

3M
Organic Vapor Monitor
Sampling Guide
For
Organic Vapor Monitor #3500/3510
Organic Vapor Monitor
With Back-Up Section #3520

December, 1982

ANOTHER STEP TOWARDS BETTER OCCUPATIONAL HEALTH AND SAFETY
R35SG-A (1221) R2

Litho in U.S.A.

Occupational Health and Safety Products Division/3M
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St. Paul, Minnesota 55144

3M

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Use of the Sampling Guide Tables:

The following table summarizes OSHA standards, 3M monitor sampling information and recommended sampling procedures for a variety of organic compounds for which the 3M Organic Vapor Monitors can be used to accurately determine the environmental exposures. The table is not exhaustive and will be updated periodically. To obtain periodic updates, return the registration card contained in every box of monitors to 3M Company.

A. OSHA Standards

The OSHA TWA-PEL's (Time Weighted Average) given as workshift time weighted averages are taken from the Federal Register as found in 29 CFR 1910.1000 as of 1 January 1977 and are summarized in the "NIOSH/OSHA Pocket Guide to Chemical Hazards." Also included in parentheses are the current ACGIH (American Conference of Governmental Industrial Hygienist) values in cases where they differ from OSHA TWA's. These values are subject to change and appropriate publications should be consulted for the most current information.

B. Monitor Samples Information

*** Sampling Rate**

All sampling rates have an accuracy of $\pm 5\%$. The (*) compounds in the Sampling Guide tables have been subjected to an extensive amount of laboratory work to verify the sampling rate. The sampling rates given for the remaining compounds in this table were determined from empirical relationships as outlined in a publication on Sampling Rate Validation. The sampling rates are tabulated as cubic centimeters/minute and micrograms/ppm-hour. The publication on Sampling Rate Validation Protocol can be obtained upon request from 3M Company.

The top section of the #3520 (containing the primary absorbent) has the same geometric dimension as the 3M Organic Vapor Monitor #3500. Therefore, the sampling rates are the same, and also have an accuracy of $\pm 5\%$.

*** Capacity**

The capacity of the monitor for each individual compound is a function of molecular structure, vapor pressure, environmental conditions, etc. The capacity values are tabulated in Section II - Analysis Guide, and are used to determine the length of a recommended sampling period.

Because of the backup section, the effective sampling capacity of the Organic Vapor Monitor #3520 is four times greater than the values listed for the Organic Vapor Monitor #3500/3510.

When sampling environments containing contaminant mixtures on environments with high relative humidity, it is difficult to accurately define the diffusional sampling capacity. Therefore, under these conditions, the weight (W_s) collected by the secondary absorbent of the backup section can be compared with the weight (W_p) collected by the primary absorbent to determine sample validity. The ratio W_s/W_p must be equal to or less than 0.50.

C. Length of Sampling Period

1. General

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When sampling for organic contaminants, full workshift sampling periods are recommended as the most comprehensive measures of worker exposure. When sampling some organic contaminants, sampling periods shorter than a full workshift are required in order to sample within the recommended capacity of the monitor. Under these circumstances, sequential sampling with several monitors can be performed.

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For those compounds where the recommended length of the sampling period for the Organic Vapor Monitor 3500/3510 is less than a full workshift, the length of the sampling period can be increased by a factor of four when using the Organic Vapor Monitor #3520. Because of the increased effective capacity of the Organic Vapor Monitor #3520, sampling periods longer than a full workshift are possible. The preferred recommendation is for full workshift sampling periods.

2. Effect on Humidity

Recommended sampling periods have been tabulated for concentration ranges from .1 to .5 times the PEL and from .5 to 3 times the PEL for relative humidities less than or greater than 70%. These recommended sampling periods should not be exceeded when using OVM #3500/3510.

3. Minimum Sampling Time

To confirm quantitatively the presence and concentration of a contaminant in the atmosphere, most analysts must have a minimum of 10 micrograms for G.C. analysis. A sampling period of at least 15 minutes is recommended even when 10 micrograms of the contaminant could be collected in a shorter period. For a contaminant at a low concentration level, the sampling rate of micrograms/ppm-hr. should be used to verify a sampling period during which at least 10 micrograms of the contaminant would be collected.

