PART I

ASBESTOS AND HEALTH

Asbestos, used since antiquity, has widespread and important applications in our modern technological society. Approximately 3,000 different products containing asbestos are in daily use throughout the world. Its increased use in the 20th century has lent urgency to the need to cope with occupational health problems related to the excessive inhalation of asbestos dust.

Such problems are not unique to the asbestos industry. Many substances and materials in common use today can be detrimental to the health and safety of industrial workers under uncontrolled conditions. A vital and widely used raw material, asbestos is but one of a number of potentially harmful substances used by industry.

Basically, the known facts about asbestos-related disease can be summed up as follows:

First, asbestos-related health risks today are almost exclusively confined to the occupational setting.

Second, the effects of excessive inhalation of asbestos are both time and dose related. This means that asbestos-related diseases may develop, generally, only after the inhalation of substantial amounts of asbestos dust over a substantial period of time. Thus, there are levels of exposure that will not result in any increased risk of disease.

Third, there is presently no evidence of risk to the general public from exposure to the minute amounts of asbestos that have been found in community air.

Fourth, because of the long latent period of asbestos-related disease, the disease being found today among some long-term industry employees is not an indication of present day conditions, but is a result of conditions existing decades ago, at a time when neither the industry, government, or the medical profession knew very much about the health effects of asbestos and even less about the proper means for their control.

These facts are well recognized by the asbestos manufacturing industry, which has made substantial progress over the years in protecting those who work with asbestos and in eliminating emissions of free asbestos fiber into the community air.

Known and Suspected Occupational Risks

There are three primary diseases known to be caused or exacerbated by prolonged and heavy inhalation of asbestos fibers. They are asbestosis, bronchogenic (lung) cancer, and mesothelioma. Prolonged heavy exposure does not necessarily result in disease and death—but there is little question that risks are significantly increased.

Asbestosis

This is an occupational disease characterized by lung scarring, and is one of the lung diseases called pneumoconioses. It is the most common of the three asbestos related illnesses and is found only among those who have worked regularly and continuously with asbestos under inadequately controlled conditions. The average time span from first exposure to the first clinical signs of asbestosis is 17 years, although some cases have been reported in as few as ten years.

Asbestosis is neither malignant nor necessarily fatal. Many asbestos workers with minor cases can and do continue to work and lead normal lives without difficulties. The asbestos

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industry has long recognized the risk of this disease and has implemented safeguards to protect workers' health.

As far as can be determined, asbestosis never has been found in the general public, even among people living in close proximity to asbestos mines and processing plants.

Bronchogenic (Lung) Cancer

A number of medical studies have linked heavy asbestos exposure with an increased risk of lung cancer. While lung cancer occurs far less frequently among asbestos industry workers than asbestosis does, under some circumstances it occurs more frequently than in the general population.

As with asbestosis, the amount of fiber to which an employee is exposed is an important factor in lung cancer development. A continuing study of workers in a British asbestos textile plant has shown that dust control measures, which had substantially reduced the incidence of asbestosis, also reduced the incidence of lung cancer among the workers to that existing in the general public. In addition, it is the considered opinion of many scientists that lung cancer will not develop in an employee if he did not first have asbestosis.

Unquestionably, factors other than heavy asbestos exposure are important in the causation of lung cancer among asbestos industry workmen. The most documented example is cigarette smoking. Studies conducted of as many as 17,500 asbestos insulation workers show that those who smoke have a much greater risk of contracting lung cancer than non-smokers in the general public, but that those asbestos industry workmen who do not now smoke cigarettes and who have never smoked regularly, have no greater risk of lung cancer than the average man-in-the-street who does not smoke.

Mesothelioma

This disease is an extremely rare cancer of the lining of the chest (pleura) or the abdominal cavity (peritoneum). It is found more frequently among those with occupational asbestos exposure than among the general population. It also has been found among people who, in the past, lived in close proximity to uncontrolled crocidolite asbestos plants or mines, and even, on rare occasions, in the households of employees who worked in crocidolite asbestos factories or mines and who presumably brought substantial quantities of this particular type of asbestos fiber into their homes on their work clothes. This has not been found to be the case with individuals exposed only to chrysotile asbestos, which accounts for 97% of the asbestos fiber used in the U.S. today.

Since the latent period for mesothelioma ranges from 30 to 45 years, it is impossible at this late date to determine precisely the exposure levels experienced by these "neighborhood" and "household" cases. However, they were probably quite high by today's standards. In any case, as technology was developed for the control of asbestos dust levels, both in the plant and out, these potentially hazardous conditions were eliminated.

A relatively small number of cases have also been reported among employees in shipyards and on construction projects who, while not working directly with asbestos, were exposed to heavy concentrations of airborne fiber by working in close proximity to those who did. Exposures of this type have been reduced by strictly enforced industrial safety devices and procedures.

