

ST048

PB90192964



Statement of

Mr. Richard A. Lemen, Assistant Branch Chief  
Industry-wide Studies Branch  
Division of Surveillance, Hazard Evaluations and Field Studies  
National Institute for Occupational Safety and Health  
Center for Disease Control  
Department of Health, Education, and Welfare

Before the  
Subcommittee on Coast Guard and Navigation  
House Committee on Merchant Marine and Fisheries

February 12, 1980

REPRODUCED BY  
U.S. DEPARTMENT OF COMMERCE  
NATIONAL TECHNICAL INFORMATION SERVICE  
SPRINGFIELD, VA 22161



<b>REPORT DOCUMENTATION PAGE</b>		1. REPORT NO.	2.	3. Recipient's Accession No. <b>PB 90 1929 64 /AS</b>	
4. Title and Subtitle NIOSH Testimony on Asbestos by R. A. Lemen, February 12, 1980				5. Report Date 80/02/12	
7. Author(s) NIOSH				8. Performing Organization Rept. No.	
9. Performing Organization Name and Address NIOSH				10. Project/Task/Work Unit No.	
				11. Contract (C) or Grant(G) No. (C) (G)	
12. Sponsoring Organization Name and Address				13. Type of Report & Period Covered	
				14.	
15. Supplementary Notes				<i>U.S. National Institute for Occupational Safety &amp; Health</i>	
<p>16. Abstract (Limit: 200 words) This testimony concerned the activities of (NIOSH) in regard to asbestos (1332214) hazards in the workplace. Workers have been exposed to asbestos while mining, milling, and transporting the mineral and while manufacturing and working with products which contain the substance such as protective clothing, mailbags, padding, conveyor belts, pipes, roofing shingles and gutters. <del>Asbestos also has other special uses.</del> Exposure to asbestos significantly increases the risk of contracting three serious diseases: asbestosis, lung cancer, and mesothelioma. Other causes of death associated with asbestos exposure include gastrointestinal cancer and laryngeal cancer. While it was not certain how asbestos causes disease, there has been thought that the surface properties, fiber size, and metallic content of the fibers may influence the carcinogenic properties of the substance. Exposures to asbestos among shipbuilders and seamen were highlighted in this report with mention being made of several epidemiologic studies conducted among workers in these occupations. The importance of occupational standards for asbestos exposure was discussed, and the history traced of the development of the standard. The current occupational exposure standard for asbestos permitted a maximum of two fibers larger than 5 microns in length per cubic centimeter of air. Based on recent evidence, NIOSH has requested that this standard be lowered to 0.1 fibers per cubic centimeter. NIOSH was also involved in establishing a Cooperative Center for Occupational and Environmental Health located in Baltimore to further studies in this area of concern.</p>					
17. Document Analysis					
a. Descriptors					
b. Identifiers/Open-Ended Terms NIOSH-Publication, NIOSH-Author, NIOSH-Testimony, Lemen-R-A, Asbestos-fibers, Mineral-dusts, Asbestos-workers, Occupational-exposure Respiratory-system-disorders, Epidemiology, Cancer-rates, Risk-factors					
c. COSATI Field/Group					
18. Availability Statement			19. Security Class (This Report)	21. No. of Pages 12	
			22. Security Class (This Page)	22. Price A03	



## **GENERAL DISCLAIMER**

**This document may be affected by one or more of the following statements**

- **This document has been reproduced from the best copy furnished by the sponsoring agency. It is being released in the interest of making available as much information as possible.**
- **This document may contain data which exceeds the sheet parameters. It was furnished in this condition by the sponsoring agency and is the best copy available.**
- **This document may contain tone-on-tone or color graphs, charts and/or pictures which have been reproduced in black and white.**
- **This document is paginated as submitted by the original source.**
- **Portions of this document are not fully legible due to the historical nature of some of the material. However, it is the best reproduction available from the original submission.**



I am pleased to have been invited to discuss occupational exposure to asbestos, a subject I have been involved with since 1970. I participated in the investigation that helped to stop exposures in the asbestos insulation plant in Tyler, Texas, where over one fourth of the plant's former employees are expected to contract asbestos-related diseases. I have also conducted industrial hygiene and epidemiologic studies in approximately a dozen other asbestos manufacturing and processing facilities in the United States. I was the primary author of the NIOSH revised recommended standard for asbestos, as well as the monograph on asbestos published by the International Agency for Research on Cancer (IARC).

I would like to begin by describing the functions of the National Institute for Occupational Safety and Health (NIOSH) and then give a brief review of what is known about asbestos-related disease. I will also provide some information about shipboard exposures.

