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THE OCCURRENCE OF ASBESTOSIS AMONG INSULATION WORKERS IN THE UNITED STATES*

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Information currently available concerning asbestosis has been derived largely from studies of employees of asbestos textile factories and should properly be referred to such individuals. It is inadequate to speak now of "asbestos workers." With the growth of asbestos utilization, including rapid multiplication of the number and variety of its applications, it would perhaps be more accurate to categorize workmen exposed to asbestos as "asbestos textile workers," "asbestos insulation workers," "asbestos miners," "asbestos mill workers," "asbestos-cement workers," etc. The different occupations vary widely in important respects; in intimacy, intensity and duration of exposure, in variety and grade of asbestos used, in working conditions, in concomitant exposure to other dusts or inhalants. The importance of this distinction and the parallel obligation to evaluate and study the experience of asbestos exposure in other trades, is emphasized by the fact that asbestos textile workers are now a minority of those exposed during the industrial use of asbestos.

There were good reasons for the early emphasis on asbestos textile workers. The first cases of asbestosis were in textile workers.¹⁻³ Following the republication of Cooke's case in 1927,⁴ with its rapid confirmation by the report of another case by Seiler,⁵ the Factory Department in Great Britain had to decide whether these were exceptional occurrences or represented a significant health risk in industry. Accordingly, an investigation into the problem was undertaken during 1928 and 1929.⁶ The scope of the study had to be restricted. The textile industry was selected for study since only here was there pure or almost pure asbestos exposure. Since it was urgent to investigate the effect of this dust, limiting the investigation to this branch of the industry avoided the possible complications which might be introduced by the presence of other potentially fibrogenic dusts. Moreover, in other asbestos trades, there were varying portions of asbestos in the dust to which workers were exposed, which would have added another complicating factor. It was accepted that there were considerable numbers of workers exposed to mixed dusts whose risk would not be documented by study of the asbestos textile industry.

Subsequent surveys, similarly designed to study the risk of industrial asbestos exposure, were also largely confined to asbestos textile workers.⁷⁻¹¹

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predecessor of the American Federation of Labor), as "The Salamander Association of Boiler and Pipe Felters."¹⁰ In 1910, the present union of insulation workers in this country was chartered by the A. F. of L. as the International Association of Heat and Frost Insulators and Asbestos Workers, with the amalgamation of the Salamanders' Association of New York and other independent locals through the country.¹¹ The members of this union are insulation workers, primarily employed in the building trades doing construction insulation work but also employed as insulation workers in shipyards and powerhouse construction and repair. Much of their work is in the open air but it sometimes is, as aboard ship, in rather tight quarters with poor ventilation. The men generally work at all parts of the trade; few are specialists at one part of it or limit themselves to one material. Conditions of work vary from job to job and from company to company. Among the 1,117 men we have examined (see below), fewer than nine per cent of those with 20 years of work experience or more had worked for one employer primarily — even after four years of work experience less than half had remained with their original employer. Review of work practices with insulation workers from various parts of the United States and with knowledgeable officials of the union and insulation employers indicates that techniques, materials and practices are rather the same through the country. Similarly, data published concerning the work practices in other countries¹² suggest that asbestos exposure in insulation work is approximately the same the world over.

The asbestos exposure to which insulation workers are subject is limited and intermittent. Some of the materials used contain no asbestos. Seventy-five years ago, the magnesia pipe coverings had shredded rope as a binder, with no asbestos. Later, much work was undertaken with hair-felt, wool-felt, cork, rock-wool. In the past three decades, fibrous glass products have come into increasing use and these have been supplemented recently with foamed and expanded plastics for certain applications. Of the asbestos-containing products which are widely used by these men, magnesia block insulation was and remains perhaps the most important. This usually contains approximately 15 per cent asbestos. While asbestos cement has a varying asbestos content depending upon its manufacture, it also generally has 15-20 per cent or less of asbestos. Asbestos paper products such as air-cell have a higher asbestos content but are used in much smaller quantities.