The search for answers to the mesothelioma problem is complicated by a number of factors. In the first place, the number of cases being found, even today, is still relatively small. In all of Canada, for example, only 165 cases were reported in the ten-year period ending in 1968. Secondly, it appears highly likely that certain varieties of asbestos (crocidolite and amosite) are more likely to cause mesothelioma than others. Thirdly, its diagnosis and recognition are still considered problems among medical experts. It is also certain that

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there are other causes of mesothelioma besides asbestos. Unfortunately, what those other causes might be is still unknown. Until these and other equally important factors are thoroughly investigated, the mesothelioma question will remain unresolved.

Other Tumors

Some researchers have reported higher-than-normal rates of gastrointestinal cancer among some heavily exposed industry groups. Other researchers have reported no increase of this type of cancer. The consensus of medical opinion is that the evidence is too scanty for a definitive conclusion.

Asbestos and the General Public

Medical reports of excess asbestos-related disease among occupationally exposed populations have been frequently cited by some writers, environmentalists, politicians and others as "proof" that the health of the general public is endangered by the minute amounts of asbestos dust being found in community air. "Neighborhood" and "household" cases of mesothelioma are cited extensively in this regard, as are the frequent reports of the findings of free asbestos fibers and so-called ferruginous bodies (which sometimes contain asbestos) in the lungs of some city dwellers at autopsy.

The truth is, however, that there is no evidence—either from experience or from scientific research—that anyone in the general public has ever contracted any asbestos-related disease from exposure to these minute amounts of airborne asbestos, which are many times lower than levels which have been demonstrated to result in no excess of disease in occupationally exposed populations.

This conclusion is supported by both the Asbestos Panel of the National Academy of Sciences' Committee on Biologic Effects of Atmospheric Pollutants, and the 33 member Advisory Committee on Asbestos Cancers of the International Agency for Research on Cancer, a division of the World Health Organization.

In its 1971 booklet, entitled "Asbestos: The Need For And Feasibility of Air Pollution Controls," the NAS Asbestos Panel, which consisted of seven of the nation's top experts on asbestos and health, stated that "there is no evidence that persons in the general population—without occupational, household or neighborhood exposures—have any increased risk of neoplasm, even though there may be ferruginous bodies or fibers in their lungs."

Warning against conclusions of the type frequently reached by the uninformed with regard to asbestos, the report further stated: "One cannot extrapolate from the mortality experience of, on the one hand, those who are directly and indirectly exposed to asbestos in their employment to, on the other hand, the general public, who have had moderate or slight exposures from ambient air."

The report concluded with the statement that "there is no evidence that the small numbers of fibers found in most members of the general population affect health or longevity."

The report of the IARC Advisory Committee represents the consensus of present world medical opinion on all aspects of the asbestos-health problem. Meeting immediately after the October 1972 Lyon Conference on the Biological Effects of Asbestos, the Committee, with representation from ten different countries, drafted the following opinions on asbestos-related disease and the general public:

Asbestosis: "There is at present no evidence of lung damage by asbestos to the general public. The amount of asbestos in the lungs of members of the general public is very small, compared to those occupationally exposed."

Lung Cancer: "The evidence . . . suggests that an excess lung carcinoma risk is not detectable when the occupational exposure has been low. These low occupa-

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tional exposures have almost certainly been much greater than that to the public from general air pollution."

Mesothelioma: "There is no evidence of a risk to the general public at present."

Because of some recent controversy in the United States and Canada on this subject, the question was also examined whether there is any "evidence of an increased risk of cancer resulting from asbestos fibers present in water, beverages, food or in the fluids used for the administration of drugs." The answer of the Committee was: "Such evidence as there is does not indicate any risk."

While the conclusions of these two eminent scientific bodies should be reassuring to those concerned with the presence of minute amounts of asbestos in the ambient air, the asbestos manufacturing industry in the United States will continue in its efforts to reduce asbestos emissions so that potentially hazardous levels will never be permitted to develop in the future.

Asbestos and Health Research

Extensive medical and technical research into the health effects of asbestos and the proper means for their control is being conducted in laboratories throughout the world. A significant percentage of this research is being sponsored, co-sponsored or cooperated in by the world asbestos industry. In fact, two of the largest non-governmental sources of funds for asbestos-health research are the Institute of Occupational and Environmental Health (IOEH) in Montreal, which is sponsored by the Quebec Asbestos Mining Association, and the Asbestosis Research Council, sponsored by the British asbestos manufacturing industry. The results of research sponsored by these two agencies and also by individual companies acting independently have contributed significantly to our knowledge of the biological effects of asbestos.

In addition, industry environmental control experts are constantly working to develop new or improved methods of handling asbestos and asbestos-containing products safely.

Much has been learned about asbestos and health in a very short time—especially when you consider that the greater part of all medical information about asbestos-related disease is less than a decade old. According to Dr. Premysl Pelnar of the Institute of Occupational and Environmental Health, approximately 90 per cent of all information and data now available is the result of medical studies undertaken during the past ten years.

Much more is still needed: In late 1972, The International Agency for Research on Cancer made recommendations for further research and indicated priorities for work of immediate and long-term value. Emphasis was placed on epidemiological and pathological studies, and high priorities were urged for certain projects.

