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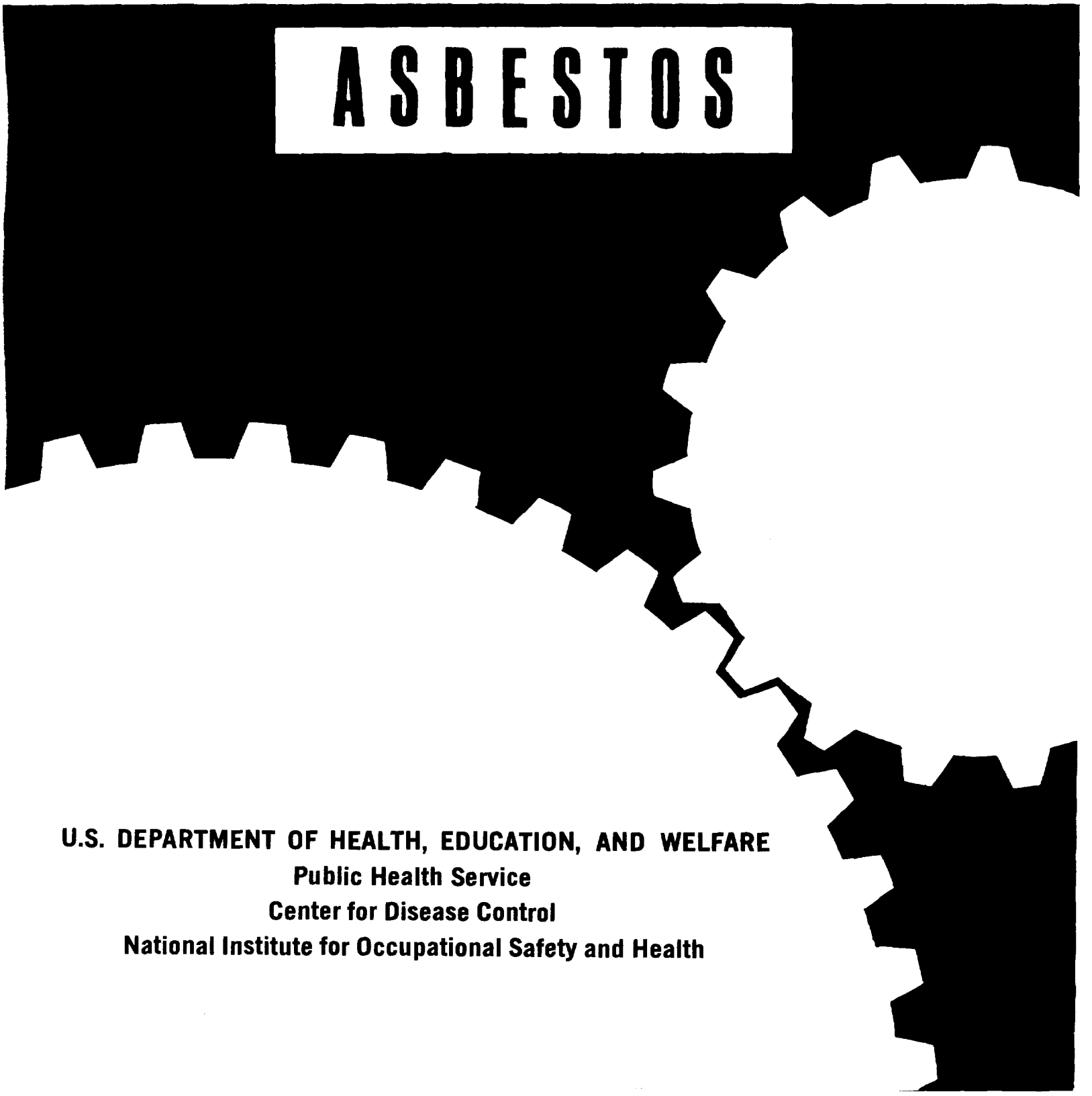
criteria for a recommended standard . . . .

