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Book 1 of 6

CONFIDENTIAL RECOMMENDATIONS

TO CONTAIN

AUDICOTE CONTROVERSY

FOR

U.S. GYPSUM

July 22, 1983

HILL AND KNOWLTON

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HILL AND KNOWLTON

CONFIDENTIAL

Memorandum to: U.S. Gypsum

Subject: Recommendations To Contain Audicote Controversy

United States Gypsum has asked Hill and Knowlton to study the public relations problems that have arisen -- and which may arise -- from the controversy over Audicote and to recommend a course of action in response. This memorandum addresses that request.

EXECUTIVE SUMMARY

U.S. Gypsum is facing a severe problem that could have far-reaching, bottom-line implications for the Company.

It is possible that U.S. Gypsum may not be able to win in this situation. The Company is threatened by the opposition of the U.S. Attorney General and the Environmental Protection Agency, extensive litigation, and public opinion on the asbestos issue, which has been negative for over a decade.

The controversy over Audicote is growing in the media and is being fueled by crusading regulators, lawyers who seem anxious to establish a new field of practice, unions, U.S. Gypsum's competition, contractors, and other assorted publicity seekers.

The problem is exacerbated in that Audicote, alleged to cause health problems, was used in schools -- two subjects that are of great interest to the media and the public today and which can be used in populist appeals.

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The problem is further complicated in that litigation over the matter is local in scope and U.S. Gypsum could find itself facing not one focused situation, but scores of difficulties throughout the nation. Indeed, the Company is already a defendant in at least 14 cases ranging from New Jersey to Texas.

While the first trial date is set for September 1983, the Company can expect media exposure to continue long after the trial. Based on all we know, the media exposure of this matter will increase as additional school systems report findings and as those systems seek solutions to their problem. The coverage of lawsuits underway or pending will further extend the coverage of the issue in general and in turn promote the filing of additional lawsuits as other systems seek ways to recover the costs. All of these factors only further fuel the fires of media interest.

The growing intensity of press coverage, as reports of asbestos in schools begin to roll in from across the nation, suggests the beginning stages of a national focus on an issue that might well bring dramatic and harsh public action. The political system, as witnessed by the extreme response of the attorney general and some EPA coordinators, is in the process of reformulating policy. In the last several years, the media has interpreted public policy as "too easy" in matters relating to the environment.

Unlike Love Canal and the dioxin issue, the presence of asbestos in schools provides local media a unique

opportunity to cover a national issue as comprehensively as the national media. For the first time local press will have access to main characters who may not take a reasoned approach in the face of such public scrutiny and pressures from interested parties.

Finally, in the absence of reasoned explanation and some assurances of safe conditions, the media will focus its full attention on the reaction of public officials and the resolution of the problem as recommended by the highest authority or readily accessible "expert." These experts would range from EPA officials, outside consultants, attorneys and perhaps even local contractors.

On the positive side, U.S. Gypsum has extensive testing and other data that prove Audicote is not a problem to human health. Additionally, media coverage, while intense, has not reached significant volume or into top national news or editorial columns.

However, U.S. Gypsum must act now and must act aggressively to deal with this problem. We have considered the option of taking no action and feel that inappropriate. Matters have gone too far and something must be done to stop the spread of this story.

The remainder of this memorandum includes:

- o History of the problem
- o Scope of the problem
- o Key groups
- o What they are saying

- Political and regulatory environment
- An approach

HISTORY OF THE PROBLEM

U.S. Gypsum's Audicote Acoustical Plaster has been identified as an asbestos product. Audicote was used, from 1955 to 1972, as a ceiling spray in the construction of schools and other public buildings.

With concerns growing over asbestos-related health hazards, in 1978 the EPA initiated a voluntary program among schools throughout the nation to identify the presence of "friable" asbestos. In 1980 Congress passed the Asbestos School Hazard and Control Act. In 1981, the U.S. Attorney General submitted "The Attorney General's Asbestos Liability Report to Congress." This report was required by the 1980 Asbestos Act directing the Attorney General to:

> Conduct an investigation to determine whether, by using all available means, the United States should or could recover, from any person determined by the Attorney General to be liable for such costs, the amounts expended by the United States to carry out this Act (federal grants and loans to detect, remove and contain friable asbestos in the schools).

The Attorney General concluded that:

> Litigation, but by school authorities rather than the federal government, should be quickly investigated by school authorities and their counsel as one potential means of reducing the fiscal impact on taxpayers of abating asbestos hazards in the schools.

To date, 14 lawsuits have been filed against U.S. Gypsum by school authorities. Others are contemplated.

SCOPE OF THE PROBLEM

Based on a review of press clippings, it is apparent that a significant number of schools throughout the country have identified the presence of asbestos and are beginning to realize the costs for removal may far exceed their abilities to cover those expenditures.

Media coverage of the issue has been significant and widespread, albeit dominantly local in nature. A review of the Nexus data bank has identified 983 stories on the issue since 1978, almost half, 453, coming since October of last year. This data bank contains only UPI and AP national wires, UPI state wires and selected national or regional publications, such as the New York Times and Washington Post. The magnitude of the UPI state clippings indicates that this is a story of significant local interest, suggesting considerably more coverage than is contained in the data banks. Traditionally, media coverage on an issue of this nature follows a pattern or stages of coverage.

1) Identification of a problem
2) What will be required to resolve the problem?
3) Who is responsible for the problem?
4) Who is liable for the problem and its resolution?
5) What actions will be taken?

While media coverage has been widespread (virtually every region of the country except the Pacific Northwest) and has intensified in recent months, it has concentrated

primarily on the very early stages of this issue -- identification of asbestos in the schools.

Some areas have identified the magnitude of the dollar expenditure necessary to correct the problem. This type of coverage begins to occur as school systems report the results of their surveys on the presence of asbestos.

