DUP-2515
PLAINTIFF'S
EXHIBIT

not a scientifically determined level at which safety could be assured) was derived.[14] The failure to present the asbestos threshold limit value (TLV) as an attempt at risk reduction made many believe that there was no longer a need to keep track of disease incidence or exposure levels below the threshold limit values. In fact, there are people today who believe that as long as exposure is below the threshold limit value, injury will not occur.

Need for critical review

It was a failure to view the scientific literature in a critical manner, to understand the basis upon which certain judgments were made by others. Further, it was a failure to continually evaluate the scientific data as it became available, to reduce the risk. Thus, a critical review or a continuing analysis of the problem must be a part of the safety professional's approach to determine the presence of hazards, risks, and dangers, or else the opportunity to eliminate or prevent injury-causing events can be lost.

There are several types of asbestos: chrysotile, crocidolite (more properly known as riebeckite), anthophyllite, amosite (more properly known as cummingtonite-grunerite), tremolite, and actinolite. Some have attempted to rank each type in terms of its injury-producing potential;[15] to determine whether one type might be used with lesser or no danger. However, the medical reports seem to indicate that irrespective of the ranking of the types of asbestos, each type produces the disease entities now attributed to asbestos.

Certainly the techniques of limiting exposure level should be known to those who are responsible for the safety of people involved in work with asbestos: use of air supplied respirators, use of localized exhaust hoods to draw asbestos away from work areas, use of suction devices (instead of air hoses) by persons repairing brakes to clear away asbestos dust from the brake drum, wetting of asbestos when it is used, use of baghouses to collect asbestos dust from the ventilation system, use of automated systems that do not require human contact with the asbestos, packaging so that dry asbestos is mixed with water before it is removed from the package. Each technique is intended to prevent the generation of dust, inhalation, or human contact with asbestos.

The analysis includes production and use of asbestos products, reduction of risk for bystanders, neighbors and family, and consideration of risk at the disposal site. Thus, use of disposable clothing and garments as well as showers before going home, are means of reducing the risk to the family members. Disposing of asbestos products and the shower water in sealed containers in special dump sites is a means of controlling disposal to minimize future release into the atmosphere.

Bystanders, neighbors and families should be given the same protection as those working with the products. Finally, the protection must extend from the day the asbestos is mined to the day that it is disposed of.

Are warnings effective?

Some people have viewed the problem as one which can be adequately handled by the use of warnings. The basic problems attendant in selection of warnings are (1) they are not a means of preventing risk, but only of reducing it and (2) their effectiveness may be predetermined by a number of factors.

The questions that have to be asked in preparing a warning are (1) Will the warning reach each person who is likely to be injured? (2) Will the warning communicate the message it is intended to explain (that is, will the person receiving the warning understand it)? (3) Will the warning convey the exact hazard, the magnitude of the risk, the consequences of failure to heed the warning, the means to prevent injury, and alternatives that may be used which will not cause injury?

Warning labels which have been used in the past made statements like:

Asbestos, Dust Hazard, Avoid Breathing Dust

Asbestos Dust May Be Hazardous to Your Health

Certainly, the warnings which have been used on asbestos products did not reach bystanders or family members likely to be exposed, persons likely to be exposed at the dump site, nor those environmentally exposed. They did not communicate to persons who were illiterate or who did not read English. For these people, a pictorial or written warning in their native tongue was needed. The warnings did not communicate the diseases likely to occur, their latency, or the debilitating nature of the disease. Further, there does not appear to have been a clear explanation of alternatives or how to avoid the danger.

Often the person using the product relies upon common sense in interpreting warnings. Words such as "avoid creating dust" may be translated into "avoid creating dust that you can see." Moreover, it does not say how to avoid it. In fact, a Texas court determined that the warnings used by asbestos product manufacturers were inadequate as a matter of law.[16] The low level of reliability of warnings in preventing injury, even after meeting the criteria just outlined, makes them the less acceptable solution where alternatives exist.

In some countries, it has been determined that the risk of injury, for some uses, is unacceptable. For example, spraying of asbestos insulation in buildings, with its attendant risk to persons living in the area and the further risks created by decay of the insulation or by later building demolition, has been banned in some cities and countries. Others are beginning to call for the search for substitutes, the banning of asbestos outright where commercially feasible alternatives are readily available, and the placement of a moratorium on future asbestos use.

