

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



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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August 1992

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DHHS (NIOSH) PUBLICATION NUMBER 92-104

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

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ACKNOWLEDGMENTS

The editors wish to express their gratitude to all the contributing authors for all of their contributions of time and expertise. The editors wish to specifically thank Marion Curry, Phillip Froehlich, and Leroy Mickelsen for their assistance in reviewing this document and Ronald Hall for his assistance in preparing the art work for this report.