Of the 350 stories that appeared in 1983, less than 15 percent indicated that legal action was contemplated. Ninety percent of the stories in which legal action was contemplated emanated from the Southeast. That appears to be the most predominant area where coverage has extended through all the stages to the point of identifying actions that will be taken to resolve the problem.

The Southeast also appears to be the area where emotional appeals have played the greatest role to date. Clippings point to aggressive public officials such as Charles Graddick, state attorney general of Alabama. Graddick made statewide news in the fall of 1982 with pronouncements on the dangers of asbestos and the need to rid Alabama of such dangers immediately.

Finally, the majority of the stories (92 percent) were straight, factual reporting or hard news stories. Few registered opinions other than those offered by officials. Fewer still provided a balanced viewpoint or suggested that the asbestos was either contained in such a manner or in significantly small quantities that it may not cause a

hazard -- nor did they suggest that the problem warrants further study.

Following is a breakdown of the story types nationally and by each region: East, Southeast, Midwest, Southwest and West.

Location	Type of Story	Number of Stories
National	Discovery	225
	Removal	164
	Government/political	65
	Litigation	6
East (224 total)	Discovery	98
	Removal	85
	Government/political	38
	Litigation	3
Southeast (145 total)	Discovery	80
	Removal	48
	Government/political	15
	Litigation	2
Midwest (36 total)	Discovery	16
	Removal	14
	Government/political	6
	Litigation	0
Southwest (34 total)	Discovery	17
	Removal	12
	Government/political	4
	Litigation	1
West (14 total)	Discovery	7
	Removal	5
	Government/political	2
	Litigation	0

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While some school administrators have stated publicly that the presence of asbestos does not constitute a significant hazard at this time, pressures by key groups, including parents, have forced many to take actions.

KEY GROUPS

Several key groups, individuals and organizations have fueled additional media coverage by taking strong positions on this issue. A recent survey by the Service Employees International Union was quoted in the Wall Street Journal and other publications throughout the country as saying that perhaps nine percent of all schools in the country have potentially dangerous asbestos problems. Key governmental groups connected with this issue include:

- o Environmental Protection Agency
- o Congress
- o Justice Department
- o Local public school officials

Association and union groups include:

- o The National Education Association
- o The National Parent and Teachers Association
- o The American Federation of Teachers
- o The Service Employees International Union

Key individuals include:

- o EPA regional asbestos coordinators
- o State attorney generals
- o Attorneys

WHAT THEY ARE SAYING

An Emotional Response: How Safe is Safe?

The combination of asbestos (health hazard), education and children has created an emotional reaction that is being played on and promoted by all the groups and indivudals listed above.

> Not only is the health of childern at stake but also that of teachers, para professionals and other staff who are likely to spend many more years working under potentially hazardous conditions.
>
> -- AFT President

While some school officials have stated that the existence of asbestos alone in schools does not present a health hazard at this time, pressure from parents and other groups in some locations has forced school officials to take action they might not have considered necessary. Although these school officials may have believed their buildings safe, parents have not been willing to accept degrees of safety where it concerns their children and the possible contact with a hazardous substance. When faced with a product linked to cancer and in place in schools, emotional reactions are likely to dominate reason. As the issue grows, pressure on public officials to take action will increase.

National media attention is focusing more and more on the "human side" of the asbestos issue. A recent Washington

Post article focused on the tragic story of a promising young attorney who died as a result of asbestos fibers in his lungs. Such emphasis only serves to fuel the emotional response to the issue of asbestos and to suggest a style of coverage for local and regional media to follow.

Environmental Concerns

The national media view asbestos as one of a growing list of toxic substances threatening public health. The coverage given to Love Canal and, more recently, the dioxin issue graphically demonstrates the emphasis placed on public health matters. It also reveals the emotional response elicited by that coverage nationally despite the localized nature of the incident.

The EPA references these concerns when it recommends removal rather than containment of asbestos and asbestos-containing products as the most cost-effective method of resolving the problem. The EPA raises the spectre of the Clean Air Act, its compliance procedures and costs at some future point when a building containing asbestos is demolished. Their rationale is that the costs to remove the product at this time would be the same and are recoverable through litigation against manufacturers. That option may not exist at some future time when the building is demolished.

Recoverable Expense

The concerns for the escalating cost of education and the public mood favoring fiscal restraint and reduced

taxation raise the side issue of the expense of correcting the asbestos problem to one of prominance in the media. "Who will bear the costs?" was of obvious concern to Congress in 1980 when it directed the Attorney General to submit a liability report. Those concerns have continued to be of major emphasis in media coverage of the problem. Most news items focus on the cost estimates to correct the problem. Where the question of who will bear the burden of such costs are raised (predominantly in the Southeast), the solution most often mentioned is to sue the products' manufacturers.

POLITICAL AND REGULATORY ENVIRONMENT

The issue was created by the EPA with its voluntary survey begun in 1978. It was followed up by Congress with its Asbestos School Hazard and Control Act of 1980 and the Attorney General in his Asbestos Liability Report of 1980. All of this was covered by the national media creating an issue of national importance.

The EPA is currently in a state of reorganization following the dismissal of several key officials. However, some members of the EPA have taken this opportunity (perhaps because of a temporary void in leadership) to promote aggressively legal action by school officials against asbestos product manufacturers. Such aggressive posture has provided those individuals considerable visibility in the media and in the communities affected by the problem. Dwight Brown, EPA Asbestos Coordinator for Region IV (Southeast) was mentioned on several occassions.

The issue also offers those with political ambitions in each state a ready-made platform appealing to the emotions of the public. Graddick was quick to grab that opportunity in Alabama, along with the extensive media coverage it offered him.

