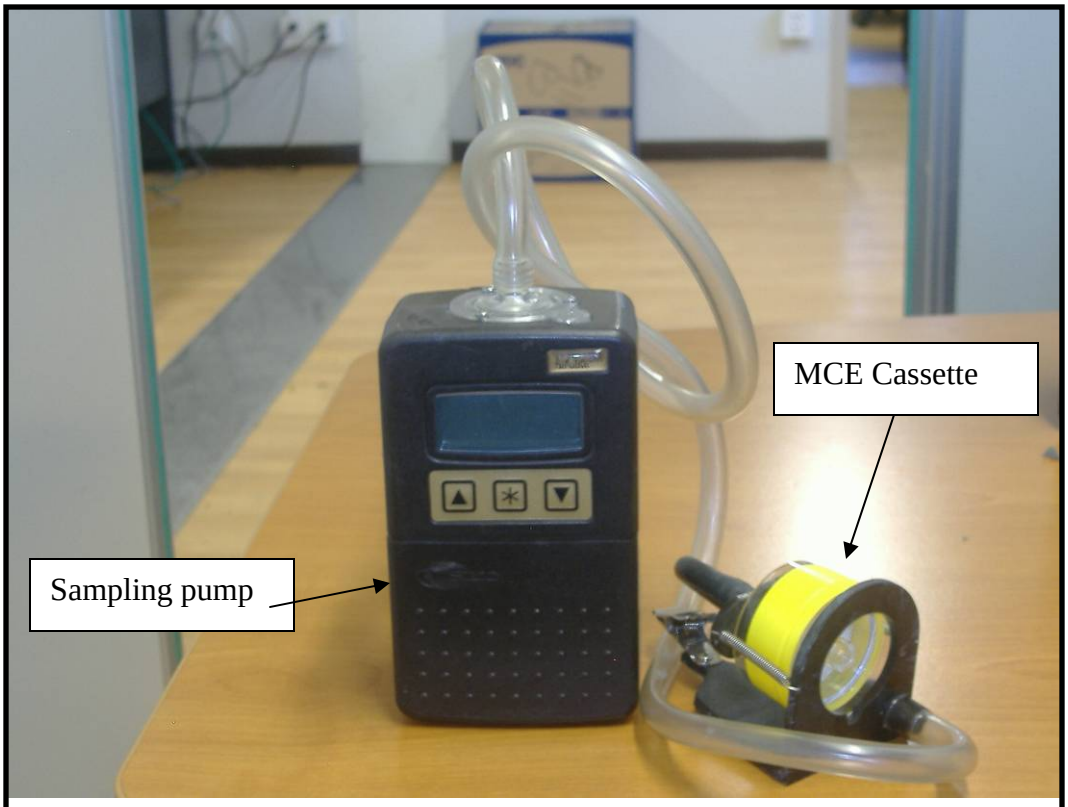
Chapter 7
Airborne Lead/Arsenic Sampling Procedures

This chapter will discuss how to sample airborne lead or arsenic dust/fume concentrations. Lead and Arsenic are sampled using nearly identical methods; therefore the chapters will be combined.

Airborne lead & arsenic requires the use of a mixed-cellulose ester (MCE with 0.084 micron pore size) cassette with a sampling pump. The sampling pump should be calibrated to 1-4 LPM before sampling (please see the Calibration Procedures Chapter).

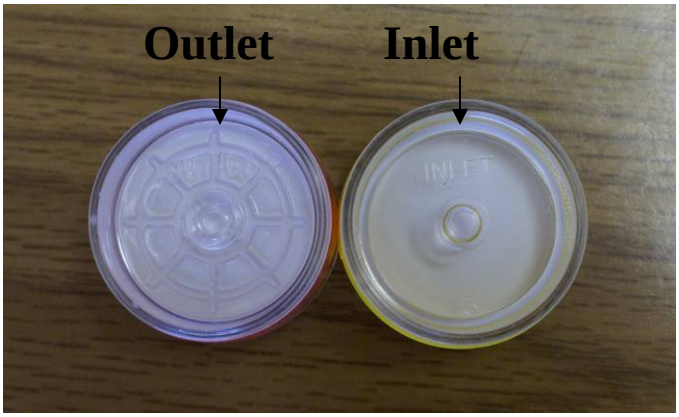


Picture 1 – airborne lead dust & fume sampling train

Sampling Train

The sampling train (see picture 1) will consist of:

- Air sampling pump,
- Tygon tubing, the tubing must be long enough to reach from the air pump (at person's waist) to the cassette (at the person's collar)
- MCE cassette.
- Cassette holder, the cassette holder will hold the MCE cassette and have a clip that will



clip to the person's collar. Please note that the cassette outlet says outlet on it. It also has a 'wagon wheel' looking air-channel to distribute the air across the filter evenly. This end of the cassette must be connected to the Tygon tubing so air flows into the cassette through the inlet side only.