D. Short Term Exposure Limit (STEL)

The ACGIH has recommended a short-term exposure limit (STEL) as a maximum concentration to which workers can be exposed for a period up to 15 minutes continuously. No more than four (4) such excursions per day are permitted, with at least 60 minutes between exposure periods, provided that the recommended ACGIH daily TLV-TWA also is not exceeded. The STEL values summarized in the following tables can be found in the "Threshold Limit Values for Chemical Substances in Workroom Air Adopted by ACGIH for 1980." The monitor is recommended for STEL sampling if, during the 15 minute sampling period, the monitor will collect a minimum of 10 micrograms of the contaminant when sampling at the STEL concentrations.

E. Unsuitable Compounds

The OVM is not recommended for the compounds listed below because of adverse or inadequate interactions with the sorbent material. This list is representative of classes of compounds not suitable for use with the OVM.

Compounds not on this list or the Compound Guide should be handled by consultation with OH&SP Technical Service.

Compounds

Ammonia	Methane, Ethane, Propane
Carbon Monoxide (1)	Methyl Alcohol (Methanol)
Ethylene Oxide (2)	Methyl Chloride
Formaldehyde (3)	Methyl, Dimethyl, Trimethyl Amines
Hydrogen Sulfide	Organic Solids
Isocyanates	Sulfur Dioxide

- (1) Carbon Monoxide can be monitored using 3M Monitor #3400
- (2) Ethylene Oxide can be monitored using 3M Ethylene Oxide Monitor #3550/3551
- (3) Formaldehyde can be monitored using 3M Formaldehyde Monitor #3750/3751

F. Compounds Printed in Bold Type

All compounds listed in **bold type** in the OVM Sampling Guide will be analyzed by 3M for the OVM #3510. †For more information contact your 3M Sales Representative or your local OH&SP Safety Products Distributor.

†Pre-paid analysis for up to three compounds.

