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IX. APPENDIX I

AIR SAMPLING PRACTICES FOR FLUORIDES

General Requirements

Air contaminant concentrations shall be determined within the worker's breathing zone and shall meet the following criteria in order to evaluate conformance with the standard:

(a) Samples collected shall be representative of the individual worker's exposure.

(b) Sample data sheets shall include:

(1) The date and time of sample collection

(2) Sampling duration

(3) Volumetric flowrate of sampling

(4) Ambient temperature and pressure

(5) A description of the sampling location

(6) Other pertinent information (eg, worker's name, shift, work process, etc)

(c) Sampling will be in accordance with the provisions of the procedures outlined herein.

Breathing Zone Sampling

(a) In order to assure that a sample is representative of a worker's exposure, collection shall be as near the breathing zone of the worker as practical. Sampling should not hamper the typical movement patterns associated with his work.

(b) A portable, battery-operated personal sampling pump capable of being calibrated to ±5% at the required flow, and a 2- or 3-piece filter cassette containing a filter (prepared as in Appendix II) shall be used to collect the sample.

(c) The sampling rate shall be accurately maintained at a value between 1.5-2.5 liters per minute and samples shall be taken for a time period appropriate to the estimated concentration of fluoride in the air; eg, at the environmental limit (2.5 mg F/cu m), a flowrate of 2.0 liters/min, and sample time of 60 min, fluoride would be present in solution at 7.5 ppm after sample treatment (20 ml water and 20 ml Total Ionic Strength Adjustment Buffer [TISAB]).

(d) A minimum of 4 samples shall be taken for each operation and averaged on a time-weighted basis.

(e) For determining background correction a field blank and a laboratory blank (clean filters) shall be analyzed simultaneously with the sample.

Calibration of Sampling Trains

Since the accuracy of an analysis can be no greater than the accuracy of the volume of air which is measured, the accurate calibration of a sampling pump is essential to the correct interpretation of the pump's indication. The frequency of calibration is dependent on the use, care, and handling to which the pump is subjected. In addition, pumps should be recalibrated if they have been subjected to misuse or if they have just been repaired or received from a manufacturer. If pumps receive hard usage, more frequent calibrations may be necessary. Regardless of use,

maintenance and calibration should be performed on a regular schedule and records of these kept.

Ordinarily, pumps should be calibrated in the laboratory both before they are used in the field and after they have been used to collect a large number of field samples. The accuracy of calibration is dependent on the type of instrument used as a reference. The choice of calibration instrument will depend largely upon where the calibration is to be performed. For laboratory testing, a 1- or 2-liter buret or wet-test meter is recommended, although other standard calibrating instruments such as spirometer, Marriott's bottle, or dry gas meter can be used. The actual set-up will be similar for these instruments.

Instructions for calibration with the soapbubble meter follow. If another calibration device is used, equivalent procedures should be followed. The calibration setup for personal sampling pumps with a filter is shown in Figure XII-1.

(a) Check the voltage of the pump battery with a voltmeter both with the pump off and while it is operating to assure adequate voltage for calibration.

(b) Place a treated membrane filter in the holder.

(c) Assemble the sampling train as shown in Figure XII-1.

(d) Turn the pump on and moisten the inside of the soapbubble meter by immersing the buret in the soap solution. Draw bubbles up the inside until they are able to travel the entire buret length without bursting.

(e) Adjust the pump rotameter to provide a flowrate of 1.5-2.5 liters per minute. (Often a flowrate of 1.8 liters a minute is

satisfactory for prolonged sampling periods.)

(f) Check the water manometer to insure that the pressure drop across the sampling train does not exceed 13 inches of water (approximately 1 inch of mercury).

(g) Start a soapbubble up the buret and, with a stopwatch, measure the time it takes for the bubble to transit a minimum of 1.0 liter.

(h) Repeat the procedure in (g) above at least 3 times, average the results, and calculate the flowrate by dividing the volume between the preselected marks by the time required for the soapbubble to traverse the distance.

(i) Data for the calibration include the volume measured, elapsed time, pressure drop, air temperature, atmospheric pressure, serial number of the pump, date, and name of the person performing the calibration.

(j) Corrections to the flowrate may be necessary if the pressure or temperature when samples are collected differs significantly from that when calibration was performed. Flow rates may be calculated by using the following formula:

$$q\ (\text{actual}) = q\ (\text{indicated}) \sqrt{\frac{P\ (\text{calibrated})}{P\ (\text{actual})} \times \frac{T\ (\text{actual})}{T\ (\text{calibrated})}}$$

where q = volumetric flowrate

P = pressure

T = temperature (in degrees Kelvin or Rankine)

(k) Use graph paper to record the air flow corrected to 25 C and 760 torr as the ordinate and the rotameter readings as the abscissa.