommends abatement measures. There are at least five engineers and a project engineer available. The schools are being re-surveyed based on new guidelines, as inspections in 1978 only covered sprayed-on asbestos in public areas.

Region II

EPA Region II asbestos coordinator, Arnold Freiberger, has seven inspectors to check some 3,000 schools in New York and New Jersey. Out of 108 districts inspected, only 13 were in compliance with EPA rules, 32 had minor violations and 63 had either failed to inspect or identify asbestos or to post notices and notify parents and teachers.

New York has provided funds for asbestos control, reported Henry Binzer, associate in school business management, state Department of Education. In addition to state grants of $1.75 million annually for the past four years, school districts may tap state building aid for asbestos control.

An annual state survey of schools revealed 509,000 square feet of potentially hazardous asbestos.

The New York State School Asbestos Safety Act of 1979 required schools to identify asbestos and, if it is hazardous, take control measures. Encapsulation is most popular with schools. "The problem is that still has to be watched," Binzer noted. Removal is permanent, but expensive.

The state does not give advice on specific jobs, but provides an educational program for contractors and information to schools.

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New Jersey doesn't provide specific aid for asbestos removal, but schools can get assistance through the foundation aid program, said Dr. Irving M. Peterson, manager, Facility Planning Services, state Department of Education.

In 1979, a governor's Task Force on Asbestos set minimum specifications for removal of friable asbestos. The specifications, which contractors must follow, require notification of state and federal agencies prior to the start of a project, require documentation of the contractor's qualifications, and require the contractor to follow stringent procedures for removal. The standards do not permit encapsulation (by coating the asbestos-containing layer) in New Jersey.

The state must approve all construction projects, plans, make field inspections to assure the work area is set up properly so contamination doesn't spread and check at the end of the project. Contractors, agents and workers must all attend a one-day state-EPA seminar and carry certification cards on the job.

Out of 2,400 public schools in New Jersey, asbestos removal projects have been approved in 350. Costs have totaled $46 million, for an average of $131,000 per school. It's up to local districts to remove the asbestos and as many as 100 more may not have acted yet.

EPA's new rule requiring parental notice "triggered a lot of work," Peterson said. As many projects were approved last year as in the previous four years.

Region IV

EPA doesn't have the resources to inspect school compliance with asbestos regulations, declared Dwight Brown, asbestos coordinator for Region IV covering Alabama, Georgia, Kentucky, Mississippi, North Carolina, South Carolina and Tennessee.

Most commonly, schools have either failed to inspect or to notify parents, Brown noted. He added that common law requires building owners to identify and notify occupants of hazards, and to provide medical surveillence if there is evidence of exposure.

Region IV also provides technical assistance and its intensive seminars on asbestos are attended by many from outside the region.

Most of the asbestos found in Georgia schools was in boiler rooms or pipe wrapping and has been corrected, said Lovett Fletcher, asbestos coordinator. State environmental, health and education departments worked with the U.S. EPA to provide information and hold seminars for superintendents. In addition, 70 environmental health specialists were trained to assist local systems. Schools with acute problems could get matching state aid through the state capital outlay, Fletcher said.

Kentucky helps schools comply with EPA inspection requirements, but has no money to aid them, said Jim Judge, unit director of property insurance, Department of Education. Asbestos cleanup was estimated to cost $26 million last year, but a survey now underway could change that estimate. Judge noted that the EPA doesn't require removal and many schools "are hesitant to post a warning." Asbestos problems in the state's 180 districts range from major ones with ceilings to boiler rooms.

Affected schools mostly include those built from World War II to the early 1970s. Judge said certain architects used lots of asbestos while others didn't.

South Carolina selected the critical points of EPA's regulations in requiring public and private schools to inspect, sample and analyze for asbestos, said Lee Bacot, asbestos coordinator, Department of Health and Environment. Results of the school surveys and health hazard assessments were required to be publicized in meetings and by notifying parents.

Out of 1,200 public schools, 1,080 or 90 percent complied with EPA's rule and 270 found friable asbestos. Only about 30 percent of the 450 private schools complied.

Asbestos inspectors must be certified by the state and must send survey results to the state. A one-day course is offered by the state to consultants and state and local staff. Schools are provided information, but the state does not provide specific advice or any funds.

Tennessee had a governor's task force on asbestos in 1978, according to Robert Foster, chief, technical services, Division of Air Pollution Control, Bureau of the Environment.

Out of 1,773 schools, 150 reported potentially hazardous asbestos.

The state provides free analysis of suspected asbestos materials, provides information to schools, and conducts training sessions. Because there is a shortage of EPA inspectors, Tennessee Gov. Lamar Alexander wrote the EPA offering to help enforce the inspections. However, EPA has not responded. The state plans to proceed to develop the data anyway, Foster said.

"We're convinced asbestos in the schools is one of the more important health problems," Foster declared. "It's an absolute human carcinogen. It causes serious irreversible health effects. Even brief exposure can cause painful disease. Children are even at more risk."

The goal should be to eliminate the hazard, Foster continued, while the EPA only requires inspections and warnings which can lead to panic and make schools vulnerable to unscrupulous contractors. People need to be educated on how to abate the hazard, he said. He added that although "most want to do the best, it's hard to convince them that a little dust out of the ceiling will kill them."

"I've gone in schools where the material (asbestos) was hanging off chairs," Foster said. In that case the superintendent closed the schools upon the state's recommendation. More troublesome are marginal situations, Foster noted, where schools don't understand the potential hazard. "They look to the state or federal government," he said. "But hope for federal or state aid is a loser."

Region V

"There's quite a few violations of EPA's rule," said Anthony Restaino, asbestos coordinator for Region V covering Illinois, Indiana, Michigan, Minnesota, Ohio and Wisconsin.

Many school officials thought asbestos "was a low priority, didn't take time to inspect, didn't touch asbestos-materials to see if it crumbled or didn't notify parents or employees," Restaino said. Out of 43 school districts inspected, 29 were in violation. The Region V inspection staff was recently doubled to eight.

Illinois treats asbestos as a health and public safety issue, said Ralph Morrisette, architect, school facilities and organization section, State Board of Education.

Under Illinois law, school boards can hire an architect to determine if school building conditions endanger lives. After a survey of the cost to remove the asbestos, the local district can levy a tax for the amount without a referendum. Because schools are able to raise the funds, most of those with asbestos are having it removed, Morrisette said.

Most Wisconsin schools have inspected for asbestos, reported Nori Roden, school asbestos program coordinator, Department of Health and Social Services.

Out of 3,027 schools, 3,006 inspected and 1,089 found friable asbestos. Corrective action was taken by 583: 395 rewrapped pipes, 94 removed asbestos, 33 enclosed it and 61 encapsulated it.

Wisconsin has had an asbestos program since 1980. The Department of Industrial Labor and Human Relations conducted asbestos inspections when it conducted fire and other safety inspections. Samples were analyzed by the state lab. The Department of Public Institutions targeted schools for the free inspections, helped with record keeping, and provided technical assistance and consultation services. The health department computerized and coordinated the data and consults on health effects of asbestos.

A position paper being developed by the health department will most likely recommend removal of all friable asbestos, Roden said. "We're cautious of encapsulation and enclosure," she said. Advantages of the temporary measures include less cost and time, but the disadvantage is the "asbestos is still in the building," Roden said.

Minnesota in 1983 authorized a $25 per pupil unit capital expenditure levy and aid for asbestos removal or encapsulation and PCB cleanup with Department of Education approval.

Region VIII

The major violation found in Region VIII is that schools "aren't willing to put up notices," said Steve Farrow, EPA asbestos coordinator for Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming. Instead, schools are trying to remove or encapsulate the asbestos first, he said.

Of the states, Farrow said that Utah's problems were with pipes and boiler rooms, North Dakota was making progress and Wyoming had few major problems.

Chuck Johanningmeier, technical advisor for the region, said, "Many people hoped it would go away. Medically, it is just getting worse." A Fargo teacher had contacted the EPA after discovering asbestos debris left in a school storeroom. Not long afterwards, the lawyer for the teacher's estate reported the man had died of mesothelioma (a rare cancer associated with asbestos exposure).

Unqualified contractors can do more damage than if the asbestos was left alone, Johanningmeier said. A proposed measure before the Colorado Legislature will require contractors to be certified to work on asbestos.

In another case, a contractor left asbestos which students and teachers dusted up. As a result the EPA is helping write specifications in a contract for cleanup which will be available to others as well.

There are some bright spots as well. Johanningmeier praised the work of Gill Johnson, the asbestos coordinator for a Jefferson County, Colorado, district. Johnson overcame school resistance and succeeded in cleaning up the asbestos in the district's schools.

No Cavalry in Sight

Although asbestos was recognized as a nationwide health problem by the Congress in 1980, there's no real federal effort to protect the health of exposed school children. Even though most states have asbestos coordinators, few states mandate cleanup or provide funds for removal. Essentially, asbestos removal or cleanup is left up to local school districts. Local school officials may not be willing or understand how to inspect for asbestos. Some may not understand the health dangers or legal liability they incur by allowing asbestos to remain. Apparently, many refuse to adequately notify parents or teachers if asbestos is found. Even then, students have no choice but to attend the school and teachers may be fearful of retribution if they take action. Many schools don't have or don't want to spend the money it takes to remove or cleanup asbestos.

Alvin L. Alm, deputy administrator of the EPA, recently acknowledged that the agency was reconsidering its approach to asbestos in the schools.

* * *

Leonard P. Stavisky

State Responsibility for the Control of Asbestos in the Schools

Asbestos, widely used in construction, is hazardous to human health. Schools represent the most pressing concern for public policymakers who are faced with the asbestos issue. With few exceptions, compulsory attendance laws exist throughout the United States. Typically, state statutes prescribe that minors from six to 16 years old attend school for approximately 180 days a year. Parents and guardians have no discretion in this matter and those who refuse may be charged with neglect. As a result of these laws, government's legal and ethical responsibilities may be greater in this area than in others where one's presence is voluntary or where minors are not involved.[1]

On the school asbestos issue, the educational and public health mandates of existing state constitutions come into conflict. In the language of one state constitution: "The legislature shall provide for the maintenance and support of a system of free common schools, wherein all of the children of the state may be educated." The same constitution further stipulates that "the protection and promotion of the health of the inhabitants of the state are matters of public concern and provision therefore shall be made by the state and by such of its subdivisions (including school districts) and in such manner, and by such means as the legislature shall from time to time determine." Obviously, though teaching and learning cannot be suspended, the public deserves ironclad guarantees that the instruction will be offered in a safe environment.[2]

Such guarantees come in implied warranties of quality — the presumption that a product is free from substantial, latent defects which are not obvious through inspection; these appeared in Roman edicts as early as 150 B.C. In modern commercial practice, the term warranty has always meant that the conditions are exactly as they have been stated, that standards of quality exist, and that those in positions of responsibility recognize their obligation to repair or replace defective parts. Implied warranty of quality exist even in cases in which there is no sale. Thus, nonprofit institutions have been named as defendants under breach of warranty.[3]

Statutory law has extended the boundaries. In real property law, states have enacted warranties of habitability which presume that a dwelling is suitable for human habitation and that the occupants will not be subjected to conditions which are "dangerous, hazardous or detrimental to their life, health or safety." Similar language appears in occupational safety codes, public health laws and environmental protection legislation.[4] In recent decades, government has become a landlord — involved in the ownership and management of public housing. Formerly private buildings have been acquired through "in rem" proceedings resulting from non-payment of taxes. Does the warranty of habitability therefore apply to the public sector?[5] Does it extend to other physical settings such as schools? Presumably, when a child is enrolled in a public school, for which taxes are paid in lieu of tuition, there is an implied warranty that professional services will be rendered in a building that is free from conditions and substances which are hazardous to health.[6]

