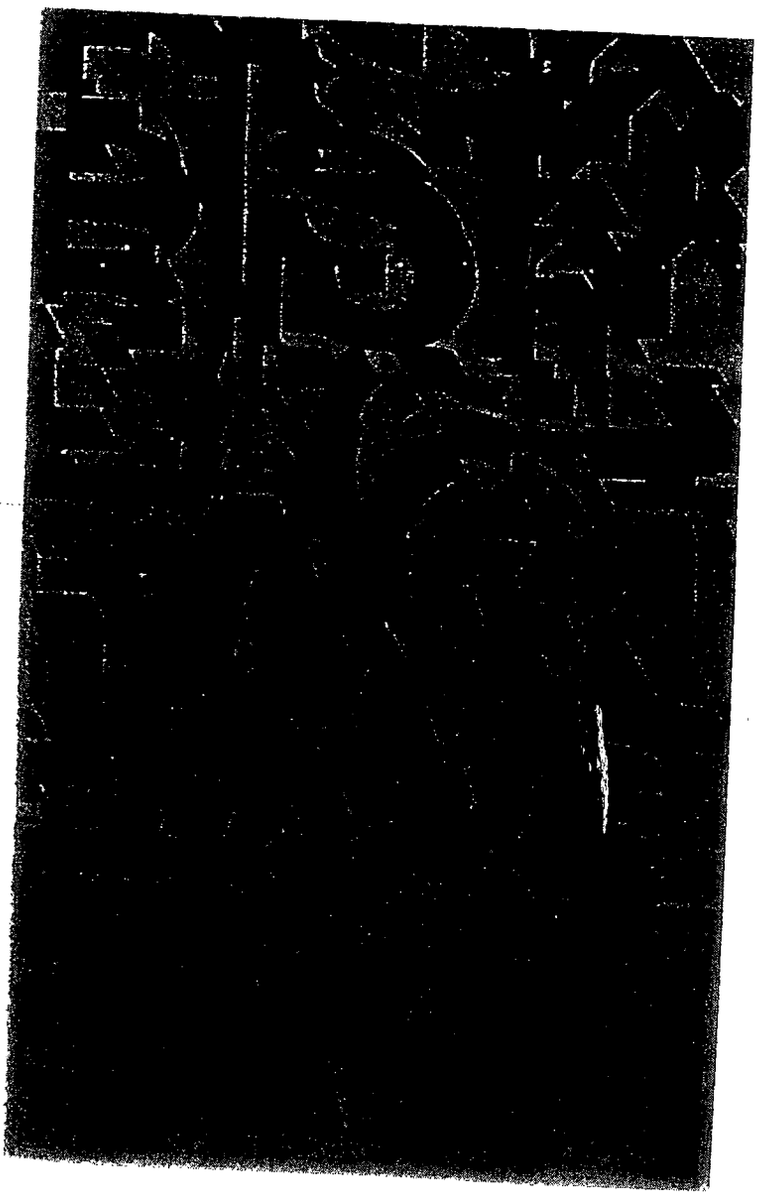
A/C Pipe and Drinking Water



PLAINTIFF'S EXHIBIT

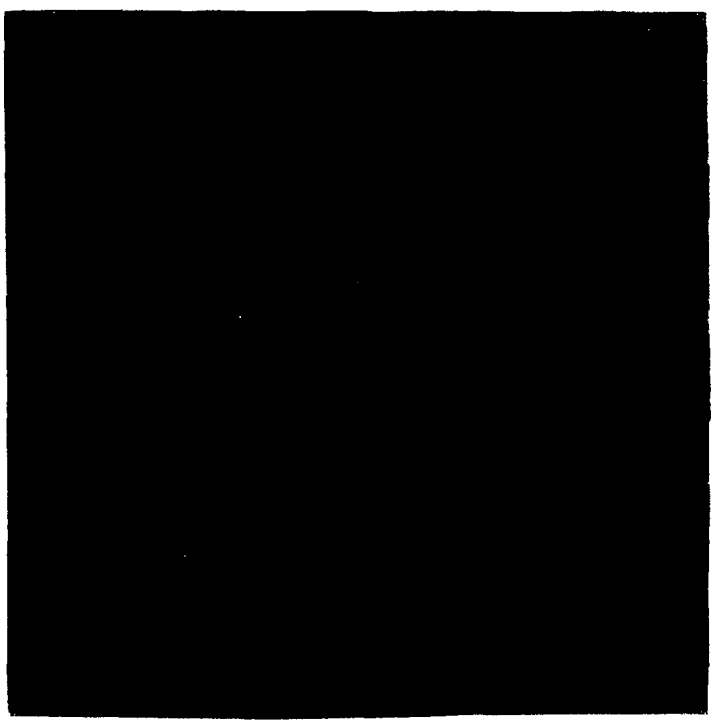
CT-385

CTD01099

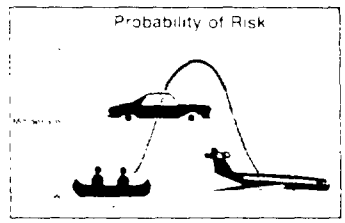
Contents

Perceptions of Risk

Safe vs. Zero Risk

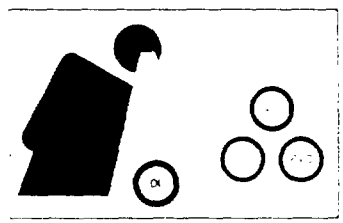


from Washington to New York City [illegible] traveling the same distance by automobile, the risk increases five-fold."



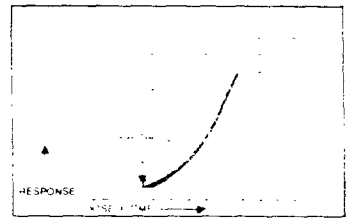
Nothing is [illegible] risk [illegible] so nothing can be absolutely safe. But like electricity and your automobile, there are non-harmful ways to use potentially harmful things [illegible] it's simply a matter of probabilities.

Cancer and Carcinogens--Few risks are as well-publicized and frightening as the risk of cancer. While the fear of cancer may alter the perception of risk, it cannot [illegible] does not [illegible] alter the probability of risk.



[illegible]

known or potential carcinogens, have been identified in drinking water alone. This fact has prompted a close examination of common water pipe materials, since all contain potentially toxic substances.



Dose-Response and Threshold--The critical question with asbestos, as with any toxic material, is "at what exposure level is it hazardous?" Medical science determines this by a principle known as dose-response. The principle is rather straightforward. For every dose [illegible] there is a proportionate biological response. Now let's add another wrinkle [illegible] there is a dose small enough which will result in no measurable response. This [illegible] called a threshold. Threshold effects are common. We have thresholds for hearing, pain, heat [illegible] even matrimony.