Sampling Procedures

- Select employees to be sampled. Explain that the purpose of the sampling is to monitor the employee's exposure to lead or arsenic dust and/or fume over his shift.
- Instruct the employee to wear the sample the entire shift.
- Attach the pump to the employee. This can be done several ways:
    - Attach the pump to the employee's belt
    - Use the carrying case & straps that usually come with a sampling pump
    - Use a vest, such as a fishing vest to carry the pump.
- Attach the cassette assembly to the employee's collar. This should be within the employee's breathing zone (within 12-inches around the employee's head).
- Explain to the employee that the sample inlet must face downwards at all times. (If the inlet faces up, dust can fall into the cassette, giving an erroneously elevated result). Do not cover the sample with coat, coveralls, etc.
- Check on the sample every couple of hours to ensure:
    - Pump is still running
    - Sample is still in correct position
    - Employee is still performing same task
    - Etc.
- A task log could be given to the person to fill out every half-hour. This helps in identifying tasks that may have contributed to elevated exposures.

Collect Samples When Sampling is Complete:

- Collect sample train
- Record sample run time in minutes
- Perform post calibration as described in the Pump Calibration Procedures chapter
- Remove cassette from cyclone and insert plugs into inlet & outlet
- Charge pump for next sampling
- Send samples to IH-Accredited lab for analysis. Request NIOSH 7082 for lead analysis or NIOSH 7900 for Arsenic analysis. (NIOSH 7300 can be used if sampling for both lead & arsenic with same cassette).

Calculating TLV & Interpreting Results:

- Results usually are received in milligrams (mg) per sample. If results are reported in micrograms (ug) multiply the result in micrograms by .001 to move the decimal point 3 places to the left. For example 125ug x .001 = .125mg.
    - Calculate cubic meters of air ran through the sample (average liters per minute (lpm) ran during sampling multiplied by number of minutes the sample ran. For example, if the average of the pre & post calibrations was 1.705 lpm and the sample time was 480 minutes, then use 1.705 lpm *480 minutes* .001= 0.818 m^3.

        - Please note that if a personal sample is conducted on an employee that works more than an eight-hour shift, then the sample must be shift-weighted (called a Shift-Weighted Average (SWA)) in order to compare the exposure to MSHA's TLV. To shift-weight an exposure, 480 minutes must be used no matter what the sample time was (as long as the sample was more than eight hours). For example, if a full-shift sample was conducted on an employee working a 12-hour shift, then the formula used to calculate the cubic meters would be 1.700 * 480 * .001. Please notice that 480 minutes is used in the SWA, not 720 minutes.
    - Calculate exposure:
        - Divide the mg/sample received from the lab by the cubic meters calculated above.

Example (using lead):
Employee sampled for full 12-hour shift

- Results received from lab in micrograms (ug).....44
- Pre Cal.....1.700 LPM
- Post Cal.....1.715 LPM
- Shift Duration (12-Hours).....720 Minutes

- Change 44 micrograms to milligrams.....44ug x .001 = .044mg

Calculate Air Volume
- Average Liters per Minute = (1.700+1.715)/2 = ...1.708 LPM
- Total Liters (1.708 LPM * 480) = ...820 Liters

Please note that 480 minutes is used to Shift Weight the result although the sample time was actually 720 minutes.

- Total cubic meters (m^3) 820 liters * .001= .....0.82m^3

Calculate Exposure
Divide lead(mg) by cubic meters
    - .044mg / 0.82m^3 = 0.054mg/m^3

In this example, the employee was over the current American Conference of Governmental Industrial Hygienist's (ACGIH) TLV of 0.05mg/m^3. Please note that MSHA's TLV from 1973 is three times higher at 0.15mg/m^3.