Asbestos, a hydrated mineral silicate which was widely used for fireproofing, soundproofing and decorating during the post-World War II construction boom, was introduced in Great Britain in 1932 and in the United States three years later. Between 1946 and 1972, sprayed-on asbestos was used in school auditoriums, gymnasiums, classrooms, hallways and libraries. Of the one million tons consumed in the United States in a single year, the material was applied to insulation, ceilings, floor tiles, cement, roofing and shingles. Homes, offices, factories, government buildings, private institutions and places of public accommodation were laden with this ubiquitous substance. More than 3,000 known asbestos products came into use.[7]

Concern over the impact on human health arose as a result of the inordinately high rates of disease discovered among employees handling asbestos in mining, manufacturing and construction. During the 1950's and 1960's, clinicians and researchers reviewed the medical records of asbestos workers and established positive correlations between persons who had been exposed to extraordinarily high asbestos air concentrations and specific diseases such as: 1) asbestiosis, a non-malignant scarring of the lungs; 2) bronchogenic carcinoma, a malignancy of the lungs; 3) mesothelioma, a malignancy of the lining of the abdomen or chest cavity, and 4) cancer of the gastrointestinal tract (esophagus, stomach, colon or rectum). By the early 1970's, medical researchers at the National Cancer Institute demonstrated in laboratory experimentation that malignancies "comparable to those resulting from asbestos exposure in man, can be induced rapidly in the rat and hamster by direct intrapleural application of asbestos. Such experiments attest to the carcinogenity of asbestos and offer an excellent means of investigating those carcinogenic mechanisms involved," these studies concluded.[8]

Government has responded in various ways. Since 1970, the Occupational Safety and Health Administration (OSHA) has regulated working conditions in the asbestos industry. In 1973, the United States Environmental Protection Agency prohibited the spraying of asbestos materials for fireproofing and insulation. Five years later, the ban was extended to all forms of sprayed asbestos, including decorative applications. Agencies of government promulgated regulations to control the industrial discharge of asbestos materials into the air and water. The sale of spackling compounds containing asbestos and the use of asbestos in imitation fireplaces was halted. Placing asbestos on the list of hazardous materials is under consideration. In all sections of the country, monitoring and informational programs have been initiated by federal, state and local authorities.[9]

Efforts have also been made to verify the effects of asbestos in non-occupational settings, but here the information has been imprecise. Abnormally-high disease rates have been linked to people who live near asbestos mines and factories. Among the families of asbestos workers, diseases have been traced to the minute particles brought into homes of the workers' clothing, Nevertheless, attempts to define standards that would be applicable outside of industrial settings have been opposed by an unexpected source. Scientists who have worked in this field appear unwilling or unable to provide definitive answers to the question of what represents a "safe" level of exposure to asbestos over a given period of time. Researchers are currently unprepared to support publicly or privately an accepted standard such as nanograms of asbestos per cubic meter of air nor are they willing to risk their reputations or the health of the public by categorically stating that the presence of asbestos below certain levels is tolerable. In the opinion of many reputable scientists, there is no way to compromise with a carcinogenic substance.[10]

Asbestos fibers, which are neither chemically nor biologically degradable, are virtually indestructable. Once the particles have been released into the environment, the slightest turbulence disturbs those that have already settled. People are constantly exposed to asbestos in the air they breathe, in the water they drink and in the food they eat. Processed asbestos fibers are more hazardous than the natural mineral. The thin strands which are by-products of the manufacturing process are easily inhaled or ingested. Asbestos fills the urban environment as a result of incessant braking of motor vehicles, building construction and demolition projects, and the incineration of certain plastic products. In suburban and rural areas, asbestos exposure is most likely to stem from mines, mills, manufacturing plants and waste disposal sites.[11]

Although asbestos permeates the environment in various settings, outdoors the moving air currents disperse the particles to reduce the levels of concentration. Indoors, the presence of asbestos poses a special hazard. Architects have designed many structures with inoperable windows. At one time, planners even specified windowless schools for blighted urban neighborhoods. Within such enclosed ventilation systems, asbestos particles are continually recycled throughout these buildings.[12]

Most educational officials have not kept adequate records to deal with asbestos in their schools. State and local authorities never examined the building specifications to check for the presence of asbestos. Even when plans were reviewed by state agencies in order to determine eligibility for building aid, officials simply looked at the adeq . y of the space in relation to the educational progra After a few years, those plans that had been filed t the school districts were routinely discarded in some states in order to "save space." As a result of a new wave of concern about asbestos in the schools, state and local ed tional authorities may be compelled to reassemble formation which was once available to them when the schools were originally constructed or remodeled.[13]

Progress in this field has been painfully slow. By the late 1970's, only 27 states and the District of Columbia were known to have conducted any asbestos inspections. Approximately 15 states had looked at more than a few schools. Of these, New Jersey, Massachusetts New York had each inspected more than 1,000 s facilities, while Indiana, Rhode Island, Michiga Vermont had each examined more than 100 buil California and New Mexico had simply reporte "many" inspections. Rhode Island, the only state which had presumably inspected all of its buildings identified asbestos in 19 locations. Seventeen states, primarily in the South, the Middle West and the Far West, had not reported any school asbestos inspections. In other states, the extent of the testing remained uncertain. Individual school districts undertook limited inquiries, but approximately forty per cent of the states in the nation had no asbestos programs at all. Nationally, no agency of the United States Government could provide reliable information as to how many schools had asbestos problems.[14]

Two principal methods exist for determining whether asbestos is present in a school — visual inspection and laboratory testing. The most common method of detecting asbestos in a friable or crumbling condition involves direct observation. Unfortunately, visual inspections can be quite subjective and deceptive. What appears to be asbestos to the naked eye may prove under a microscope to be some other material. On the other hand, asbestos may be concealed in unconventional forms. Laboratory analysis of air samples offers more reliable identification. However, the levels of asbestos may fluctuate dramatically from place to place within the same facility and vary from day to day, depending on how much activity preceded the collection of the sample.[15]

Funding poses another problem. Optical laboratory tests may cost $30 to $50 per air sample. To be accurate, multiple tests may be necessary; different locations within a building may have to be sampled at different times. Electron microscopic analysis may cost ten times as much as optical testing and finding competent laboratories is sometimes difficult. A Connecticut laboratory incorrectly labelled cellulose as asbestos. The error was not detected until the ceiling had been removed, at considerable cost to the local school district.[16]

Policymakers, the educational community and the public are caught in a cruel dilemma. There should be no danger to the life, health or safety of any child or adult in any school. On the other hand, the educational process cannot grind to a halt. Creating a sense of public panic or uncertainty is not the answer. Neither is indifference to the problem. What is needed is an immediate, responsible nationwide plan for school asbestos indentification and control. The commitment to act must involve lawmakers, boards of education and school administrators throughout the United States.

First, those entrusted with responsibility for the schools must become familiar with the fact that asbestos materials appear in various forms under different names ch as chrysotile, amosite, crocidolite, tremolite, anthrophyllite and actinolite. Often, more than one form of asbestos is present and the fibers are frequently combined with other products.

While it would be desirable to deal with all types of asbestos at once, fiscal constraints dictate a strategy that focuses on those forms and conditions which knowledgeable scientists agree are hazardous to human health. Accordingly, many authorities have suggested that school officials concentrate on asbestos which has been sprayed on structures or applied in the form of plaster or textured paints. In addition, the physical condition of the asbestos should be considered. As a general guideline, an imminent hazard is likely to exist where the asbestos material is flaking, dusting, or shows similar evidence of damage, deterioration or disturbance because of abuse, abrasion, water leakage or forced air circulation which results in dispersing asbestos fibers and particles in the school.[17]

School-by-school surveys can be mandated by state statute or by the rules and regulations promulgated by the chief state school officer or the state board of education. With scientific and technical information provided by the state, preferably the superintendent of public instruction or commissioner of education after consultation with the department of health or the environmental protection agency, the school districts can proceed with the inspections. In most instances, the custodian who works in the school building daily is in a position to know where asbestos may be present. Regional training programs may be desirable to enhance the skills of those who conduct the preliminary surveys. Materials suspected of containing asbestos can be sent to approved

higher priority

"Inside air" — whose responsiblity ??

public or private laboratories for analysis.[18]

Once the asbestos has been identified and corrective action is required, there are three methods of dealing with the problem: 1) encapsulation, involving the use of a sealant which covers the original asbestos material and prevents further flaking; 2) structural containment, in which a permanent partition is installed between the asbestos area and the public and 3) removal of the asbestos.[19]

Each control method poses certain problems. A chemical sealant may be the easiest to apply and the least expensive technique, but it may not hold up for a long period of time. The very act of applying a chemical covering may damage some of the asbestos. Furthermore, in these days of mercurial changes in scientific data, there is no guarantee that a particular sealant itself may not subsequently stand accused as a hazard to health.

Structural containment is predicated upon the assumption that the area will not have to be accessible at a later date. Many school buildings have been designed to utilize the space between a ceiling and the floor above for electrical, plumbing, heating and ventilation installations. If a permanent partition is installed rather than a suspended ceiling made up of removable tiles, workmen may not be able to check faulty wiring, water leakage or a breakdown in the air circulation system. Also, although the asbestos will no longer be visible to the pupils and staff, asbestos particles may continue to be recycled through ventilation ducts after a new structural separation has been built.

Total removal is obviously the most comprehensive method. Nevertheless, substantial skill is required. The act of extricating the asbestos may pose a hazard for the occupants of the building and the workmen. Consequently, removal may have to take place during vacation periods. In most cases, work areas have to be sealed off from other sections of the building and care exercised to guarantee that asbestos particles do not become lodged in the air circulation system. Removal is also the most expensive program.[20]

Although not as dramatic, asbestos poses the same type of public health menace as the Three Mile Island nuclear reactor accident in Pennsylvania, the radiation near the desert testing sites of Utah and Nevada or seepage of toxic wastes from the Hooker Chemical Company in the Love Canal area of western New York. Public policymakers cannot risk having a whole generation of young adults discover 20 or 30 years from now that they have contracted lung cancer and other malignancies as a result of prolonged exposure to asbestos in the schools.

The United States Environmental Protection Agency is considering a plan for long-term surveillance of children exposed to asbestos in seriously contaminated schools. Unfortunately, the effort is fraught with complications. In an unpublished, in-house report, EPA acknowledges that the effects of asbestos exposure will not be evident for many years to come. "Medical examination of children now, whether to document exposure or to detect clinical disease, would be fruitless," the staff report concludes. "The psychological and monetary costs would be considerable. If a means were available to identify exposed school children so that they could be located years later, positive steps could be taken. As adults these persons could be informed of their childhood exposure and advised of the proper measures they personally could take." In the next breath, however, the agency has acknowledged the superficial, conscience-soothing nature of this recommendation, by admitting that "although no cures are currently known for asbestos-induced diseases, therapeutic research continues; it may be possible by then to apply *palliative* (emphasis added) measures. Without a means of identifying these children now almost nothing can be done to help them in the future." As a temporary expediency, some EPA officials have suggested issuing Social Security numbers to these children so that at a later date someone could open the sealed files and advise these people of their fates.[21]

The federal government, the states and local school districts should obviously pursue immediate programs of prevention and abatement instead of waiting to notify potential cancer victims that they have been needlessly exposed to an incurable disease. In the absence of an adequately-funded federal policy which would require appropriate corrective action throughout the country, the most promising approach seems to fall within the realm of the states. State legislation could establish goals and procedures which would:

1. Develop precise, scientific definitions of asbestos materials.

2. Identify the circumstances under which certain forms of asbestos pose hazards to human health.

3. Require the state commissioner of education — in consultation with state health or environmental officials — to: a) inform school authorities of the asbestos hazards; b) advise school districts of the methods of identifying, sampling and testing materials suspected of containing asbestos and constituting a health hazard; c) direct the school districts to undertake surveys of school buildings throughout the state; d) maintain current records regarding the condition of asbestos in the schools based upon periodic surveys by local school officials or inspections by the state education agency; e) provide scientific and technical assistance to the

school districts; f) require the districts to prepare and submit abatement plans; g) promulgate standards under which the containment or removal of asbestos shall proceed; h) establish regional training programs for contractors and supervisors engaged in eliminating asbestos hazards and i) monitor the implementation of these programs.