NIOSH was established by the Occupational Safety and Health Act of 1970 to conduct programs of occupational safety and health research, standards development, technical assistance and manpower development. Under the Federal Mine Safety and Health Act NIOSH is also responsible for conducting mine health research, recommending health standards and conducting health hazard evaluations in mines. Under these authorities NIOSH makes recommendations to the Department of Labor for new or revised occupational standards.

## Asbestos

Workplace exposure to asbestos is probably the number one occupational health problem in the United States, both because of the vast number of workers exposed--an estimated 8 million workers since the beginning of World War II--and the potential for very severe and debilitating disease.

Asbestos has been termed "the mineral with a thousand uses", which suggests the degree to which the substance pervades modern life. By actual count there are more than 3,000 uses for asbestos, and this versatility is reflected in the variety as well as the size of the workforce exposed. About 1 million workers are currently thought to be exposed to asbestos.

There are several commercial forms of asbestos used in the manufacture of various products. Amosite, sometimes referred to as "brown" asbestos, and crocidolite, sometimes referred to as "blue" asbestos, and chrysolite, sometimes referred to as "white" asbestos, were the most common fiber types used in the shipbuilding industry. Although their physical characteristics vary somewhat, each of these types of asbestos has been shown to cause cancer and fibrotic lung changes in man.

Workers are exposed to asbestos while mining, milling, and transporting the mineral and while manufacturing and working with products which contain the substance. These products include protective clothing, mailbags, padding, conveyor belts, pipes, roofing shingles and gutters. It is also used in manufacturing special paper products, including millboard, fine quality electrical papers, friction materials, such as gaskets and automotive clutch

and brake linings, as well as insulation for pipes and boilers and bulkhead linings for ships.

Many workers not directly employed in industrial processes involving asbestos exposure must also be considered susceptible to exposure. Maintenance personnel must often repair machines, pipes, boilers and bulkheads in asbestos-contaminated work spaces or work directly with products containing asbestos.

#### Asbestos-Related Diseases

Exposure to asbestos significantly increases the risk of contracting three serious diseases: asbestosis, lung cancer and mesothelioma. Other causes of death that have been associated with asbestos exposure include gastrointestinal cancer and laryngeal cancer. Although asbestos workers who do not smoke can contract lung cancer, the risk is dramatically increased for asbestos workers who also smoke cigarettes.

It is not known how asbestos causes disease. There has been speculation that surface properties, fiber size, and metallic content of the fibers may influence the carcinogenic properties of the substance. The speculation, however, remains to be proven. What is known is that fibers too fine to be seen by the human eye become airborne during various industrial processes, repair or demolition and may be inhaled or swallowed.

Asbestos comes from a Greek word meaning "inextinguishable". The etymology aptly describes an especially vexing property of asbestos: its ability to remain in the body, to be, in a sense, "inextinguishable" after it has been inhaled or ingested. As much as 50 percent of inhaled asbestos fibers remains lodged in the lungs where it is almost impossible for the body to dispose of it.

Asbestos-related diseases, particularly cancers have long latency periods. Frequently it is from 20 to 40 years after first exposure that the disease becomes apparent.

Our best information about the increased risk associated with asbestos exposure is based on NIOSH and other HEW supported studies of workers heavily exposed to asbestos before the Government began to regulate the substance in the late 1960's and early 1970's. Of the approximately 4 million workers heavily exposed to asbestos in the past, approximately 40 percent can be expected to die of asbestos-related cancer. In the absence of asbestos exposure less than 10 percent would be expected to die from these types of cancer. Workers without high exposures face smaller risks of asbestos-related disease. But it must be noted that scientists have not been able to determine a safe level of exposure to asbestos.

## Exposures to Asbestos Among Shipbuilders and Seamen

During World War II, 4.5 million workers are estimated to have worked in shipyards. Currently there are some 120,000 shipyard workers employed in about 450 establishments in the United States.

Several epidemiologic studies have been conducted of persons involved in the building, maintenance and repair of seagoing vessels. Each of the studies has shown an excess of asbestos-associated diseases, including asbestosis, lung cancer and mesothelioma. In some cases asbestos-induced changes in the lung were detected in the X-rays of over 50 percent of the workforce. Mortality among shipyard workers has been much greater than that expected when compared with control populations. This excess has mainly been accounted for by diseases associated with asbestos exposure.

For example, in a study conducted by Dr. Irving J. Selikoff, cancer was responsible for one-half of the total deaths observed among shipyard workers, with lung cancer accounting for 27 percent of all deaths, mesothelioma for 10 percent, and asbestosis for 17 percent. In this study, the levels were generally in the range of 4 to 12 fibers/cc for fibers greater than 5 microns in length.

