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December 4, 1936

Mr. E. C. Carlisle, President,
The Toledo Vitrified Brick Company,
1220 Madison Avenue,
Toledo, Ohio.

Dear Mr. Carlisle:

In response to your letter of December 3, would say that the terms "free silica" and "combined silica" refer to the state of the silica, that is whether it is in combination with another substance or not. Examples of free silica are quartz, chert, or flint. Examples of combined silica are sodium silicate, magnesium silicate, aluminum silicate, etc.

It has been definitely established that silicosis is caused only by the inhalation of dust containing silica in a free or uncombined state. With the exception of asbestos, there is no dust or combined silica which will, as far as we know, produce a disabling fibrosis of the lungs.

Therefore, in endeavoring to estimate the seriousness of a silica hazard, it is necessary to know what is the amount of free silica in the dust. Ordinary chemical analysis, as a rule, merely shows the total silica present without attempting to differentiate whether it is present in a free or combined state. Barre granite, for instance, contains about 35% of free silica. The ore in the copper mines in Butte is imbedded in a country rock containing about 60% free silica, whereas in the lead and zinc mines in Missouri, Kansas, and Oklahoma District, the country rock is practically pure silica. I would say that any dust that contains over 70% or 75% of free silica was a highly siliceous dust.

There are three variables in connection with the cause of silicosis, namely the amount of dust in the air, the amount of silica in the dust and the constancy of exposure. Intermittent exposure to a dust containing 35% free silica is obviously less dangerous than constant exposure to dust containing 90% free silica. I imagine that the free silica content of various sands varies greatly. The sand used in sand blasting, for instance, is usually highly silicous and this, in connection with the immense amount of dust produced in sand blasting makes this a hazardous occupation that needs very careful supervision.

There are no permissible standards of dustiness because the multitude of various dusty conditions in the many industries concerned makes the elaboration of such standards impracticable. The United States Public Health Service in its study of the anthracite industry determined that dust containing not more than 5% free silica would not cause disabling silicosis in the average life time in concentrations up to fifty million particles per cubic foot.

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In the Barre, Vermont, study, also made by the Public Health Service, it was determined that granite dust, containing 35% free silica, would not cause disabling silicosis in concentrations of ten to twenty million particles per cubic foot.

There is plenty of evidence both from this country and South Africa to indicate that more than five million particles per cubic foot are dangerous where the dust is highly siliceous, that is roughly from 80% to 100% free silica. Where such highly siliceous dust is present, every effort should be made to keep the count below ten million particles per cubic foot with the purpose of getting the count down to five million particles, if practicable.

If you have any questions or this explanation is not clear, please let us know and we will try to be more explicit.

Sincerely yours,

A. J. Lanza, M.D.
Assistant Medical Director

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