Whether or not we have a chemical or physical threshold for cancer depends on a very controversial question. The answer is as philosophical as it is scientific. Like the perception of risk, opposition [illegible] simply reflects different [illegible] on

And it constitutes an acceptable risk measured by real world doses and real world probabilities.

Everything known about asbestos indicates it observes the rules of dose-response. Therefore, a practical, realistic level of safe level of exposure to asbestos must exist. If it did not, it would be difficult to reconcile the prevalence of asbestos in the environment with the absence of related disease.

The general public on

Asbestos-The Unique Fiber—Asbestos is found throughout the world. 470 million years ago, hot subterranean water dissolved rock layers containing iron, magnesium and silica, forming "veins" of liquid minerals. As the earth cooled, these minerals crystallized into the ore known today as asbestos.

Pharaohs and ancient kings used this unique product of nature. Today, you don't have to be royalty to use asbestos.

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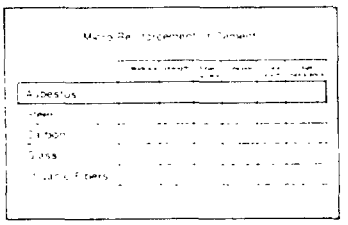
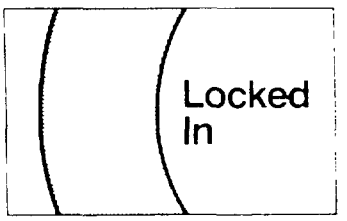
Asbestos and A/C Pipe



practically everyone does. Over 3,000 products use it, usually in combination with other materials. With proper fiber, unmatched by any other natural or man-made material, asbestos is irreplaceable for the micro-reinforcement of high performance products like asbestos-cement (A/C) pipe.