Asbestos cement pipe—A present day controversy

A safety analysis is not solely limited to events of the past; it is a means of preventing future illness and disease. For example, asbestos cement pipe (A/C pipe) is the center of a controversy. Many have asked the

DUP 0908900

DU 028759

question, whether the 1½ million miles of chrysotile-containing asbestos cement pipe in use in the world today, poses a significant risk.

For the present, the discussion will be confined to the likelihood of injury to persons drinking water from asbestos cement pipes. The actual, thorough analysis should extend not only to persons consuming the water, but persons involved in the manufacture of the pipe, persons living near the factory, persons who cut the pipe and thereby generate dust to which they and persons near them are exposed, those who remove the pipe, and those who are exposed to the asbestos from the pipe after it has been placed at a waste site.

The trade associations have indicated their belief that there is an "incredibly low probability of risk" and that "A/C pipe never will be a risk to the public."[17] Others have indicated their belief that only in areas where water is "aggressive" (that is, is highly acid) will there be a leaching of the asbestos from the water pipe in sufficient quantities to pose a threat to human health.

However, a recent study by Kanarek, Conforti & Jackson tested 39 pairs of water samples. The first 39 represented samples of water before the water had travelled through asbestos cement pipe. The second 39 samples were taken after the water had travelled through the asbestos cement pipe. It was found that the amount of asbestos in the water had increased 115 times after the water flowed through the asbestos cement pipes.

Contrary to some assertions that "aggressive water" is essential to the release of asbestos, the test was run in an area where the water was "nonaggressive." The authors suggested other factors might be determinative of whether asbestos is released from the asbestos cement pipe such as: size of pipe, rate of flow of water through the pipe, the quality of joint materials and whether corrosives were used to flush the pipes to clean them.[18] This was the first time anyone attempted to delineate asbestos released from the pipe. There are a number of prior studies which found asbestos in water from A/C pipe of an unspecified origin, such as those in Ottawa, Toronto, and Montreal.

Statistical studies or risk assessment has been done. In one study, it was stated that even if one ingested water that contained 6 million fibers per gallon over a 70-year life span, one would ingest only .3 g of asbestos.[19]

> . . . asbestos can travel . . . to other parts of the body.

Taking the same statistics, and assuming that one consumes 10 ounces of water each day in which the asbestos is evenly distributed, 119,765,620 fibers would travel through the gastrointestinal tract in a 70-year life span. However, whether the initial concentration is a valid estimate of what may be expected, or whether those fibers penetrate the gastrointestinal tract or do injury before or while they pass through the tract are questions which must be answered.

The concentrations Kanarek[18] found in the water he sampled were as high as 1,000,000 fibers per liter.

Additionally, if the particles are swallowed would they, in fact, have qualitatively greater results than the obvious possibility of cancer of the gastrointestinal tract? There is evidence that the asbestos fibers can travel through the gastrointestinal tract. A study by Masse, Sebastien, Monchaux & Bignon[20] involved placing a gelatin capsule containing asbestos in the stomach of some experimental rats. Within 2 to 24 hours, the asbestos was found in the abdominal lymph of the animals.

Others have done similar experiments and found the asbestos had migrated to the spleen, heart, lungs, brains, and even across the placenta.[21] This suggests that the asbestos can travel through the gastrointestinal tract to other parts of the body. Whether cancers or injuries to those parts of the body are likely to result has not been shown. But it would appear that the quality of the injuries, the nature of the risk, can be substantially greater than merely gastrointestinal injuries.

Further, there is not a large number of reported cases presently available of direct evidence of gastrointestinal cancer or other cancers from drinking water which has flowed through asbestos cement. The studies now published did not show a cause-effect relationship between fibers from asbestos cement pipe and various types of cancer. Rather, they have attempted to correlate A/C pipe useage or asbestos levels in tap water to various cancers.

The cancer registries available did not specifically identify asbestos as a cause, possibly because pathologists may not have realized that tests for asbestos should be performed, may not have been able to do so, or may not have reported the known cases. There may also have been an insufficient time elapsed for the level of deterioration of the pipe and latency period of the disease to have occurred.

It should be remembered that asbestos cement pipe has been in use in large quantities for a relatively short period of time when compared to the latency period of the diseases likely to occur. Thus, it seems that a potential hazard may be present, and there is neither exculpating nor inculpating direct evidence available. But, there is indirect evidence of injury from ingested asbestos.

