U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 8

STANDARD OPERATING PROCEDURE (SOP) FOR REAL-TIME AEROSOL MONITORING

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REVISION LOG

Date	Revision
02/28/01	--
03/15/01	Update for specific instrumentation being used

PROCEDURAL SECTION

1.0 Scope and Applicability

This Standard Operating Procedure (SOP) provides a standardized method for real-time measurement and recording of aerosol (dust) concentrations in air using an aerosol monitor. It is intended to be used as a semi-quantitative (relative) index of the concentration of airborne dust particles in the vicinity of people engaged in activities that may result in the release of asbestos fibers into air.

2.0 Summary of Method

A microprocessor controlled real-time monitor with an internal air sampling pump is used to monitor particulate concentrations. The monitor uses a detached sensor to measure particles using the principle of near forward light scattering of infrared radiation. The monitor also contains an in-line 37mm filter cassette in order to allow the user to collect concurrent filter samples for asbestos analysis.

3.0 Health and Safety Warnings

Asbestos fibers are hazardous to human health when inhaled. Exposure to excessive levels may increase the risk of lung cancer, mesothelioma, and asbestosis. All personnel engaged in activities that may release asbestos fibers into air must have adequate health and safety training and must wear an appropriate level of personal protective equipment (PPE).

4.0 Cautions

None

5.0 Interferences

None. However, because aerosol monitors measure the concentration of all particles in air, it is important to understand that the real-time results are not specific for asbestos fibers.

6.0 Personnel Qualifications

Field personnel that deploy and operate the real-time aerosol monitor must be trained in the proper use of the equipment, and must have adequate health and safety training when working in areas where asbestos fibers might be present.

7.0 Apparatus and Equipment

Direct Reading Exposure Monitor

For aerosols such as asbestos fibers or other airborne dusts, direct reading measurement of exposure is made with a light scattering aerosol photometer. These devices measure the aerosol concentration based upon the amount of light scattered by the aerosol in the sensing chamber of the instrument. For this study, the HazDust II Real-time Personal Dust Monitor, Model HD-1002 (Environmental Devices Corporation, Haverhill, MA) will be used to measure exposure concentrations. This instrument can be configured with various sampling heads to sample for inhalable, thoracic and respirable aerosols. It contains an internal sampling pump and can be outfitted to collect filter samples for post-collection analysis. The HazDust II is calibrated for Arizona Road Dust, with the instrument output relative to this standard. The monitor has a data logging system for recording the real-time data. This data logging system can then be downloaded to a personal computer for storage and analysis.

Computer System

A personal computer system is used for several different purposes. First, the HazDust II monitor downloads its data to the computer through an RS232 port. The downloading procedure is controlled by the HazComm software supplied with the HazDust II monitor. Once the data are downloaded to the computer, the data can be evaluated and analyzed to determine the contribution of the workers' activities to the overall exposure. This analysis is typically done using a spreadsheet program such as Excel (Microsoft Corp., Redmond, WA).

Filter Cassettes

All samples will be collected on conductive filter holders consisting of 37-mm diameter, three piece filter cassettes. The cassette shall be pre-loaded with a mixed cellulose ester (MCE) filter with pore size 0.8 um.

To reduce contamination and to hold the cassette tightly together, seal the crease between the cassette base and the cowl with a shrink band or adhesive tape. If particle deposition on the inside of the cowl is observed, it may be necessary to ground the cowl to reduce static charge. This is done by attaching one end of a length of flexible wire to the plastic cowl with a hose clamp and attaching the other end of the wire to a suitable ground (e.g., a cold water pipe).

Sample Labels

A pre-printed sheet of sample labels (2 identical labels per sample number) is required. One label should be attached to the filter cassette before the sample collection period begins, and the matching label should be attached to the field log book that records relevant data on the sample being collected.

Field Log Book

A field log book is required to record relevant information regarding sampling (e.g., location, time, activity being recorded, unusual conditions or problems, etc.).