Asbestos-cement pipe contains a blend of asbestos fibers. *Chrysotile* is used for reinforcement, *crocidolite* facilitates the pipe manufacturing process, as well as strengthening the cement matrix.

Free vs. Bound Asbestos—Asbestos comprises less than 20 percent of A/C pipe. Contrary to some perceptions, A/C pipe is not lined with asbestos. The fibers are not there, like reinforcing rods in concrete; they are bound, encapsulated, locked in the cement binder.



The distinction between *free* and *bound* asbestos is extremely important. Why? [illegible]

Dose and Routes of Entry

[illegible]

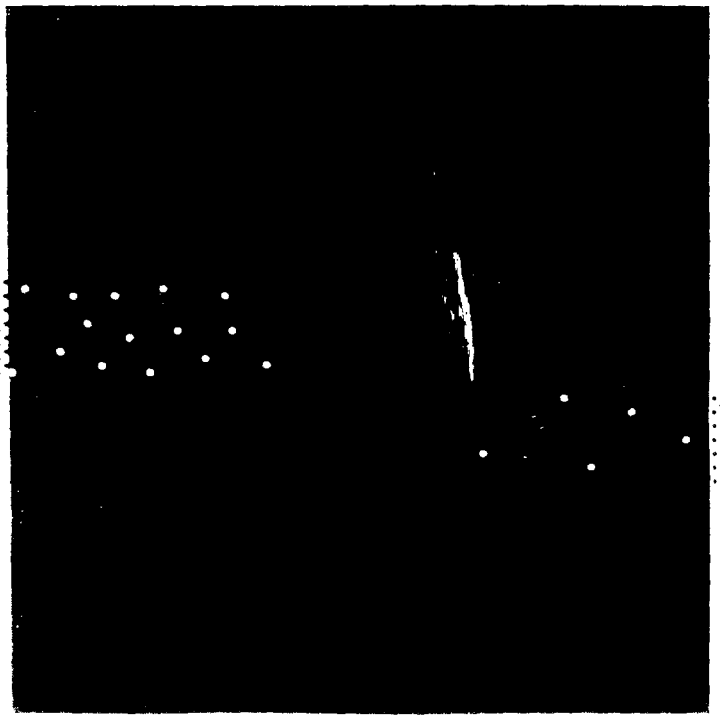
[illegible]

Inhalation and Ingestion

[illegible]

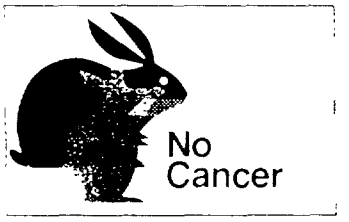
[illegible] abdominal cavity. To date [illegible] [illegible] cases [illegible] buried in asbestos [illegible] [illegible] exposures [illegible] [illegible] [illegible] [illegible]

[illegible] normal rate of GI cancers has



Asbestos Exposures from Field Operations

been reported. Presumably, this is because the body's natural cleansing mechanisms [illegible] and clear by swallowing [illegible] over 90 percent of inhaled [illegible]. Yet a number of similarly exposed occupational groups have not shown



these increases. And everything from mice to baboons has been worked, force-fed or injected with asbestos, as much as 6 percent of their body weight, without evidence of tumor production.

These tests are the basis for [illegible]

Regulatory agencies throughout the world set exposure levels to airborne asbestos based on the number of fibers longer than 5 micrometers. Proposals to lower existing levels are under consideration. Let's take a look at fiber levels measured when installing A/C pipe or recommitment work [illegible]

Cutting, installing and stringing out A/C pipe are so dusty that these operations. Even in the most controlled working scene, fiber levels are easily measurable. A survey conducted by the Port of Tyne Authority in England measured fiber levels in the air during stringing A/C pipe. The highest fiber measurement was 0.5 fibers [illegible] the limit of the proposed U.S. OSHA Occupational Standard.