4. Establish timetables for abatement programs within state school asbestos legislation and create advisory councils of repr- ntatives from state education agencies; local school districts; medical, public health, architectural and engineering professionals; employers and employees in the construction industry; parents and the general public.[22]

Implementing such a state plan will inevitably be influenced by considerations of cost. New York City school officials estimated that the price of containing or removing all of the asbestos found in nearly 300 schools could easily range between $35 and $50 million. While construction costs are not uniform throughout the nation, an effective program in any state is certain to be expensive. In several New Jersey schools, expenditures for sealing ranged from $1 to $2 per square foot, while removal and replacement of asbestos ceilings varied between $2 and $5 per square foot. Without additional funding from federal or state government, real danger that school districts facing fiscal constraints, taxpayer revolt and declining enrollment may delay the implementation of asbestos identification and abatement.[23]

Asbestos control is not an ordinary building need. Surely in a health e- -rgency, an overriding state or national obligation might be invoked. However, certain guarantees are required. A building treated for asbestos should not be one which is likely to be closed within the foreseeable future because of age or declining enrollment. The state -ust expect, and -ive, adequate assurances that t- are no other fa- -es available to accommodate th- -dents and that t- -uilding utilization rate is above a minimum percentage. The anticipated life of the -cture should also be considered before asbestos funding is provided. School officials must be prepared to justify the continued occupancy of any building for which major asbestos abatement is ordered.

What is the federal role in the detection, containment or removal of asbest-? In 1980, a year after the enactment of the New York State Asbestos Safety Control Act, parallel legislation was approved by Congress and signed into law by President Carter. However, there is no certainty that the United States Asbestos School Hazard Detection and Control Act will provide immediate and adequate relief for school systems that are concerned with asbestos problems. Although the legislation set up a fund for testing and evaluating potential hazards and ostensibly created a loan program to assist in the containment or removal of asbestos, the program is presently unfunded. The future of this program is further complicated by the results of the 1980 presidential election and the apparent unwillingness of the Reagan administration to implement new federal regulations for school asbestos control.[24]

There are public policy lessons to be derived from the school asbestos experience. Initially, lay decision makers feel unqualified to judge public health issues. Eventually, they may recognize that there is uncertainty even within the scientific community, that potential victims have not been warned of imminent life-threatening hazards and that a chasm exists between research and public policy. Practitioners in medicine and public health, producers and distributors of asbestos as well as the construction industry neglected to subject the mineral to ample, long-range testing before using it. Tragic and unforeseen mistakes were made by architects and engineers who specified the incorporation of asbestos in building plans and by the educational authorities who approved and then destroyed the working drawings which would have illuminated its use and the extent of the present predicament. Finally, state and local governments nationwide incorporated the use of asbestos in building codes and issued certificates of occupancy attesting to the safety of the structures.

Nevertheless, the search for villains is pointless. Decisions do not wait for convenient time or circumstances, nor pause for optimum technical nor fiscal resources. Policy makers who are presently confronted with urge- -ises may not have created the original condition- -ich they are called upon to correct. Furtherm- some problems defy government's best available solutions.

The decision making process has been compared to a multiple choice examination. In approaching the school asbestos issue, public officials could adopt a wait and see attitude or appoint a study commission. In this situation, such a choice would be deadly, for it would endanger the lives of a whole generation of students and educators who would be needlessly exposed to a known carcinogenic substance.

A second -ternative would be to raise the level of public con- -sness, to alert the teachers and parents of school- -hildren that asbestos, in various forms, pervades - educational system. In so doing, the alarmists -ld create a climate of fear, making it impossibl- instructional programs to continue until all quest- have been answered. However, a third more r- - option is to undertake an immediate investigation of the scope and nature of the problem and use every available federal, state and local resource to finance corrective actio.

Sensing the complexity of the ... al picture, reviewing the available scientific data, assessing the impact of each option, accepting responsibility and, ultimately, deciding upon the most propitious policy are essential ingredients for dealing intelligently with the school asbestos issue. However, any course of action may establish new conditions for which the ramifications are unknown or unanticipated. Beyond the schools, there are libraries and museums, community centers and civic auditoriums, as well as other public buildings and quasi-public facilities which contain asbestos. The legal and ethical principles inherent in the doctrine of implied warranty will not stop at the schoolhouse door. Future legislation and litigation will expand the boundaries.[25]

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4. *McKinney's Consolidated Laws of New York*, Book 49, *Real Property Law*, §235-b, notes 2, 11. Tenants' reliance upon implied warranties of habitability is discussed in John M. Strikor and Andrew D. Shapiro *New York City Tenant Handbook* (New York, 1978); *McKinney's Consolidated Laws of New York*, Book 30, *Labor Law*, §470, Book 17½, *Environmental Conservation Law*, §19-0107; Book 44, *Public Health Law*, §225.

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9. Environmental Protection Agency, Office of Toxic Substances, "Draft Phase I Report," pp. 1, 9, 22-26; *Environ Defense Fund Newsletter*, November/December 1978.

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15. State of New Jersey, Department of Environmental Protection, "Guidance Document for Eliminating Health Risks from Sprayed-on Asbestos Containing Materials in Buildings," May 1977; Levin, "Asbestos in Schools," p. 31-32; Anthony R. Smith, "Asbestos in School Buildings," Memorandum #1 to Dr. Frank Macchiarola, Chancellor, New York City School System, November 6, 1978, and Memorandum #2, November 15, 1978; Nicholson, "Control," p. 19.

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17. New York State Assembly Education Committee Conference, February 6, 1979, Albany; Nicholson, "Control," pp. 15-17; New Jersey, "Revised Guidance Document," October 20, 1978. United States Environmental Protection Agency, *Asbestos-Containing Materials in School Buildings: A Guidance Document* (Washington, 1979), Part 1, pp. 2-4. For a precise definition in statute law, consult the "New York State School Asbestos Safety Act." Chapter 501 of the Laws of 1979.

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ASBESTOS

The clock is ticking in your schools, and inaction could prove to be devastating

By Kathleen McCormick

ALL TALK AND no action: That's the way the asbestos-in-schools game has been played in the past several years by the federal government and thousands of U.S. school systems. It's time—past time—to respond to the potentially fatal hazards of asbestos in our schools. The ante has been raised in recent months, and from the look of things, school boards that haven't complied yet with federal regulations concerning inspection, notification, and record keeping could be in for a rough time. And even if you *have* made the inspections, posted the required notices, and notified parents and staff of potential health risks in your schools, you still might be the target of a lawsuit should a student or staff member become ill or die because of an asbestos-related disease.

That's not exactly reassuring news, but you can take some steps to meet federal regulations and protect your students and staff. Prudent school leaders would do well to consider carefully some of the recent developments in medical research, federal enforcement, and legal actions. Read on:

The asbestos ante has been raised in recent months, and boards that don't respond could be in for trouble

The medical risks

As far back as the 1930s, manufacturers of asbestos knew the substance was a killer. But the American public first became aware of the hazard when the Environmental Protection Agency (E.P.A.) banned some uses of sprayed-on asbestos in 1973, after research concluded that thousands of shipyard workers who had handled the substance during World War II were dying (or had died) of asbestos-related diseases. Five years later, an award-winning article in this magazine broke the disconcerting news to school leaders that U.S. schoolchildren faced imminent danger from asbestos. In schools built between 1946 and 1973, tens of thousands of tons of asbestos products were used for fireproofing, soundproofing, and insulating ceilings, walls, pipes, and boilers. As friable (loose or flaking) asbestos materials age, they release tiny particles into the air; if enough particles are inhaled, they can cause cancer and a variety of respiratory ailments. And if these materials get wet (say, from a roof that leaks) or are disturbed (perhaps by maintenance workers who fix electrical wiring in the ceiling), countless particles are dispersed, presenting an even greater health hazard.

What are the risks? Cancer, for starters: The most common form of asbestos-related cancer is lung cancer. Next is mesothelioma, a rare and fatal tumor of the membrane linings in the chest or abdominal cavities; its only known cause is asbestos. Exposure to the deadly mineral filaments released by asbestos also has been proved to cause cancers of the colon, rectum, stomach, esophagus, kidney, larynx, and pharynx. An associated disease is asbestosis, a scarring of the lungs that progressively robs the victim of breath and sometimes of life. The effects of asbestos are pervasive even among people who don't work directly with the stuff: Research has shown that among the immediate families of asbestos workers, 1 percent of the family members died from an asbestos-related cancer, and one-third were afflicted with asbestosis.

The number of airborne asbestos particles in your schools, of course, is considerably smaller than what asbestos workers once were exposed to on a daily basis. But that doesn't reduce the overall risk—nor does it absolve you from the responsibility of dealing with the problem. Dr. Edwin C. Holstein, clinical assistant professor at the Environmental Science Laboratories of Mount Sinai School of Medicine in New York, explains: "All scientific evidence suggests there is no safe dose of asbestos. Any exposure, no matter how small, will increase the risk of cancer." Dr. Holstein and his colleagues at Mt. Sinai, the preeminent U.S. institution for medical research on asbestos, have concluded the substance is a public health problem that must be remedied as soon as possible.

"For any one person, the risk is low," says Dr. Holstein. "But for a school system, sheer numbers tell you that you have a problem. It's like the half-full/half-empty glass of water," he notes. "The optimists say the health risks of asbestos are tiny; the pessimists—including public health authorities—know some people are going to die from exposure to asbestos."

Kathleen McCormick is assistant editor of the JOURNAL.

OPINIONS EXPRESSED BY THE JOURNAL OR ANY OF ITS AUTHORS DO NOT NECESSARILY REFLECT POSITIONS OF THE NATIONAL SCHOOL BOARDS ASSOCIATION

And they'd like to see schools help prevent those deaths—no matter how few—by removing the risk.

It could be many years before we're able to draw conclusions on the effects of asbestos exposure in schools. The risks vary, of course, depending on individual people, the condition and location of asbestos materials in school buildings, and the amount and duration of exposure. The appalling truth, according to Dr. Holstein: "It's false reassurance if no one is sick [now], because they might be sick by 1990 and dead by 1992." But despite the tendency for people to personalize this kind of highly emotional, life-and-death issue, he says, school board members and administrators should assure concerned parents that "there's no need to get hysterical; it's a problem that can be remedied."

The remedy

At the very least, you already should have complied with all federal regulations pertaining to asbestos in schools. Three sets of regulations have been issued. First, Department of Education (ED) regulations specify *how* states must distribute information on asbestos to schools, according to the Asbestos School Hazard Detection and Control Act of 1980. Second, Occupational Safety and Health Administration regulations detail procedures for the protection and decontamination of asbestos abatement workers and for measuring airborne asbestos. Schools engaged in containing and removing the friable fibers must comply with these procedures. Third—and more to the point—are the E.P.A. regulations: As of June 1983, you're responsible for having met the requirements of Section 6(a) of the Toxic Substances Control Act (T.S.C.A.), which were specified in "Friable Asbestos-Containing Materials in Schools; Identification and Notification Rule" (47 *Federal Register* 23360, May 27, 1982).