Among the medical reports of injuries among asbestos workers is an increase in gastrointestinal cancer of 2 to 3 times that which might be ordinarily observed in the general population.[22] Some writers believed that this may be due to mucociliary action. That is, tiny fibrils located in the top of the respiratory tract catch and move asbestos particles back from the lungs. The fibers are then swallowed. Certainly, if this theory is correct, it could account for the increase in stomach cancer and could be an indicator of the risk of gastrointestinal cancer which would occur from asbestos in the potable water supply.

If consideration is given to the studies presently available, there is some evidence that cancer of the stomach, small intestine, pentoneum, retroperitoneum, abdomen, lung, and pancreas did increase in areas of Duluth, Minnesota and Quabec where asbestos cement pipe was in use. But it should also be noted the authors of the reports did not attribute the increase in cancer

DUP 0908901

to the asbestos cement pipe, since the determination of the exact location of the pipe could not be made.

Further, one might extrapolate from the cases of stomach cancer experienced by Japanese people who consumed rice that was treated with asbestiform talc.[35] The ingestion of an asbestiform mineral did result in a cancerous reaction.

Circumstantial risk

Quantification of the risk or frequency of diseases due to the ingestion of asbestos from asbestos cement pipe today, is at best, circumstantial. Bignon and Bader have suggested that attempts to quantify the diseases actually occurring as a result of asbestos ingestion be undertaken.[34]

There are other factors which further confound the analysis of the health risk which may be posed by asbestos cement pipe. That is, some ground waters may be located in areas where natural deposits of asbestiform minerals may be found. Further, there are some areas where pollution of water with asbestos has already occurred.

Some mining operations that extract nickel or magnetite from ores containing asbestos, may also discharge a slurry, which contains asbestos, in waterways. In some instances, open asbestos pits or dump sites for asbestos waste have been exposed to rainwater, and the asbestos follows the water into nearby watersheds. Thus, the fact that asbestos is present in the water supply may not be due entirely to asbestos cement pipe.

Any determination that the lack of specific quantification of risk must end the discussion, is a societal value judgment that statistical documentation is required before action can be undertaken. However, it should be remembered that in other areas of evaluation of asbestos toxicity, the evidence has been gathered or its toxicity was suspected since 1898.[36]

The early reports, the clinical and pathological studies, of the 1920's and 1930's were ignored.[3] Some epidemiological studies were misinterpreted. It took until the mid-1960's before there was a general acceptance of the dangers with asbestos insulation products.[36] The question is whether the risk is sufficiently quantified that a societal judgment can or should be made and what that decision should be.

> . . . it should be noted that asbestos is a dangerous mineral . . .

Alternatives

Alternatives to asbestos cement pipe include cast iron, ductile iron, steel, and plastics such as PVC or polystyrene. Or, a lining of plastic (such as urethane, polystyrene, etc.) or other materials might be used to reduce the likelihood of asbestos leaching from the asbestos cement pipe. However, it should be noted that there were studies which linked PVC to cancer, so that its selection as a substitute might not be appropriate since it may have a potential for similar or increased danger.

The alternatives in terms of risk reduction would be water treatment or filtration of the water to remove asbestos after it has flowed through asbestos cement pipe. However, the filtration medium would have to be very effective and could not utilize a filter of asbestos materials. And, the filtration system would have to be effective in removing all asbestos; would have to be monitored; and would have to be properly maintained.

In conclusion, it should be noted that asbestos is a dangerous mineral which should be evaluated, from the standpoint of the safety professional, to determine whether: (1) any uses are appropriate, (2) bans on all or some uses may be needed, (3) product substitution, controls, warnings should be utilized, or (4) inactivity is appropriate at the present time. However, the choice should be a conscious one, after a thorough review of information which is presently available to persons with the knowledge, skill and expertise to make this choice. It should not be the result of indifference, emotion, or a review of information now available, with the intention of protecting the status quo.

Mistakes were made in the past in failing to analyze the hazards, risks, and dangers of asbestos. As a result, needless injury occurred. But future injuries can be prevented by a thorough evaluation of the facts now available.