These included:

1. Usefulness of early detection in the prevention of progressive fibrosis and asbestos cancers and in the identification of hazardous conditions;
2. Assessment of excess cancer risks following exposure to only one variety of asbestos;
3. Amount and type of asbestos in the lungs of mesothelioma cases;
4. Secular changes in incidence of pleural and peritoneal mesotheliomas nationally and internationally;
5. Possible association between past exposure to asbestos and cancer of sites other than lung, pleura and peritoneum;
6. Relationship between asbestosis and risk of carcinoma.

The asbestos manufacturing industry will continue to support and cooperate in research projects of this nature. The Asbestos Information Association, for example, is presently

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sponsoring a study at the Harvard School of Public Health on chest ausculation (breathing sounds) as an early detection device in the diagnosis of asbestos-related disease. While this needed additional information and data is being developed, the industry will take all steps necessary to assure a safe working environment for its employees and for applicators and fabricators of asbestos-containing products.

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PART II

WHAT ASBESTOS IS: HOW AND WHERE IT IS USED

"Asbestos" is derived from an ancient Greek work meaning "inextinguishable." In reality, mineral asbestos is non-flammable even at extremely high temperatures, it inhibits certain types of chemical reactions, and is extremely flexible and durable. All these qualities combine to make it especially suitable for a wide variety of demanding uses, particularly those that protect human life and property. Asbestos is unique because its primary function is to save lives.

What Asbestos Is

Asbestos is the generic name given to a group of hydrated silicate minerals that can be separated into relatively soft, silky fibers which have great tensile strength. Certain grades can be carded, spun and woven. Others can be pressed or laid to form paper.

Chrysotile, crocidolite (or blue fiber), and amosite are the three varieties of asbestos that are commercially significant today. Each differs from the others both physically and chemically (See Appendix A for chemical breakdowns).

Chrysotile is a flexible white magnesium silicate which can be attacked by acids. It differs from other asbestos minerals in that it has a positive rather than a negative electrical charge in water. Chrysotile now accounts for 97 percent of all asbestos used annually in the United States. This high percentage of use is due in part to industry awareness of medical studies that show amosite and crocidolite to be more potentially hazardous to health than chrysotile asbestos. Canada and the Soviet Union are the leading producers of chrysotile fiber, but small deposits are also found in the United States, Italy, South Africa, Rhodesia and China.

Crocidolite, characterized by a deep blue color, is a ferrous sodium silicate that is acid resistant but less flexible than chrysotile. The bulk of the world's supply comes from South Africa. Crocidolite was a strategic material during World War II, when it was used as the filtering element in gas mask cannisters. It can be spun or woven into materials and fabrics used in acid-resistant packings and flame-resistant clothing.

Amosite, which is mined commercially only in the Transvaal district of South Africa, is a brown ferrous magnesium silicate that occurs in the same type of iron-rich sedimentary rock as does crocidolite. It is brittle and not as acid resistant as crocidolite. Amosite is used principally in the manufacture of heat insulating materials.

Properties and Advantages

It is estimated that as many as 3000 different products in daily use throughout the world contain some asbestos. While in certain products the percentage of asbestos may be small, the unique properties of asbestos usually are responsible for the functioning of the product in a demanding application.

The heat-resistant properties and fibrous structure of asbestos make it extremely desirable as a fireproofing and insulating material, an application which already has saved countless lives and prevented billions of dollars of property damage. Typically, asbestos is used wherever fire and excessive heat are a threat to safety.

The wide range of applications for asbestos indicates the incredible demands which any material would have to satisfy. At this time, there is no one material (available at a reasonable price) which can outperform asbestos in all these applications, especially where high temperatures are critical.

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Companies now are looking at fibrous glass, plastics, ceramics, and various synthetic materials as possible replacements for asbestos in certain applications. However, there generally is no one adequate substitute material available since increased costs, poor performance and weight often make their replacement for asbestos unattractive.

The general feeling in industry continues that asbestos fiber can be used safely and effectively, if efficient dust control methods and organized programs of preventive plant maintenance are implemented according to the standards set by the EPA and OSHA (U.S. Department of Labor).

How Asbestos Is Used

Asbestos fibers can be classified into two types: spinning and non-spinning. Spinning fibers comprise the longer grades of chrysotile and crocidolite; non-spinning fibers include the shorter grades of chrysotile and crocidolite, plus the long and short grades of amosite. Use of a specific grade of fiber depends greatly upon application, and to a lesser extent on price and availability.

Longer-grade chrysotile fibers can be carded, spun and woven to make textile products such as rovings, yarn, tape and cloth. Asbestos textiles are used to make fireproof clothing, packings, friction materials, gaskets, lagging cloth, and laps that provide electrical and thermal insulation. Spinning-grade asbestos fibers also are used in such non-spinning applications as compressed sheet packings and gaskets. They also are an ingredient of strong asbestos paper used in tape form to wrap electrical wires and cable.

The shorter-grade (non-spinning) chrysotile fibers make up the great majority of chrysotile used in the U.S. These fibers go into numerous asbestos-cement products, including pipe, roofing shingles, flat and corrugated siding, millboard, cements and fillers, and insulation paper. Short chrysotile fibers are used extensively in brake linings and automatic transmission friction materials.