OSHA Asbestos Exposure Standards

[illegible]

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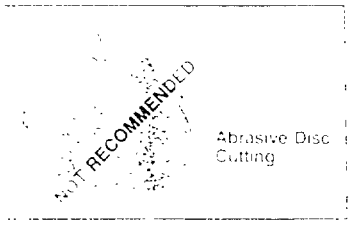
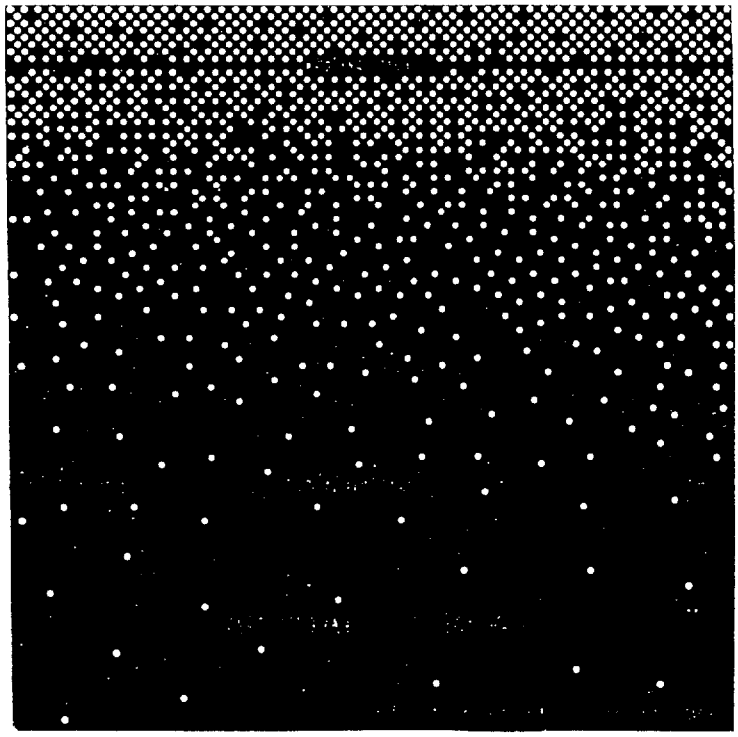
Appendix A



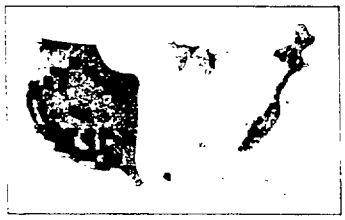
asbestos fiber is locked-in the cement binder. The infrequency and short duration of these operations further reduce even these minimal exposures. Conclusion: when recommended work practices are followed, the risk of working with A/C pipe is virtually non-existent.

Remember the as-



A/C Pipe and Waterborne Asbestos

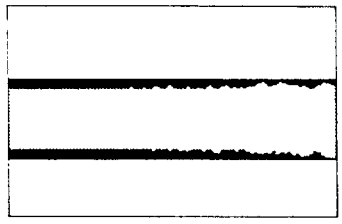
Source Waters—The prevalence of asbestos in soil results in its presence of most lake, river and well waters, and in many distribution systems regardless of the piping material utilized.



Surveys by the United States Environmental Protection Agency showed that natural and treated waters in Montana, Washington, Pennsylvania, California, Massachusetts and Georgia had levels in the range of millions of fibers per liter. There is asbestos in all surface waters of all habited areas of Ontario, and many parts of Quebec and British Columbia. Natural weathering and erosion have in the past [illegible] asbestos to surface waters and in Canada and [illegible] the world.

