

VINYL CHLORIDE

General

Chemical formula $\text{CH}_2 = \text{CHCl}$. Vinyl chloride is a colorless gas, boils at -13.9°C ., has a pleasant ethereal odor, is slightly soluble in water, and is inflammable in concentrations of 4 - 21% by volume in air.

Industries Concerned

Vinyl chloride is used in the synthesis of certain resins and in the manufacture of koroseal which is polyvinyl or polymerized vinyl chloride.

Maximum Allowable Concentration - 500 p.p.m. (Utah).

Toxic Concentrations

10-25% causes light narcosis of guinea pigs in two minutes, preceded by unsteadiness, staggering gait, motor ataxia and convulsions, but no irritation of the eyes or nose. Continued exposure at that level causes deep narcosis in 20 minutes. Higher concentrations (40-50%) cause almost immediate deep narcosis.

Pathology

Animals dying after acute, intense exposure show the signs of pulmonary irritation, with intense congestion and edema of the lungs and hyperemia of the liver and kidneys. Non-fatal doses recover completely, and show no signs of organic damage at autopsy.

Clinical Picture

Vinyl chloride is a strong narcotic drug and apparently has no effect other than that of narcosis.

Treatment

Removal from exposure. Oxygen if narcosis is deep and respirations failing.

Prevention - Avoidance of exposure.

Polyvinyl chloride or polymerized vinyl chloride (koroseal) has not been widely studied. It has also been suggested as a wrapping for meat. A number of questions were posed before it could be declared safe for this purpose.

References

1. Industrial Solvents - Lehmann, Flury.
2. J. Pharmacol. 48:284 (1933).
3. U. S. Pub. Health Reports 45:1963 (1930).
4. Communication Dr. Heyroth

L. B. Edwards, 1941

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MAXIMUM ALLOWABLE CONCENTRATIONS
of

INDUSTRIAL ATMOSPHERIC CONTAMINANTS

	California	Connecticut	Florida	Kansas	Kentucky	Louisiana	Maryland	Massachusetts	Minnesota	New Hampshire	New York	Ohio	Oregon	South Carolina	Utah
Acetaldehyde															
Acetic acid											10				
Acetone	500		500		200			500	500		1000	500	500		200
Acetylene tetrachloride (see 1,1,2,2-tetrachloro- ethane)															
Acrolein	1		0.5		1							0.5	1		3.3
Acrylonitrile	20										20	20	20		
Ammonia	100		100	100	100	100		100	100		100	100	100	100	100
Amyl acetate	400		200	400	400	400		200	400		400	400	400	200	400
Iso-amyl alcohol	200		100		55						200				
Aniline	5		5	5	5	5		5	5		5	5	5	5	5-7
Arsenic		*0.15	*0.15		*0.5			*0.15	*0.15	*0.15	*0.15		*0.15		*0.5
Asnine	1		1	1	1	1		0.05	1		1	1	0.5	1	1
Barium peroxide (as Ba)											*0.5				

MAXIMUM ALLOWABLE CONCENTRATIONS

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INDUSTRIAL & ATMOSPHERIC CONTAMINANTS

[illegible]

	California	Connecticut	Florida	Kansas	Kentucky	Louisiana	Maryland	Massachusetts	Minnesota	New Hampshire	New York	Ohio	Oregon	South Carolina	Utah
Benzene (Benzol)	100	100	75	100	75	100	75	75	100	75	50	100	75	100	100
Benzine (Gasoline)	1000	1000	1000		1000			1000			1000				1000
Bromine	1		1		1						1				1
1,3-Butadiene															
n-Butanol (Butyl alcohol)	200		50	100	100			50			200	100	200	100	100
2-Butanone	500							300				300	500		
n-Butyl acetate	400		200	400	400	100		200	400		400	400	400	200	400
Butyl cellosolve	50														
Cadmium	*0.1	*0.1	*0.1	*0.1	*0.1	*0.1	*0.1	*0.1	*0.1	*0.1	*0.1	*0.1	*0.1	*0.1	*0.1
Carbon dioxide	5000				5500						5000		5000		5550
Carbon disulfide	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Carbon monoxide	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Carbon tetrachloride	100	100	50	100	50	100	50	50	50	75	75	100	50	75	100
Carbon No. 2. (See Monofluorotrifluoromethane)															
Cellosolve	500														500
Cellosolve acetate															

