MORANDUM

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

: Morton Corn, Ph.D.
Assistant Secretary of Labor
Occupational Safety and Health Administration
Department of Labor

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: Director, National Institute for
Occupational Safety and Health

T: Evaluation of Data on Health Effects of Asbestos Exposure and Revised Recommended Numerical Environmental Limits

According to your request, NIOSH has evaluated available data concerning the health effects of exposure to asbestos. The general conclusion of this study is that all forms of asbestos, both commercial and non-commercial, are carcinogenic. All have the capacity to induce pleural and peritoneal mesotheliomas and/or lung cancer in man. In addition, all forms of asbestos have been found to cause asbestosis in man.

NIOSH has proposed new environmental limits which are based on this study. These recommend that no worker be exposed to an airborne concentration of asbestos in excess of 100,000 fibers over 5 μm in length per cubic meter on an 8-hour time-weighted average basis. In addition, the proposed standard states that no worker should be exposed to peak concentrations in excess of 500,000 such fibers per cubic meter of air based on 15-minute sampling periods. Currently, it is not possible to establish a safe exposure level for a carcinogen. Therefore, recommended exposure values are based on the lowest concentration at which asbestos fibers can be monitored reliably using phase-contrast fiber counting procedures. After a thorough review and evaluation of all available sampling and analysis methods, NIOSH feels that phase-contrast microscopy is the only generally available and practical technique for routine monitoring, although electron microscopic methods are available on a limited scale for more precise research studies.

The recommended TWA standard of 100,000 fibers over 5 μm in length per cubic meter of air is intended to (1) protect against the noncarcinogenic effects of asbestos and (2) materially reduce the risk of asbestos-induced cancer. Because it is not possible yet to specify a safe exposure level for the carcinogenic activity of asbestos, only a ban on its use 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.

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The present indications are that concentrations of asbestos fibers of 100,000 per cubic meter will occur rarely except in the asbestos-processing industry. Asbestos-containing fireproofing and anechoic linings of air-ducts and plenums, although they are possible sources of asbestos fiber, probably are not major polluters of air within buildings.

This report addresses only the health effects of exposure to asbestos and the proposed environmental limit. NIOSH intends, however, to address formally, as soon as possible, the other provisions of the standard outlined in OSHA's Notice of Proposed Rulemaking dated October 9, 1975, and further comments will be brought to your attention.

John F. Finklea, M.D.

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Re-examination and Update of Information on the Health Effects of Occupational Exposure to Asbestos

This report later issued by NIOSH as "Revised Recommended Asbestos Standard"

U.S. Department of Health, Education and Welfare
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health

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In a study of 232 former insulation plant employees, Selikoff (1976a) reported positive x-ray findings among individuals having exposures to asbestos known to be as short as one day. More recently, Anderson et al (1976) reported x-ray findings consistent with asbestosis in household and family members having no known exposure to asbestos other than residing with a known asbestos worker. These two studies demonstrate the presence of asbestos disease in the absence of continuing new exposures.

Wagoner et al. (1973) demonstrated a significantly increased risk of death for nonmalignant respiratory disease and for diseases of the heart, which in part were secondary to pulmonary disease, among a cohort of workers in a major manufacturing complex using predominately chrysotile. Among those workers observed 20 or more years after onset of employment, a four-fold increased risk of death due to nonmalignant respiratory disease was observed. Further evaluation of these deaths revealed the majority occurred within 1 year after termination of employment and at an average age of 53.8 years.

Newhouse (1969) reported an increased risk of death from nonmalignant respiratory disease in male asbestos textile and insulation workers with low to moderate exposure.

Enterline and Henderson (1973) reported that for all ages, only 18 deaths occurred due to asbestosis in several asbestos plants studied from 1941 to 1959. It is of significance, however, to note that the state of New Jersey alone, in the years 1969-1970, had awarded workmen's compensation for asbestosis to 455 workers from one of the plants in the study. (Heymann. 1971; Serraino. 1970)

Selikoff (1976a) reported a significant excess of deaths due to asbestosis among a group of workers in the U.S.

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the general population. No mesotheliomas were found, but Kogan indicates that this might be explained by the insufficient experience of pathologists with this rare type of cancer in that geographical area. Also, the numbers of people in the study populations were not reported.

Wagoner et al (1973) reported on the cancer risk among a cohort of workers in a major manufacturing complex utilizing predominately chrysotile asbestos in textile, friction and packaging products. An excess of respiratory cancer occurred among asbestos workers in each duration-of-employment category down to and including 1-9 years. They observed a statistically significant standard mortality ratio of 122 for all malignant neoplasms and 244 for malignant neoplasms of the respiratory system. The asbestos workers in this study were located in an area of predominately Amish Dutch population with known low frequencies of smoking. The authors, nevertheless, used the general white male U.S. population as a control group, which would tend to underestimate the degree of risk.

Enterline and Henderson (1973) found that for retired men who had worked as production or maintenance employees in the asbestos industry and who had reached 65 years of age, those who had been exposed only to chrysotile had a respiratory cancer risk 2 - 4 times than that expected. Among men within the asbestos cement industry exposed only to chrysotile, a one- to four-fold excess of respiratory cancer was found. Of 802 deaths, only one mesothelioma had been recorded in the several plants investigated. In contrast, a subsequent investigation by Borow et al (1973) found 70 cases of mesothelioma from only one of these plants. The discrepancy was due to methodological variations, for example Enterline and Henderson (1973) had limited their investigation to men of 65 or over, while many of the mesothelioma cases reported by Borow et al (1973) had died before that age.