

SAINT LUKE'S HOSPITAL
of the Methodist Church
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CLEVELAND, OHIO 44101

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December 26, 1969

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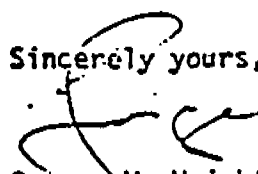
Dear Andy:

When I met with Selikoff and Kleinfeld last week, it was Doctor Selikoff's impression that our task was to define asbestosis since that was the biological abnormality for which an Industrial Hygiene Standard was to be considered. My own belief was that we were to do somewhat more than that and to discuss somewhat in more detail the medical aspects of the problem, with particular emphasis on the facts that lead one to conclude that, at this time, the Standard for asbestosis might be recommended. Doctor Kleinfeld gave me the impression that he thought we were to do something somewhere in-between these views. In any event, all three of us decided that we could agree on the features that would go into a definition of asbestosis, and you will find enclosed a single sheet to that effect.

Prior to the meeting of the three of us, I had prepared a rather brief set of comments which I thought might be the starting point for our discussion. I indicated to both Doctor Selikoff and Kleinfeld that I planned to give you this as my own personal view and contribution and not as coming from the three of us. I would like further to say that I don't believe you are to be bound in any way by the definition of asbestosis as we have envisioned it, nor by the comments that I am sending you on an individual basis. If any of it can be of help to you, you are more than welcome to use it.

With best wishes,

Sincerely yours,


George W. Wright, M.D.

GAH:vk

Enclosure

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Standards for Asbestos dust
concentration for use with the
Asbestos Regulations 1989

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STANDARDS FOR ASBESTOS DUST CONCENTRATION FOR USE WITH THE ASBESTOS REGULATIONS 1959

In this note guidance is given on how HSE inspectors of Factories will interpret the expression 'dust consisting of or containing asbestos to such an extent as is liable to cause danger to the health of employed persons' and how the measurements may be made. It is emphasized that these notes have been prepared for the guidance of HSE inspectors since only the Courts can give binding decisions in these matters. It is important to bear in mind that these standards are provisional and may have to be revised from time to time.

Chrysotile, amosite and fibrous anthophyllite

- (a) Where the average concentration of asbestos dust over any 10 minute sampling period is less than 2 fibres/cc or 0.1 mg/m³, HSE Factory Inspectors will not seek to enforce the substantial provisions of the Regulations, in particular Regulations 7 and 8. Where the concentration is 2 fibres/cc or 0.1 mg/m³ or more (but not more than 12 fibres/cc or 0.6 mg/m³) further sampling over a four hour period will be carried out to determine whether the average concentration of asbestos dust has exceeded 2 fibres/cc or 0.1 mg/m³.
- (b) Where the average concentration of asbestos dust over a four hour sampling period is 2 fibres/cc or 0.1 mg/m³ or more the extent to which HSE Factory Inspectors will require the standard of control to be improved will depend upon the amount by which it exceeds 2 fibres/cc or 0.1 mg/m³ and the duration of exposure.
- (c) When the average concentration of asbestos dust over any 10 minute period exceeds 12 fibres/cc or 0.6 mg/m³, Inspectors will normally seek to confirm or otherwise the accuracy of the test by means of a further sample before taking action to enforce Regulations 7 or 8 whichever is appropriate.

Crocidolite

The Regulations will apply in full wherever workers are engaged in processes involving crocidolite because the concentration of this mineral, that is believed to be liable to be dangerous to health, is very small indeed. An approved form of respirator will be required to be worn unless the concentration in the breathing zone of a worker in a crocidolite process can be maintained below 0.2 fibres/cc or 0.01 mg/m³ when measured as the average concentration over a 10 minute sampling period. Inspectors will normally seek to confirm the accuracy or otherwise of the test by means of a further sample before taking action.

NOTE (1) "fibre"/cc means particles of length between 5 microns and 100 microns and having a length to breadth ratio of at least 3:1, observed by transmitted light by

means of a microscope at a magnification of approximately 500x.

(2) "mg/m³" means milligrammes per cubic metre.