We have studied the insulation materials with which these men worked in the past, in several ways. First, review of old trade and technical publications from the early part of the century to about 1930¹³ indicates that the major asbestos-containing materials have remained about the same, especially insofar as the amount and nature of the asbestos content is concerned. As expected from knowledge of sources of U. S. imports of as-

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bestos, chrysotile asbestos was largely used.¹⁵ This has been confirmed by analyses of magnesia block obtained during repair work. In later specimens so obtained, crocidolite has also been found. Moreover, materials used for ship insulation, while containing the same amounts of asbestos as above, began in 1934 to have significant amounts of amosite in addition to chrysotile, because of the lighter weight of the material.¹⁶ Marr¹⁷ has recently brought shipyard insulation experience up to date, comparing it with the observations of Fleischer and colleagues,¹⁸ and concludes that "... insulation materials and work methods have remained essentially the same" since 1945.

Measurement of dust exposures of insulation workers have been but infrequently reported and have been hampered by the varied nature of the work. As in other asbestos work, peak counts are met which are excessively high but generally counts for asbestos fibers have been within the five mppcf. M.P.C. of the A.C.G.I.H.^{19,20} Such counts as have been available, made during work engaged in by the men studied by us, have shown a range similar to that of published counts.²¹

Present Investigation

We undertook to study the question whether asbestos exposure during insulation work in the U. S. was associated with the hazard of asbestosis and its complications. Our investigations have been concerned with the 1522 members of the insulation workers union in the New York (Local 12)-New Jersey (Local 32) metropolitan area. The New York Local of the Union is a direct lineal descendant of the Salamanders' Association, and is the oldest Union of insulation workers in the U. S. The 1522 men studied by us include all members of these Locals from 1942 to 1962. On December 31, 1942, there were 632 members and 830 men subsequently joined between 1942 and December 31, 1962. This includes every man who was a member of either of these locals at any time in this period, whether or not he remained in the trade as an insulation worker. It is believed that the experience of these men fairly represents a cross section of the experience of insulation workers during the history of this trade in the U. S. Records of the union indicate that these locals had 335 members in 1914 and that 1738 members were admitted to these locals from 1915 to 1963. In the United States as a whole, the Insulation Workers Union in 1914 had 1487 members and 23,338 were admitted from 1915 to 1963. The adequacy of our sample can be gauged by reference to these figures (see TABLE 1). However, our data does not include information concerning nonunion insulation workers, maintenance insulation workers, insulation work as part of other trades or undertaken by insulation workers in other unions. The number of men involved in insulation work in these areas is not known to us.

of both the pleura and peritoneum. A lung cancer has also been reported in a workman in a factory making asbestos insulation.²³ However, these reports, while interesting and valuable, could not establish an association between the two conditions. It is possible that additional lung cancers and mesotheliomas have occurred and may even have been reported but such reports do not state the nature of the asbestos exposure and such instances may be included among cancers in "asbestos workers."

Our experience that the lapsed period from onset of exposure is generally prolonged before the appearance of lung cancers in asbestos insulation workers coincides with the general experience of long "latent periods" in such cases. Indeed, in the infrequent cases in which very short periods have elapsed from onset of exposure, it might well be that the lung cancer found is coincidental. Such long latent periods would correspond to similarly prolonged periods associated with lung cancer in chromate workers,²⁴ nickel²⁵ cancers, arsenical lung cancers²⁶ and the increased incidence of lung cancer among regular cigarette smokers.²⁷ In Doll's series,²⁸ a long latent period was noted in all cases.

Neoplasms have also been reported among individuals indirectly exposed to asbestos insulation work, as carpenters,²⁹ steam fitters,³⁰ and other building trade workers.³¹

Summary

An investigation involving 1522 asbestos insulation workers in the New York-New Jersey metropolitan area has been conducted. Among 392 individuals examined more than 20 years from onset of exposure, radiological evidence of asbestosis was found in 339. In half of these, the asbestosis was moderate or extensive. In individuals with less than 20 years of exposure, radiological evidence of asbestosis was less frequent and when present, much less likely to be extensive.

Neoplastic complications of asbestos exposure were studied among 307 consecutive deaths in this group of men. Lung cancer was found to be at least seven times as common as expected and cancer of the gastrointestinal tract three times as common as expected. There were 10 instances of mesothelioma of the pleura or peritoneum.

Of the 1258 men alive at the start of this survey, 1117 were examined. Eleven cancers of the lung or pleura were found during this survey of the living members, all among the 392 men with more than 20 years from onset of exposure. No cancers were found in those men, the onset of whose work experience was less than 20 years.

We may conclude that asbestosis and its complications are significant hazards among insulation workers in the United States at this time.