ESSO LABORATORIES
STANDARD OIL DEVELOPMENT COMPANY

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P. O. BOX 51, LINDEN, N. J.

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Mr. F. S. Venable
Medical Department
Esso Standard Oil Company
Louisiana Division
Baton Rouge, La.

Dear Fred:

At the time of our informal meeting in Pittsburgh, you requested that we supply you with information on the collection and counting of asbestos dust. Frank Church has prepared some material on this subject and we have obtained a copy of Public Health Service Bulletin No. 241, "A Study of Asbestosis in the Asbestos Textile Industry". This material is attached for your information.

Very truly yours,

Van

N. V. HENDRICKS

NVH/hp
Encl: (1) FWC Memorandum 11/30/51
(2) PHS Bulletin No. 241

cc: Dr. C. M. Berry
Dr. H. Hansen
Dr. L. J. Wade

ASBESTOS DUST

CHEMISTRY:

Asbestos is the class name for several different fibrous minerals, but commercial asbestos is mainly chrysotile. Chrysotile is the fibrous form of serpentine and is a hydrous magnesium silicate, $3MgO.2SiO_2.2H_2O$, or $Mg_3Si_2H_4O_9$, containing 44.1 per cent of combined silica, 43.0 per cent of magnesia, and 12.9 per cent of water. Other types of asbestos often contain silicates of iron, calcium, and aluminum, as well as magnesium. Chrysotile represents approximately 95% of the asbestos used in this country. Other less common silicates which can appear in fibrous form include:

Anthophyllite (Amosite) - $(Mg,Fe)_7Si_8O_{22}(OH)_2$

Tremolite - $Ca_2Mg_5Si_8O_{22}(OH)_2$

Actinolite - Tremolite in which Fe has replaced Mg in amounts greater than 2%

Hornblende - $Ca_2Na(Mg,Fe^{II})_4\ (Al,Fe^{III},Ti)_3Si\ _6O_{22}(O,OH)_2$

Enstatite - $MgSiO_3$

Aegirite - $NaFe^{III}Si_2O_6$

Jadeite - $Na\ Al\ Si_2O_6$

Wollastonite - $CaSiO_3$

Epidote - $Ca_2(Al,Fe)_3(SiO_4)_3(OH)$

Sillimanite - Al_2SiO_5

Dumortierite - $Al_8BSi_3O_{19}(OH)$

TOXICITY:

The histological findings, particularly of early asbestosis, does not indicate a chemical injury. Gardner, as a result of studies at Saranac Laboratory, made the following statement:

"We have come to the conclusion that inhaled asbestos fibers are irritating, not because they are silicates but because they are stiff fibers which mechanically irritate the lungs. Unlike the free silicas, these minerals will not stimulate fibroblasts in any part of the body; only those in the lungs are affected. It was inferred that these organs were affected because the movements of respiration are so much more rapid and continuous than those of other viscera. Then it was discovered that if asbestos was ground very finely so that few of the fibers were longer than 2 microns in length, the irritating property of the asbestos was practically destroyed. Inhalation experiments with such fine chrysotile asbestos were carried out over a period of several years. No fibrosis has developed in spite of the fact that an average atmospheric concentration of 125 million particles per cubic feet of air has been maintained. In contrast in a previously reported experiment, one-third this concentration of long-fiber asbestos dust produced well marked fibrosis after about two years."

Only those silicates which are fibrous in structure have been definitely identified as pulmonary irritants. Serpentine which has the same chemical composition as chrysotile asbestos does not cause a pulmonary fibrosis and is considered as being physiologically inert. Talc, a hydrous magnesium silicate, and diatomaceous earth, particularly calcined earth, have some clinical indications of having pathological significance other than benign, non-specific pneumoconiosis. The finding of asbestos bodies in the sputum is of considerable diagnostic importance. The identification of asbestos bodies in sputum can be done by the procedure given in "Industrial Dust", first edition, Drinker and Hatch, pp. 165-166.

English experience had indicated a chemical pathogenesis for asbes-

tosis. This is at direct variance with experience in this country and could possibly be partially accounted for by a difference in chemical or physical composition of the asbestos. This variance, however, indicates a need for further study of the pathogenesis.

MAXIMUM ALLOWABLE CONCENTRATION:

The MAC of asbestos dust is 5 million particles per cubic foot of air, of a size from 2 microns long up. Because of the English experience, it is also advisable to hold the total count to 10 million particles per cubic foot of air, of a size from 5 microns down.

COLLECTION OF AIR SAMPLE:

A Greenburg-Smith or midget impinger flask is used with 25% isopropyl alcohol as a collecting medium. The standard sampling rate of 1 c.f.m. or 0.1 c.f.m., respectively, is used.

COUNTING SAMPLE:

The counting technique is the light field method, as specified in either "The Determination and Control of Industrial Dust", Public Health Bulletin #217, pp. 40-43, or "Poisons, Hazards, Solvents", second edition, N. B. Jacobs, pp. 144-147, with the following exception:- 'Two simultaneous counts are made -- total particles 5 microns and less and asbestos fibers 2 microns and larger. Great care must be exercised to obtain a good focus and a good light contrast during counting. Some asbestos fibers are extremely thin and consequently, hard to see and easily "burned out".

F. W. Church

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11/30/51