PLAINTIFF'S EXHIBIT
UC-1063

ASBESTOS DUST
DETERMINATION BY MEMBRANE FILTER TECHNIQUE
USING PHASE CONTRAST MICROSCOPY

1 PURPOSE AND LIMITATIONS. This procedure has been written to conform to the U.S. Public Health Service recommended method for sampling and counting airborne asbestos fibers.

2 PRINCIPLE. The asbestos dust is collected by drawing air through a cellulose acetate membrane filter. The filter is then mounted on a standard microscope slide using a media which renders the filter transparent. The fibers on the filter are counted with a phase contrast microscope using 430X magnification. With phase contrast illumination, the light waves traveling through the fibers are retarded by a fraction of a wavelength to produce a change of phase over the mounting media, making the fibers visible with phase contrast optics as light or dark objects against the background.

3 APPARATUS AND REAGENTS.

a) Microscope with phase contrast accessories having 430X magnification (4-mm high-dry objective and a 10X eyepiece).
b) Eye piece reticle, either Whipple disk or Porton type.
c) Stage micrometer, 2 millimeter in length, divided in units of 0.01 millimeter.
d) Microscope slides, 25 x 75 mm.
e) Cover slips, No. 1 1/2, 22-mm diameter.
f) Millipore type AA filters and holders, Millipore Field Monitor Case Cat. No. MAWP-037A0, Millipore Filter Corporation, Bedford, Mass.
g) Millipore Filters Cat. No. AAWP-03700, 0.8 μ pore diameter, plain white, 37-mm diameter, Millipore Filter Corporation, Bedford, Mass.
h) Cellulose bands, white opaque, 41 x 25 mm, No. 28, Walter H Jelly and Co., 2822 Birch St., Franklin Park, Illinois.
i) Weaton balsam bottle.
j) Mounting media. Mix equal volumes of dimethyl phthalate and diethyl oxalate in the balsam bottle and dissolve 0.05 gm of the Millipore filters (paragraph f) for each milliliter of solution. (This will require considerable time with stirring to dissolve the filter. Allow to stand overnight before using.)

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k) Sampling pump - M-S-A Monitaire Sampler portable pump or equivalent.
l) Scalpel with No. 10 curved blade.
m) Tweezers for handling the membrane filters.
n) Optical lens tissue, non-linting.

4 SAMPLING PROCEDURE

a) Remove the cellulose band from filter holder and pry the top section from the holder.
b) Remove the back plug from the holder and attach the sampling line from the pump to the filter.
c) Set the pump to aspirate air through the filter at a rate of 2.0 liters per minute.
d) Use a sampling time of 15 minutes in the breathing zone area of the employee. (This is an average time; in very dusty atmospheres, the time will have to be reduced.)
e) Remove the sampling line and replace the plug and the top section on the filter holder.
f) Record the rate of sampling in liters per minute and the total sampling time.

5 MOUNTING PROCEDURE

NOTE: The area used to mount the samples for counting must be clean and free of dust and smoke. A dry-box arrangement (without gloves) can be used satisfactorily if no clean areas are available. The dry-box should have filtered air piped into it to provide a slight positive pressure and the glove ports should be covered with rubber sheeting to keep out dust when not in use.

a) Wash the microscope slides and cover slips with Drene or some other suitable detergent, rinse in dust-free water, and dry with optical lens tissue.
b) Remove the top and middle sections from the filter holder. Remove the membrane filter, grasping the outer edge with tweezers; do not handle the filter with the fingers.
c) Lay the filter on lens tissue and cut a wedge-shaped piece out of it with the scalpel.
d) Place a drop of the mounting media on the center of a clean slide and spread the fluid into a triangular shape slightly larger than the wedge cut from the filter.
e) With the aid of tweezers place the filter wedge sample side up into the mounting media.
f) Place the cover slip over the sample and press it lightly into place. An hour or more will be required for the filter to clear and the media to spread completely under the cover slip.
g) Prepare duplicate slides on each sample and mount a blank filter in the same manner for a background count.

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6 COUNTING PROCEDURE

NOTE: If a phase contrast microscopy is not available at the sampling location, then the prepared slides can be mailed to the R and D Environmental Hygiene Laboratory, P. O. Box 8361, South Charleston, W. Va. 25303

a) Place the prepared slide on the microscope stage. Make sure the objective is over the area of the filter wedge.
b) Adjust the focus - CAUTION - never lower the lens of the microscope while looking through the eyepiece. First lower the lens system by viewing the space between the objective lens and the cover slip from the side. Then looking through the eyepiece, adjust the focus to the top surface of the filter wedge by adjusting upward.
c) Refer to the manufacturer's instruction manual to insure the microscope is adjusted properly for phase contrast viewing, as the procedures vary with different microscopes.
d) Count the number of fibers greater than five microns in length in the counting area subtended by the reticle.
NOTE: A fiber is defined as any particle three times as long as it is wide. The length of the fiber is estimated by comparison with the known diameter circles on the proton reticle or the fine ruled squares on the Whipple disk which have been calibrated for width.
e) Count at least 100 fibers or until twenty random fields have been counted, whichever is less.
f) Calibrate the counting area by using a stage micrometer to measure the length of a side of the large square on the reticle, this procedure is detailed in 38E-J5-R2.1.

7 CALCULATIONS

$$(L)^2 = C$$

$$\frac{(N - B) \times A}{C \times V \times 1000} = \text{concentration, fibers per milliliter} > 5\mu$$

A = area of the millipore filter in mm^2
(The 37-mm diameter filters have an area of 855 mm^2)
B = average count from blank of fibers $>5\mu$ in length
C = counting area in mm^2
L = length in millimeters of one side of the square of the reticle used as the counting area, paragraph 6f
N = average fiber count from the sample
V = total volume of air sampled, in liters (time x flow rate)

8 REFERENCE 4-RSC-103

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① 8-10 people
3 at top
1 at Bottom
4 Samples one day.

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7:30 AM Start-Time
BS / ER Where Located } ?
Stop-Time

14" overlap to valve
12" strip completely
Column - Water

Contractor - John Manville - C.D. Mathews

1 Operator

[Background Levels ?] Pat Walton's Concern.

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