E.P.A. issued this rule because its Technical Assistance Program (TAP), launched in 1978, had limited success in getting schools to comply voluntarily with previous E.P.A. inspection and record-keeping guidelines. The T.S.C.A. rule applies to all elementary and secondary schools, except those built after December 31, 1978, and those that can document they already have checked buildings and either found no friable asbestos or satisfactorily dealt with the material. Schools were given one year to comply with the requirements.

(1) *Inspection.* You must inspect each building for friable materials.

(2) *Sampling.* If you find friable materials, you must take samples, following E.P.A. instructions.

(3) *Analysis.* A qualified laboratory must perform an analysis using polarized light microscopy, a sophisticated (and expensive) technique for measuring the amount of asbestos fibers in asbestos-containing materials.

(4) *Warnings and notifications.* You must post warning signs wherever you find friable asbestos-containing materials in schools—and send written notification to the staff and the P.T.O. of each school involved, specifying where the hazardous materials are located.

Note that the T.S.C.A. rule does *not* require you to remove, cover, or encapsulate the asbestos; it's up to individual school systems to decide how to dispense with the offending material. The rule also doesn't require you to report your findings to E.P.A., although you *do* need to keep complete and detailed records documenting your compliance with the T.S.C.A. rule.

Once you've found asbestos in your schools, you have a choice of four acceptable ways to resolve the problem: (1) removing the material altogether; (2) enclosing the areas containing asbestos to prevent fibers from escaping; (3) encapsulating completely the area that contains or is coated with asbestos; and (4) observing and maintaining the affected surfaces to avoid any damage that could cause the release of more fibers. Experts say removal is the only surefire way to rid your schools finally and completely of asbestos hazards. But the removal process itself is an extremely dangerous undertaking; a faulty or incomplete removal job could present even greater health hazards to your students and staff, as well as to asbestos abatement workers. So before you contract for any asbestos containment or removal work, refer to the technical advice presented in the E.P.A. document, "Guidance for Controlling Friable Asbestos-Containing Materials in Buildings," published in March 1983. And even though other measures might work in some schools, many school systems have found that public pressure is brought to bear on the school board to remove asbestos completely—regardless of expense.

The cost

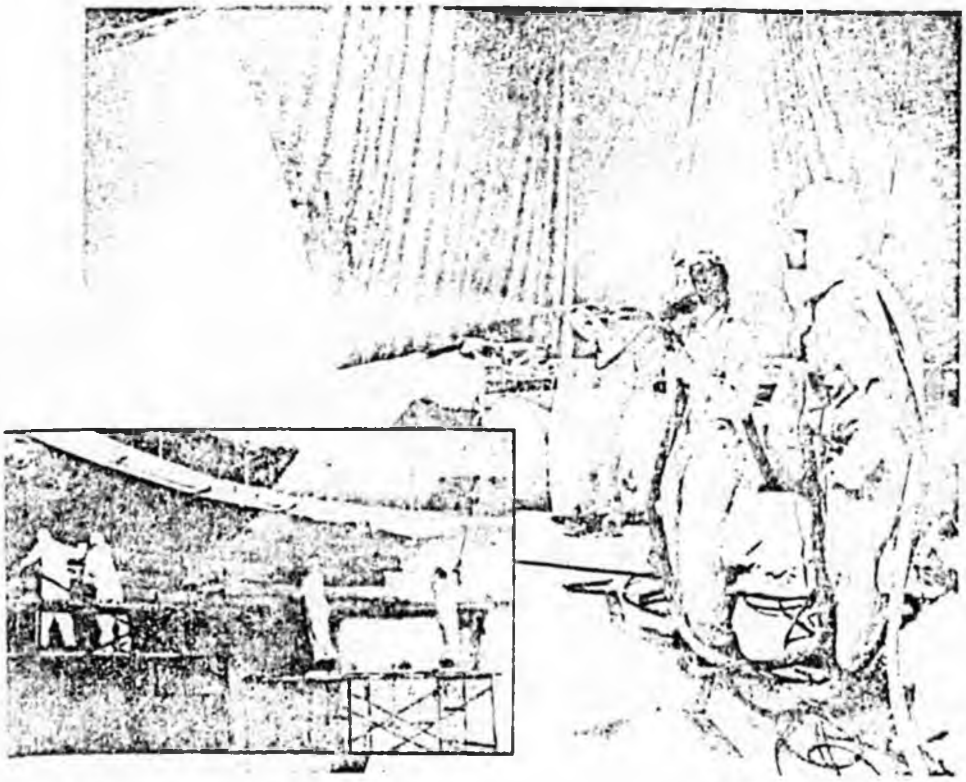
E.P.A. estimates that as many as 14,000 U.S. schools might contain dangerous friable material composed of more than 1 percent asbestos—which means more than 3 million students and 250,000 staff members are at risk right now. The agency estimates the total cost of asbestos abatement at $1.4 billion nationwide, or $100,000 per school building. Some school systems already have spent millions. According to Dwight Brown, formerly asbestos coordinator for E.P.A. Region IV in Atlanta, schools can expect to pay between $3 and $10 per square foot for asbestos removal—and the price can go as high as $28 per square foot. What drives the cost so high is the need for sophisticated analysis equipment and clothing to protect workers, Brown explains. Analysis of asbestos samples using an electron microscope goes for between $200 and $500 per sample—and you might need scores of samples to determine the hazard level in only one school.

Without a doubt, asbestos is a financial burden for school systems. At President Reagan's behest, Congress repeatedly has refused to provide funds to accompany the federal regulations it requires schools to obey. Part of the Asbestos School Hazard Detection and Control Act of 1980, for example, called for $700 million in grants and interest-free loans to help state and local education agencies identify and correct asbestos hazards in schools; no appropriations were made. Don't count on E.P.A. for changes in the funding situation, either: Officials there say they have no plans to request or provide money for school systems to deal with asbestos problems.

School systems in several states are fortunate to be reimbursed for expenses they incur in removing asbestos. In the past four years, for example, New York has given more than $12 million in grants and state building aid to help local asbestos removal programs. And in the same period, Florida has appropriated $10.5 million for asbestos removal. These are notable exceptions, however. Most school leaders have to dig into general operating budgets to come up with the funds. Such cost considerations, along with federal regulations that are at once technical and vague, have caused many school leaders to avoid the issue of asbestos altogether. But ducking the issue can only bring harm to your schools.

The consequences

Forewarned is forearmed: E.P.A. is stepping up its monitoring of schools' compliance. Although the agency has no conclusive statistics, E.P.A. officials say the rate of noncompliance by schools is high. Proferred proof: An E.P.A. staff



Space-age procedures are needed to eliminate asbestos from schools. Here, abatement workers wet down and remove the substance from a school gymnasium.

memorandum in August 1983 indicated that 80 percent of a sample of 167 schools were in violation of the E.P.A. inspection rule. And, according to E.P.A.'s compliance monitoring office, inspections conducted in 275 school systems since June 1983 show that 190—nearly 70 percent—had not complied with E.P.A. regulations on obtaining asbestos samples, notifying parents, keeping records, and so forth. The 275 school systems inspected include approximately 80 of the 100 largest school systems in the U.S.

Now something is being done about that kind of slackness: In fact, E.P.A. inspectors could come knocking on your door any day, asking to see your records. You could be cited for violations of T.S.C.A. on these grounds: failure to inspect schools; failure to sample friable materials; failure to analyze asbestos samples; failure to notify parents and staff; and failure to keep records.

Depending on the number and type of violations, your schools could be fined as much as *$25,000 per day per violation*—an amount that quickly could snowball into an outrageous sum. Here's how the fine system works: If E.P.A. finds you haven't complied with T.S.C.A., your central office will be given 30 days to certify compliance in writing. If certification isn't received within 30 days, E.P.A. files a civil complaint against your schools. Agency officials then will ask to see a compliance schedule as a demonstration of your good intentions. If these negotiations fail—if you don't cooperate—E.P.A. will attempt to collect the fines it has levied against your schools.

If you think the E.P.A. is making idle threats, think again: Under the direction of old/new Director William Ruckleshaus, E.P.A. has become more vigilant and is going after asbestos in schools as one of its Top Ten priority items. E.P.A.'s design in these aggressive actions is to force schools into compliance through pressure from the community, according to Connie DeRocco, a specialist in E.P.A.'s asbestos enforcement program. It stands to reason that school board members and administrators would tend to choose compliance over the chance that a concerned parent might blow the whistle on the schools' negligence.

Other signs that E.P.A. means business: The agency is doubling its monitoring staff for fiscal year 1985. And then there's the Philadelphia case: E.P.A. has threatened to set a precedent by filing a civil complaint for noncompliance against the Philadelphia schools, to the tune of $378,000 in fines ($6,000 for each of 63 nursery and day care centers housed in buildings leased by the school system that weren't inspected for asbestos). School officials are trying to head off the complaint by inspecting the buildings; E.P.A. officials say they are willing to negotiate as long as the Philadelphia schools can show they mean to comply fully with E.P.A. regulations.

But public pressure also is mounting on E.P.A. itself to issue more stringent and specific regulations on asbestos in schools. In response to a petition filed last November by the Service Employees International Union—prompted by the asbestos-related death of a school custodian—E.P.A.'s Ruckleshaus announced in late February that the agency will set formal standards for schools to remove or seal crumbling asbestos materials.

The legal ramifications

Before you make any decisions about asbestos in your schools, consult your school attorney. Advice from Dwight Brown, who has conducted seminars on asbestos in schools for the past five years: Devise a three-part legal action plan with your attorney concerning cost recovery, tort claim defense, and the process of administering contracts for removing and disposing of asbestos.

One legal question on everyone's mind: Can you recover costs of removing asbestos from the manufacturers of the material? "The Attorney General's Asbestos Liability Report to the Congress," published in September 1981, says schools should have a good chance of recovery in court. The bankruptcy last year of a major asbestos producer, Johns Manville Co., cast a pallor over what some school attorneys had held were excellent chances to recover costs. But in February, Lexington County School District No. 5 in South Carolina brought suit against U.S. Gypsum Co. to recover approximately $300,000—the cost of removing asbestos from Irmo High School. (The potentially precedent-setting case was about to come to trial as the JOURNAL went to press.) The school system is being represented by Daniel A. Speights of Hampton, S.C. Speights anticipates having filed as many as 30 asbestos-related lawsuits against U.S. Gypsum Co., National Gypsum Co., and W.R. Grace & Co. by July on behalf of school systems in Florida, Alabama, Mississippi, New Hampshire, and other states. He says these cases stand a "good chance" of winning. The Lexington suit, then, could open the floodgates for thousands of lawsuits against asbestos manufacturers.

Other legal issues you should be aware

Asbestos-control funds sought from legislatures

The Environmental Protection Agency is threatening to require schools to eliminate asbestos or face closure.

In autumn 1982, the U.S. House of Representatives voted to appropriate $50 million to provide school districts with interest-free loans to help defray the cost of removing or controlling asbestos in school buildings. But the measure, authorized under the Asbestos School Hazard Detection and Control Act that was passed in 1980 but never funded, failed to win the support of the Senate. When a conference committee also decided against asbestos-control funds, the chances that Washington would provide money for removal became remote.