8.0 Instrument Preparation/Calibration

Direct Reading Exposure Monitor

The HazDust II monitor is factory-calibrated. For field operation, the monitor needs to be zeroed, the calibration span checked with a reference scatter, and the sampling pump calibrated. This should be performed at the start of a sampling day, as well as periodically throughout the day (every 2-4 hours). The HazDust II should be zeroed before checking the span or the pump flow rate. A empty filter cassette is connected to the sensor housing, and the pump tube is connected to the cassette. The thoracic sampling inlet is inserted into the sensor housing, and the zero filter is inserted into the sampling inlet. The zeroing procedure of the HazDust II is then started according to the operation manual. Following zeroing, the calibration span of the HazDust II should be checked. The pump tubing is removed from the filter cassette, and the thoracic inlet is removed from the sensor housing. The reference scatter is inserted into the sensor housing and the HazDust II is started with the sampling time set to 1 second. The readout of the instrument should match the “k” value on the reference scatter. Details of this procedure are given in the operation manual of the HazDust II. Next, the pump on the HazDust II should

be calibrated. A filter cassette of the same type being used during data collection should be connected to the sensor housing, and the pump tubing connected to the filter cassette. The thoracic sampling inlet is inserted into the sampling head, and the tubing from the calibrator is connected to the inlet. The instrument sample time is set to 1 second and sampling is started. The pump flow rate should be set to 2.0 l/min, and is set by adjusting a potentiometer on the bottom of the HazDust II. Once the flow rate is adjusted properly, instrument sampling is stopped, the calibrator tube is removed, and the inhalable inlet is inserted into the thoracic inlet.

The final items to set on the HazDust II are the sampling inlet and date and time. Details of these procedures are given in the operation manual of the HazDust II monitor. The inlet type used for this study is the inhalable inlet.

9.0 Data Collection

For personal samples, the HazDust monitor is fastened to the worker's waist by a belt, and the sampling head is clipped to the worker's collar near the breathing zone with the sampling inlet oriented downward. The sampling head should be fastened securely enough to prevent it from interfering with the work being performed. For stationary air samples, the sampling head should be mounted on a tripod or other suitable device with the sampling inlet oriented downward so that the air is collected from an appropriate height, generally intended to represent the breathing zone of the exposed individual (e.g., 1.5 to 2 meters above the floor). Data collection begins by starting the HazDust monitor. When starting the HazDust II monitor, the sampling time should be set to 1 second. It is recommended that the HazDust II monitor be downloaded frequently throughout the sampling day (i.e., every 1-2 hours). This prevents the loss of large qualities of data in the event of in instrument failure. The HazDust II is downloaded to a personal computer through a download cable, using the HazComm software. This software saves the exposure data, and allows it to be imported into a spreadsheet program. Details for using this software are given in the HazDust II operation manual. All relevant information on location, time, and activities should be recorded in the field logbook.

QUALITY CONTROL and QUALITY ASSURANCE

Pre-Project Filter ("Lot") Blanks

Before samples are collected, two cassettes from each filter lot of 100 cassettes should be randomly selected and submitted for analysis. The lot blanks will be analyzed for asbestos fibers

and other mineralogic materials by the same method as will be used for field samples. The entire batch of cassettes should be rejected if any asbestos fiber is detected on any filter.

Field Blanks

Blank samples are used to determine if any contamination has occurred during sample handling. Prepare two blanks (from the sample lot used for field sampling) at each sampling location (residence). Filter blanks should be taken to a sampling location, prepared there, and remain at the sampling location as long as field samples are collected. Remove the caps on the filter cassette and hold the cassette open for about 30 seconds. Attach and secure a sample seal around each sample cassette in such a way as to assure that the end cap and base plug cannot be removed without destroying the seal. Tape the ends of the seal together since the seal is not long enough to be wrapped end-to-end. Initial and date the seal. Store blanks for shipment with the sample cassettes.