Sampling Guide

COMPOUND	RECOMMENDED SAMPLING PERIOD (Hrs.)				SHORT TERM EXPOSURE LIMIT (15 min.)		OSHA Standard TWA-PEL () ACGIH TLV C-Ceiling (ppm)	SAMPLING RATE	
	RH < 70%		RH > 70%						
	.1-5 PEL	.5-3 PEL	.1-5 PEL	.5-3 PEL	STEL (ppm)	OVM Usage		(cc/min.)	Microgram ppm/hr.
Acetone*	1	0.5	1	0.5	1250	Yes	1000	40.1	5.71
Acetonitrile*	8	2	6	1	60	Yes	40	48.2	4.85
Acrylonitrile	8	2	6	1	—		2	43.8	5.70
Allyl Alcohol	8	8	8	6	2	No	2	40.4	5.75
Allyl Chloride	8	8	8	6	2	No	1	35.1	6.63
n-Amyl Acetate*	8	8	8	4	150	Yes	100	26.0	7.36
s-Amyl Acetate	8	8	8	4	—		125	27.2	8.68
n-Amyl Alcohol*	8	8	8	4	—		(100)	31.4	6.78
i-Amyl Alcohol*	8	8	8	4	125	Yes	100	32.3	6.98
s-Amyl Alcohol	8	8	8	4	—		(100)	32.3	6.98
Benzene*	8	8	8	6	25	Yes	10	35.5	6.78
Benzyl Chloride	8	8	8	6	—		1	27.2	8.48
Bromoform	8	8	8	6	—		0.5	29.3	18.19
Butadiene	0.4	NR	0.4	NR	1250	Yes	1000	42.8	5.67
n-Butyl Acetate	8	7	6	3	200	Yes	150	31.6	9.00
s-Butyl Acetate	8	5	6	3	250	Yes	200	28.6	8.14
t-Butyl Acetate	8	4	6	3	250	Yes	200	29.4	8.37
Butyl Acrylate	8	8	8	6	—		—	28.7	9.01
							(10)		
Butyl Alcohol*	8	8	8	4	—		100	34.3	5.55
							(50)		
s-Butyl Alcohol	8	6	6	3	—		150	34.8	6.32
t-Butyl Alcohol	8	7	6	3	150	Yes	100	35.2	6.39
Butyl Cellosolve* (2-Butoxyethanol)	8	8	8	6	150	Yes	50	28.2	8.15
Butyl Glycidyl Ether (BGE)	8	8	8	6	—		50	27.0	8.61
p-tert-Butyltoluene*	8	8	8	6	20	Yes	10	20.7	7.51
Camphor	8	8	8	6	3	No	2	21.4	7.11
Carbon Disulfide	8	2	6	1	—		20	42.8	7.88
Carbon Tetrachloride*	8	8	8	6	20	Yes	10	30.2	11.41
Cellosolve* (2-Ethoxyethanol)	8	5	8	3	150	Yes	200	32.4	7.14
							(100)		
Cellosolve Acetate* (2-Ethoxyethyl Acetate)	8	8	8	4	150	Yes	100	26.6	8.60
Chlorobenzene*	8	8	8	5	—		75	29.3	8.12
o-Chlorostyrene	8	8	8	6	75	Yes	—	26.0	8.87
							(50)		
o-Chlorotoluene	8	8	8	6	75	Yes	—	27.3	8.51
							(50)		
Chlorobromomethane*	8	1.5	6	1.5	250	Yes	200	34.4	10.89
Chloroform*	8	4	6	3	50	Yes	50	33.5	9.78
							(10)		
1-Chloro-1-nitropropane	8	8	8	6	—		20	30.4	9.25
Chloroprene (2-Chloro-1,3-butadiene)	8	8	6	4	—		25	32.2	7.03
							(10)		
Cumene*	8	8	8	6	75	Yes	50	24.5	8.82
Cyclohexane*	8	3	6	2	375	Yes	300	32.4	6.67
Cyclohexanol*	8	8	8	6	—		50	29.5	7.24
Cyclohexanone*	8	8	8	6	—		50	28.9	6.94
Cyclohexene*	8	3	6	2	—		300	32.3	6.49
Diacetone Alcohol*	8	8	8	6	75	Yes	50	28.2	7.15
o-Dichlorobenzene*	8	8	8	6	—		50	27.8	10.03
p-Dichlorobenzene*	8	8	8	6	110	Yes	75	27.8	10.03
1,1-Dichloroethane	8	1.5	4	1.5	250	Yes	100	33.2	8.07
							(200)		
1,2-Dichloroethylene*	1	0.2	1	0.2	250	Yes	200	35.2	8.38
1,1-Dichloro-1-nitroethane	8	8	8	6	10	Yes	10	28.5	10.07
Dichloroethyl Ether	8	8	8	6	10	Yes	15	26.1	9.16
							(5)		
Diisobutyl Ketone* (DIBK)	8	8	8	6	—		50	24.6	8.56