More than 90 percent of the asbestos fiber used annually in the United States is incorporated into finished products where the fiber is entrapped, or locked in, and not free to serve as a possible contaminant in the atmosphere. Asbestos can be locked into a product with a binder, saturant, coating or bonding agent so that normal handling, application and use will not generate significant quantities of asbestos dust. Asbestos-cement products are examples of "locked-in" materials whereas many insulating materials and spray-on fireproofing compounds are so-called "non-locked-in" materials.

Where Asbestos Is Used

The total annual world production of asbestos is approximately four million tons. Canadian production accounts for about 30 percent of the total; production in the United States accounts for about 3 percent.

Use of asbestos fiber in the United States increased after World War II. By 1950, the use of asbestos reached a plateau, and during the last 20 years usage in the U.S. has remained fairly constant. Asbestos consumed in the United States in 1972 amounted to slightly over 800,000 tons (See Appendix B for 1971 breakdown, the last year for which detailed figures are available) and was valued at $85 to $90 million. Gross sales of finished products containing asbestos in 1971 amounted to nearly $1 billion (See Appendix C for sales breakdown). Their products were manufactured in over 400 different facilities, large and small, that employ approximately 30,000 people with a total payroll of $300 million.

Products Containing Asbestos

Asbestos is used in over 3000 different products throughout the world either because it inhibits combustion, because it is acid-resistant, or because the great tensile strength and

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light weight of asbestos fibers enhances their use as a filler or binder in a wide range of products.

Fire prevention and retardation is a feature of asbestos-containing products like protective (safety) clothing, thermal, electrical and acoustical insulating materials, roof shingles, siding and flooring, space-vehicle heat shields, theatre curtains, boiler jackets, welding screens and blankets, gaskets for spark plugs, motor casings and insulating tapes for wire and cable.

Fireproofing plus protection against abrasive wear and tear (including the caustic action of acids) are qualities of asbestos which combine to make it useful in products like vinyl and asphalt floor tile, asbestos-cement pipe, asphalt paving, friction materials, packings and gaskets, asbestos-cement building materials, paper, felts and many textile products.

The adhesive and binding properties of asbestos fibers make asbestos a useful ingredient in products like reinforced plastics, paints, varnishes, roofing cements, wicks, rope, twine, protective coatings and felts used in paper manufacturing.

The spinning and weaving capability of asbestos fibers is basic to the asbestos textile industry. Asbestos fibers also are used in filters which collect dust and other air pollutants, and in filtration systems used in the processing of beverages, liquids and drugs.

It should be remembered that in approximately 90 percent of these products, the asbestos fibers are solidly locked into the product so there is no danger of dust generation during normal use and handling of the product.

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APPENDIX A

There are six common varieties of asbestos—actinolite, amosite, anthophyllite, chrysotile, crocidolite and tremolite. Chrysotile, which accounts for more than 97 percent of the asbestos used in this country, is a member of the Serpentine group of minerals that consist essentially of a hydrous magnesium silicate compound. The five other varieties—none of which has the commercial significance that chrysotile has—are members of the Amphibole group of minerals. They have like crystalline structures and generally consist of three or four ions—magnesium, sodium, iron and silicon.

These six major types of asbestos minerals are distinguished chemically as follows:

Chrysotile	$3MgO\ 2SiO_2\ 2H_2O$
Actinolite	$(Ca.Mg.Fe)_6\ Si_8O_{22}(OH)_2$
Amosite	$1.5MgO\ 5.5FeO\ 8SiO_2\ H_2O$
Anthophyllite	$7MgO\ 8SiO_2\ H_2O$
Crocidolite	$Na_2O\ Fe_2O_3\ 3FeO\ 8SiO_2\ H_2O$
Tremolite	$2CaO\ 5MgO\ 8SiO_2\ H_2O$

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APPENDIX B

Following is a listing of product lines containing asbestos and the tonnage shipped for each in the United States in 1971:

Product Lines		Tonnage
Vinyl-Asbestos Floor Tile		145,000 tons
Asbestos-Cement Pipe		140,000
Felt and Paper		110,000
Friction Materials		80,000
Asbestos-Cement Building Materials		50,000
Packing Materials		25,000
Textiles		22,000
Asbestos Insulation		16,000
Spray-on Asbestos Materials		15,000
All Other Asbestos Products		147,000
	TOTAL	750,000 tons

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APPENDIX C

Following is a listing of product lines containing asbestos and a breakdown in sales in the United States for 1971:

Product Line	Sales in Millions of Dollars
Vinyl-Asbestos Floor Tile	$190.3
Asbestos-Cement Pipe	147.1
Brake Linings	135.3
Packings and Gaskets	99.5
Asbestos Paper	75.0
Asbestos-Cement Building Materials	70.4
Other Friction Materials	43.8
Asbestos Insulations	40.9
Textiles	38.2
Asbestos Felts	35.2
Asbestos Reinforced Plastics	12.1
All Other Asbestos Products	104.8
TOTAL	$992.6

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PART III

PROTECTING THE ASBESTOS WORKER

The asbestos industry has invested millions of dollars in equipment and techniques to prevent the inhalation of asbestos dust by workers involved in the mining and milling of asbestos and in the manufacture of asbestos-containing products. Many more millions are earmarked today for continued improvement in the years to come.