In the upcoming 1984 campaigns for Congress and the White House, several candidates have stated their intentions to make hazardous waste a major campaign issue. It would be a simple step to expand that to include all toxic substances and public health. The presence of toxic substances in

schools makes an ideal issue to gain public support and to attack incumbents for their lack of action, as was demonstrated in Alabama.

The Problem

1) Clearly media coverage will continue and intensify as the reports on asbestos detection are filed and public officials seek means of resolving the problem.

2) In the absence of scientifically verified facts and a reasoned approach to the resolution of the problem or, at the least, alternative solutions, the media coverage will continue to be unbalanced, emotional and seek to lay blame or find fault. In that atmosphere, it is easy for the media to accept fingers pointed at disembodied and far-removed corporate entities.

3) The media coverage will tend to feed on itself, from local to state and regional, to national and back to local in a manner out of proportion to the magnitude of the issue. Local coverage will expand its reporting to cover the problems and proposed resolutions of other areas.

4) The lawsuits filed and subsequent court activities will extend the media coverage on the issue and further tend to promote the filing of additional suits as a resolution to the problem, which in turn will increase the media coverage.

5) Ultimately, a volume of law suit filings reported in the media may create a panic on the part of school officials

and parents to seek quick resolutions in the courts leading to even more suits.

6) In the absence of a strong public position by the company, employees will be hard pressed to defend the company's role in this issue as well as the performance and safety of its products.

7) In the face of growing public concern and an atmosphere that will likely build to one of antagonism on the part of the media and public officials, the financial community will be concerned over the prospect of growing litigation and company liability and the effects such liability may have on the company's earnings. If it appears that the company is not taking aggressive action in its defense, a sell off by some stockholders may ensue.

AN APPROACH

We have reviewed several options open to the company.

- o Do nothing
- o Develop an all-out response nationwide
- o Choke off negative publicity at the source, on a targeted basis

The magnitude of the problem, and the probability that media coverage and legal action will intensify, may well lead to a unified public outcry demanding a resolution and even a corporate scapegoat. We, therefore, believe U.S. Gypsum should adopt the third option -- choke off negative publicity at the source.

The spread of media coverage must be stopped at the local level and as soon as possible. Lawyers seeking to capitalize on the problem, unions seeking public support for their positions, oportunistic public officials, competitors, contractors and other assorted publicity seekers must be neutralized and their call for legal action mitigated if U.S. Gypsum hopes to prevent the proliferation of lawsuits against it.

We believe that U.S. Gypsum should take the medical position that while asbestos is certainly a potent co-carcinogen, the amount of asbestos and, even more important, the size of the fibers to which children might have been exposed constitute a minimal hazard at worst and, most likely, no hazard at all. A credible argument to this effect can be developed, based on existing research on

exposure to sub-micron sized asbestos fibers and information on the magnitude of exposure.

Further, the Company should develop the argument that the alleged cancer hazard from sprayed asbestos is far less than the hazard from fire, which is created when asbestos insulation is removed.

In communicating this message, the Company must consider key audiences important to its operation that could be affected by negative media coverage. It must also be prepared to address targeted audiences directly affected by the problem.

What is presented here are several strategies for tackling the problem. Each needs to be fleshed out with supporting tactics, but we believe the approach outlined here offers the best opportunity to bring the problem under control.

Flexibility, allowing adjustments to changing situations, will be an important ingredient in any program chosen to address the problem since the volatile nature of the problem and the emotional response it elicits could cause rapid and dramatic changes in the emphasis and reactions of the public. Consequently, we recommend, at the outset, that a task team be established and that the team work aggressively to get activities underway.

Strategies

At the least United State Gypsum needs to:

1) Prepare itself for negative publicity
2) Find ways to shut off negative publicity
3) Seek methods to put the whole issue in perspective
4) Establish a monitoring sytem with key Company audiences
5) Develop, based on the course this matter takes, a plan for dealing with audiences not directly and immediately affected -- the financial community; employees, especially those in cities where litigation is entered; customer; and others.

We believe that turning around public opinion on this issue -- and therefore getting a chance in court on the liability question -- will require a blend of training, media contact, special analysis, political and regulatory contact, involvement with selected third parties including lawyers, school board officials and others, and more.

The Company should train spokespeople, scientists and technical types, to present the evidence that asbestos insulation does not present a significant health hazard to children, but that removal does pose a fire hazard. These spokespeople should appear in front of targeted audiences -- those affected by the controversy -- in as many

forums as possible. This effort should be the bedrock of the Company's public relations program.

By such means the Company can add perspective to the issue. It can then position the problem as a side issue that is being seized on by special interests and those out to further their own cause. The media and other audiences important to U.S. Gypsum should ideally say, "Why is all this furor being raised about this product? We have a non-story here."

United States Gypsum should seek a coalition to pursue these strategies, but we submit that too little time may be available to form such a group. If that is the Company's judgment as well, then action should go forward immediately.

Tactics

While specific tactics in support of the recommended strategies will be fleshed out in working closely with the task team, the following are recommended strategies that should be initiated as soon as possible in preparation for shutting off continued and growing adverse publicity.

1. Preparing for negative publicity:

TACTIC: Identify and appoint task team with responsibility for all activities involving the issue.

TACTIC: Further identify research that has been conducted on the hazards of sub-micron sized asbestos fibers.

TACTIC: Brief and train spokespersons (task team members) in preparation for media briefings and interviews.

TACTIC: Establish national monitoring system of key media in selected major markets as an early warning system to alert task team to new and increasing negative press.

2. Reduce or eliminate negative publicity/create perspective:

TACTIC: Create advisory board of independent experts to include noted scientists and school administrators.

TACTIC: Prepare backgrounders and fact sheets on the issue.

TACTIC: Produce a series of op-ed pieces from the fact sheets authored by members of the advisory board for placement in key regional and national newspapers.