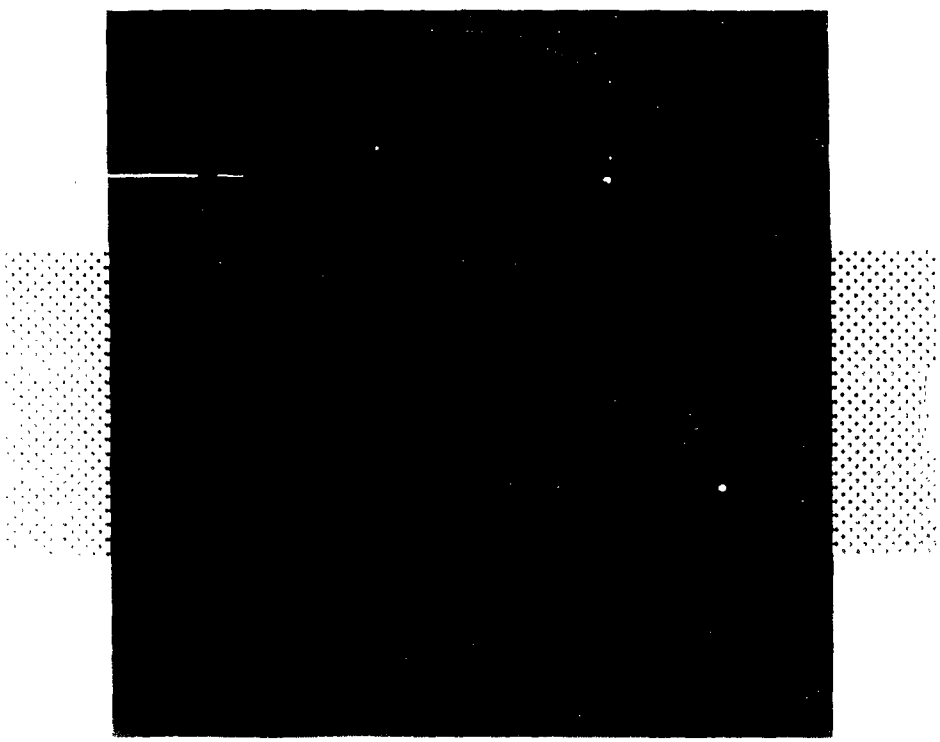
Soils—Another potential [illegible] water: the asbestos [illegible] asbestos bearing soil [illegible] the pipe lining [illegible] [illegible] whether the pipe is [illegible] [illegible]

Tapping A C Pipe—Tapping A C pipe to provide house connections also can contribute asbestos to drinking water. *The industry recommends when tapping A C pipe while under pressure, that equipment with a positive purge be used.* This ejects 99 percent of the asbestos-cement chips, and downstream flushing takes care of the rest. Another alternative is the use of heavy-walled tapped couplings supplied directly from the factory.



Aggressive Waters—Now the critical question . . . *does A C pipe contribute asbestos to drinking water conveyed through it?* The answer is not a simple one, but we do know this: [illegible] depends on the water. As long as the cement binder forms an intact [illegible] release of any of the locked in fibers is minimal.

A C pipe is remarkably corrosion resistant [illegible] much more so than metallic pipe. However, certain corrosive or aggressive waters will at [illegible] even corrosion resistant asbestos cement. The most common are low hardness or soft waters and low pH or



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[illegible] cardiovascular disease as cities where the water was hardest. Economics alone argue strongly for treatment of corrosive waters [illegible] the potential loss of life punctuates the urgency.

Aggressive Water Guidelines—The A C pipe industry is not the first to spotlight the need for stabilization, but it has been a leader in taking preventive steps to include aggressive water guidelines in its national product specifications. These guidelines do not recommend the use of asbestos cement pipe with highly aggressive waters without consulting with the manufacturer.

Aggressive Water Guidelines

Asbestos in A C Pipe Systems [illegible]

[illegible]

significant release of asbestos from A C pipe.[12]

California [illegible] an analysis of water from a distribution system with nearly 1,000 miles of A C pipe. [illegible] Conclusion: *Asbestos levels below detectable limits.*[13]

New Mexico [illegible] an analysis of asbestos fiber concentrations in water systems containing 548 miles of A C pipe. [illegible] Conclusion: No evidence of asbestos pick up from A C pipe.[14]

Texas, Ohio and Connecticut [illegible] EPA studies of A C pipe systems [illegible]. Conclusion: *Fiber levels "not statistically significant" or "below detectable limits."*[15]