The defeat of the funding measure is likely to mean that state legislatures will feel increased pressure from school officials to come up with asbestos-control funds. Some states — New York and Alabama, for example — already have provided such funds. Alabama uses a $75-million fund drawn from oil and gas revenues. In Mississippi, state education officials planned to go to the Legislature to ask for funds to offset the estimated $20 million it will cost to remove asbestos from schools. schools.

The continued absence of federal funding comes at a time when public pressure to deal with asbestos in the schools is increasing in many areas, in part because the Environmental Protection Agency may now issue a press release announcing which schools have not met the requirements of its regulation. Under the EPA regulation, all public and private schools were required to inspect for friable (crumbling) asbestos by June 28, 1983. If they found asbestos but took no action, the schools were required to notify parents and staff members. Although there is no federal requirement that asbestos be removed from the schools, the belief was that knowledge of its presence would generate enough public pressure to force action.

What this strategy of the EPA did not take into account, however, is that many school districts lack the money to pay for the often costly abatement procedures, and would instead simply fail to notify anyone of the presence of crumbling asbestos. As of last fall, an EPA survey outlined in an internal memorandum found that about 66 percent of all schools had not complied with some component of the regulation. The most common violation, the survey found, was failure to notify.

Although more school districts are belatedly complying with the regulation, according to EPA officials, the problem of funding remains serious for some. A report prepared for the Senate Appropriations Committee by the U.S. Department of Education estimated the cost of removing asbestos from schools nationwide at $1.4 billion. Under the loan program authorized in the 1980 legislation, the federal share of this would be $700 million. Acknowledging that there are no firm data to support this estimate, the report places the number of schools with an asbestos problem at 14,000. The estimated cost of removal is $100,000 per school, according to the draft report. That figure is dramatically higher in some areas: Jackson, Miss., faces a $6-million bill, and in Philadelphia school officials estimated the cost at $17 million. Others, of course, will require much less money because their asbestos situation is less dire.

A growing concern that they will be held liable for any asbestos-related illness — cancer, for example — contracted by students or staff is also prompting some school officials to step up the removal process and accelerate their quest for outside funding. Lawyers who handle asbestos litigation argue that, although no school suit of this type has been filed, school officials who do not remove a substance known to be hazardous will indeed be legally liable.

Some school districts — about 35 as of last fall — have filed suits of their own against asbestos manufacturers. Should one of these cases be decided in favor of a school district, more suits may follow, and favorable rulings would allow districts to recoup the cost of removal. Until then — barring the possibility of federal funding — districts have few places to turn and state legislators may find themselves the recipients of pleas from school officials.

— Susan Walton

States help employees buy out failing firms

Since the mid-1970s, more than 6,000 businesses across the nation have become, wholly or in part, owned by their employees. In most cases, employees have simply purchased stock through Employee Stock Ownership Plans (ESOPs), and there has been little state involvement.

When the number of plant shutdowns and relocations rose during the recent recession, however, legislators in several states sought ways to encourage "buyouts" of ailing firms by employees to save their jobs.

At least 12 states — California, Delaware, Illinois, Maryland, Massachusetts, Michigan, Minnesota, New Jersey, New York, Ohio, Oregon, and West Virginia — have laws concerning worker ownership. Although some of these laws simply direct that state agencies study the issue, others, such as in California, Illinois, Michigan, and New York, have broader provisions that provide venture capital, technical assistance, and other help to workers attempting a buyout.

Maryland and Wisconsin also have strong legislation pending, while an attempt to add to New Jersey's law was vetoed last year by Governor Thomas H. Kean.

Essentially, there are two types of employee buyouts. The first is the most widely publicized — but least frequent — when, in a last-ditch attempt, employees try to save their jobs by buying a failing or unprofitable plant in danger of being closed. Weirton Steel in West Virginia is a recent example. This kind of buyout, however, constitutes "only about 1 percent of the total," according to Corey Rosen, director of the Center for Employee Ownership in Washington, D.C.

Far more common are ESOPs. In a typical plan, workers are simply offered company stock at market value rates.

Workers of firms that offer ESOPs typically own from 15 to 30 percent of the stock, although often the stock offered is nonvoting. ESOPs are encouraged by various federal tax incentives, and little state legislation has been enacted.

Instead, some state lawmakers have designed their efforts specifically to help employees purchase failing firms, particularly in already hard-hit urban areas. For example, in Illinois, Democratic state Representative Wyvetter H. Younge, hoping to "subsidize employment rather than unemployment," sponsored a bill that passed and was sign-

TARGET VOL. 13/APRIL-MAY '84/NO. 5

Authority: "To secure adequate laws for the care and protection of children and youth." National PTA Bylaws, Article II:c

Asbestos: Still a danger in schools

by Elaine S. Knapp

For Phyllis Adams and Ann Gibbs the last year has been a frustrating one—trying to get their local school board to remove asbestos from the school their children attend.

"It's frustrating, our children are being poisoned and there's not anything we can do," Mrs. Gibbs declared. What the Lexington, Kentucky, housewife has done is work through the PTA, form a group of concerned parents, go door-to-door telling parents of the danger, gather hundreds of signatures on petitions, read volumes on asbestos, call and write federal agencies and confront the school administrator and board.

After a year of parental pressure being applied and at least a decade after school authorities knew of the asbestos hazard, Mrs. Gibbs said, "We don't think anything will be done until the government makes them (the school board)." School authorities maintain the asbestos will be cleaned up if money is available for renovation next year.

Ironically, the major government effort to control asbestos lies in Mrs. Gibbs and others like her. Telling parents and teachers that their school has asbestos and relying on them to pressure local action is the heart of the U.S. Environmental Protection Agency's (EPA) strategy to rectify the nationwide problem of asbestos in schools.

No effective federal program exists to protect schoolchildren from asbestos, state efforts vary widely and local schools often ignore the danger due to the cost of cleanup.

Asbestos dangers

Any exposure to asbestos involves some health risk, according to the Congress, the EPA and the scientific community. Children are especially vulnerable, according to the EPA guidance document on asbestos sent to schools. Their remaining life expectancy provides the 20 to 40 years it takes for disabling and fatal asbestos-related diseases to develop. Large numbers of children may be exposed in a contaminated school and exposure is continuous during the school year. Children are active and breathe more frequently than adults, possibly inhaling more asbestos fibers. Smoking can increase the cancer risk due to asbestos exposure.

Most hazardous is friable asbestos that can be crumbled. It sends deadly fibers into the air which may lodge in the lungs indefinitely, according to EPA's guidance document. Asbestos workers often develop a chronic and debilitating lung disease called asbestosis. Lower and shorter exposure can result in death many years later.

Asbestos diseases include: 1) asbestosis, a disease in which asbestos clogs the lungs, 2) pleural calcification, a deposit of calcium salts in the lung lining, 3) malignant tumors of the lung, 4) mesothelioma, a rapid and fatal cancer of the lung and 5) intestinal and uterine cancers.

This is a reprint of a portion of an article appearing in State Government News, *March 1984. It is authored by and printed with permission of Elaine S. Knapp, its editor.*

Hot potato

Asbestos in the schools has been a "hot potato" tossed among various levels of government and federal agencies. One reason is that removal of asbestos can be quite expensive, especially if large areas of buildings are affected. Funding is basically up to local schools as is asbestos detection and control. No federal funds are available and state aid varies.

The U.S. EPA requires schools to inspect for asbestos and notify parents and [school] employees of asbestos hazards. The EPA doesn't require removal or abatement. "The theory is that PTAs and employees would pressure local districts to take remedial action," said Terrell Hunt, assistant to EPA Deputy Administrator Alvin Alm.

However, a recent internal EPA report found that many schools did not meet EPA's June 1983 deadline for asbestos detection, record keeping and notification.

No federal funds

Federal funds of $172 million authorized by the Asbestos School Hazard Detection and Control Act of 1980 were never appropriated. Grants were promised for schools to identify asbestos hazards and loans for mitigation of asbestos hazards. But funds were never requested by the Department of Education, reported John Bennett, aide to U.S. Representative George Miller, D-Calif., who sponsored the act. In 1983, a $50 million recommendation by the House was omitted in a House-Senate conference.

The U.S. Department of Education had a task force which set standards for state grants in 1980, according to W. Stanley Kruger, deputy director for state and local programs. However, when the program wasn't funded, the department "deferred to EPA," Kruger said.

Under pressure from Congress, the department reactivated its task force in October 1983 and is gathering information on asbestos to send to chief state school officials, Kruger said. The department also reactivated its requirement that states file plans for asbestos in the schools' programs and report on their progress every six months. All but two states have filed.

EPA's program

The federal effort has largely been a requirement by the EPA that schools inspect for asbestos hazards, sample and analyze material to determine if asbestos is present, keep records of the inspection, post notices, and notify parents and employees if asbestos is found. Although schools were to comply with the rule by June 1983, the EPA doesn't know how many did. It does not require schools to report to it and must send federal inspectors to schools to check their records. EPA staff said when the EPA regulation was written that the administration opposed imposing a data reporting requirement. The EPA recently doubled its field force of inspectors by adding 16 people through a contract with the American Association of Retired Persons, Hunt said. These include retired architects and engineers. Primarily, EPA staff look at school records and physically inspect some schools. However, there are not enough inspectors to cover but a small portion of the nation's schools.

In providing technical advice, EPA can help schools determine the best strategy for evaluating the risk and responding to asbestos, Hunt said. He said that anything short of removal is considered a short-term solution.

Connie Derocco, environmental protection specialist with EPA, said that out of 1,527 schools inspected in 468 districts, some 60 percent did not comply with EPA rules. Most failed to notify and warn PTAs and employees of asbestos materials [manufacturers]. Schools know they will be pressured once the word is out, and they are hesitant to deal with the asbestos problem, Derocco explained. After receiving a notice of noncompliance, schools have 30 days to act before the EPA files a civil complaint.

Labor union concern

An estimated 3.24 million schoolchildren and 648,000 school employees are potentially exposed to asbestos, according to Kitty Conlan, research analyst with the Service Employees International Union (SEIU).

The SEIU is lobbying Congress to fund the 1980 act for grants and loans to schools. Schools don't have the money to clean up on their own, Conlan said. "It's a nationwide problem which affects the health of millions of people."

SEIU is suing the EPA to require schools to clean up flaking asbestos. "Schools say if EPA thinks asbestos is so bad, then EPA would require them to get rid of it," Conlan commented.

EPA does give schools good technical advice on how to get rid of asbestos, Conlan noted. But some schools accept the lowest bid rather than follow EPA guidelines. If the cleanup is not done right, the asbestos danger can be worsened.

Conlan said SEIU doesn't think suing asbestos' manufacturers is worthwhile, citing lack of action on suits filed by asbestos workers. "We're hesitant to have our members litigate themselves to death," she said.

Conlan added that school districts can also be held responsible for asbestos. "They can face a big liability," she commented.

Lawsuits filed

A number of lawsuits on behalf of school boards and building owners in Kentucky, Mississippi, New Hampshire, Florida, South Carolina, Alabama and Tennessee have been filed by a South Carolina law firm.

Daniel Speights (a school board attorney) noted that legal theories available to school boards against manufacturers of asbestos include: contract (the products were not fit for the use intended), negligence (the manufacturers were negligent in informing users of the risks associated with the products), strict liability (manufacturers should be strictly liable for failing to warn of asbestos hazards), and restitution (manufacturers have a duty to abate the hazard).

A civil action filed on behalf of the Barnwell, South Carolina, school district notes that school districts and public officials could be held liable for failing to abate a health hazard.

A September 1981 report by the U.S. attorney general to Congress recommended that school authorities seek to recover asbestos abatement expenses from asbestos manufacturers. The report said federal litigation would be ineffective unless Congress imposed liability on asbestos manufacturers.