Sampling Guide

COMPOUND	RECOMMENDED SAMPLING PERIOD (Hrs.)				SHORT TERM EXPOSURE LIMIT (15 min.)		SHA Standard TWA-PEL () ACGIH TLV C-Ceiling (ppm)	SAMPLING RATE	
	RH < 70%		RH > 70%						
	.1-5 PEL	.5-3 PEL	.1-5 PEL	.5-3 PEL	STEL (ppm)	OVM Usage		(cc/min.)	Microgram ppm/hr.
Dimethyl Formamide (DMF)	8	8	8	6	20	Yes	10	32.4	5.8
p-Dioxane	8	8	8	4	—		100 (50)	34.5	7.45
Dipropylene Glycol Methyl Ether	8	8	8	4	150	Yes	100	25.3	9.19
Enflurane	8	8	8	6	—		(2)	28.3	12.81
(2-Chloro-1,1,2 trifluoroethyl difluoromethyl ether)									
Epichlorohydrin	8	8	8	6	5	No	5 (2)	29.6	6.76
(1-Chloro-2,3-epoxy-propane)									
Ethyl Acetate*	7	1	4	1	—		400	34.5	7.45
Ethyl Acrylate	8	8	6	4	—		25	32.2	7.90
Ethyl Alcohol	4	0.5	4	0.5	—		1000	51.2	5.78
Ethyl Benzene	8	8	8	4	125	Yes	100	27.3	7.10
Ethyl Bromide*	1	0.2	1	0.2	250	Yes	200	36.4	9.74
Ethyl Butyl Ketone (3-Heptanone)	8	8	8	6	75	Yes	50	28.0	7.83
Ethyl Ether	0.3	NR	0.3	NR	500	Yes	400	36.8	6.68
Ethyl Formate	3	0.5	3	0.5	150	Yes	100	36.8	7.04
Ethylene Chlorohydrin (2-Chloroethanol)	8	8	8	6	—		5	33.9	6.66
Ethylene Dibromide*	8	8	8	6	—		20	29.6	13.66
(1,2-Dibromomethane)									
Ethylene Dichloride*	8	8	6	4	15	Yes	50 (10)	33.2	8.07
(1,2-Dichloroethane)									
Furfural	8	8	8	8	15	Yes	5	34.3	8.08
Furfuryl Alcohol	8	8	8	6	10	Yes	50 (5)	32.6	6.98
Glycidol (2,3-Epoxy-1-propanol)	8	8	8	6	75	Yes	50	37.1	6.74
Halothane	8	8	8	4	—		(2)	30.2	14.63
(2-Bromo-2-chloro-1,1,1 trifluoroethane)									
Heptane*	8	2	4	2	500	Yes	500 (400)	28.9	7.08
Hexachloroethane	8	8	8	8	3	Yes	1	26.7	15.53
Hexane*	8	1.5	4	1.5	125	Yes	500 (100)	32.0	6.74
s-Hexyl Acetate	8	8	8	4	—		50	28.1	9.93
Isoamyl Acetate	8	8	8	4	125	Yes	100	27.2	6.68
Isoamyl Alcohol*	8	8	8	4	125	Yes	100	32.3	6.98
Isobutyl Acetate*	8	8	8	4	187	Yes	150	31.0	8.82
Isobutyl Alcohol*	8	8	8	4	75	Yes	100 (50)	35.9	5.81
Isophorone*	8	8	8	6	—		25 (5)	21.7	7.34
Isopropyl Acetate	8	2	6	2	310	Yes	250	31.7	7.93
Isopropyl Alcohol	8	2	6	2	500	Yes	400 (250)	39.4	5.17
Isopropyl Ether	5	0.8	4	0.8	310	Yes	500 (250)	31.2	7.81
Isopropyl Glycidyl Ether	8	8	8	6	75	Yes	50	29.1	8.28
Mesityl Oxide*	8	8	8	6	—		25	31.2	7.49
Mesitylene* (Trimethyl Benzene)	8	8	8	6	35	Yes	25	26.3	7.73
Methyl Acetate*	3	0.5	3	0.5	250	Yes	200	37.9	6.72
Methyl Acrylate	8	7	6	3	—		10	35.8	7.56
Methylal (Dimethoxymethane)	0.3	NR	0.3	NR	1250	Yes	1000	37.9	7.07
Methyl Amyl Ketone (2-Heptanone)	8	8	8	4	150	Yes	100	27.9	7.81
Methyl Bromide	4	0.5	3	0.5	—		20 (15)	46.5	10.84

