

Average Exposures Low

1945 Results Available

Table 1 lists the fiber exposure data obtained from over 200 dust counts by Fleischer in 1945 and also those obtained by Murphy³ during 1965 and 1966. Using data supplied on the number of individuals engaged in the various work activities, a time-weighted (actually man-weighted) average asbestos exposure is calculated.

A detailed analysis of the results, however, presents difficulties. In each yard, a worker's average exposure was dominated by insulation activities aboard ship. For such activities, the average asbestos dust levels reported in

the different shipyards varied by nearly one hundred times.

It should be recognized that these fiber counts represent all fibers enumerated in the field of view of a komimeter. These would include fibers perhaps as short as 1.5 microns. Supplementary data⁵ on the size distribution of amosite aerosols in shipyards suggest that this overestimates the number of fibers longer than five microns by a factor of two.

Taking this factor into account, the average of the eight-hour concentrations of fibers longer than five microns in the four U.S. shipyards studied by Fleischer in 1945 would be from 15 to 20 fibers per milliliter (f/ml). It must be emphasized, however, that such averages are highly subjective and depend strongly upon the vagaries of the particular work practices selected for sampling and conditions present at that time.

Similar considerations would yield a value of 4 f/ml for the shipyard survey by Murphy in 1965-66.

New Techniques Used

The first research that quantified asbestos insulation exposures using membrane filter techniques was that of Balzer and Cooper published in 1968⁶ and extended in a report at the Dresden Conference on the Biological Effects of Asbestos in 1969.⁷

Their initial publication, however, enumerated fiber concentrations in marine and commercial insulation work in terms of all visible fibers, including those shorter than five microns. The later subsequent publication also provided data on fiber concentrations longer than five microns. Table 2 summarizes these results.

Using the information provided on

dust concentrations and the percentage of time a worker is engaged in a particular practice, a time-weighted average of 2.7 f/ml was obtained for exposures during asbestos insulation work in light and heavy construction, and 6.6 f/ml in marine construction and repair.

Cooper and Balzer noted that at the time of their study, approximately 55% of the work time of insulation workers was spent using materials other than asbestos. Thus, eight-hour time-weighted average exposures for asbestos workers during 1968 in the western United States would have averaged less than 1.5 f/ml in light and heavy construction. Moreover, it is noteworthy that Cooper and Balzer state their samples were "deliberately taken under conditions where the highest dust concentrations representative of a particular job were being developed."

Union Cooperation Obtained

The environmental evaluation of insulation work that was undertaken by the Mount Sinai School of Medicine under the auspices of the Insulation Industry Hygiene Research Program⁸ revealed asbestos air concentrations somewhat higher than those measured by Balzer and Cooper. Again using information supplied by union members and from observation of work practices, estimates were made of the percentage of time workmen were engaged in various activities in commercial and industrial construction.

The information on measured asbestos air concentrations obtained during these work activities is shown in Table 3. They were used as indicated to arrive at the estimated time-weighted average exposure of about 6 f/ml for insulators when working with asbestos.

On the average, in the eastern United

PURPOSES OF THE INSULATION INDUSTRY HYGIENE RESEARCH PROGRAM

1. To develop improved methods for minimizing exposure of insulation workers to dusts and fumes encountered in their work.

2. To disseminate knowledge of these improved methods of dust control wherever they may be applied advantageously and to offer cooperation, advice and assistance toward their universal adoption.

TABLE II

Asbestos fiber concentrations by membrane filter techniques

Job Classification	Percentage of work with asbestos	Light and Heavy Industrial Fibers/cc mean		Marine Construction and Repair Fibers/cc mean	
		All Lengths	Length > 5µ	All Lengths	Length > 5µ
Prefabrication	10%	10.1	6.6	30.4	20.0
Application	40%	12.4	8.0	24.8	16.8
Mixing	5%	2.4	1.6	10.6	7.1
Finishing	30%	2.7	1.8	1.8	1.2
Tearing Out	10%	12.8	8.4	31.5	20.2
General	5%	0.8	.5	.2	0.1

Time-Weighted Average Exposure 4.1 2.7 0.0 6.6

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