OCCUPATIONAL EXPOSURE TO ASBESTOS



U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health

criteria for a recommended standard . . . .

OCCUPATIONAL EXPOSURE TO ASBESTOS

U.S. Department of Health, Education, and Welfare
Public Health Service
Health Services and Mental Health Administration
National Institute for Occupational Safety and Health

1972

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Section 3 - Labeling

(a) A warning label for asbestos as shown in Figure 1 shall be used.

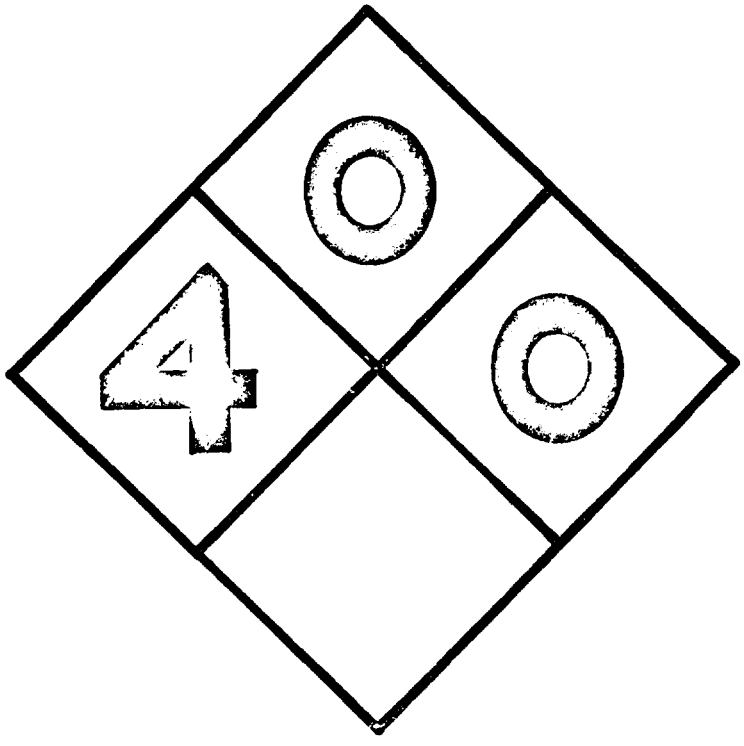
(b) Numerical designations indicate the following:

(i) 4= Health Hazard (color code, blue). Inhalation may cause asbestosis, pleural or peritoneal mesothelioma, or lung cancer.

(ii) 0= Fire Hazard (color code, red). Asbestos is non-flammable and has negligible vapor pressure, volatility, flash point, and explosive limits.

(c) The details of the numerical hazard rating system are found in Appendix II.

ASBESTOS



HARMFUL: May Cause Delayed Lung Injury

(Asbestosis, Lung Cancer).

DO NOT BREATHE DUST

Use only with adequate ventilation and
approved respiratory protective devices.

The occupational safety and health aspects of the mining and milling of asbestos ores are covered by provisions of the Federal Metal and Nonmetallic Mine Safety Act (30 US.C. 725 et seq.) under which provisions the Bureau of Mines has promulgated applicable regulations. Relevant data, however, bearing on the safety and health hazards from exposure to asbestos dust in the mining and milling of ores were considered in this document.

These criteria were developed to assure that the standard based thereon would, (1) protect against asbestosis and asbestos-induced neoplasms, (2) be amenable to techniques that are valid, reproducible, and available to industry and official agencies, and (3) be attainable with existing technology.

The recommended standard is designed primarily to prevent asbestosis. For other diseases associated with asbestos, there is insufficient information to establish a standard to prevent such diseases including asbestos-induced neoplasms by any all-inclusive limit other than one of zero. Nevertheless, a safety factor has been included in arriving at the concentration level that will reduce the total body burden and should more adequately guard against neoplasms.