Sampling--general considerations

There should be an awareness of the philosophy of dust sampling before attempts are made to carry this out and a knowledge of the inherent difficulties in the interpretation of the results obtained. The concentration and composition of the dust environment of a worker will vary within wide limits throughout his work cycle so that it is often difficult to choose representative intervals if discontinuous sampling methods are used. Clearly, the longer the duration of each sample and the more samples that are taken, the more accurately will the average exposure be determined.

Short period samples will be taken over a ten minute period by means of an instrument with its inlet placed in the immediate breathing zone of a worker engaged in a process to which the Regulations may apply. Inspectors will choose the sampling period to coincide with a period of maximum dust generation. Sampling over the period will be continuous or at regular intervals in the case of use of manual bellows aspiration and the size range of the particles collected for examination by optical microscope will not be deliberately restricted.

Portable continuous sampling equipment carried on the worker may be used in many circumstances as it is thought that in general this will be less likely to lead to error in determining average dust exposures. Four hour tests therefore may be carried out in this manner or by successive tests of shorter duration; alternatively where employment at a continuous process is itself continuous, for instance at a spinning frame, an array of continuous sampling static instruments set at head height about the mean working position may be used.

Analysis of samples

It is necessary to obtain a measure of the concentration of the asbestos mineral of interest, not merely of the total mineral dust concentration, unless the concentration of the latter is less than the figures stated in paragraphs 2 and 3 of this note. The total dust concentration can be used for routine monitoring purposes in a particular factory provided that acceptable evidence is available to relate the total dust concentration to the asbestos content of the airborne dust. The composition of airborne dust is only similar to that of the parent material when substances are being handled, because of differing physical properties of the components or mixtures. Particles of no hygienic interest, derived from the general environment, are invariably present. Until generally acceptable gravimetric methods are available therefore which exclude these larger particles, analytical methods should take cognisance of the physical dimensions of the dust sampled.

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Examination of grain-size samples by X-ray diffraction techniques has been found to be of great value when the asbestos content of the dust exceeds 10% by weight. The overall sensitivity of the method can be increased if it is possible to concentrate the sample by means that do not attack the asbestos mineral of interest. Dust samples collected on membrane filters by HMA Factory Inspectorate are analysed by this means at the Laboratory of the Industrial Hygiene Unit, in HMFL, to whom application should be made for the equipment and

the equipment is
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Recognition of
the filters, in dust
microscope suffer
of resolution of the
The diameter of the
of airborne dust samples
theoretical limit of resolution
of optical systems. But
is inadequate for the examination
collected from the, often, very dilute
in fact, so that it is convenient
minimum dimension, of the particles
in this way and to assume that the
of such particles is related to the
of all airborne particles of the mineral
The limited experimental work that has
indicates that the determination by
copy of the concentration of asbestos
related dimensions is related to the mass
in airborne dust samples, where the
distribution is not distorted by secondary
such as re-circulation of air through

Long period continuous sampling instruments

reference will be made to equipment
available, that is used by HMA
Inspectorate. The fact that other instruments
mentioned or are not stated to be used by the
is not to be taken to mean that they have
to be unsuitable for sampling asbestos

Particle size selection

Asbestos produces its biological effect is not
certainly. Some commercially available
are fitted with particle size selecting
their inlets to enable estimates to be made
of the dust cloud of particle size likely
of penetrating the lung. It is not thought
that the currently available are suitable for
sampling of these particles, such as
cotton or some micas, whose particle
diameter markedly from that of spheres.

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Long period continuous sampling instruments

Personal sampler

Small and light weight battery driven samplers are available to draw air through a filter held in a sampling head that can be carried by a worker close to his face. Membrane filters of small diameter can be used and evaluation, by weighing on a glass slide, by examination with a microscope to obtain particle number estimates. To facilitate evaluation by avoiding errors due to overlapping and coincident particles, the sampling head should be replaced by one loaded with a clean filter as often as appears necessary by experience and by judgment of the apparent dust concentration of the environment. The instrument can also be used as a static sampler. One such instrument is sold by C F Casella and Company Limited, London N1. The sampling rate is variable up to 2 litres per minute and the instrument will operate for about five hours without recharging the battery, when using cellulose nitrate or comparable membrane filters.