Sampling Guide

COMPOUND	RECOMMENDED SAMPLING PERIOD (Hrs.)				SH RT TERM EXPOSURE LIMIT (15 min.)		OSHA Standard TWA-PEL () ACGIH TLV C-Ceiling (ppm)	SAMPLING RATE	
	RH < 70%		RH > 70%						
	.1-5 PEL	.5-3 PEL	.1-5 PEL	.5-3 PEL	STEL (ppm)	OVM Usage	(cc/min.)	Microgram ppm/hr.	
Methyl Butyl Ketone* (2-Hexanone)	8	8	8	4	50	Yes	100	29.7	7.29
Methyl Isobutyl Ketone* (Hexanone)	8	8	8	4	125	Yes	100	30.0	7.35
Methyl Cellosolve* (2-Methoxyethanol)	8	8	8	6	35	Yes	25	36.3	6.76
Methyl Cellosolve Acetate* (Ethylene Glycol Methyl Ether Acetate)	8	8	8	6	35	Yes	25	29.0	8.38
Methyl Chloroform*	6	1	4	1	450	Yes	350	30.9	10.09
Methyl Cyclohexane*	8	2.5	6	2	500	Yes	500	28.9	6.94
Methyl Cyclohexanol	8	8	8	4	75	Yes	100 (50)	28.8	8.06
Methyl Ethyl Ketone* (2-Butanone)	8	3	6	2	300	Yes	200	36.3	6.41
Methyl Formate	0.7	NR	0.7	NR	150	Yes	100	45.0	6.33
5-Methyl-3-heptanone (Ethyl Amyl Ketone)	8	8	8	6	—		25	26.4	7.39
Methyl Iodide	6	1	4	1	10	Yes	5	36.7	12.79
Myethyl Isobutyl Carbinol (Methyl Amyl Alcohol)	8	8	8	6	40	Yes	25	29.2	6.51
Methyl Isoamyl Ketone	8	8	8	4	150	Yes	100	28.0	7.83
Methyl Methacrylate	8	8	8	4	125	Yes	100	31.8	7.80
Alpha Methyl Styrene*	8	8	8	4	—		100	25.0	7.24
Methylene Chloride* (Dichloromethane)	1	0.2	1	0.2	250	Yes	500 (200)	37.9	7.91
Naphtha (VM&P)*	8	2	6	2	400	Yes	300	33.2	8.15
Naphthalene	8	8	8	6	15	Yes	10	24.6	6.88
Nonane*	8	5	6	3	250	Yes	— (200)	24.6	7.71
Octane*	8	3	6	2	375	Yes	500	26.6	7.43
Pentane*	2.5	0.4	2.5	0.4	750	Yes	1000 (600)	35.3	5.56
2-Pentanone* (Methyl Propyl Ketone)	8	5	6	3	250	Yes	200	33.0	6.95
Perchloroethylene (Tetrachloroethylene)	8	7	6	3	150	Yes	100	28.3	11.53
Phenyl Ether	8	8	8	6	2	No	1	24.1	10.05
Phenyl Glycidyl Ether	8	8	8	6	15	Yes	10	20.8	7.71
n-Propyl Acetate*	8	4	8	3	250	Yes	200	30.1	7.53
n-Propyl Alcohol*	8	8	6	4	250	Yes	200	39.7	5.21
Propylene Dichloride* (1,2-Dichloropropane)	8	8	6	4	110	Yes	75	30.6	8.49
Propylene Glycol Monomethyl Ether	8	8	8	4	150	Yes	— (100)	32.4	6.09
n-Propyl Nitrate	8	8	8	4	40	Yes	25	33.3	7.27
Stoddard Solvent	8	4	6	3	125	Yes	500 (100)	24.3	8.59
Styrene*	8	8	8	4	125	Yes	100	26.8	6.83
1,1,2,2-Tetrachloroethane	8	8	8	6	10	Yes	5	28.4	11.71
1,1,1,2-Tetrachloro-2,2-difluoroethane	5	0.75	4	0.75	625	Yes	500	29.7	14.87
1,1,2,2-Tetrachloro-1,2-difluoroethane	5	0.75	4	0.75	625	Yes	500	28.2	14.12
Tetrahydrofuran	8	2	4	2	250	Yes	200	37.2	6.57
Toluene*	8	8	6	3	150	Yes	200	31.4	7.08
1,1,2-Trichloroethane*	8	8	6	6	20	Yes	10	29.7	9.89
Trichloroethylene*	8	8	8	6	150	Yes	100 (50)	31.1	10.00
1,1,2-Trichloro-1,2,2-trifluoroethane	0.5	NR	0.5	NR	1250	Yes	1000	31.4	14.41
1,2,3-Trichloropropane	8	8	8	6	75	Yes	50	27.4	9.88
Vinyl Acetate	8	8	6	4	20	Yes	— (10)	35.8	7.56
Vinyl Bromide	2	2	2	2	—		(5)	41.0	10.77
Vinyl Chloride*	2	2	2	1.5	—		1 (5)	40.9	6.22
Vinylidene Chloride	2	2	2	2	20	Yes	(10)	38.6	9.19
Vinyl Toluene	8	8	6	4	150	Yes	100	26.8	7.75
Xylene*	8	8	6	4	150	Yes	100	27.3	7.09

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