

USE OF PERSONAL SAMPLING PUMPS

In most cases, sampling is conducted in order to determine the concentration of a contaminant to which an employee may be exposed while performing a specific job. The airborne concentration of a contaminant is determined by measuring the amount of contaminant in a given volume of air sampled and calculated using the equation listed below:

$$\text{Airborne Contaminant Concentration} = \frac{\text{Amount of Contaminant Collected}}{\text{Volume of Air Sampled}}$$

Filtration is the most widely used technique for particulate or other aerosol sampling such as for lead or asbestos because of its low cost and simplicity. Using this sampling method, the amount of contaminant collected is determined by chemical and/or physical analyses of the filter. Laboratory results will provide this data.

The volume of air sampled can be determined only if the flow rate of the pump and the sampling time are known. The pump flow rate refers to the volume of air the pump draws through the filter each minute it is operating. The total volume of air sampled is calculated using the following equation:

$$\text{Volume of Air Sampled} = \text{Flow Rate} \times \text{Sampling Time}$$

The flow rate can be determined only through calibration of the sampling pump.

The common instrumentation and supplies used for aerosol sampling by filtration are described below:

Filter Cassettes

The filter cassette is an assembly with three basic components:

- Sampling Filter
- Back Up Pad
- Filter Holder (Cassette)

The sampling filter may be one of several material types including:

- Mixed Cellulose Ester Filters (MCEF)
- Glass Fiber Filters
- Polyvinyl Chloride (PVC) Filters
- Silver Membrane Filters

They may also be of various pore sizes and diameters.

The cassette may have two or three parts or stages. The two stage cassette is used only for closed face sampling; the three state cassette may be used either closed or open face mode.

The selection of the type of filter, the filter pore size, and the sampling mode (open or closed face) will depend on the contaminants sampled.

For sampling lead and asbestos, a mixed cellulose ester filter with a diameter of 37mm is required. The filter is mounted in a cassette with a back up pad. Sampling must be conducted closed face for lead (2 or 3 stage cassette) and open face for asbestos (3 stage cassette only).

Sampling Pump

Battery operated diaphragm pumps called personal sampling pumps, are used to draw air through the filter which then traps the particles. Most personal sampling pumps will operate for up to 8 hours sampling time before needing recharging. Recharging time is usually overnight (16 hours). The pump must be capable of pulling at least 2 liters of air per minute through the filter. A rotameter (or flowmeter) on the side of most pumps can be used to determine the flow rate at which the pump is operating.

No discussion of calibration
" , periodic checking of flow rate
" Breathing Zone sampling
" employee instructions

Occupational Safety and Health Administration (OSHA)

promulgates regulations governing occupational safety and health issues.

Environmental Protection Agency (EPA)

promulgates regulations governing management of emissions and waste products.

OSHA - health standards for physical (noise, radiation) and chemical agents.

Types of health standards:

Ceiling limits - maximum short term acute exposures

Permissible Exposure Limits (PELs)

average eight hour exposure

PELs based on dose concept:

Establish average concentration or level allowed over 8-hour workday.

Action level - average exposure, lower than PEL value, triggers medical surveillance requirements.

e.g.

	<u>8-hr. PEL</u>	<u>8-hr. Action Level</u>
Lead	50 $\mu\text{g}/\text{m}^3$	30 $\mu\text{g}/\text{m}^3$
Asbestos	2 fibers/ cm^3	0.1 fibers/ cm^3
Noise	90 dBA	85 dBA

Instrumentation required to determine compliance with 8 hr. PEL and Action Level are personal samplers measuring average exposure.

Noise measurement:

Sound Level Meter - Instantaneous reading, direct measurement of sound pressure level.

Operated on: A weighting

slow setting

Calibration at 1000 HZ

Dosimeter - gives dose reading, where 90 dBA for 8 hours would result in 100% dose, 85 dBA for 8 hours would result in 50% dose.

Lucas D, Hartwell T, Rao AV. 1980a. *Asbestos-Containing Materials in School Buildings: Guidance for Asbestos Analytical Programs*. Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency.

Lucas D, Hartwell T, Rao AV. 1980b. *Asbestos-Containing Materials in School Buildings: Guidance for Asbestos Analytical Programs, Statistical Background Document*. Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency.

Nicholson WJ, Rohl AM, Ferrand EF. 1971. "Asbestos Air Pollution in New York City." In: *Proceedings of Clean Air Congress*. England HM, Barry WT, eds. New York: Academic.

Nicholson WJ, Rohl AM, Weisman I. 1975. *Asbestos Contamination of the Air in Public Buildings*. Washington, DC: U.S. Environmental Protection Agency.

Pinchin DJ. 1982 (June). *Asbestos in Buildings*. Mississauga, Ontario, Canada: Ontario Research Foundation.

Samudra AV, Horwood CF, Stockham JD. 1977 (revised June 1978). *Electron Microscope Measurement of Airborne Asbestos Concentrations*. Research Triangle Park, NC: Office of Research and Development, U.S. Environmental Protection Agency.

Sawyer RN, Spooner DM. 1979b. *Asbestos-Containing Materials in School Buildings: A Guidance Document, Part 2*. Washington, DC: Office of Toxic Substances, U.S. Environmental Protection Agency.

USEPA. 1979. U.S. Environmental Protection Agency. *Asbestos-Containing Materials in School Buildings: A Guidance Document, Part 1*. Washington DC: Office of Toxic Substances, USEPA.

USEPA. 1980. U.S. Environmental Protection Agency. *Asbestos-Containing Materials in Schools, Economic Impact Analysis of Identification and Notification Proposed Rule, Sec. 6, TSCA*. Washington, DC: Office of Toxic Substances, USEPA. EPA-560/12-80-004.

USEPA. 1981. U.S. Environmental Protection Agency. *Evaluation of Encapsulants for Sprayed-On Asbestos-Containing Materials in Buildings*. Summary. Cincinnati, OH: Office of Research and Development, USEPA.

USEPA. 1982. U.S. Environmental Protection Agency. *Support Document for Final Rule on Friable Asbestos-Containing Materials in School Buildings: Health Effects and Magnitude of Exposure*. Washington, DC: Office of Toxic Substances, USEPA.

Versar Inc. 1980. *Exposures to Commercial Asbestos, Sec. 3: Comparability of Asbestos Data*. Preliminary draft report. Washington, DC: Office of Pesticides and Toxic Substances, U.S. Environmental Protection Agency. Contract No. 68-01-5791.