Long running thermal precipitator

This is a self-contained battery powered instrument for use as a static sampler. Dust laden air is drawn by means of a pump driven by an electric motor, down a vertical passage and along a horizontal channel, the floor of which is formed by a glass slide. At first particles settle out from the air by gravity and the remainder are precipitated thermally beneath a heated wire. The flow rate is 2 cu cm per minute and the instrument will operate for 8 hours without recharging the battery. A valuable feature of the instrument is its ability to collect dust in the same form in which it is present in the air. Natural aggregates are not broken up, nor are fragile dust particles shattered. The sample elutriator is removed when sampling asbestos dust.

The collected sample is examined with the optical microscope. Errors in evaluation due to overlapping and coincident particles are relatively rare because the sample is deposited over an area 1 cm sq. Deposition of the sample on glass gives good visibility under the microscope and enables high resolution objectives to be used.

A version of the instrument is sold by C F Casella Co Ltd, London N1.

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'Hurricane' high volume sampler

This instrument consists of a 240 volt AC motor driven portable pump that can be fitted with small or large filter holders. The pump is capable of drawing 27 cu ft through 10" x 8" cellulose acetate membrane filters of 1.2 micron pore size. A sample large enough for weighing and for full compositional analysis, by X-ray diffraction techniques or otherwise, can be obtained in most environments in the reasonably short sampling time of three-quarters of an hour. The samples on membrane filters can also be examined with the optical microscope.

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It is noisy and discharges clean air that may dilute the work room air significantly unless arrangements are made to duct it away. It is normally suspended with the membrane filter facing downwards.

The instrument is sold by Hawksley and Sons Ltd., Lancing, Sussex, from whom the fine membrane filters can also be obtained. Many other pumps of rather low sampling rates are also available and will serve a similar purpose.

Rayco particle counter

Complex instrument designed for continuous monitoring of particle concentrations in 'clean' rooms. Used, limited by its large size and weight and to low concentrations of dust unless a complex dilution system is used as an accessory. Continuous chart recording or data printing system can be fitted. Several models are available. A sampling rate of one is 250 cc per min at sufficient dilution. The air sample passes through a very small coil illuminated by an intense monochromatic light and the light pulses scattered at right angles to the beam are recorded and their amplitude determined electronically to give simultaneous particle number concentrations and size distribution data. Discrimination against particles of no hygienic interest is not normally possible and no information on the composition of dust can normally be obtained. It appears to be an excellent particle counter and has the great virtue of examining the dust in its undisturbed airborne condition. It is also quick. The size distribution data may not be reliable. The pulse height amplitudes are set in relation to light scattered from latex spheres which in no way resemble the dust particles found in factory atmospheres. It is possible to relate the counter readings to size determinations made by microscope on the particles collected on a filter placed in the effluent line from the instrument counting coil and so obtain notional fibre concentra-

tions. Facilities for recording up to 23 different size groups can be provided.

In relation to asbestos it is used principally in areas such as textile process workrooms where asbestos is the only dust expected to be present in significant quantities.

The instrument is made in America and is supplied in the UK by Hawksley and Sons Limited, Lancing, Sussex. An instrument operating on a similar principle is made by Bausch and Lomb Limited.

Discontinuous sampling instruments

(a) Draeger dust sampler

Simple hand held and operated collection instrument that collects dust from 100 cc of air over 5 seconds sampling time, or in multiples of this volume, by filtration of the air through a membrane filter held in a metal filter holder. The dust collected on the filter can be examined with the optical microscope. Discrimination against particles of no hygienic interest is not possible.

The hand pump is supplied and is sold by Draeger Konimeter Limited, Kitty Brewster, Blyth, Northumberland. 1" open fit or holders are sold by Hawksley and Sons Limited, Lancing, Sussex.

(b) Other small pumps such as the personal samplers previously mentioned can also be used as (a) above to take short period samples on membrane filters.

(c) In addition H.M.F.I. have from time to time made use of Zeiss 10 Konimeter as an instrument to indicate gross exposure or to identify its source. Its accuracy in relation to asbestos is not such that it could be relied on to determine the values in the first part of this document.

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