Asbestos manufacturers are being sued by at least 20,000 people on the grounds that the companies knew of asbestos hazards and covered them up, according to a September article in the *National Journal.*

A 1983 report from the Rand Institute says that asbestos litigation and compensation has cost an estimated $1 billion over the past decade. Only 37 cents of every dollar went for actual compensation to plaintiffs. Estimates of the number of deaths due to asbestos over the next 30 years range from 74,000 to 265,000.

What you should do about asbestos in your school

Given current asbestos rules and regulations, PTAs should check on the following:

1. Was each school in your district inspected for friable asbestos? If not, request this action immediately.
2. Was an analysis of asbestos samples, using polarized light microscopy, conducted?
3. Are records of the asbestos inspection on file in the school district?
4. Does the PTA have a copy of the report in its records?

In schools where asbestos was found, has the school complied with the following:

1. Did the school district notify the children's parents, either directly or through the PTA?
2. Were school employees notified of the location of the materials?
3. Did the school post a standard form in administrative and custodial areas?
4. Are measures being taken, if not already completed, to remove asbestos in the school?
5. Did the school district provide maintenance and custodial employees with instructions for reducing exposure to asbestos?

If asbestos was found in your school, but corrective measures are not being taken, the following steps should be pursued:

1. The PTA should work with the school to affect removal or abatement. Invite parents, teachers, employees of the building, the school principal, and the superintendent to a PTA meeting. Request information about the degree of the asbestos problem and what plans are being developed for cleanup.

2. If plans are not under way or seem unsatisfactory, contact the school board to inform it of your concern. If informal discussions do not produce results, get the issue on the agenda of the next school board meeting. Be prepared to provide the facts, including the inspection reports and the cost of abatement, to school board members.

3. Meanwhile, inform your state legislature and the U.S. Congress about the problems and the degree of difficulty there is in terms of cleanup.

4. If the school board is unable or unwilling to ameliorate the problem, one resort would be a lawsuit. Be sure that you have tried every alternative before taking this step.

Ombudsman

John B. Chenoweth

State of Alaska

Reply to:

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January 17, 1985

Representative Max Gruenberg, Jr.
Alaska House of Representatives
Pouch V
Juneau, Alaska 99811-3100

RE: House Bill 5

Dear Representative Gruenberg:

The legislation which you have offered is directed at asbestos abatement in school buildings within the state.

Presently, I am investigating a complaint regarding asbestos levels in a correctional institution. Though I am prohibited by statute from discussing details of that investigation until it has been completed and I have received the agency's response, based on my work may I respectfully suggest that you consider extending the asbestos abatement program proposed in the legislation to include other institutions for which the state has a direct operating responsibility. I am asking that you consider extending the program to include, by name, Pioneers' Homes, correctional facilities, and institutions for juveniles and the mentally handicapped and developmentally disabled. I cannot give you an estimate of the incremental cost for the inclusion of these facilities, though the institutions' superintendents or OSHA inspectors (Division of Labor Standards and Safety) may be able to advise you with respect to exposure, need for abatement, and cost.

Sincerely,

John B. Chenoweth
Ombudsman

JBC:jdt

RESOLUTION: 84-10

ASBESTOS ABATEMENT IN ALASKA SCHOOLS

The Alaska Public Health Association,

Believing that friable asbestos, similar to that which was discovered in schools in the Anchorage School District, exists in numerous other schools in school districts throughout the State; and

Knowing that an Asbestos Technical Panel, convened in Anchorage by the Anchorage School Board, reviewed thoroughly health hazards associated with asbestos in Anchorage schools; and, as a result, recommended that friable asbestos be removed from Anchorage schools as an unacceptable health hazard[1]; and

Believing that many Alaskan school children in school districts other than Anchorage may be exposed to health hazards from asbestos that are preventable; therefore

Urges passage of Senate Bills 373 and 374; and

Urges the Governor to form a special task force with representatives of Department of Health and Social Services, Department of Labor, Department of Education, Department of Transportation & Public Facilities, Department of Environmental Conservation, parents of school children, and teachers to implement an asbestos abatement program in all Alaskan schools in accordance with recognized standards for asbestos abatement[2]; and

Urges implementation of an asbestos abatement program which will include the following tasks:

1. Implement and insure completion of a comprehensive survey to identify and categorize asbestos in all Alaskan schools.
2. Evaluate health hazards associated with any asbestos (friable asbestos and asbestos in other forms) discovered in the survey and make recommendations for appropriate medical surveillance of students, teachers and workers exposed to asbestos.
3. Insure notification of teachers, parents, and students of the presence of friable asbestos identified in Alaskan schools in accordance with guidelines established by the EPA.
4. Recommend a plan for removal of friable asbestos, where necessary, and develop appropriate bid specifications and guidelines so that school districts can be assured that asbestos will be removed according to established standards which protect workers, students, parents and teachers during the removal process as well as insure that asbestos is removed totally and is adequately disposed of in approved sites.
5. Increase awareness of the health hazards associated with asbestos and protect against future problems by making sure that asbestos containing materials are not used in new construction.

---

1. Asbestos Technical Advisory Panel Recommendations, ASD Memorandum #534(82-83), Anchorage School District, Anchorage, Alaska, May 23, 1983.
2. Asbestos-Containing Materials in School Buildings: A Guidance Document, Part 1 and 2. U.S. EPA, Office of Toxic Substances, Washington, D.C., March 1979.

ALASKA FEDERATION OF NATIVES, INC.
1984 ANNUAL CONVENTION

RESOLUTION NO. 84-32

TITLE: ASBESTOS ABATEMENT IN ALASKA SCHOOLS

WHEREAS, Believing that friable asbestos, similar to that which was discovered in schools in the Anchorage School District, exists in numerous other schools in school districts throughout the State; and

WHEREAS, Knowing that an Asbestos Technical Panel, convened in Anchorage by the Anchorage School Board, reviewed thoroughly health hazards associated with asbestos in Anchorage schools; and as a result, recommended that friable asbestos be removed from Anchorage schools as an unacceptable health hazard; and

WHEREAS, Believing that many Alaskan school children in school districts other than Anchorage may be exposed to health hazards from asbestos that are preventable,

NOW THEREFORE BE IT RESOLVED that the Alaska Federation of Natives urges the Governor to form a special task force with representatives of the Department of Health and Social Services, Department of Labor, Department of Education, Department of Transportation and Public Facilities, Department of Environmental Conservation, appropriate federal agencies, parents of school children, and teachers to implement an asbestos abatement program in all Alaska schools, including those under Bureau of Indian Affairs jurisdiction, in accordance with recognized standard for asbestos abatement and

BE IT FURTHER RESOLVED that the Alaska Federation of Natives urges implementation of an asbestos abatement program which will include the following tasks:

1. Implement and insure completion of a comprehensive survey to identify and categorize asbestos in all Alaska schools.

2. Evaluate health hazards associated with any asbestos (friable asbestos and asbestos in other forms) discovered in the survey and make recommendations for appropriate medical surveillance of students, teachers and workers exposed to asbestos.

NEA-ALASKA

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January 22, 1985

TO: Co-Chairman, Representative Niilo Koponen and Max Gruenberg
Members, House HESS Committee

RE: HB 57 "An Act making special appropriations for an asbestos health hazard abatement program; and providing for an effective date.

NEA-Alaska strongly supports and encourages expeditious attention to this extremely serious matter.

We further encourage that the suppliers and producers be held accountable for their products and services.

With this memorandum, supplemental information is being provided for the Committee.

Respectfully submitted:

Robert Manners
Executive Secretary

L85:03

Alaska Health Project

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Excerpted from Asbestos: Its Hazards and How to Fight Them by Molly Coye, Oil,Chemical and Atomic Workers International Union, 1978.

What is Asbestos? Who is Exposed to Asbestos?

Millions of American workers are handling asbestos on their job site, and medical experts estimate that because of this, 400,000 workers will die of cancer during the next half century.

Many workers who handle asbestos do not even know they are exposed because the asbestos is not labeled. Asbestos is a mineral, widely used for its heat and acid resistant properties. When separated from rock, it is fluffy and fibrous, and can be inhaled by workers--and by family members exposed to their clothing. Although asbestos is often bonded or woven for industrial uses, the mats and sheets wear down over time, releasing fibers into the air. Welders, for example, use asbestos "protective" blankets, which protect them from flying sparks, but at the same time surround them with flying asbestos fibers as the blanket is cracked and worn with use. Office workers are exposed because ventilation systems lined with asbestos release fibers into the air system. Pipe fitters are exposed because most piping is protected with asbestos. The list of exposed workers is very long, but the largest number of exposed workers include:

- Air filtration systems workers
- Asbestos cement pipe makers
- Asbestos cement sheet makers
- Asbestos cement shingle makers
- Asbestos shingle and board makers
- Asbestos textile makers
- Automobile mechanics
- Barge builders
- Building construction workers
- Burial vault builders
- Cement insulation makers
- Cement insulation workers
- Cement makers
- Cement pipemakers
- Cement workers
- Chemical workers
- Concrete runway builders
- Dam builders
- Drain tile makers
- Fireproofers
- Heat insulation makers
- Oil refinery workers
- Oil well builders
- Paint makers
- Pier builders
- Pipe and furnace fitters
- Post makers
- Pump packers
- Reservoir builders
- Road construction workers
- Sidewalk builders
- Silo builders
- Smokestack builders
- Sound insulation makers
- Stadium builders
- Storage tank builders
- Swimming pool builders
- Tunnel builders
- Vinyl asbestos tile makers
- Water pipe makers
- Welders

Three-quarters of the asbestos used in the United States each year is used in the construction industry, but as this list shows, many workers who are exposed would not consider themselves part of the construction industry. For example, it has been estimated that 40,000 field insulation workers in the United States are exposed, but that the activities of these workers cause secondary exposures to 3 - 5 million other workers. You may be exposed to asbestos on almost any job, and you should never assume there is not asbestos exposure on your job.

How Do I Know if I am Exposed to Asbestos?

You may be able to recognize asbestos-made or asbestos-containing materials in your workplace, or recognize your job on the list in the last question. But you should never assume that you are not exposed to asbestos. To find out what you are working with - whether it is asbestos or some other toxic substance - your local union can use a letter of information like the one included in the back of this packet. This letter asks for important information about exposures in the workplace and about worker health and safety records, under the responsibility of union representatives in collective bargaining. These rights are implicit in the collective bargaining agreement. Further information on how to proceed should be obtained through your International Union.

Are Some Kinds of Asbestos Safe?

No. Every kind of asbestos causes cancer, and every kind of asbestos causes asbestosis.

Asbestos itself is a mineral, divided into five major types:

1-chrysotile (white asbestos) - more than 95% of the asbestos used in the world is chrysotile. It is mined in the U.S. and Canada as well as processed and used industrially.

2-crocidolite (blue asbestos) - approximately 3% of the asbestos used in the world is crocidolite. It is used for ship-building because of its resistance to acids and sea water, and is also mixed with chrysotile to accelerate the production of asbestos pressure pipes and sheeting.

3-amosite - bonds well with plastics and is used for floor tiles, fireproof boards in ships and for spraying insulation.

4-anthrophyllite and 5-tremolite - are talc-like forms, used as industrial talcs and in paper-making.

Most asbestos used is a mix of two or more of these types, usually of chrysotile with either crocidolite or amosite. Ninety-two percent of the asbestos used in the construction industry is bonded - "locked in" to such products as floor tiles, asbestos cements, roofing felts and shingles. The other 8% is friable or in powder form, in insulation materials, asbestos cement powders, and accoustical products. Because fibers are easily released from even the bonded forms, a minor remodeling job may release large amounts of fibers into a home or office.