TACTIC: Write a series of speeches to be employed by members of the advisory committee and the task force on selected regional platforms.

TACTIC: Conduct editorial board briefings with all media who are covering the issue.

TACTIC: Conduct editorial board briefings with key national media.

3. Seek methods to put the whole issue in perspective.

TACTIC: Hold a summit meeting with William Ruckelshaus explaining U.S. Gypsum's side of the story.

TACTIC: Explore contacts with EPA officials as well as political allies to identify means of reducing or eliminating adverse activities of its regional coordinators.

TACTIC: Set up media field offices and/or vans to educate the public, respond to accusations in targeted areas where the controversy is intense.

TACTIC: Be prepared to present testimony before targeted state and local governments on the safety of the product and potential fire hazard if removed.

TACTIC: Identify industry allies for funds, influential spokespeople (for third party endorsements), support.

TACTIC: Stage community meetings in target areas; have U.S. Gypsum spokespeople present their side of the story and answer questions.

TACTIC: Identify leaders in the medical and science professions to provide third-party endorsements of U.S. Gypsum's position.

4. Establish a monitoring system with key Company audiences.

TACTIC: Research EPA coordinators to identify hidden objectives, political ambitions, anonymous sponsors.

TACTIC: Establish monitoring system in key local and state political arenas to identify which politicians are taking up the issue and undertaking potentially harmful activities/ramifications that could otherwise lead to legislative action.

5. Develop plan for audiences not directly affected.

TACTIC: Conduct soft-soundings among financial analysts to determine their knowledge and concern regarding this issue.

TACTIC: Develop a coalition of industry and business allies to create a white paper on the lack of health hazards posed by asbestos in the schools -- and the more serious fire hazard if removed.

TACTIC: Hold a series of meetings with employee groups to answer their questions about the issue.

Conclusion

We feel that because this issue has reached such magnitude, and because it is attracting increasing media attention, the Company should develop a program in order to contain the controversy. We strongly recommend that you begin immediately to name a task team or advisory committee for that purpose.

Hill and Knowlton is prepared to work with you in developing additional strategies, tactics and materials and to work with the task team in developing a full program to address the problem.

DRAFT 3/8/85

ASBESTOS IN SCHOOLS: A HEALTH ASSESSMENT

For years, concern about the presence of asbestos in schools and other buildings across the country has created fear, anxiety and confusion among parents, school administrators and the public at large.

While millions of words have been written about this issue in the scientific, quasi-scientific and popular press, the fact remains that all assessments of potential risks to children, teachers and custodial personnel are based on extrapolations from the health experience of heavily exposed occupational groups.

At present, there is no credible scientific evidence to indicate that even one child exposed solely to the extremely low levels of asbestos found in schools has ever contracted an asbestos-related disease or suffered any other physical impairment from that exposure.

Much of the fear concerning asbestos in schools has been generated unwittingly by the Federal Environmental Protection Agency (EPA). The EPA, in an attempt to address the potentially serious problem of "peak" asbestos exposures caused by the visible flaking of asbestos-containing material from severely damaged insulation, proposed a school evaluation program to assess the extent of asbestos usage in

American schools. In order to justify its program, EPA prepared a "worst case" risk assessment document in 1980 that exaggerated every potential hazard and minimized or ignored every mitigating factor.

The EPA program raised apprehension levels but failed to give specific directions to school districts as to what was safe and what was not. Such decisions were left, therefore, to the districts themselves, which responded, quite naturally, to the fears and concerns of parents and other involved citizens.

A "one fiber can kill you" hysteria swept the nation, which resulted in a mad rush to remove asbestos-containing insulation from schools, in some cases without even determining whether the insulation was releasing fibers into the air.

It is not the purpose of this document to assess the national turmoil created by the indecisiveness of the EPA program, but rather to evaluate the scientific facts realtive to the potential hazards of asbestos exposure in schools. It will demonstrate in simple but logical fashion the following five points:

(1) While asbestos is a well-recognized occupational health hazard, extrapolations from the experience of heavily exposed working populations to lesser

of heavily exposed working populations to lesser exposed groups have proven inaccurate.

(2) Although asbestos is known to cause disease in the neighborhoods of some types of asbestos plants and even in the households of asbestos workers, the exposures experienced by people in these non-occupational settings were "semi-occupational" in magnitude when compared with general public or school exposures. Even then, cases of disease were quite rare.

(3) In assessing the potential hazards of asbestos exposure, it is critical to consider the type and size of the asbestos fiber involved, as well as the amount of exposure. Both of these considerations indicate a lesser degree of risk to school children.

(4) Asbestos has been used in various ways and in large quantities in a "friable" (easily crumbled) form in schools for nearly four decades. If children are, as some experts theorize, more susceptible to asbestos than adults and if it is appropriate to extrapolate from the experience of occupationally exposed groups to far lesser exposed groups like school children, then surely

we would have seen evidence of it by now. No such evidence exists!

(5) A number of both national and international scientific review panels have assessed the asbestos in schools situation. They have all concluded, unlike the EPA, that the danger is minimal, but that precautionary measures in extreme circumstances are warranted.

What is Asbestos?

Asbestos is a generic term used to identify a group of naturally occurring hydrated silicate minerals that can be separated into short, silky fibers. The two major families of asbestos are called "serpentine" and the "amphiboles" Chrysotile, the most widely used type of asbestos, is the sole member of the serpentine family. The amphiboles include amosite, crocidolite, tremolite, actinolite and anthophyllite. Among the amphiboles, only amosite and crocidolite have been used commercially in large quantities.

Asbestos is ubiquituous in our environment. While asbestos is mined commercially in only a few countries -- Canada, South Africa, Zimbabwe and the Soviet Union are the prime producers -- it is found is small quantities practically everywhere.