MAXIMUM ALLOWABLE CONCENTRATIONS

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California	100	100	1000	1	200	500	400	50	*0.1	5000	20	100	100	500
Connecticut	100	1000	1000						*0.1		20	100	100	
Florida	75	1000	1000	1	50	100	200	400	*0.1		20	100	100	
Kansas	100				100	400	400		*0.1		20	100	100	
Kentucky	75	1000		1	100	400	400		*0.1	5500	20	100	50	
Louisiana	100					100			*0.1		20	100	100	
Maryland	75								*0.1		20	100	50	
Massachusetts	75	1000			50	300	200		*0.1		20	100	50	
Minnesota	100					400			*0.1		20	100	50	
New Hampshire	75								*0.1		20	100	75	
New York	50	1000	1		200	400			*0.1	5000	20	100	75	
Ohio	100				100	300	400		*0.1	5000	20	100	100	
Oregon	75				200	500	400		*0.1	5000	20	100	50	
South Carolina	100				100	200	200		*0.1		20	100	75	
Utah	75	1000	1		100	400	1000		*0.1	5550	20	100	100	500
Washington	100				100						322	100	100	
Wisconsin	75					400			*0.1		15	100	100	
American Std. Assoc.	100								(0.1)		20	100		
U.S. Public Health Serv.	100	1000			100	400			*0.1	5000	20	100	100	
Accepted Values	100	500	1		500	200	200	200	*0.1	5000	20	100	100	100

ofluorotr (chloromethane)

MINIMUM ALLOWABLE CONCENTRATIONS

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Chlorine	1	California
2-Chlorobutadiene (Chloroprene)	1	Connecticut
Cyanogen & compounds	*1.5	Florida
Chlorobenzene	100	Kansas
Chlorodiphenyl	*1	Kentucky
Chloroform	100	Louisiana
Chloronaphthalenes (See hexa-penta & trichloronaphthalenes)	*0.1	Maryland
1-Chloro-1-nitropropane		Massachusetts
Chromic acid	*0.1	Minnesota
Cyclohexane	18	New Hampshire
Cyclohexanol	*0.1	New York
Cyclohexanone	*0.1	Ohio
Cyclohexene	*0.1	Oregon
o-Dichlorobenzene	75	South Carolina
Dichlorodifluoromethane (Freon-12)		
1,1-Dichloroethane (ethylidene chloride)		

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MAXIMUM ALLOWABLE CONCENTRATIONS

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	California	Connecticut	Florida	Kansas	Kentucky	Louisiana	Maryland	Massachusetts	Minnesota	New Hampshire	New York	Ohio	Oregon	South Carolina	Utah
1,2-Dichloroethane (ethylene dichloride)	100		100	100	100	100	100	75	100		100	100	100	100	100
1,2-Dichloroethylene	200		200		100						15	15			100
Dichloroethyl ether	15		15	15	15	15		15	15		15	15			15
Dichloromethane	200										500				
Dichloromono-fluoromethane (Freon-21)															
1,1-Dichloro-1-nitroethane															
Dichlorotetrafluoroethane (Freon-114)															
Difluoromono-chloromethane (Freon-22)															
Dimethylaniline	5										5	5	5	5	
Dimethylsulfate															
Dinitrotoluene					*1.5						*1.5			*1.5	
Dioxane															1000
Ethyl acetate								400			1000	400			
Ethyl alcohol	1000		1000		250										
Ethyl benzene															
Ethyl bromide	1700		400											< 1000	1700

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MAXIMUM ALLOWABLE CONCENTRATIONS

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	California	Connecticut	Florida	Kansas	Kentucky	Louisiana	Maryland	Massachusetts	Minnesota	New Hampshire	New York	Ohio	Oregon	South Carolina	Utah
Ethyl chloride	20,000		5000		2000										20,00
Ethylene chlorhydrate															
Ethylene dichloride (Common name for 1,2-Dichloroethane)															
Ethylene oxide															
Ethyl ether	400		400	400	400	400		400	400		400	400	400		< 25
Ethyl formate															
Ethyl silicate															
Fluoride dusts, smokes								* 1					* 2		< 50
Formaldehyde	10	10	10	20	20	20	10	10	10	10	5	10	10		2
Freon (cf., respective Dichloro, Difluoro & Monofluoro Compounds)															
Gamma radiation - r. units/work day					0.1					0.1					
Gasoline	1000		1000	1000	1000	1000	1000	1000	1000	1000	1000		500		100
Heptane															
Hexachlorophthalene													* 0.5		
Hexane															
Hexanone (see Methyl butanone)															