References

1. Peters, George A. "Systematic Safety," *National Safety News*, Vol. 117, pp. 83-90 (Sept. 1975).
   Philo, H. M., Robb, D. A. "Hazard and Risk Recognition," *LDR* (5th Edition), San Francisco, California U.S.A.: Bancroft-Whitney, pp. 1153-1159 (1975).
2. *Borker v. Lull Engineering Corporation* 20 C. 3d 413, 143 C.R. 225, 573 P. 2d 443 (1978).
3. Recommended reading for purposes of understanding and locating scientific and medical literature. Note, these volumes also reference the clinical and pathological studies of the 1920's and 1930's:
   Selikoff, I. J. & Lee, D. H. K. *Asbestos and Disease*, New York, N.Y., U.S.A.: Academic Press (1978).
   Peters, G. A. & Peters, B. J. *Sourcebook on Asbestos Diseases*, New York, N.Y. U.S.A.: Garland STPM Press (1980).
4. There were some reports of zeolites as a cause of mesothelioma, but subsequent studies showed the asbestos was the cause of the so-called "zeolite mesothelioma"
   Yesilogiu, S. "Pleural Calcification Associated With Exposure to Chrysotile Asbestos in Southeast Turkey," *Chest*, Vol. 70, pp. 43-47 (July 1976).
   Yesilogiu, S., Ilcayto, R., Baki, K., Sayli, B. S. & Yorulmez, B. "Pleural Calcification, Pleural Mesothelioma and Bronchial Cancers Caused by Tremolite Dust," *Chest* Vol. 38, pp. 564-569 (1980).
5. 24 to 36 year latency:
   McDonald, G. & McDonald, A. "Age and Latency in Mesothelioma," *Lancet*, Vol. 2, No. 8151, p. 1074 (Nov. 17, 1979).
   children:
   Resia, W. J., Russum, B. C. & Egan, W. J. "Mesothelioma of the Pleura of a Child," *American Journal of Diseases of Children*, Vol. 80, pp. 86-90 (July 1950).
   Wasserman, M. Wasserman, D., Steinitz, R., Katz, L., & Lemesch, C. "Mesothelioma in Children" (available in reprint form from authors at Israel Cancer Registry).
6. Musk, A. W. & Woodward, S. D.

DUP 0908902

DU 028761

Conventional Treatment and Its Effect on Survival of Malignant Pleural Mesothelioma in Western Australia," *Australian & New Zealand Journal of Medicine* (1982).

7 Bignon, J. & Bistra, M. "Amiantes et Manifestations Pathologiques de l'Appareil Respiratoire et d'Autres Organes," *La Vie Medicale*, Vol. 21, pp. 1927-1931 (Sept. 2, 1977).

8 environmental:
Sebastien, P., Billon, M. A., Dufour, G., Gaudichet, A. & Bonnaud, G. "Levels of Asbestos Air Pollution in Some Environmental Situations," *Annals of the New York Academy of Sciences*, Vol. 330, pp. 401-405 (1979).
familial:
Anderson, H., Lilis, R., Daum, S., Fischbein, A. & Selikoff, I. J. "Household Exposure to Asbestos and Risk of Subsequent Disease," in *Dusts and Disease*, Park Forest, Ill., U.S.A., Pathotox Publishers, pp. 145-156 (1979).
bystanders at a shipyard:
Selikoff, I.J., Lilis, R. & Nicholson, J. "Asbestos Disease in the United States," *Annals of the New York Academy of Science*, Vol. 330, pp. 291-311 (Dec. 14, 1979).

9 Sebastien, P., Billon, M., Dufour, G., Gaudichet, A. & Bonnaud, G. "Levels of Asbestos Air Pollution in Some Environmental Situations," *Annals of the New York Academy of Sciences*, Vol. 330, pp. 401-415 (1979).
Nicholson, W. J. Rohl, A. N. Weisman, I. & Selikoff, I. J. "Environmental Asbestos Concentrations in the United States," *Biological Effects of Mineral Fibres*, Vol. 2, Lyon, France: IARC at pp. 823-826 (1980).

10. Selikoff, I. J., Nicholson, W. J. & Lilis, R. "Radiological Evidence of Asbestos Disease Among Ship Repair Workers," *American Journal of Industrial Medicine*, Vol. 1 pp. 9-22 (1980).

11. Nurminen, M. "A Study of Mortality of Workers in an Anthophyllite Asbestos Factory in Finland," *Work-Health-Environment*, Vol. 9, No. 3, pp. 112-118 (1972).