In the United States, chrysotile asbestos is found in commercially viable deposits in Vermont, Arizona and California. California, in fact, sits on vast beds of low grade asbestos, most of it, however, of no commercial value. Naturally occurring ambient levels of asbestos in California are probably the world's highest, in some rare cases actually exceeding the U.S. Occupational Safety and Health Administration's standard for occupational exposure to asbestos!

A number of American cities have extremely high levels of asbestos in their water supply -- up to a million fibers per liter -- essentially all of it coming from the natural erosion of asbestos-containing rocks by rain and stream water.

Most states contain rock formations containing small qualities of asbestos. Wherever these formations protrude above the earth's surface, wind and water erosion will release small though detectable amounts into the air and water.

Asbestos found in polar ice thousands of years old makes it quite clear that the mineral existed in our environment long before its commercial use became widespread. Man thus evolved into his present form in an environment containing asbestos in the air he breathed and the water he drank.

Commercial Uses of Asbestos

Through the centuries asbestos has been used in many hundreds of applications. Because it is a mineral, it is incombustible, which makes it an excellent thermal and electrical insulator. Curiously enough, the word "asbestos" comes from the Greek word for "unquenchable," because the ancient Greeks used it for lamp wicks that never burned out.

Asbestos also has high tensile strength and its fibrous form lends strength and cohesion to certain products, such as floor tile. Unlike other minerals, asbestos can be woven into yarn and used to make packings, insulating blankets and other similar industrial products.

Asbestos products can be generically separated into two broad categories: "locked-in" products in which the asbestos is firmly bound into the matrix of the product by cement or plastic resins; and "friable" products, such as sprayed-on fireproofing and accoustical insulation, which can be readily crumbled in the hand, particularly after aging or water damage.

Because of the potential for hazards to workmen applying the products and the possibility for fiber release after installation, friable asbestos products are no longer used in the United States.

Health Hazards of Asbestos

Of all the health hazards experienced by man, perhaps none has been more extensively studied than asbestos. Over the past few decades, literally thousands of scientific and technical papers on the subject have been produced. The vast majority of the epidemiological studies undertaken have been of heavily exposed occupational groups or of people living in the vicinity of asbestos mines or plants.

Based on these studies, asbestos causes, either by itself or in combination with other factors such as cigarette smoking, three diseases. They are: (1) asbestosis, a non-cancerous scarring of the lung similar to Black Lung caused by coal dust or byssinosis caused by cotton dust; (2) lung cancer; and (3) mesothelioma, an invariably fatal cancer of the lining of either the lung or abdominal cavities. Unlike lung cancer, mesothelioma is exceedingly rare, except in certain asbestos exposed populations. It is therefore extremely useful as an asbestos "tracker." While in 10-30 percent of mesothelioma cases no asbestos connection can be discovered, most researchers believe that when a case of mesothelioma is discovered, asbestos should be considered the causative agent unless there is evidence to the contrary.

Other diseases, such as gastrointestinal cancer, have been linked by some researchers with asbestos exposure. The evidence on these other diseases is far less definitive than for the three discussed above.

Health Hazards to the General Public

Based on the available scientific evidence, mesothelioma is the only asbestos-related disease that has been definitely linked to non-occupational exposure to asbestos. In both the United States and in Great Britain, cases of mesothelioma have been found among the families of heavily exposed asbestos workers. Presumably, this was due to asbestos dust brought home from work on the employees' clothes. Approximately 60 such cases have been identified worldwide.

In addition, mesothelioma has been found among workers who lived in the vicinity of crocidolite asbestos mines in South Africa and 11 cases were found in the neighborhood of a United Kingdom plant that was a heavy user of crocidolite.

Since most of the exposures that resulted in these cases occurred 35-40 years ago, it is impossible at this point in time to determine how high they may have been; however, it is likely that they were extremely high in comparison with any known current ambient level.

Chrysotile asbestos -- which has acccounted over the years for more than 95 percent of the U.S. asbestos consumption -- is less hazardous, particularly with regard to the development of mesothelioma, than the amphobile varieties. Most countries -- the U.S. being the major exception -- have more stringent occupational exposure standards for amosite and crocidolite (the two major amphobiles) than for chrysotile asbestos.

Asbestosis occurs only in workers with extremely high exposures over relatively long periods of time. It has not been found among people with "household" or other "semi-occupational" exposures and is thus not of concern in assessing the risk of asbestos in schools or buildings.

The threat of lung cancer to the general public from ambient asbestos exposure is the most difficult to access. Because, in the United States, lung cancer accounts for approximately 5 percent of all deaths, any small increase in this percentage due to asbestos exposure would be essentially impossible to detect even with today's sophisticated statistical methodologies.

A number of studies have, however, attempted to access the lung cancer risk for people living in the vicinity of asbestos mines, mills and plants. For women living in two mining/milling towns in Canada (combined population: 30,000), there was no excess lung cancer mortality from

their very heavy non-occupational exposure to chrysotile asbestos. In addition, no excess deaths due to lung cancer were found among men living in the vicinity of an amosite asbestos factory in New Jersey.

While hardly definitive, these results are reassuring in that they indicate that if there is any lung cancer risk from non-occupational exposure to asbestos, it is very small indeed.

The Extent of the Asbestos Health Hazard

The degree of hazard presented by exposure to asbestos is dependent upon many factors, including type of occupation, length of exposure, how much asbestos an individual is exposed to, type of asbestos, the size of the fiber, and other complicating factors.

In general, the scientific evidence, based primarily upon studies of occupationally exposed groups, indicates the following general conclusions:

- Workers who install or rip-out asbestos-containing insulations have experienced the greatest mortality of any occupational group.
- Workers in most other asbestos-using industries, such as those involved in asbestos-cement production or in the manufacture of brake linings and other friction materials, have experienced little or no excess mortality from their exposure.