Asbestos has been mined, milled, processed, and used for many years, and as a result, a number of workers have experienced significant accumulative exposure to asbestos dust over a working lifetime. It has been recognized that biological monitoring (by periodic chest roentgenograms) and removal from further exposure after initiation of fibrosis, calcification or neoplasia will not absolutely prevent

would be expected in the same number of similar individuals in the general population.[17,18] Information is insufficient at this time to set an exposure standard (other than zero) which would assure prevention of mesothelioma in all workers, as the disease may occur following a very limited exposure 20-30 years earlier.

An increased rate of occurrence of mesothelioma of the pleura or peritoneum was reported in some populations in 1959 and in subsequent years. The possibility that asbestos may play a role in this distribution has been raised. Investigations of the distribution of mesothelioma in populations occupationally exposed to asbestos indicate a strong relationship between exposure to asbestos fiber and the presence of mesothelioma.[18,20,24,25]

Neoplasms, such as mesothelioma, may occur without radiological evidence of asbestosis at exposure levels lower than those required for prevention of radiologically evident asbestosis. This may be of particular importance when consideration is given to short-term, high levels of exposure, and may result in the development of mesothelioma before or after completion of a normal span of work either in or out of the asbestos industry.

This is illustrated by several case studies, including two cases of malignant mesothelioma, one a "family" and the other a "neighborhood" case.[26] In another "family" case, a woman washed the overalls of her three daughters at home; all three daughters worked for an asbestos company with possible heavy exposures to asbestos.

The time lapse between onset of exposure and mesothelioma in 344 deaths among asbestos insulation workers was studied. Mesothelioma developed after a longer lapse of time from onset of exposure to asbestos than was the case in the development of asbestosis (Table XXVIII).[15] Knox[27] reported 4 cases of mesothelioma in men and women with less than 10 years exposure, one with only seven months exposure, with the latent time for the development of the mesothelioma from 23 to 53 years.

D. L. Cran[28] indicated that mesothelioma did occur in cases of asbestosis, but that in most cases of mesothelioma that he had seen, the occurrence of asbestosis was not found. He postulated that the difference being the long periods of exposure required to produce asbestosis, while mesothelioma could occur long after a short intensive exposure. The 27 cases of mesothelioma in children under 19 years of age indicates the latent time period for development of mesothelioma may be shorter than first estimated.[29]

Fifteen cases[30] of pleural mesothelioma associated with occupational exposure were reported in Australia. The relationship between the mesothelioma development and asbestos was based upon occupational histories and finding of asbestos bodies in the tissue. In some of these cases, the relationship to occupational exposure could not be developed with any degree of certainty, but included patients whose exposure was as short as six months. No patient was regarded clinically or radiologically as suffering from asbestosis; one person had pleural plaques that were radiologically visible.

Stumphius,[31] between 1962 and 1968, found 25 cases of mesothelioma on Walcheren Island. Of these cases, 22 had been employed in the shipyard trades. Stumphius noted that the shipyard employed about 3000 men. This would result in a rate of mesothelioma of approximately 100 per 100,000 males per year. He also noted that the rate for Dutch provinces with heavy industry is 1.0 per 100,000 per year.[31] In the same study, examination of sputum from 277 shipyard workers showed that 60% had asbestos bodies. The frequency varied from 39% of those with no obvious exposure to 100% among those with slight but definite asbestos exposure.

McEwen[32] found that the incidence of mesothelioma in Scotland was similar to that found in other parts of the United Kingdom and confirmed the association between the development of the tumor and occupational exposure to asbestos.

In 1968 Stumphius and Meyer[33] concluded that asbestos exposure may lead to asbestosis, to carcinoma of the lungs and digestive tract, and to mesothelioma. They further stated that there may be no indication of definite exposure to asbestos. It must be pointed out that a clear picture of the relationship between the type of asbestos and the production of asbestosis, neoplasms, and mesotheliomas is not defined in the exposures reported. In many cases mixed exposures have occurred; e.g., the cases from the Naval dockyards in Great Britain where exposures have occurred in unknown amounts to crocidolite and amosite.