Establishing Safe Dust Levels

When asbestos is mined, milled or processed in manufacturing plants, its minute dry fibers become airborne like dust particles. Long exposure to heavy concentrations of asbestos dust has been linked directly to an increased incidence of such diseases as pulmonary fibrosis (asbestosis), bronchogenic carcinoma (lung cancer) and mesothelioma among long time workers in the asbestos industry.

The first epidemiological study of the effects of asbestos dust on workers was reported in 1930.[1] From that time on, it was generally recognized in industry that asbestosis serious enough to interfere with respiratory or cardiovascular functions could be prevented by reducing dust levels to a specified threshold limit value (TLV).

The American Conference of Governmental Industrial Hygienists (ACGIH) set the industry's first standard in 1938 by establishing a threshold limit value of five million particles per cubic foot. Independent research supported by the Johns-Manville Corporation concluded at about the same time that a TLV of one million fibers, 10 microns or longer, per cubic foot would be an adequate level for safe occupational exposure.

In 1968, the ACGIH established a new standard with a TLV of 12 asbestos fibers, five microns or longer, per cubic centimeter, and this was later modified in 1970 by reducing the time-weighted average to five fibers per cubic centimeter with a maximum of 10 fibers per cubic centimeter at any one time.

This standard was adopted as a temporary measure in 1972 by the Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor, and is the present accepted level. However, on July 1, 1976 a new standard is scheduled to go into effect that will reduce the TLV to only two asbestos fibers, five microns or longer, per cubic centimeter on a time-weighted average.

Protecting the Worker

While there are many differences of opinion within the medical profession concerning the problem of asbestos and health, it is universally accepted that levels of asbestos dust in the workplace must be kept to a minimum.

Industry has attacked the problem in a number of ways. Typical methods implemented to control dust levels include sophisticated dust collection systems (which combine high-power exhaust fans, duct networks and high-efficiency filters); special methods of waste disposal; use of protective clothing and portable dust respirators; and innovative wetting and dampening methods which minimize dust generated during production.

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1. E. R. A. Merewether, "The Occurrence of Pulmonary Fibrosis and other Pulmonary Affections in Asbestos Workers," *Journal of Industrial Hygiene,* 1930.

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The asbestos industry has developed a completely automatic fiber bag opening station that will permit workers to open the bags, remove the fiber, dispose of the bags and enter fiber into the manufacturing process without creating dust. In general, greater use of automation is being sought throughout the asbestos industry to reduce dust levels and to minimize exposure of employees to airborne asbestos fiber.

Basically, the requirements of an effective dust control program are twofold: (1) Design fabrication processes and production equipment so as to minimize dust generation as much as possible; and (2) Implement highly organized programs of industrial maintenance (including hygiene surveys) to insure that safe levels are maintained. Periodic monitoring of dust concentrations should reveal dust levels which exceed the threshold limit value (TLV).

It is obvious that good preventive maintenance must go hand in hand with effective dust control measures if the standards recently announced by OSHA are to be achieved.

OSHA Regulations

On June 7, 1972, the Occupational Safety and Health Administration established by the Williams-Steiger Occupational Safety and Health Act of 1970 issued standards regulating asbestos dust exposures. These occupational standards deal with (1) permissible concentrations of asbestos fibers, (2) methods of compliance, (3) warning signs and labeling of potentially dangerous products, (4) monitoring of dust levels, (5) medical examinations for employees, and (6) recordkeeping by employers. These standards have one basic purpose—to protect employees from exposure to potentially hazardous amounts of asbestos dust in their workplace.

The major obligations placed on employers, and industry in general, by the new standards can be summed up as follows:

A. The employer shall maintain a healthy workplace, making sure that no employee is exposed to concentrations of airborne asbestos fiber in excess of established limits.

B. Where the exposure limits are exceeded, the employee shall be notified in writing of the situation by his employer and shall be informed of corrective measures being undertaken to reduce his exposure to a safe level.

C. Engineering controls and the implementation of safe work practices are the only approved permanent methods of correction.

D. While corrective measures are being instituted, the employee shall be protected by other means, such as the wearing of an approved respirator provided by his employer, or by job rotation.

E. The use of respirators or shift rotation to achieve control is not permitted except (1) during the time required to install engineering controls or implement safe work practices, or (2) in situations where such controls or practices are not technically feasible, or (3) in emergencies.

F. No employee shall be assigned to a task requiring the use of a respirator if his most recent yearly medical examination indicates that he would be unable to function properly while wearing one, or if the wearing of a respirator would endanger the employee's health or safety, or that of another workman on the job.

G. Special protective clothing, change rooms, and separate clothes lockers shall be provided for employees in certain situations.

H. The personal and environmental monitoring of a workplace shall be conducted by the employer to assure that the standards are being met. Employees shall have access to the results of the monitoring of their jobs.

I. Warning signs shall be posted at entrances to areas where dust levels are in excess of the standard.

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J. Caution labels shall be placed on any finished asbestos-containing products that are likely to release free asbestos fiber in excess of the standard during handling, application, or fabrication.