- Workers employed in the mining and milling of asbestos -- particularly chrysotile asbestos -- also have an extremely low mortality rate.
- The longer an individual is exposed to asbestos, the more likely he or she is to be affected. Most cases, however, do not occur until at least 20 years after the beginning of exposure.
- Asbestos-related disease is very heavily dose related, i.e., the more an individual is exposed to over a lifetime, the greater the chance of disease. In some cases, it would appear that a heavy dose over a relatively short period of time is more dangerous than lower doses spread out over many years.
- Without question, mesothelioma -- the only asbestos-related disease known to occur outside occupational settings -- is more directly related to crocidolite than to chrysotile exposure. Amosite falls somewhere in between in its ability to cause mesothelioma.
- Fiber size affects mortality. Long fibers are apparently less hazardous than short ones, which are more respirable. On the other hand, extremely short fibers -- of the size most commonly found in the ambient air and in schools -- pose few

problems because they are effectively disposed of by the body's natural defense mechanisms.

- Cigarette smoking greatly increases the risk of lung cancer among asbestos exposed workers. While the question is not completely settled, asbestos exposure may present little or no excess lung cancer risk to workers who do not smoke. The same does not apply with regard to the development of either asbestosis or mesothelioma.

All of the above factors are important in assessing the risk posed by the presence of friable asbestos products in U.S. schools and buildings.

EPA Risk Assessment

In 1980 the EPA, as justification for its asbestos in schools program, developed a draft health effects support document that predicted alarmingly high numbers of deaths from cancer among children, teachers and maintenance personnel in schools with friable asbestos. The EPA estimated that between 125 and 7,000 -- with the most likely number being about 1,000 -- premature deaths would occur over their lifetime among the approximately 3,000,000 students, 222,000 teachers and 23,000 custodians exposed in schools with friable asbestos. Approximately 90 percent of

the deaths would be among people who were exposed as children. Most deaths would occur after age 60.

Recent docments released by EPA estimate that the number of children in schools with friable asbestos may be as high as 15,000,000. Since the number of exposed people is therefore rather unclear, it is perhaps more useful to examine the EPA risk estimates in terms of "risk rate per million" for exposed children.

The EPA estimates can be demonstrated in the following chart:

TABLE I

Exposure	Projected Excess Mortality	Risk Rate Per Million
"Low" (.0017 fibers/cc of air)	111	37.8
"Medium" (.0081 fibers/cc of air)	960	327.2
"High" (.016 fibers/cc of air)	5,866	1,999.3

These estimates are based on the assumption that children would be exposed to the above levels 36 weeks a year, six hours a day, five days a week, for 15 years. The number of years of exposure is based on the assumption that throughout his or her schooling, including nursery school

and kindergarten, a child would be in a school with friable asbestos. This is most likely an overestimation, and a figure of ten years or less is probably more realistic.

How do these EPA figures compare with estimates of the risk of low level asbestos exposure compiled by other authorities and institutions?

One way of looking at the various estimates is to compare the cumulative exposure with the assumed risk of excess mortality per million of population. Since asbestos is thought to cause disease in a "linear non-threshold dose-response" fashion (a cumulative exposure of 1,000 persons to 10 fibers/CC would result in the same number of deaths as a cumulative exposure of 10,000 persons to 1 fiber/cc), it is reasonable to use this sort of approach.

Scientists often express cumulative asbestos exposure in fiber-years; one fiber-year of exposure can be caused, for example, by one year of exposure at 1 fiber/cc or 10 years exposure at 0.1 fiber/cc.

Ambient air and school exposures are extremely low in comparison with occupational exposures (the highest cumulative lifetime exposure in the table below amounts to 0.25 fiber-years, while unregulated workplace exposures have been estimated at 600-900 fiber-years or more of cumulative exposure). For this reason, the table uses the concept of fiber-hours instead of years.

Since most of the studies represented below are not directly comparable in terms of exposure levels, the last column represents an attempt to clarify this by calculating the predicted excess mortality per fiber-hour of cumulative exposure.

What this table demonstrates is that, with the exception of EPA, all other expert groups that have examined the subject have predicted consistently low risk rates from ambient or school exposure to asbestos.

The Ontario Royal Commission/National Research Council compilation is included because it combines the two most reasonable estimates of (1) school exposure (.001 fibers/cc) and (2) predicted excess mortality from cancer per fiber hour of exposure.

Applying the UK Advisory Committee risk estimates to the Ontario Commission school exposure level would have resulted in considerably lower mortality estimates (.02 to 0.17 excess lung cancer deaths per million). The Ontario report alone, extrapolated to school children, would result in slightly higher estimates (2.49 excess deaths per million).

When one considers that approximately 200,000 of every million Americans will eventually die of cancer, the above data show that breathing 0.001 fiber/cc of asbestos during

TABLE II

Projected Excess Cancer Mortality

		Fibers/CC	Lifetime Fiber-Hours	Excess Mortality Per Million	Excess Mortality Per Fiber/Hour
National Research Council (NRC) (73 years)		.0004	255.0	36.13	.141
NRC (50 years)		.0004	175.0	36.13	.206
Ontario Royal Commission (10 years)		.0010	87.4	20.00	.223
Ontario/NRC (10 school yrs.)		.0010	10.8	2.23	.206
UK Advisory Committee (50 years)	(a)	.0050	2,190.0	25.00	.011
	(b)	.0050	2,190.0	50.00	.022
	(c)	.0050	2,190.0	169.00	.077
	(d)	.0050	2,190.0	68.00	.031
EPA: (15 school yrs) "Low"		.0017	27.5	37.80	1.370
"Most Reasonable"		.0081	131.2	327.20	2.490
"High"		.0160	259.2	1,999.30	7.710

NOTES: The number of years listed under each study indicates the years of assumed exposure at the fiber level given. All are "building" exposures with the exception of the NRC study, which combines both "building" and ambient exposures. The excess mortality for the four UK Advisory Committee studies are for lung cancer alone. Some mathematical extrapolations from data contained in the various studies were necessary to produce the above Table. The NRC (50 years) projection, for example, was developed on the assumption that, due to the 20-year latency period of most asbestos-related diseases, the last 20 years of a person's exposure would have little bearing on his or her mortality. This 50-year projection was used in developing the combined Ontario/NRC estimates. It thus constitutes a "worst case" estimate.

school hours for a period of ten years would increase that risk by approximately 1/90,000th or .001 percent. If lung cancer alone is considered, the excess risk is 1/23,000th or .004 percent.

