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Analyzing Workplace Exposures Using Direct Reading Instruments and Video Exposure Monitoring Techniques

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control
National Institute for Occupational Safety and Health

ERRATA

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Page 22--Replace the value "0.8" with "1.2" on line 12 of the first paragraph.

ANALYZING WORKPLACE EXPOSURES USING DIRECT READING INSTRUMENTS AND VIDEO EXPOSURE MONITORING TECHNIQUES

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ABSTRACT

A typical evaluation of a worker's exposure to an air contaminant requires a pump to draw air through a filter, sampling tube, or other media suitable for collecting the contaminant for a measured period of time. These "integrated" samples provide an indication of the extent of a worker's exposure. Depending on the worker's job tasks, these samples normally do not identify the specific job elements that contribute most to the worker's exposure. To help identify these critical work elements, a technique called video exposure monitoring has been developed by researchers from the National Institute for Occupational Safety and Health.

Part 1 of this document (1) outlines the techniques for conducting video exposure monitoring; (2) describes the equipment required to monitor and record worker breathing zone concentrations; (3) discusses the analysis of the real-time exposure data using video recordings; and (4) discusses the use of real-time concentration data from a direct reading instrument to determine a room's effective ventilation rate, the mixing factor, and the room concentration at a given time. Part 2 contains case studies describing a variety of circumstances where the video exposure monitoring techniques provided useful information not obtainable by integrated sampling. Each case study briefly describes the process being monitored and the methodology used to monitor the exposures and, further, discusses the findings and the recommendations derived from the case study. These case studies demonstrate the power and utility of video exposure monitoring.

ABBREVIATIONS

A	Absorbance of sample
ASCII	American Standard Code for Information Interchange
A/D	Analog to digital
β	Regression coefficient
C	Concentration
C_{avg}	Average concentration
cfm	Cubic feet per minute
cm	Centimeters
C_{red}	Concentration at reduced pressure
C_{act}	Actual concentration
C(t)	Concentration at time t
°C	Degrees Celsius
DC	Direct current
ε	molar absorbtivity (l/mole/cm)
ϵ	Regression constant
EGA	Enhanced Graphics Adapter
eV	Electron volts
fibers/cc	Fibers per cubic centimeter
fpm	Feet per minute
ft^3	Cubic feet
G	Emission factor
HAM	Handheld Aerosol Monitor
hr	Hours
HVLV	High velocity-low volume
Hz	Hertz
in	Inches
I	Intensity of light transmitted by sample
I_0	Intensity of incident light
IR	Infrared
IR_i	Time weighted average instrument response
IR(t)	Instrument response at time t
K	Mixing factor
KB	Kilobytes
kg	Kilograms
kHz	Kilohertz
L	Path length
l	Liters
lb	Pounds
l/min	Liters per minute
l/mole/cm	Liters per mole per centimeter
m	Meters
m^2	Square meters
m^2	Square meters
m^3/hr	Cubic meters per hour
mg/m^3	Milligrams per cubic meter
moles/l	Moles per liter
mv	Millivolts
n	Number
N_2O	Nitrous oxide
NIOSH	National Institute for Occupational Safety and Health
NMAM	NIOSH Manual of Analytical Methods
NTSC	National Television System Committee
O_2	Oxygen
OSHA	Occupational Health and Safety Administration
p	Probability
P_{atm}	Atmospheric pressure
P_{drop}	Pressure drop
ppm	Parts per million
Q	Volumetric flow rate
Q/V	Air changes
RAM	Real-time Aerosol Monitor
REL	Recommended Exposure Limit
rpm	Revolutions per minute
sec	Seconds
STEL	Short Term Exposure Limit
ST_i	Time weighted average sorbent tube concentration
t	Time
TWA	Time weighted average
μm	Microns
UV	Ultraviolet
V	Volume
v	Volts
VGA	Video Graphics Array
VHS	Video Home System
X	Independent variable
Y	Dependant variable

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FIGURES

TABLES

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