K. The employer shall provide yearly medical examinations for employees exposed to concentrations of asbestos dust. Pre-employment and termination medical exams also are required.

L. Upon request, an employee's medical records will be made available to his family physician.

Other requirements included in the standard require that: (1) where respirators are permitted, they must be selected from among types approved by the U.S. Bureau of Mines or the National Institute for Occupational Safety and Health (NIOSH); (2) no asbestos cement, mortar, coating, grout, plaster or similar material containing asbestos can be removed from shipping bags or their containers without being either wetted, enclosed or ventilated; (3) insofar as practicable, asbestos must be handled, mixed, applied, removed, cut, scored, or otherwise worked in a wet state to reduce fiber emissions unless this would diminish the usefulness of the product; (4) hand tools that may produce or release asbestos fibers in excess of the limits must be provided with local exhaust ventilation systems; (5) external work surfaces must be kept free of excessive accumulations of asbestos fiber; (6) waste must be collected in sealed impermeable bags or other closed, impermeable containers.

The Asbestos Industry's Commitment

The asbestos industry is firmly committed to the protection of its employees from health problems related to asbestos dust.

This commitment is evidenced by three major factors:

(1) *Past and Present Research.* The industry has spent millions of dollars to improve mining, milling and manufacturing methods during the past 30 years. Accompanying these advances have been increasingly safer working conditions in mines, factories and at job locations. This work continues unabated. The asbestos industry is working openly and enthusiastically with the Federal government, and with independent medical researchers.

(2) *Cooperation in Setting Work-Safety Standards.* The asbestos industry has participated without reserve on government committees, investigative panels and at public hearings to review and improve work-safety regulations and asbestos control standards.

(3) *Implementation of Controls.* In the past decade, the industry has spent some $110 million to implement work-safety controls in its mines and plants. At least another $95 million will be spent during the next three or four years to upgrade facilities to meet the standards set by OSHA. Through its organizations—principally the ASBESTOS INFORMATION ASSOCIATION/NORTH AMERICA—the industry shares information on new control technology with its own members, its customers, and small producers and users not associated with its industry groups.

The asbestos industry also is striving for better communication between all concerned parties—workers and their unions, government agencies, basic producers and end users. The ultimate goals are the reduction of dust to a minimum level, the protection of all workers from asbestos-related diseases, and protecting the general public from future exposures to levels of asbestos dust that could be potentially hazardous to health.

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PART IV

ASBESTOS AND THE GENERAL PUBLIC
QUESTIONS & ANSWERS

Much has been printed and said about asbestos and health, much of it inaccurate, misleading or completely false.

Some of the more prevalent of these fallacies are discussed in a question and answer format in the following pages.

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QUESTION

Is asbestos a major air and water pollutant in our society?

ANSWER

Asbestos exists naturally in small though detectable amounts in serpentine rock formations throughout the world and is constantly being released into the atmosphere through erosion by wind and water. Asbestos is thus natural to our environment, and—as analysis of dated ice from the polar caps has revealed—has been for thousands or even millions of years.

Man therefore probably evolved into his present form in an atmosphere containing a natural background level of asbestos—both in the air he breathed and in the water he drank. While precise comparisons are impossible, today's atmospheric levels of asbestos, even in urban settings, are still only marginally higher than in the distant past and are many thousands of times lower than any levels known to result in disease in occupational settings.

There is no indication that levels of asbestos in community air and water have been increased significantly by modern uses of asbestos. The only exceptions that have been found were in the past in environments close to manufacturing and mining facilities, and in applications where simple controls were not implemented—such as unrestricted spraying of asbestos fireproofing in construction. These emissions are currently under control, in accordance with federal, state and local standards that are designed to help keep asbestos in ambient air everywhere at levels that are not injurious to health.

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QUESTION

Do asbestos-containing brake linings used on trucks, buses and automobiles release harmful amounts of asbestos dust into community air?

ANSWER

Brake linings used in transportation vehicles contain up to 55 percent asbestos fiber, but this fiber is locked into the linings with various resins and polymers. When brakes are applied, enormous amounts of heat are generated, which changes the chemical nature of the asbestos in the lining, thus producing a non-fibrous, non-toxic material called fosterite. Studies conducted in the United States and Great Britain have shown that brake lining dust contains only traces (one to three percent) of free asbestos fiber.

In fact, the total amount of free fiber released by brake lining wear throughout the United States in an entire year is less than 20% of the total emissions of particulate matter in a city the size of Los Angeles in a single day!

In addition, tests conducted in New York City at specially selected locations where traffic is heavy and braking frequent have shown that asbestos dust levels are only marginally higher than normal background levels, and many thousands of times lower than levels which could be considered potentially hazardous.

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QUESTION

Is asbestos used in the manufacture of clothing worn by the general public?

ANSWER

In 1971, a clothing manufacturer imported cloth from Italy that contained 8 percent asbestos fiber. It was used to make 200,000 women's overcoats. An emotional outcry resulted, but Food & Drug Administration tests showed that the amount of asbestos dust which could be generated from such a coat, even under extreme conditions, would not pose a health hazard to the wearer of the coat.