It is no wonder, therefore, that most expert groups have concluded that the threat from asbestos in buildings is minimal at worst. For example, the UK Advisory Committee concluded:

> "Unless contaminated buildings are very much commoner than seems likely, no appreciable mortality from lung cancer can be associated with any degree of contamination by chrysotile (asbestos) likely to be encountered in the U.K. in the ambient air or in buildings not under active construction or repair."

The Ontario Royal Commission similarly said:

> "We deem the risk which asbestos poses to building occupants to be insignificant and therefore find that asbestos in building air will almost never pose a health hazard to building occupants."*

*It is interesting that the EPA has discounted the opinions of the Ontario Commission on the basis that Ontario is only seeking to protect its asbestos mining industry. The fact is that Ontario produces very little asbestos, the vast majority of Canadian production being centered in Quebec. The EPA's argument would be equivalent to claiming that the state of Alaska has discounted the health effects of aflatoxin in order to protect its peanut growing industry.

Evaluating the EPA Risk Assessment

Since the EPA assessment of potential risk to children in schools with "friable" asbestos is not supported by any other expert group, it is important to look at the assumptions underlying the EPA calculations.

To begin with, the EPA document was based on extrapolations from only three studies. The first -- the health effects study -- was that conducted by Selikoff et al on the mortality experience of U.S. insulation workers. As was mentioned earlier, the insulation workers have suffered the greatest amount of excess cancer due to asbestos exposure of any worker group studied. There were, according to the EPA analysis, 716 excess cancer deaths among 12,051 workers exposed for more than 20 years, or 59 deaths per thousand.

The second study, by Nicholson et al, was an estimate of the asbestos exposure of the insulation workers over their careers. Without going into the complicated mathematics involved, Nicholson concluded that the insulation workers were exposed to an average of 3 fibers/cc during the 1960s, but that exposures in the past may have averaged between 10 and 15 fibers/cc.

The third study was one of asbestos levels in buildings in France that had been insulated with sprayed asbestos.

Using these data, EPA calculated the amount of cumulative exposure for the insulation workers at three levels -- 3, 9 and 15 fibers/cc -- that it assumed accounted for their total cancer excess. These calculations were then applied to the estimated school exposure levels to produce the three estimates of excess cancer mortality reproduced in Table 1.

For example, an average exposure of 3 fibers/cc for the insulation workers produced the lowest cumulative exposure but the highest risk per fiber. Applying this number to the highest possible school exposure produced the estimate of 1,999.3 excess deaths per million of exposed children.

EPA's "most reasonable estimate" of 960 excess deaths was therefore based on an average exposure to the insulation workers of 9 fibers/cc and a school exposure of .0081 fibers/cc.

What, then, is wrong with the EPA approach?

To begin with, there appears to be something particularly unusual about the health experience of the asbestos insulation workers. With the possible exception of workers in certain asbestos textile factories, no other asbestos exposed population has suffered the increase in mortality per exposure level suffered by the insulation workers.

However, attempts to extrapolate their experience to other asbestos-exposed working populations have fallen on rocky ground.

For example, in 1978, then Secretary of the U.S. Department of Health Education and Labor Joseph A. Califano, released a National Institutes of Health report indicating -- based exclusively on the insulation workers study -- that asbestos exposure was responsible for 13,900 excess cancer deaths a year; 10,400 from lung cancer and another 3,500 from mesothelioma. Selikoff himself has been quoted as predicting 10-20,000 excess deaths a year from asbestos exposure for "the next 40 years."

Do these extrapolations make any sense?

Not according to most experts.

Sir Richard Doll and Dr. Richard Peto of Oxford University, perhaps the world's two leading experts on occupationally induced cancer, said in reference to the HEW report that "these estimates of total risk were so grossly in error that no arguments based even loosely on them could be taken seriously."

Similar comments were expressed by the Director of the International Agency for Research on Cancer of the World Health Organization, and others.

According to an analysis done by the American Industrial Health Council, an industry group, if Selikoff's

insulation workers data were applicable to other asbestos-exposed working populations -- such as WWII shipyard workers -- at least 10,000 mesothelioma deaths should be occurring each year in the United States. The actual number is less than a thousand, a number far less than any estimate based on the insulation workers study.

Unfortunately, the Califano/HEW/NIH report -- which was never published in a scientific publication for peer review -- received enormous publicity and has subsequently become gospel among many public and private groups and was one of the influencing factors in launching the EPA asbestos in schools program.

Part of the explanation for the extremely high mortality of the asbestos insulation workers -- particularly from mesothelioma -- may be traced to the fact that large amounts of amosite asbestos were handled by the insulation workers, particularly during the war years. As was stated earlier, amosite seems to occupy a middle ground in toxicity among asbestos types, being less dangerous than crocidolite but more so than chrysotile. Based on numerous studies, chrysotile asbestos alone could not account for the extremely high mesothelioma rates of the asbestos insulation workers.

In contrast to the insulation workers' exposure, very little amosite asbestos -- except for some boiler room

applications -- was ever used in school accoustical or fireproofing products, the main sources of possible childhood exposure. Even more importantly, crocidolite asbestos, undeniably the primary cause of mesothelioma, has never been used in friable school products.