All of these kinds of asbestos cause asbestosis, and all of them cause cancer. There is no safe kind of asbestos.

Why Does Asbestos Make You Sick? What is Asbestosis?

Asbestos fibers float in the air and you inhale them. When they lodge in the lung, these fibers - even fibers so small that they are invisible - irritate the lung. The irritation sets up a reaction, an inflammation (like a

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sore when you cut your finger) in the small air tubes and sacs of the lung. As the inflammation heals, it leaves scar tissue, called fibrosis. (Asbestos fibers which work their way into the skin cause a similar process, and the heaped-up fibrosis or scar tissue forms "asbestos corns" or "warts".) In the lung, this fibrosis causes two things:

1) it thickens the lining of the air sacs (alveoli) so that it is hard for oxygen to pass from the air into your bloodstream. Slowly, as the scarring progresses, the worker begins to suffocate - even though he can breathe air in, it doesn't get into his blood.
2) The lack of oxygen and hard breathing puts a strain on the heart, so a worker suffering from asbestos may either die of suffocation or of a weak heart leading to heart failure.

The entire process is the disease called "asbestosis." (Asbestosis is not the same thing as cancer, although both asbestosis and cancer are caused by asbestos exposure.) Once the process of fibrosis or scarring starts in asbestosis, it is irreversible. There is no treatment which can make the lung as healthy as it was before. The fibrosis is progressive, and will continue to develop; if it is already in an advanced stage, it may continue to develop even if you completely remove yourself from further exposure to asbestos. The disease asbestosis is incurable. Once the lungs are scarred, there is no way to get the oxygen across them and into the bloodstream. The only known treatment for asbestosis is to prevent it in the first place.

What Are the First Signs of Asbestosis?

A worker suffering from asbestosis will begin to notice that he is short of breath, having trouble doing what he used to do without breathing hard. He may have a dry cough, and sometimes there is pain in the upper chest or back. As the ability to breathe is limited, his fingers and toes become "clubbed" - rounded, with flattened nails. This is one of the signs of decreased oxygen reaching the blood. Because these are such vague symptoms, it is easy for doctors to blame them on other causes instead of asbestos exposure. The symptoms may go on for a long time, while the disease progresses, without other symptoms or a correct diagnosis.

How Can You Test for Asbestosis?

There are a number of ways of finding out if you have asbestosis, but the only sure way is a combination of these tests, recommended by the government:

1) personal/work history - to determine whether you have been exposed to asbestos and for how long.
2) physical examination - with special attention to the sound of the lungs, to thickening and rounding of the finger tips (called clubbing), and other signs of effects on the lungs and heart.
3) chest x-ray - to look for the thickening and scarring which results from asbestosis, or for early evidence of cancer.
4) pulmonary function tests - to find out how much air your lungs can hold (vital capacity) and how fast you can empty your lungs (FEV: forced expiratory volume in one second). These tests are done by having you breathe into a mouthpiece connected to a machine measuring the volume of air.

What Kind of Medical Testing Should Asbestos Workers Have?

All asbestos workers exposed to asbestos, must have a regular program of medical testing under the new OSHA Asbestos Standard. This testing is not intended to protect against asbestos exposure in the workplace today, or in the future - that must be done with engineering controls. Medical testing is intended to identify workers who have already developed or are developing asbestos-caused diseases. The required medical surveillance program for all asbestos workers is: 1) personal/work history, 2) physical examination, 3) chest x-rays, and 4) pulmonary function tests (see the last question for an explanation of these). The chest x-rays and pulmonary function tests must be performed at least every year for workers exposed to asbestos. Medical examinations are also required at the time of hiring and of leaving a job. The employer is required to provide all these forms of medical testing, and he must have begun providing them from January 31, 1973 on a yearly basis.

However, the worker is not required to take these tests, and often he or she would be better off refusing company-run tests. For, as things stand now, th law does not provide economic job protection for the worker who is transferred to a safer work area on the basis of medical tests. So, unless your collective bargaining agreement guarantees rate retention, seniority and all future wage increa that would accrue to the position left, you do face the threat of economic discri nation from company medical testing programs.

What Kind of Cancer Does Asbestos Cause?

Asbestos exposure causes an increased death rate from many kinds of cancer, including cancer of the stomach, esophagus (tube to the stomach) and bowel, in addition to two kinds of cancer which are very strongly related to asbestos, lung cancer and mesothelioma.

Lung Cancer caused by asbestos exposure is the same as lung cancer caused by smoking. It is hard to diagnose early, it often spreads rapidly and can rarely be cured. Most people who are found to have lung cancer live only six to nine months after it is discovered.

Mesothelioma is an extremely rare kind of cancer, almost always caused by exposure to asbestos. The exposure to asbestos can be very small; in some cases, a family member has been exposed for only a month or two, and then twenty years later develops mesothelioma. Mesothelioma is a cancer of the lining of the lung (the pleural membrane) and of the lining of the abdomen (the peritonealarea). This cancer is incurable; it kills you within 6 months to 2 years, and there is no treatment - drugs, x-rays or surgery - which can help you.

Gastrointestinal Cancer is a general term for several different kinds of cancer of the digestive system. It includes cancers of the esophagus, stomach, colon (large bowel) and rectum. Surgery has been successful in removing tumors and preventing recurrences in some bowel and rectal cancers, but cancer of the esophagus and stomach is rarely detected in time for such success.

What Are My Chances of Getting Cancer If I Work with Asbestos?

If you work with asbestos, your chance of getting cancer is three times higher than the chance for someone not working with asbestos. As you saw on page 7 of the slide show script, forty-five percent of all asbestos workers will die from some form of cancer. The death rates vary for each particular kind of cancer. For lung cancer the average survival time after diagnosis is 6 to 9 months. Only one in five people with lung cancer will live more than a year. Cancer of the stomach, colon and rectum is three times as common a cause of death for asbestos workers as for other people. Mesothelioma is an extremely rare kind of cancer, so rare that cases of this kind can almost always be traced back to some sort of asbestos exposure; yet, in some studies of asbestos workers, more than 10% of the deaths are due to mesothelioma.

Why Do Only Some People Exposed to Asbestos Get Cancer?

No one really knows how certain toxic substances, like asbestos, cause cancer - and because of this, we don't know why one worker exposed to asbestos may get cancer while the worker next to him does not. Two factors are known to increase the risk of developing cancer from asbestos: length of exposure, and smoking. But anyone exposed to asbestos may get cancer--there is no way to play it safe.

Can I Get Asbestos-Caused Cancer Even if I Don't Smoke?

Asbestos causes cancer in workers, whether or not they smoke. But the chance of getting one kind of cancer - lung cancer - from asbestos exposure is increased up to 7 times if the worker also smokes. This "cooperation" between asbestos and cigarette smoke in causing lung cancer is called "synergism." It is clear, however, that while smoking further increases your risk of cancer, asbestos exposure alone can cause lung cancer, mesothelioma and many other kinds of cancer. Smoking is not known to play a role in any kind of cancer caused by asbestos except lung cancer. Why smoking does increase your risk of asbestos-induced lung cancer is not known. But remember, you can get cancer from asbestos even if you don't smoke.

What If I Only Work with Asbestos for a Short Time?

Even is you are only exposed to asbestos for a very short time, you are still in danger. One study showed that just one month of working with asbestos can double your chances of getting cancer. Another study reported x-ray findings of asbestosis among workers who were exposed to asbestos for only one day. There is no safe amount of exposure or safe amount of time for work with asbestos.

How Long Does it Take to Get Sick from Asbestos Exposure?

Asbestosis - scarring of the lungs - develops more rapidly in workplaces with higher concentrations of asbestos in the air. With moderately heavy exposures, asbestosis may develop within 10 - 15 years; by the time a group of workers have been exposed for 20 years, as many as 40% of them may have asbestosis. Cancer usually takes at least 20 years, and sometimes as long as 25 to 30 years, to develop from asbestos exposure. The exposure to asbestos must be over a long time period to produce asbestosis or lung cancer, but may be very short in the case of mesothelioma, as short as one or two months.

Can I Get Cancer If I Don't Have Asbestosis?

Yes. Studies have found asbestos-induced cancers among asbestos workers and people living near asbestos mines and plants who did not have asbestosis. Because mesotheliomas can be caused by as little as a month's exposure, mesotheliomas are frequently found in workers who were not exposed long enough to develop asbestosis.

How Can You Test for Cancer Caused by Asbestos? Is there Any Cure?

Unfortunately most of the cancers caused by asbestos are difficult to diagnose early, before they have become untreatable. Most of the cases are found because a worker complains of weakness, loss of weight, or pain; an x-ray is taken which indicates that there is a tumor. In some cases an operation will remove enough of the tumor to allow the patient to live a little longer, but these cancers are almost never curable. This is why it is so important to protect against asbestos exposure in the first place.

Is My Family in Danger if I Work with Asbestos?

Yes. As the slide show script described family exposure on page 8, if you are bringing asbestos fibers home with you - on your clothes, in your hair, in your lunchbox - this endangers your family. In one study 1/3 of the asbestos workers' family members had abnormal chest x-rays from scarring and thickening of the chest lining (pleural membrane) 30 years after their exposure at home. Cases of mesothelioma are known to have happened after as little as 1 month's contact with a family member carrying asbestos fibers home with him. Your family is also in danger of asbestos-caused diseases if the mine or plant where you work is discharging asbestos fibers into the air of your community. Increased rates of asbestosis, lung cancer and mesothelioma have all been found in people living near mines and plants.

Is Asbestos a Danger to the Community?

The air of most cities now contains significant levels of asbestos, as a result of brake linings, construction sites and other urban uses. Concentrations high enough to threaten the health of the community are frequently found near asbestos mines and quarries - the air of Washington, D.C. was found to have dangerously high asbestos levels in 1976 because of a quarry located in Maryland. In addition to general air levels, members of the community may be endangered by asbestos used in construction sites or even brought home on a neighbor's work clothes and washed at the same laundromat.

How Long Have the Dangers of Asbestos Been Known?

Asbestos has been used in modern industry since about 1880. The first medical diagnosis of death from asbestosis was made in England only 20 years later, in 1900. The link between asbestos exposure and asbestosis, or lung scarring, was firmly established by 1930, and repeatedly confirmed in many studies after that. As early as 1918, American and Canadian insurance companies were no longer insuring asbestos workers because of the assumed health hazards of that industry. In 1935, researchers in both the United States and England reported a suspected association between asbestos exposure and lung cancer. By 1955, this association had been confirmed and the link to several other types of cancer had been made as well. The most important and valuable research in the United States has been done in the last two decades by Dr. Irving Selikoff and his team of investigators at Mt. Sinai Hospital in New York City. They determined the increased cancer rates for different kinds of cancer among asbestos workers, the amount of time which usually passes after exposure until the development of cancer, and the increased risk associated with longer or more intense exposure to asbestos. A copy of Dr. Selikoff's paper on cancer risk among insulation workers, presented at the Conference on Asbestos Disease, Rouen, France in 1975, is enclosed in this packet.

Why Wasn't I Told About the Danger from Asbestos Before?

Even though the dangers of asbestosis and cancer from working with asbestos have been known for more than fifty years, the asbestos industry refused to admit that there was a problem. For years they have attempted to obfuscate and confuse the issues, and the fact that there still is not enough research being done on asbestos-caused diseases has helped industry stall action on this dangerous cause of death and disease among workers. Although there is no longer any question about the fact that asbestos causes asbestosis and cancer, industry is continuing to fight enforcement of the legal standards.

Why is Asbestos Still Used if It is So Dangerous?