California	20,000	400	10	100	5000
Connecticut	5000	400	10	100	5000
Florida	2000	400	10	100	5000
Kansas	400	400	10	100	5000
Kentucky	400	400	10	100	5000
Louisiana	400	400	10	100	5000
Maryland	400	400	10	100	5000
Massachusetts	400	400	10	100	5000
Minnesota	400	400	10	100	5000
New Hampshire	400	400	10	100	5000
New York	400	400	10	100	5000
Ohio	400	400	10	100	5000
Oregon	400	400	10	100	5000
South Carolina	400	400	10	100	5000
Utah	20,000	400	10	100	5000
Washington	20,000	400	10	100	5000
Wisconsin	400	400	10	100	5000
American Std. Assoc.	400	400	10	100	5000
U.S. Public Health Serv.	400	400	10	100	5000
Accepted Values	10	100	100	100	1000

MAXIMUM ALLOWABLE CONCENTRATIONS

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	California	Connecticut	Florida	Kansas	Kentucky	Louisiana	Maryland	Massachusetts	Minnesota	New Hampshire	New York	Ohio	Oregon	South Carolina	Utah
Hexone (see Methyl iso-butanone)															
Hydrochloric acid	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Hydrogen cyanide	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Hydrogen fluoride	3	3	2	3	3	3	3	1.5	3	3	3	3	3	3	3
Hydrogen selenide															
Hydrogen sulfide	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Iodine			*0.1		*0.5						1		1.05		
Iron oxide			*15		*15						*30				
Isophorone															
Lead	*0.15	*0.15	*0.15	*0.15	*0.15	*0.15	*0.15	*0.15	*0.15	*0.15	*0.15	*0.15	*0.15	*0.15	*0.15
Magnesium			*15		*15										*15
Manganese	*6	*6	*6	*6	*5		*6	*6	*6	*6	*6	*6	*6	*5-50	*5-50
Mercury	*0.1	*0.1	*0.1		*0.1	*0.1	*0.1	*0.1	*0.1	*0.1	*0.1	*0.1	*0.1	*0.1	*0.1
Mesityl oxide															
Methanol (methyl alcohol)	200	200	200	200	100	200	100	200	300	200	200	200	100	200	1-200
Methyl acetate	400														

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MAXIMUM ALLOWABLE CONCENTRATIONS

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	California	Connecticut	Florida	Kansas	Kentucky	Louisiana	Maryland	Massachusetts	Minnesota	New Hampshire	New York	Ohio	Oregon	South Carolina
Methyl bromide	500		20		50						35	20	35	1
Methyl butanone														<1
Methyl cellosolve (Ethylene glycol monomethyl ether)												100		<1
Methyl cellosolve acetate												200	100	
Methyl chloride	500		200		500									
Methylethoxybenzene														
Methylcyclohexanol														
Methylcyclohexanone														
Methyl ethyl ketone (See 2-butanone)														
Methyl formate														
Methyl iso-butanone	500													
Monochlorobenzene	75		75	75	75	75		75	75		75			75
Monofluorotrichloromethane (Freon #11 - Carrene #2)														
Mononitrotoluene											5			5
Naphthalene (Coal tar)	100							200				200	200	
Naphthalene (Petroleum)			1000		5000							1000	500	1000

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	California	Connecticut	Florida	Kansas	Kentucky	Louisiana	Maryland	Massachusetts	Minnesota	New Hampshire	New York	Ohio	Oregon	South Carolina	Utah	Washington
Nicotine			*30													
Nitrobenzene	5		*1-5	5	1	5		5	5		5	5	5	5	1-5	4
Nitroethane																
Nitrogen dioxide				29	10	10	10	10							10-40	4
Nitrogen oxide	25	25	25	70					25	25	40	25	25	20	40	
Nitroglycerin			0.5												10	
Nitromethane																
Octane																
Ozone	1			1	1	1		1	1		1	1	0.5		1	
Pentachloronaphthalene	*1			*1	*0.5						*0.5	*0.5	*0.5		*0.5	
Pentane																
Pentanone (Methyl propanone) 500															1500	
Perchloroethylene (Comm. name for Tetrachloroethylene)																
Petroleum vapors					1000								300			
Phosgene	1	1	1	1	1	1	1	1	1		1	1	1	1	1	
Phosphine	1		1	2	2	2		1	2		1	1	1	1	2	

100

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MAXIMUM ALLOWABLE CONCENTRATIONS

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	California	Connecticut	Florida	Kansas	Kentucky	Louisiana	Maryland	Massachusetts	Minnesota	New Hampshire	New York	Ohio	Oregon	South Carolina	Utah
Phosphorus trichloride	2		0.5		0.7										0.7
Isopropyl alcohol (Isopropyl alcohol)															
Propyl acetate															
Isopropyl ether															
Radium-micrograms by expired air test					0.1							0.1	0.1		
Radon (radium emanation) curies per liter					10-11					10-11		10-11			
Stibine															
Standard solvent											750				
Styrene monomer	400	400						400			400	400	400		
Sulphur chloride															
Sulphur dioxide	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Sulphuric acid			*0.5		2						*5				*2
Tellurium															
1,1,2,2-Tetrachlorethane	10		10	10	10	10		5	10		10	10	10	10	10
Tetrachlorethylene	200		200	200	200	200	200	200	200		200	200	200	200	200
Tetryl	*1.5				*1.5									*1.5	