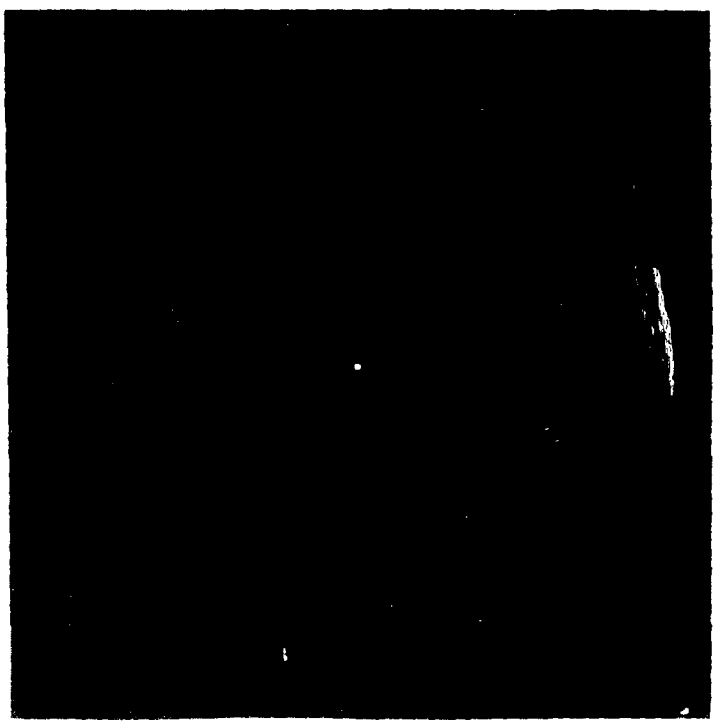
Common sense tells us that real world risk must relate to real world exposure. That's why these results are so important [illegible] they measure actual asbestos levels in A C pipe systems. Clearly the important asbestos issue, particularly as it pertains to drinking water supplies, [illegible] A C pipe was not found, certainly far less than was found in many other waters.

Asbestos in Water... The Risks

What about water systems which have measurable quantities of asbestos fiber which raise the risk of contracting cancer?

There is no evidence that anyone in the general public has ever contracted any disease from naturally-occurring asbestos [illegible] or the minute amounts of fiber released from A-C pipe. This is not a judgment of safety [illegible] this a statement of fact.

Ingested Asbestos and Cancer—In 1978, University of California researchers reported a statistical association between certain cancers and water supplies high in naturally occurring asbestos. While the study's stirred up a storm of questions, it did not pinpoint a "cause and effect" relationship between ingested asbestos and cancer. As the researchers themselves noted, important factors such as smoking, alcohol consump-



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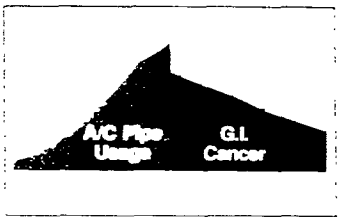
[illegible] and dietary habits, as well as occupational history, population mobility and the presence of other carcinogens in the drinking water were not included in the study.

In response to the study, the California Department of Health Services took the position: "The UC doctoral thesis abstract contains no new or original evidence of a medical nature about cancer or asbestos [illegible] establish any causal link between asbestos in Bay Area drinking water and the incidence of cancer."[illegible] A similar position was also taken by the U.S. Environmental Protection Agency.[illegible]

Further, a preliminary report on an EPA-funded study in Washington State directly contradicts the University of California findings. Researchers in the Puget Sound region, where waters also are high in naturally-occurring asbestos, did not show any association between fibers in the drinking water and cancer in the colon, [illegible] kidney or total [illegible]

A [illegible] the [illegible] with fiber size [illegible] and effect [illegible] relationship between gastrointestinal [illegible] asbestos in the use of A-C pipe [illegible] Minneapolis [illegible] Minneapolis-St. Paul, with none. *A comparison showed no statistical difference in the incidence of gastrointestinal cancer.*[30]