With regard to the insulation workers' exposure study, much criticism has been leveled at the Nicholson estimates. Many industry experts contend that average exposure levels were more in the range of 20-30 fibers/cc, particularly in the early years of the industry. Thus, the EPA's "most reasonable" estimate of average exposure may be understated by as much as 200 percent.

In addition, some experts believe that it is misleading, from a biological standpoint, to average out exposures over a workday in assessing cumulative exposure. For example, it may be more dangerous to inhale 100+ fibers/cc for an hour than to inhale 12.5 fibers/cc over an eight-hour day, because the body's natural defense mechanisms are less able to deal with the "peak" exposures and therefore more fibers are retained.

Since the asbestos insulation workers' days were typically ones of "peaks and valleys" in terms of exposure, the averages calculated by Nicholson may not reflect the true biological impact.

Of perhaps more significance is the fact that the EPA decided to consider only the first ten years of cumulative exposure in assessing the risk of the insulation workers. EPA theorized that since asbestos-related diseases do not begin to show up -- even in the most heavily exposed populations -- until 20 years after first exposure, all of the cancer deaths discovered in the Selikoff study could reasonably be attributed to their first decade of exposure.

Without going into the calculations involved, an insulation worker who began his employment in 1940, and who continued in that trade until his death from mesothelioma in 1977, would be credited in terms of the EPA formula with ten years of exposure instead of the 37 he actually experienced. This "wasted" exposure EPA considered a "safety factor" in assessing the risk to schoolchildren.

With regard to the use of the single French study by Sebastien in assessing schoolroom asbestos levels, the Ontario Royal Commission reported that "the EPA conclusions overestimated the average exposure of occupants of buildings containing sprayed asbestos insulation, in part because of a selective use of the highest levels report by Sebastien."

According to the Commission report, "of the 21 buildings studied by Sebastien, the EPA analyzed only eight, those with the highest airborne asbestos fibre levels...Nor

did it mention that in nine buildings containing sprayed asbestos insulation the maximum asbestos fiber concentration found by Sebastien was (.0002 fibers/cc) or less."

The Commission report concluded: "We find that this selective use of Sebastien's data in the EPA paper resulted in an overestimation of the average exposure of occupants of buildings containing sprayed asbestos insulation."

The Royal Commission estimated the actual averge level in buildings with friable asbestos at .001 fibers/cc, 40 percent lower than the "lowest" EPA estimate and 1/8th or 12 percent of the "most reasonable" EPA estimate.

Taken together, the above analyses of the EPA support document go a long way toward explaining why EPA predicted extremely high mortality rates for children in schools with friable asbestos products, and why they in no way reflect the thinking of other expert groups around the world.

The Susceptibility of Children

Some researchers have suggested that children may be more at risk than adults from asbestos exposure, particularly with regard to the development of mesothelioma. Others believe the matter is far from settled. Even the EPA health effects document reached no conclusion.

There is some reassurance in the fact that, while friable asbestos has been used in U.S. schools for approximately 40 years, there does not appear to be any increase in the incidence of mesothelioma among people not occupationally or "semi-occupationally" exposed to asbestos.

If children are more susceptible to asbestos than adults, we should be seeing some increase in mesothelioma among adults in their mid-40s. No such increase has been detected thus far.

This could also be due to the fact that while all three types of asbestos have been shown to cause mesothelioma, crocidolite and, to a lesser degree, amosite appear more toxic in this regard than chrylotile. Very little of either of the amphobiles was ever used in schools.

Removal Hazards

A number of groups, including the New Jersey Department of the Public Advocate and the Congressionally-chartered National Institute of Building Sciences, have warned that the improper or sloppy removal of asbestos-containing insulation in a school building may actually create a hazardous situation where none existed before.

According to a study by Donald J. Pinchin, in seven out of nine sprayed asbestos removal projects in which the

air was analyzed before, during and after removal, the levels in the building were higher after removal than they had been previously. Asbestos levels in the buildings, but outside the immediate work area, were also high during removal, in one case reaching 2.2 fibers/cc.

Of greater concern is the fact that the removal of sprayed asbestos insulation can create a major health hazard for the workers doing the removal, particularly if they are untrained. Pinchin reported worker exposure levels of between 3.8 and 6.1 fibers/cc, well above U.S. standards. In this study, the environmental control measures taken to reduce the exposure were excellent.

In testimony before the EPA, Dr. Robert N. Sawyer reported levels averaging 36 fibers/cc with a maximum of 117 fibers/cc for some types of dry removal operations. He concluded that "removal presents an unequivocable exposure risk to involved personnel. In contrast to the non-existent or negligible exposure of typical building occupants, removal operations disturb asbestos-bearing materials and will release significant numbers of fibers."

The Ontario Royal Commission stated: "the immediate effect of asbestos removal on airborne asbestos fibre levels in buildings is to leave them unchanged or to increase them... The benefit from removal, then, is not a reduction

in average fibre levels, which tend to be low to begin with."

On the other hand, there is sufficient evidence to indicate that removal operations performed by qualified personnel using sophisticated wet-technology methods will not create an unusual hazard for the workmen involved nor will they leave residual levels of asbestos in the building higher than those that originally existed.

Such qualified removal firms are unfortunately "few and far between."

Conclusion

Asbestos, a well-recognized health hazard, has been used in a friable form in schools for some four decades. Unquestionally, some exposure to school children has resulted from this use. While estimates vary, most expert groups that have reviewed the available evidence have concluded that the risk to children from exposure to asbestos in schools under normal conditions does not constitute an excessive risk when compared with risks encountered in everyday life.

The U.S. EPA undertook a well-intentioned effort to address the far more substantial risks associated with "peak" exposures, i.e., when the asbestos is damaged and