

COPY OF LETTER FROM



Dr. John. F. Knox
North Beightons
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Mr. F. W. Sands
United States Rubber Company
New York 20, New York

Dear Mr. Sands:

I was most interested to hear from you and to learn your experience of the manufacturing hazards of asbestos. The condition of asbestosis is one about which it is impossible to be categorical. There are many considerations to be taken into account, and standards of radiology and clinical examination cannot be said to be universally agreed. Similarly, with regard to the working environment, safe standards by any specific method of dust counting cannot be said to have been established. There is considerable difference also in the experience of operatives in the different manufacturing processes. Some jobs involve intermittent exposure of varying degrees of severity while others - especially in textile operations - involve a whole day working in an atmosphere with a measurable dust concentration.

In the interests of brevity, I will take it for granted that you are familiar with the experimental animal work on particle size in relation to asbestosis. This was heavily in favour of the production of fibrosis by the inhalation of the fibres around 20-50 microns in length causing irritation of the respiratory bronchioles. While agreeing with the importance of fibre length in the etiology, I consider that the retention in the lung of fibres too long for phagocytosis which later undergo changes into asbestosis bodies in or around the alveoli to be a highly significant matter. It is the later changes which occur in these bodies from 15 years and upwards which seem to be most strongly related to the genesis of asbestosis in workers. If this is so, it does account for the long incubation period, and places emphasis on the effect of general bodily states, especially infections (including tuberculosis) and cardiac insufficiency. If these factors are operative at a time when the inhaled fibres are breaking up and exerting a fibrogenic effect then the lung is less able to withstand their effects.

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This conception may help you to understand why you are experiencing trouble at this time. In the medical care of the exposed workers, it should be realised that symptoms of asbestosis may precede radiological signs and also, that the early radiological changes suggestive but not pathognomonic of asbestosis, may be present without any clinical evidence of the condition. Long observation over months, or even years, may be required before a case can be considered to have been established. Of course, if there is considerable suspicion that fibrosis of the lung may be present, further exposure to dust is highly undesirable. Unfortunately, it is not possible in some individuals to change the working area without psychological ill effects or social embarrassment in the absence of a definite diagnosis. In these early cases it is likely that pulmonary function studies of the type now being developed by the physiologists will be of great help. There are times, however, when we might regard the lung

condition as due to heavy previous exposure and provided that the working area has been significantly improved further exposure to minute concentrations might be considered permissible.

At the risk of stressing points of which you are no doubt aware already, I would say that there are four general lines of attack on the dissemination of dust (1) enclosure of the process if possible and partial enclosure with exhaust if not possible; (2) dust extraction, as close to the point of production as possible, with ducting to lead the dust laden air to an efficient filter bag unit; (3) wetting of the process or if this is impracticable, damping is most helpful; (4) frequent air changes in the workroom. It is sometimes considered desirable to use an oil and water emulsion to mix with the fibre before opening in order to diminish dust emission later. There has to be a combination of several of these methods in workrooms where a variety of processes is being conducted and sometimes more than one method in one process, e.g. damping and exhaust with weaving. In every case experiments have to be conducted with each type of machine to get the best results.

Up till now I have avoided mention of dust counts about which there is a wide difference of opinion between the United States and Great Britain. No permissible dust concentration figure is written into our factory regulations and therefore we do not hesitate to use whatever new methods of dust counting are developed. The Government Factory Inspector may consider any area unsatisfactory and demand improvement without consideration of an actual dust count figure. The instrument in use here for dust counting is the thermal precipitator and there are already several modifications of this in use. When lengthy sampling periods are required we prefer the Ottway instrument. The only U.S. dust counting instrument with which I am familiar is the Greenburg-Smith. We have attempted to find a factor of correlation between between this instrument and the thermal precipitator but as they operate on different principles this is not really possible. As far as we have been able to compare the results of the two instruments the Greenburg-Smith gives results vastly lower in similar situations than the thermal precipitator. It is in the particle size range from $\frac{1}{2}$ to 2 microns that the thermal precipitator finds the greatest number of particles on the counting slide and it is likely that the Greenburg-Smith does not reveal as many here owing to the lower power of the microscope used. A figure of 5 million particles per cubic foot (173 particles per c.c.) would be an indication of relatively good conditions as judged by the thermal precipitator. The absolute safety of such a standard for a definite number of years exposure has not been determined.

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Limitation of the number of years spent by an operative in an area of dust hazard has much to recommend it where practicable. In the case of two large asbestos firms in this country, not dealing with textiles, a period of 5 years is laid down as the maximum period for exposure, but in the textile section of the work it is impracticable to limit years of exposure like this. There are not enough alternative jobs on offer and they are usually less skilled and lower paid. The loss of work status is considerable also with transfer from a skilled area to one less skilled.

Dust masks should, of course, be worn by those doing work such as machine cleaning - which is by its nature unprotected - but workers do not take kindly to the wearing of these continuously. It is in the field of intermittent exposure that they find their greatest use, and close supervision is necessary.

There is a difference between working conditions in the U.S. and Great Britain in that we are not permitted to re-circulate air which has been through the filter bag units and therefore these are in separate chambers. We have such faith in our own arrangements that we regard this as unnecessary in the interest of works hygiene.

With regard to actual methods of dust extraction, I am not a competent authority but in general terms fiberising and mixing are best dealt with by methods of enclosure. Flyer Spinning is regarded as the least dusty process here and is not required to be ventilated. Ring Spinning is ventilated and such processes as pirn winding and doubling are rendered safe by damping rollers. Weaving is carefully ventilated and also damped where this is appropriate.

A small article on this subject is awaiting publication at present and I shall send you a reprint when available. I enclose with the correspondence, a short memorandum on the subject of asbestosis research. It is useful sometimes to set down, in a series of simple propositions, just what we are attempting to accomplish in our efforts to control a hazard.

You mention in your letter that x-ray films have been referred to Dr. Pendergrass for his opinion. He may certainly be regarded as a leading authority and I have read his work on this subject with great interest and profit. He states in "Silicosis and Asbestosis" edited by Lanza (1938), "With regard to the radiological classification of asbestosis, I should include only two states, asbestosis moderately advanced and asbestosis markedly advanced. I feel certain that the roentgenologic diagnosis of the clinically early stage of asbestosis is not entirely reliable." His recent pronouncements on this subject suggest that his views have not altered significantly from this. When we are considering the early case, I think this is a most important matter to bear in mind. In fact I occasionally find radiological appearances in new entrants to the industry suggestive of early asbestosis although they have never been exposed.

If there are any specific points on which I can give further help perhaps you would be good enough to let me know.

With kind regards,
Yours sincerely,

John F. Knox, M.B., B.Ch.
Chief Medical Officer

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