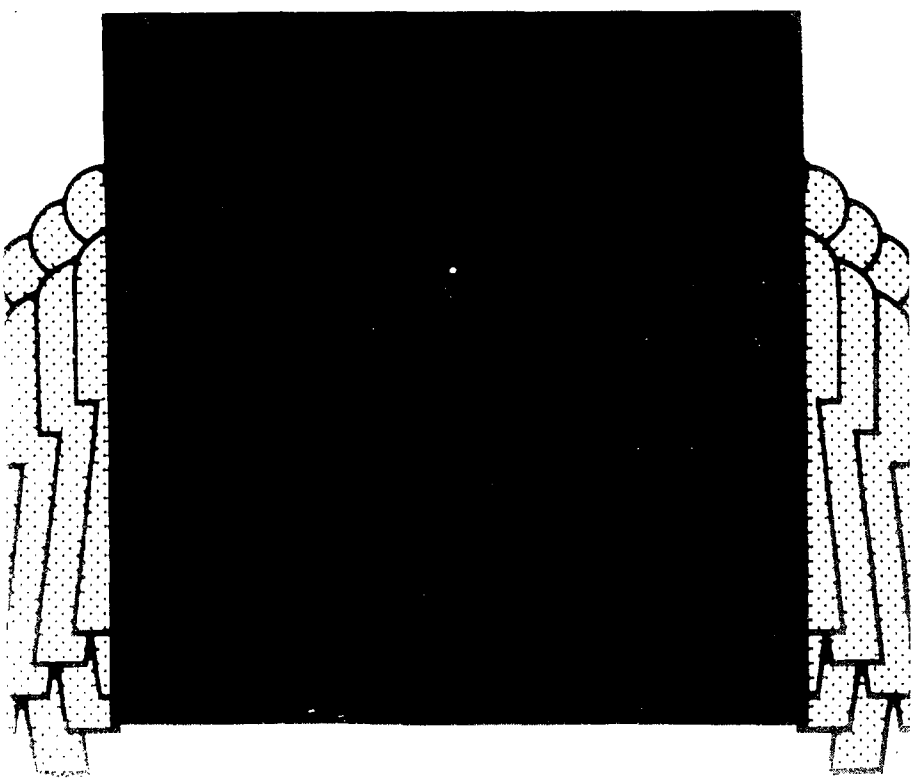
Switzerland. The highest per capita use of A-C pipe in Western Europe. From 1951 more than 20 years after A-C pipe was introduced, to 1976, *the death rate from GI cancer dropped a significant 32 percent.*[31]

Canada. A study of 22 municipalities with high concentrations of naturally-occurring asbestos in the water supplies *failed to reveal any excess cancer mortality which could be attributed to asbestos consumed in drinking water.*[32]

The United States. During 50 years of rapidly increasing A-C pipe usage, gastrointestinal cancer rates for the period 1949-1976 declined 39 percent.[33]

Connecticut. An extensive Environmental Protection Agency study showed no correlation between the incidence of GI cancer and the use of asbestos-cement water pipe.[34]

Measuring the Risks



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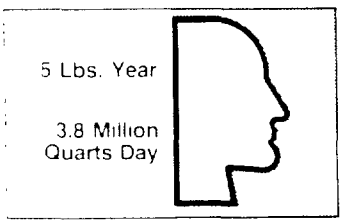
This is of course preposterous. But it does place in perspective the probability of risk from a "real world" dose of ingested asbestos from A.C. pipe.



[illegible] Million is not an [illegible] that asbestos have proven to be [illegible] carcinogenic in animal [illegible] studies.

One in a billion. That figure probably doesn't register with most people. In terms of volume, it's a very, very dry martini — one drop of vermouth in 15,750 gallons of gin. In terms of risk — it's a thousand times safer than smoking one and one half cigarettes or drinking a half bottle of your favorite wine.

Perceptions of Risk—In spite of [illegible] and publicity to [illegible] by these admittedly [illegible]

for public water supplies is concerned — we have no data demonstrating hazard."

National Cancer Institute — "NCI scientists — have found no unusual cancer mortality patterns so far among persons residing where drinking water is contaminated by asbestos."

Selected Study Committee of the American Water Works Association Research Foundation — "No firm evidence shows that the proper use of asbestos-cement pipe poses a hazard to health by reason of ingestion of asbestos fibers — the probability of risk to health from the use of such systems is small — approaching zero."