One environmental assessment study conducted for the U.S. Maritime Administration, which was submitted to NIOSH for review, reported on sampling done on two ships in port and one ship at sea.

The samples were taken in various areas of the engine room of the ships but not during routine maintenance or repair activities. Concentrations in the engine rooms of the two ships at port ranged from .001 to .152 fibers/cc greater than 5 microns in length. In the ship at sea the samples were somewhat lower but in the same magnitude range. Samples taken at the Long Beach Naval Shipyard during asbestos removal operations on other ships reported average counts of 40 fibers/cc greater than 5 microns in length and some reported as high as 150 fibers/cc greater than 5 microns in length. (NIOSH currently recommends that workers not be exposed to more than 0.1 asbestos fibers per cubic centimeter.) Based on these reports, maintenance at sea could generate exposures in these higher fiber ranges. Studies of industrial workers in asbestos trades have shown excessive disease and death for workers exposed at much lower levels than are reported during these rip-out operations. To date scientists have been unable to determine a dosage level below which asbestos will not cause disease.

#### Occupational Standards for Asbestos

As evidence of its importance as an occupational hazard, asbestos was the subject of the first criteria document developed by NIOSH. This document served as the basis for the first new standard promulgated by the Occupational Safety and Health Administration (OSHA) after the Occupational Safety and Health Act was passed.

The standard, promulgated in 1972, was intended primarily to prevent asbestosis and reduce the risk of contracting asbestos-induced cancer. It

provided for an exposure limit of 5 fibers greater than 5 microns in length per cubic centimeter of air until July 1976, when the limit was to be reduced to 2 fibers per cubic centimeter.

The current standard for occupational exposure to asbestos permits a maximum of 2 asbestos fibers larger than 5 microns in length per cubic centimeter of air. This is not because fibers shorter than 5 microns do not pose a health hazard, but because shorter fibers are difficult to detect by the economically accepted method of analysis, phase contrast optical microscopy. The current limit actually provides for a broad range of exposure to asbestos. This is because the relative proportion of airborne fibers longer than 5 microns may vary from 1 to 50 percent of the total asbestos in a particular air sample. Thus, a work environment may be in compliance with the Federal exposure standard and still offer the possibility of exposure to rather large amounts of asbestos.

Even when one considers only the fibers 5 microns or larger, the total number of fibers a worker can inhale in a permissible occupational environment can be quite large. The average worker inhales 6-8 million cubic centimeters of air per working shift. In an atmosphere which complies with the standard, this could mean inhaling up to 16 million "permissible" fibers per day in addition to the asbestos particles less than 5 microns long.

In 1976, NIOSH evaluated the studies published on asbestos since the 1972 criteria document was transmitted. By then there was evidence that chest x-

rays of British asbestos workers were continuing to show abnormalities despite exposures within a 2 fiber limit.

Based on this and other evidence, NIOSH recommended that OSHA further lower the standard to 0.1 fibers per cubic centimeter, the lowest concentration at which fibers could be reliably monitored by phase contrast microscopy. In transmitting the revised recommendations to OSHA, NIOSH made the following comment:

"Because it is not possible to specify a safe exposure level for a carcinogen, only a ban on the use of asbestos can ensure complete protection against this mineral's carcinogenic effect. Therefore, emphasis should be placed on prohibiting the occupational use of asbestos in other than completely closed operations and on substituting other products whenever possible. Asbestos should be replaced, where technically feasible, by substitutes with the lowest possible chronic toxicities."

OSHA is presently reviewing the NIOSH recommendations for a new asbestos standard and NIOSH and OSHA are working together to update information on asbestos related-disease.

Control of exposures to seafaring persons should include, as the U.S. Navy has now required, that no new ships contain asbestos and that maintenance, repair and asbestos removal operations be controlled to the greatest extent possible. This would involve assuring appropriate protective clothing and work practices

for those directly involved and keeping non-protected persons away from areas in the ship where asbestos exposure can occur.

#### Public Health Service Hospitals

Under interagency agreement with the Bureau of Medical Services, NIOSH is supporting the development of a Cooperative Center for Occupational and Environmental Health located on the PHS Hospital grounds in Baltimore. This center also represents a collaborative effort with the Johns Hopkins Hospital University School of Public Health. It will create an opportunity for clinical research, educational and training activities as well as technical assistance and outreach activities serving the greater Baltimore area. An important part of this program will be the diagnosis and treatment of asbestos-related disease. Secretary Harris has asked the Assistant Secretary of Health to monitor this project to determine whether similar projects could be undertaken elsewhere. It is hoped that the center will serve as a model to involve other units of the PHS hospital system in meeting the occupational health needs of the communities which they serve.

Mr. Chairman, I will be pleased to answer any questions you or members of your subcommittee may have.