Most of the uses of asbestos depend on its heat and acid-resistant properties. For many purposes there is not yet a satisfactory substitute, and substitutes now being used, such as fiberglass, often present their own health and safety hazards. In addition, the asbestos-producing and processing industries are very strong; world-wide production of asbestos increased by 50% in the ten years from 1964 to 1974.

Is Fiberglass a Safe Substitute for Asbestos?

Fiberglass is not "safe." At present there is not enough research to clearly define the extent of the health hazard represented by exposure to fiberglass. Fiberglass does cause both skin and eye irritation - in some cases severe. Animal experiments have suggested that fiberglass fibers - which closely resemble asbestos fibers - may cause the same fibrotic reaction in the lining of the lung (pleura) as asbestos fibers do, and that such fibers are tumorogenic (tumor-causing). Despite the lack of conclusive evidence, a symposium of experts in 1974 concluded that exposure to fiberglass should be carefully controlled. Again workers are going to bear the burden of proving the harmful effects of a toxic substance - fiberglass - and end up being the guinea pigs for industry as they were for asbestos.

Why Is Working with Talc Dangerous?

Talc itself causes pneumoconiosis, very much like asbestosis. In addition, almost all talc contains asbestos fibers, usually tremolite or anthophyllite. There is only one talc mine in the United States in which the talc is not contaminated with asbestos.

What about Public Employees?

Public employees are not covered by the OSHA Asbestos Standard; in effect, they do not have any protection other than that which they can win in bargaining agreements.

What about Workman's Compensation?

Workman's compensation provisions for asbestos-caused disease vary from state to state. You should take the appropriate steps to obtain workman's compensation in consultation with your local and international union.

How is Asbestos Measured in the Atmosphere?

Slide 28 showed asbestos fibers photographed through a microscope. The method used to measure asbestos in the air is a membrane filter to trap the fibers and a light microscope to count them. The sampling machine should be put near the nose and mouth of a worker in the exposed area (pinned to his collar, for example) to collect samples representative of the air he is breathing. After being counted, the total fibers collected are averaged out over the amount of air measured. This gives an average number of fibers for a volume of air. The OSHA Asbestos Standard limits the concentration of fibers longer than 5 micrometers to 2 fibers per cubic centimeter. This is the average concentration that cannot be exceeded for an eight-hour day. It is supposed to be a level that you can be exposed to for eight hours every working day without developing disease. This is not the case. Because you breathe in 4 to 8 million cubic centimeters of air during an eight-hour day, under the standard, you could inhale 8 to 16 million fibers in a single work day. If enforced, the current standard will significantly improve many workplaces, but there is considerable medical evidence that this standard will not eliminate lung scarring and cancer. In fact, the only exposure that doctors are certain is totally safe, is no exposure at all.

If My Employer Provides Me with a Respirator, Is That Enough Protection?

No. Under the OSHA Asbestos Standard, employers are required to use engineering controls instead of relying on personal protective equipment. Engineering controls are ways of designing the workplace and work process so that the toxic substance - in this case, asbestos - is separated from the worker or removed mechanically with ventilating and other kinds of housekeeping equipment. Examples of engineering controls for asbestos would include exhaust fans, non-spray application methods for insulating, and storing and disposing of asbestos in sealed containers. All employers should provide full body protective work clothing and hat, maintenance and laundering of the soiled protective clothing (vacuumed before removal), and separate lockers for work and street clothes. Respirators should be used only under these conditions: 1) during the period while engineering controls are being constructed; 2) when exposure is infrequent and for short time periods; or when 3) a work environment cannot meet the legal standard and has been granted a variance.

Is There Any Legal Protection against Asbestos Exposure on the Job?

Yes. In 1970, workers and their representatives won an important legal tool to help them in their fight for a safe and healthy workplace. Congress passed the Occupational Safety and Health Act and established OSHA, the Occupational Safety and Health Administration, to regulate the use of toxic substances in the workplace. One of these toxic substances is asbestos, and OSHA has set a standard with specific rules and regulations that must be followed wherever fibrous asbestos is present. Failure to follow them is a violation of the law. You should be familiar with these regulations so that you can recognize violations on your job and use the law to protect yourself. A copy of the asbestos standard is enclosed in this packet. The standard provides that:

ENGINEERING	Engineering methods such as isolation, enclosure, exhaust ventilation, and dust collection shall be the prime means of control.
TOOLS	Hand-operated and power-operated tools must have built-in controls.
HANDLING	As far as practicable, asbestos shall be handled wet.
SHIPPING	No asbestos products can be removed from shipping containers without being wetted, enclosed, or ventilated.

HOUSEKEEPING — All external surfaces must be kept free of accumulations of asbestos fibers.

RESPIRATORS — Restrictions are imposed on the use of respirators. No employee may be assigned to a task requiring a respirator if the physician determines that the employee will be unable to function normally when wearing a respirator or that the safety or health of the employee or his fellow employees will be impaired by his use of a respirator. Where respirators are used, the standard recommends "rotation of personnel."

CLOTHING — The employer must provide special clothing, change rooms, clothes lockers and laundering.

MONITORING — Monitoring means measuring the amount of asbestos fibers in the air. This is done with a dust sampler. Every employer using asbestos shall have initially monitored the exposure of his employees by December 7, 1972. Therefore, your workplace should have been monitored at least once. If the exposure is found to exceed the standard, the employer must then monitor at least once every six months.

ACCESS TO MONITORING DATA — Affected employees, or their representative, shall be given a reasonable opportunity to observe any monitoring required . . . and shall have access to the records thereof. This point is important. Have you been given this opportunity? If an employee is exposed to excessive concentrations, he must be told what corrective actions are being taken.

SIGNS — Caution signs must be posted in plants and labels attached to asbestos materials.

MEDICAL EXAMINATIONS — Physical examinations including a 14"x17" Chest X-Ray, pulmonary function tests, and a history, shall be given at preplacement, then each year, and at termination. These examinations shall be provided by the employer, and the physician who conducts the examination must report the results to the employer. Employees have access to this medical data only through their personal physician. (To obtain your medical, you can write the OCAW Citizenship-Legislative Office and we will arrange for a union physician to obtain your record and give it to you.)

TABLE I

Estimates of Lifetime Asbestosis Incidence Per 10,000 Asbestos Workers at Different Exposure Levels

Levels

Asbestos Fiber Concentration Per Cubic Centimeter	Number of Asbestos Workers (per 10,000) Estimated To Get Asbestosis*
0.5	124
5.0	1,243

*Based on a study by Finkelstein of 201 workers at an asbestos-cement factory in Ontario. Adopted from: BNA Reporter, 11/10/83.

TABLE II

Lung Cancer Deaths Per 10,000 Asbestos Workers (and other workers) Over a 20 Year Period, by Occupational Exposure and Smoking History*

History of Asbestos Exposure		History of Smoking: Yes	History of Smoking: No
	Yes	120	12
	No	25	2

*Study by Hammond et.al. Based on 8220 workers with 20 or more years exposure to asbestos. Adopted from BNA Weekly Reporter 11/10/83.

TABLE III

Estimated Asbestos Related Cancer Mortality Per 10,000 Asbestos Workers With 20 Years Exposure At Varying Levels of Exposure

Asbestos Fiber Concentration per Cubic Centimeter	CANCER			
	Lung	Mesothelioma	Gastrointestinal	Total
0.1	1	1	0	2
0.5	7	4	1	12
5.0	65	33	7	105

*Adopted from BNA Reporter 11/10/33.

ASBESTOS: What Is It and How Does It Affect Me?

Historically, asbestos remained a curiosity for centuries, with negligible production until the beginning of the 20th century when it was used as thermal insulation for steam engines. Worldwide production of the mineral now approaches 5 million tons annually, with chrysotile the principal fiber type. Annual United States consumption is approximately 900,000 tons, with more than 70 percent used in the construction industry.

It has been estimated that a majority (85 to 92 percent) of end-product uses have effectively immobilized the asbestos fibers by mixing them into a strong binding material; e.g., cement. Fibers are still liberated, however, during fabricating operations such as grinding, milling or cutting. The remaining 8 to 15 percent is in a form that will more readily permit fiber dissemination, such as friable insulation material or bagged fibers for mixing.

WHERE CAN ASBESTOS BE FOUND?

Of the many uses of asbestos, the technique of spraying fibers onto structural surfaces has been perhaps the most significant in causing asbestos exposure to construction workers during application and to the general population thereafter. Such material, in loosely bonded friable form, has been applied extensively to steelwork to retard structural collapse during fire, and to overhead surfaces for purposes of acoustic and thermal insulation, decoration, and condensation control.

Spray application of asbestos fireproofing and insulating material began in England in 1932. Spray application offered the advantage of rapidly covering large or irregular surfaces evenly and efficiently without the use of mechanical support or extensive surface preparation. Early spray applications in the U.S. were mainly for decorative use and acoustical insulation in ceiling material in clubs and restaurants. In 1950 more than half of all multistory buildings constructed in the U.S. used some form of sprayed mineral fiber fireproofing. In

1968 fireproofing alone accounted for 40,000 tons of sprayed material.

The health hazards of spray application of asbestos to spray operators, other construction workers, and the general public in the vicinity of such operations were recognized and documented. Because of these hazards, the New York City Council banned spray application in 1972. Other cities and states followed suit, and in 1973 the U.S. Environmental Protection Agency (EPA) banned spray application of insulating or fireproofing material containing more than 1 percent asbestos by weight. Decorative materials were not included in the ban, and this omission permitted some continuing application. One example involved all overhead surfaces in the large (1200 unit) condominium complex using a friable mixture of 30 percent asbestos.

On March 2, 1977, EPA proposed an amendment to the national emission standard for asbestos. These amendments would extend the spraying.

Although the spraying of friable asbestos-containing materials in construction has all but ceased, sprayed material within existing structures remains a potential widespread source of asbestos fiber exposure. Although exact figures are not available, if it is assumed that spray application was a common practice from 1958 to 1973, and that fireproofing was the major use of this material, a conservative order-of-magnitude estimate of the total amount of asbestos sprayed over this period would be 500,000 tons. It is indeed possible, therefore that sprayed asbestos material within buildings may become the most significant source of environmental asbestos contamination in the future.

Most of the hot water and steam pipes insulated between 1940 and 1979 have some form of asbestos. Nearly 100 percent of all of the cementious pipe wraps had 10-40 percent amosite. Much of the canvas wrapped glass fiber pipe wraps have between 6-16 percent chrysotile. The cardboard pipe wrap sold under the trade name Aircell has between 6-40 percent chrysotile. Be sure to take precautions before removing any old pipe wrap.

A. Uses of Asbestos

1. Special Textiles
2. Fireproof Textiles
3. Woven Fabrics
4. Acid Resistant Materials
5. Packings
6. Brake and Clutch Linings
7. Electrical and Thermal Insulation
8. Asbestos Cement Pipes and Sheets
9. Gaskets
10. Paper Products
11. Rings
12. Welding Rod Coatings
13. Sound Insulation

B. Sources
<u>Home</u>

1. Roofing
2. Siding
3. Insulation Board
4. Sewage
5. Gas
6. Table and Ironing Board Pads
7. Water Supply
8. Ovens
9. Floor Tiles
10. Floor Tiles
11. Draperies
12. Rugs
13. Electrical Equipment
14. Acoustical Ceiling
15. Talc (Impurity)
16. Covering on Heating Ducts
17. Taping Compound
18. Dry Wall

Sources
<u>Automobile</u>

1. Spark Plugs
2. Brake Lining
3. Clutch Facings
4. Mufflers
5. Filler in Undercoating