The FDA, nevertheless, decided to ban the manufacture of such "general use" garments in the future because they felt it constituted an "inappropriate use of asbestos fiber, one in which none of the special properties of the fiber that contribute to the welfare of the public are utilized." The Asbestos Information Association officially concurred in this decision.

Garments in which the special properties of asbestos are utilized, such as fireproof suits, barbecue mitts and aprons, etc., were not banned by the FDA because the asbestos fibers are "locked in" the garments by chemical agents or other means.

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QUESTION

Will there be an "epidemic" of asbestos-related mesothelioma in the future among people who worked in United States shipyards during World War II?

ANSWER

Despite the predictions of some doctors to the contrary, it appears highly unlikely that such an "epidemic" will occur. Predictions of this nature have been based primarily on the experience of workmen in British, not United States, shipyards, where a relatively small number of mesothelioma cases have been reported among yard employees not known to have worked directly with loosely-bound asbestos products in their jobs. There are several important factors, however, which do not make the British experience comparable with that in American shipyards. These are:

1. The prime method of applying asbestos-containing insulations aboard British warships was by spraying, a notoriously dusty method of application. Dust counts during spraying in British shipyards have been recorded as high as 1500 fibers per cubic centimeter of air (300 times higher than the current United States standard for asbestos exposure). Counts taken during the sweeping and bagging of asbestos debris have reached the astronomical figure of 3815 fibers per cc (more than 750 times the U.S. standard). This resulted in very high dust levels throughout the shipyard area.
2. Spray application methods were never used in United States shipyards during the Second World War. The alternative methods used in this country, while creating dusty conditions for the men doing the actual work, did not result in hazardous conditions throughout the yard, as was the case in Great Britain.
3. The type of asbestos fiber most used in British shipyards for insulation purposes was crocidolite, the variety of fiber most medical experts agree is the most likely to cause mesothelioma. Crocidolite was not used in U.S. shipyard work.
4. The actual number of shipyard mesothelioma cases reported in Great Britain, while of great concern, cannot be considered of "epidemic" proportions. In the Scottish yards, for example, 49 cases have been reported in the 18 year period ending in 1967.
5. Millions of men were employed in United States and British shipyards during the First World War and in the intervening years down to World War II. Asbestos insulations were used extensively during this period. The practices employed for the application of these insulations were similar, if not dustier, than those used in U.S. yards during World War II, yet no "epidemic" of mesothelioma occured as a result of these exposures. If thousands of cases had developed, this disease would certainly have come to the attention of asbestos-health experts much earlier than it did (in the early 1960s).

This is not to say that a few cases of mesothelioma will not develop among indirectly exposed United States shipyard workers. However, the printed medical and exposure data does not support the prediction that a hundred thousand or more will die as a result of their World War II exposures.

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QUESTION

Are cosmetic talcum powders, including baby powders, contaminated by excessive amounts of asbestos fibers?

ANSWER

A form of asbestos called tremolite can be found in nearly all talcum powder, since it is a naturally occurring contaminent in talc stone. In some industrial talcs not intended for human use, the percentage can be quite high. In cosmetic talcum powders, however, including baby powders, the percentage has been found to be very small. A 1972 study by the Office of Product Technology of the Food and Drug Administration showed that, of 40 cosmetic talcum powder samples tested, 39 contained one percent asbestos or less, while the 40th had to be retested for traces. This is far below the 15 to 25 percent figures quoted in some newspaper reports.

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QUESTION

Do asbestos-containing filter materials release asbestos fibers in potentially hazardous quantities into liquors, beers, wines, soft drinks and other liquids offered for sale to the public?

ANSWER

Asbestos-cellulose filter pads have been used in the filtration of liquids since the beginning of this century. These filter pads play an important role in clarifying and improving the taste of certain beverages, as well as removing potentially toxic substances from the finished product. The mass production of many of our more important injectable drugs would be virtually impossible without the use of asbestos-containing filter media.

While it is possible that very tiny amounts of electron microscope sized asbestos fibrils are released into some beverages from the use of asbestos-containing filter pads, there is no evidence whatever that the size and quantity of the fibrils released constitute any hazard to human health.

This same question was raised in Great Britain a few years ago with regard to fibrils of asbestos found in beer. The furor died when it was shown that the total amount of asbestos fiber found in British beer added up to only two one-thousandths of an ounce in the total United Kingdom beer production of over a thousand-million gallons a year.

In addition, a consensus report from a 1972 international meeting on asbestos-health sponsored by the World Health Organization found "no evidence of an increased risk of cancer resulting from asbestos fibers present in water, beverages, food or in the fluids used for the administration of drugs."

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QUESTION

Is the atmosphere being polluted by asbestos sprays used to fireproof the superstructure of buildings under construction?

ANSWER

The use of asbestos-containing, spray-on fireproofing compounds in high-rise building construction has been banned in the United States by the Federal Environmental Protection Agency (EPA) because the methods developed for the control of emissions of fiber from these sources proved to be ineffective.

Once this fact became established, the asbestos manufacturing industry concurred with the EPA that the use of spray fireproofing compounds should be prohibited.