MAXIMUM ALLOWABLE CONCENTRATIONS

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State	Accepted Values	U.S. Public Health Serv.	American Std. Assoc.	Wisconsin	Washington	Utah	South Carolina	Oregon	Ohio	New York	New Hampshire	Minnesota	Massachusetts	Maryland	Louisiana	Kentucky	Kansas	Florida	Connecticut	California
	0.5	0.5	400	400	200	500	0.1	10-11	1	400	500	1	400	500	1	400	500	1	400	500
	0.1	0.1	10-11	10-11	10-11	10-11	10-11	10-11	10-11	10-11	10-11	10-11	10-11	10-11	10-11	10-11	10-11	10-11	10-11	10-11
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5

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MAXIMUM ALLOWABLE CONCENTRATIONS

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	California	Connecticut	Florida	Kansas	Kentucky	Louisiana	Maryland	Massachusetts	Minnesota	New Hampshire	New York	Ohio	Oregon	South Carolina
Toluene (Toluel)	200	200	200	200	200	200		200	200	200	200	200	200	200
Toluidine					2.5									
Trichloroethylene	200	200	200	200	200	200	200	200	200	200	200	200	200	200
Trichloronaphthalene	*10		*0.5	*5	*5	*5		*5			*5	*5	*5	
Trinitrotoluene (TNT)	*1.5				*1.5			*2			*1.5			*1.5
Turpentine	200	700	200	200	200	200		200	200	200	200	200	200	200
Vinyl Chloride														
Vinyl cyanide (see acrylonitrile)														
X-ray (Gamma radiation)/r/day					0.1					0.1		0.1	0.1	
Xylene (Xylol)	200	200	200	200	200	200		200	200	200	200	200	200	200
Zinc Oxide	*15		*15	*15	*15	*15		*15	*15	*15	*15	*15	*15	*15

NOTES: All figures refer to parts per million (p.p.m.) unless otherwise designated.

Those figures designated with an asterisk* refer to milligrams per cubic meter.

Figures in parentheses () are war standards only.

Other special designations are self-explanatory.

Data collected from various State laws and Ind.Med., 14: 11, 936-946, Nov. 1945. No State laws specifically mention maximum allowable concentrations. Data are through 1946.

The column headed "Accepted Values" lists values based on industrial experience, animal experiments of persons, or a combination of these.

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	(mole/liter)	(r/day)	
California	200	200	*1.5
Connecticut	200	200	200
Florida	200	200	*1.5
Kansas	200	200	*1.5
Kentucky	200	200	*1.5
Louisiana	200	200	*1.5
Maryland	200	200	
Massachusetts	200	200	*1.5
Minnesota	200	200	*1.5
New Hampshire	200	200	*1.5
New York	200	200	*1.5
Ohio	200	200	*1.5
Oregon	200	200	*1.5
South Carolina	200	200	*1.5
Utah	200	200	*1.5
Washington	720	200	
Wisconsin	200	200	*1.5
American Std. Assoc.	200	200	
U.S. Public Health Service	200	200	*1.5
Accepted Values	200	200	*1.5

per to parts per million (p.p.m.) unless otherwise designated.

Designated with an asterisk* refer to milligrams per cubic meter.
 parentheses () are for standards only.

designations are self-explanatory.

from various State laws and Ind. Med., 14: 11, 1936-1946, Nov. 1945. No State is included unless its official mention maximum allowable concentrations. Data are through 1946.

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MAXIMUM ALLOWABLE CONCENTRATIONS

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	California	Connecticut	Florida	Kansas	Kentucky	Louisiana	Maryland	Massachusetts	Minnesota	New Hampshire	New York	Ohio	Oregon	South Carolina	Utah
2 DUSTS (as million parts per cubic foot)															
Asbestos			5			5			5	5		5	5		
Silica (above 50% free SiO ₂)			5		5	5			5	5		5	5	5	
Silica (5-50% free SiO ₂)			20		5				5	10		10	10		
Silica (below 5% free SiO ₂)			50		5	50			5	25		20	20	50	
Nuisance dust (no free SiO ₂)			50			100				variable					
Mica													15		
Pottery													10		
Talc													15		
Quartz													15		

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