12. Castleman, B. & Kibbee, B. U. "Case Records of the Massachusetts General Hospital. Case 62-1963," *New England Journal of Medicine*, Vol. 269, No. 14, pp. 747-754 (1963).

13. Nicholson, W. J., Perkel, G., Selikoff, I. J. & Seidman, H. "Cancer From Occupational Exposure Projections 1980-2000, *Banbury Report No. 9*, pp. 89-111 (1981).

14. Elmes, P. C. "Reality for the Situation Relative to Asbestos and the Establishment of Exposure Standards," *Proceedings of the Second Australia Pneumoconiosis Conference* held in Sydney, Feb. 20-23, 1978, at pp. E.1-1 to E.1-15 (1978).

15. Studies by Pooley.

16. *Borel v Fibreboard Paper Products Co.*, 493 F. 2d 1076 (5th Cir., 1973).

17. "A/C Pipe and Health," A/C Pipe Producers Association (undated, distributed in 1979).

18. Kanarek, M. S. Conforti, P. M. & Jackson, L. A. "Chrysotile Asbestos Fibers in Drinking Water From Asbestos Cement Pipe," *Environmental Science and Technology*, Vol. 15, pp. 923-925 (Aug. 1981).

19. Cooper, R. C. & Cooper, W. C. "Public Health Aspects of Asbestos Fibers in Drinking Water," *Journal of the American Water Works Association* Vol. 70, No. 6, pp. 338-340 (June 1978).

20. Masse, R., Sebastien, P., Monchaux, G. & Bignon, J. "Experimental Demonstration of the Penetration of Asbestos Fibres in the Gastrointestinal Tract," *Biological Effects of Mineral Fibres*, Lyon, France: IARC at pp. 321-328 (1980).

21. Kanarek, M. S. Conforti, P. M., Jackson, L. A., Cooper, R. C. & Murchio, J. C. "Asbestos in Drinking Water and Cancer Incidence in the San Francisco Bay Area," *American Journal of Epidemiology*, Vol. 112, No. 1, pp. 54-72 (July 1980).

22. Newhouse, M. L. & Berry, G. "Patterns of Mortality in Asbestos Factory Workers in London," *Annals of the New York Academy of Sciences*, Vol. 330, pp. 53-60 (1979).

23. Merlan, R. R. "Talc Treated Rice and Japanese Stomach Cancer," *Science*, Vol. 171, pp. 1141-1142 (Sept. 17, 1971).

24. Bignon, J. & Basler, J. P. "Amiantes Ingeres et Cancer," *Gastroenterology and Clinical Biology*, Vol. 2, pp. 453-457 (1978).

25. "Annual Report of the Chief Inspector of Factories for the Year 1898, Part II, Reports," London, England: H. M. Stationery Office, pp. 171-172 (1898).

26. Selikoff, I. J., Churg, J., Hammond, E. C. "The Occurrence of Asbestosis Among Insulation Workers in the United States," *Annals of the New York Academy of Sciences*, Vol. 132, Art. 1, pp. 139-155 (Dec. 31, 1965).

Users Rate Placement Service as "Excellent," "Big Help"

"A very big help to us," "excellent service," "saved us an advertising expense"—these comments show the satisfaction of companies hiring Society members through ASSE's Executive Placement Service.

An insurance executive said the EPS "got to the heart of the market we were looking for." Another commended ASSE for candidates that "were prompt, professional and closely matched our job requirements."

Members, too, find the Executive Placement Service useful. "I think the EPS idea is great; the fee reasonable . . . ," wrote one.

The EPS provides a list of positions available to subscribers at least once monthly for three months. Interested subscribers direct their resumes to ASSE for forwarding to potential employers. Positions differ from those listed in the Professional Safety magazine "Personnel Career."

Subscription fees for the three months' service are $10 to ASSE members, $55 to non-members. The service is provided without charge to ASSE members in good standing who are unemployed.

The Executive Placement Service provides qualified candidates for job openings at substantial savings to employers, according to Valerie Johnson, Executive Placement Service Coordinator.

A $75 fee allows a company to place a 75-word "blind" Situations Available listing in each of three monthly Bulletins. If the firm hires an employee through ASSE, an additional fee of $500 is charged.

"This is far less than advertising costs in major national publications or executive recruiter fees," explained Ms. Johnson.

Applications for the Executive Placement Service are available from Ms. Johnson in the ASSE Membership Department, 312-692-4121.

DUP 0908903

DU 028762