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QUESTION

Are asbestos-containing modeling compounds still being used by school children in art classes in the United States?

ANSWER

From time to time, a newspaper will carry a report that children at a local school or YWCA are using asbestos as a modeling compound to construct puppets or to sculpt heads. This normally results in excited denunciations by local politicians and others, who demand that the practices be stopped. Simply speaking, the asbestos industry agrees with them—the practice should be stopped!

In November 1971, the Asbestos Information Association sent a caution letter on this subject to nearly 5,000 teachers associations, hobby and craft publications, state boards of education, boy and girl scout councils, YMCA's and YWCA's, etc. This letter said in part:

"It has come to our attention that on occasion the leaders of youth activity groups have used asbestos fiber as an inexpensive substitute for modeling clay and papier-mache.

"We feel strongly that this use of asbestos should be discontinued. Although the levels to which children may be exposed are probably very small and present no hazard to health, we do know that heavy exposure to asbestos in occupational settings can be a cause of illness.

"For this reason we feel that it is prudent that the use of asbestos for hobby purposes be eliminated."

As a result of this letter, appropriate steps were taken by many of the groups contacted to discontinue this particular use of asbestos. When the Association learns of instances where this practice has not been discontinued, appropriate letters of warning are sent to the parties involved.

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PART V

THE ASBESTOS INFORMATION ASSOCIATION/NORTH AMERICA

In recent years, new findings relating prolonged inhalation of asbestos fibers to various occupational health hazards have created understandable public and governmental concern. This concern, nurtured by lack of information on the true nature and extent of these hazards, has at times created an emotional and irrational attitude toward asbestos in all its forms and applications.

Members of most producer and user companies, which have for some time implemented worker-protection procedures, individually attempted to provide facts to the press, government and public about the nature and extent of asbestos health problems and efforts to correct them. However, the industry lacked a single, constantly available source able to provide authoritative information on asbestos-health in the United States and Canada.

This situation was changed with the formation of the ASBESTOS INFORMATION ASSOCIATION/NORTH AMERICA (AIA/NA) in December 1970. Its objectives are:

1. To provide industry-wide information on asbestos and health, and on industry efforts to eliminate existing hazards;
2. To cooperate with governmental agencies in developing and implementing industry-wide standards for worker protection and for the control of asbestos dust emissions into the community air;
3. To exchange information on methods and techniques of asbestos dust control;
4. To correct misleading and uninformed reportage on asbestos-health problems;
5. To publicize the unique benefits and importance of asbestos in protecting human life and property.

The AIA/NA is governed by a Board of Directors comprised of representatives from all member companies. Day-to-day activities are conducted by an Executive Committee, which consults with member company industrial hygienists and environmental control experts, legal counsel and medical consultants whenever necessary. The chief staff officer is the Executive Secretary, Matthew M. Swetonic, who functions from AIA/NA headquarters, 22 East 40th Street, New York, New York 10016.

In its first two years of existence, the AIA has—among its many activities—conducted a full day seminar on asbestos-health for industry officials; nominated industry environmental control specialists to sit on governmental advisory committees examining (1) occupational hazards of asbestos, and (2) ambient air emissions; testified at both Federal Environmental Protection Agency and Department of Labor hearings on asbestos; sponsored technical research into the reliability of the method currently being used to measure asbestos concentrations in the workplace; provided speakers for seminars on occupational health, and developed informational programs to keep the industry fully aware of all new developments, whether medical, governmental or technical, concerning asbestos-health.

The AIA/NA, since the promulgation of the OSHA occupational health standards on asbestos in mid-1972, has devoted much of its efforts to assisting the member companies and others within the industry with their compliance programs. A 5-booklet OSHA compliance manual developed and produced by the AIA/NA is scheduled for publication in early 1973.

The AIA/NA has also provided information on asbestos-health to the press, medical researchers, federal government officials and agencies such as the Food and Drug Adminis-

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tration, the Department of Labor, the Department of the Interior, the EPA, and also to officials at state and local government levels.

It has attended and participated in local, regional and international conferences on asbestos-health, and also maintains a close working relationship with other asbestos industry groups, including the Asbestos Textile Institute, Asbestos Cement Products Association, Friction Materials Standards Institute, the British Asbestos Information Committee and Asbestosis Research Council, and similar groups in France, the Benelux countries, and Scandinavia.

(See Appendix A for membership list.)

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APPENDIX A

AIA/NA MEMBERSHIP LIST

Amatex Corp.
Atlas Asbestos Company
Cassiar Asbestos Corp., Ltd.
Cement Asbestos Products Company (CAPCO)
Certain-teed Products Corp.
Congoleum Industries, Inc.
The Flintkote Company
GAF Corp.
Jim Walter Corp.
Johns-Manville Corp.
Kentile Floors, Inc.
National Association of Filter Material Manufacturers
National Gypsum Company
Nicolet Industries, Inc.
North American Asbestos Corp.
H. K. Porter Company, Thermoid Div.
Raybestos-Manhattan, Inc.
Supradur Manufacturing Corp.
Union Carbide Corp., Mining and Metals Division
Uvalde Rock Asphalt Company

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