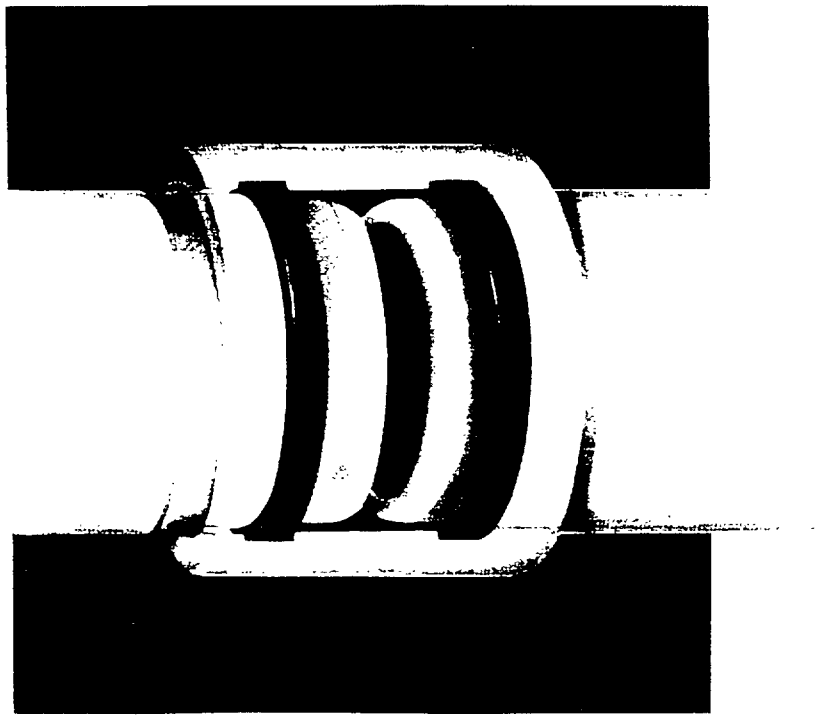
False accusations and "guilt by association" have created a perception of risk about A.C. pipe, scientific measurements and common sense show this distorted perception has no basis in fact.

A Commitment to Quality

The A C pipe industry has a commitment — a commitment to quality water. Quality water demands conservation in use, diligence in treatment and economical reliability in distribution.

Designed for value — engineered for performance — dynamized for safety — A C pipe is as cost-effective, reliable and safe as any water pipe in common use today.

Continuing to provide pipe of its integrity, which the public can use with confidence, will remain the commitment of the A C pipe industry — today — tomorrow — and in the future.



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Appendix A

Ceiling Concentrations of
Airborne Asbestos Fiber from
A C Pipe Field Operations

Task Description	Type of Pipe	Sample Time Min	Airborne Fibers cc. Operator	Helper
Recommended Work Practices				
Manual Lathe	Pressure	12-13	0.51	0.22
Manual Lathe	Sewer	4-5	0.15	0.13
Power Lathe	Pressure	5-6	0.33	0.56
Power Lathe	Sewer	6-8	1.08	1.09
Power Hole Cutting	Pressure	1.5-2	0.44	0.23
Power Hole Cutting	Sewer	1	1.65	0.38
Cutting w Chisel & Rasp	Pressure	10-11	1.99	0.90
Cutting w Chisel & Rasp	Sewer	4-6	0.30	0.25
Chain type Cutter	Pressure	2-3	0.85	0.87
Chain type Cutter	Sewer	2-3	0.06	0.06
Power type Cutter	Sewer	2-3	1.09	—
[illegible]				
Abrasive Disc Cutting	Pressure	1	[illegible]	59.70
Abrasive Disc Cutting	Sewer	1	65.50	64.00
[illegible]				

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The statements contained in this document are those of the Association of Asbestos-Cement Pipe Producers and are not intended as a warranty

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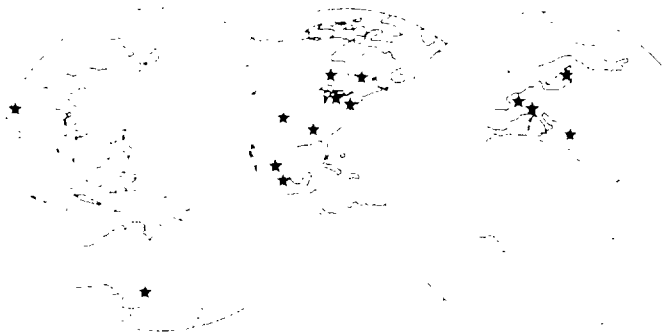

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