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Threshold Limits in Places of Employment

**RULES AND REGULATIONS
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF HEALTH**

Chapter 4

Article 432

**Regulations Establishing
Threshold Limits in
Places of Employment**

Under the provisions of the Administrative Code Act of April 9,
1929, P. L. 177, the following Rules and Regulations of the Department of
Health are adopted this 27th day of October, 1961.

Approved as to legality

of content this 6th

day of November, 1961.

Joseph L. Cohen
Assistant Attorney General

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**RULES AND REGULATIONS
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF HEALTH**

Chapter 4

Article 432

**Regulations Establishing
Threshold Limits in
Places of Employment**

Under the provisions of the Administrative Code Act of April 7, 1929, P.L. 177, the following Rules and Regulations of the Department of Health are adopted this 27th day of October, 1961:

Section 1. Purpose

The purpose of these regulations and standards is to prescribe minimum requirements and standards for the maintenance of occupational health in places of employment in Pennsylvania.

Section 2. Application

These regulations and standards shall apply to every place of employment.

Section 3. Definitions

- A. "Atmospheric contaminant" shall mean a harmful substance or material in air usually occurring in the form of a dust, fume, gas, vapor, or mist.
- B. "Department" shall mean the Department of Health, Commonwealth of Pennsylvania.
- C. "Dust" shall mean finely divided solid particles dispersed in air and having been formed by mechanical means such as grinding, crushing, blasting, and drilling.
- D. "Fumes" shall mean solid particles dispersed in air resulting from some chemical or physical process that involved a change of state, such as combustion, sublimation, or evaporation and condensation.
- E. "Gas" shall mean a formless fluid occupying the space of enclosure.
- F. "General or dilution ventilation" shall mean ventilation provided to dilute the concentration of dusts, fumes, gases, vapors, or mists in the atmosphere of all or part of the place of employment.

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Section 6. Air Recirculation and Discharge

- A. No air from any local exhaust ventilation system may be recirculated without express approval by the Department.
- B. The discharge of air from any exhaust system shall be such that no air contamination will enter any window, door, or other opening of any work area in quantities sufficient to create a health hazard to or in such area.

Section 7. Tanks and Vessels

- A. No individual shall be permitted to enter a tank or closed vessel until it has been ascertained that the atmosphere in the tank or vessel contains an adequate quantity of oxygen and that atmospheric contaminants have been diluted to safe concentrations.
- B. If the oxygen content of the air and the quantity of atmospheric contamination are not determined, entry to the tank or vessel shall be prohibited unless the workman is equipped with an air line respirator, a safety harness and safety line, and that another employee be stationed outside the tank or vessel to remove the workman in the tank or vessel should he experience difficulty.

Section 8. Housekeeping

- A. The interiors, exteriors, and environs of buildings where hazardous materials are used, stored, or handled, shall be cleaned and maintained in such a manner as to prevent harmful exposure to hazardous materials.
- B. Employees engaged in such cleaning operations and all others who may be exposed shall wear protective equipment as required. The cleaning operations should be done by suction methods.
- C. Where wet processes are used, reasonable drainage should be maintained. False floors, platforms, mats, or other means of safe footing should be provided.

Section 9. Labeling

Adequate identification, warning, and caution labels shall be applied to all containers of hazardous chemicals.

Table 1

Threshold Limit Values

Gases and Vapors

Substance	P.P.M.	Approx. mg. per Cu. Ft.
Acetaldehyde	200	360
Acetic acid	10	25
Acetic anhydride	5	10
Acetone	1,000	2,400
Acetylene tetrabromide	1	10
Acrolein	0.5	1.2
Acrylonitrile - Skin	25	40
Allyl alcohol - Skin	3	5
Allyl chloride	5	10
Allyl propyl disulfide	2	12
Anthrone	100	70
Amyl acetate	200	1,030
Amyl alcohol (isomyl alcohol)	100	260
Aniline - Skin	5	19
Arsine	0.05	0.2
Benzene (benzol)	25	80
Benzyl chloride	1	5
Boron trifluoride	1	3
Bromine	0.1	0.7
Butadiene (1,3-butadiene)	1,000	2,200
2-Butanone (methyl ethyl ketone)	200	590
Butyl acetate (n-butyl acetate)	200	950
Butyl alcohol (n-butanol)	100	300
tert. Butyl alcohol	100	300
Butylamine	5	15
Butyl cellosolve (2-butylethanol)	50	240
para-cresol Butylcellosolve	10	60
Carbon disulfide	5,000	9,000
Carbon disulfide - Skin	50	60
Carbon monoxide	100	110
Carbon tetrachloride - Skin	25	160
Cellosolve (2-ethoxyethanol)	200	760
Cellosolve acetate (2-ethoxyethyl acetate)	100	540
Chlorine	1	3
Chlorine dioxide	0.1	0.3
Chlorine trifluoride	0.1	0.4
Chlorobenzene (monochlorobenzene)	75	350
Chloroform (trichloromethane)	50	240
1-Chloro-1,2,2,2-tetrafluoroethane	20	100
Chloroform	0.1	0.7
Chloroprene (2-chloro-1,3-butadiene)	2.5	90
Cresol (all isomers) - Skin	0	22

NOTE: The word "Skin" following a compound's name indicates that the liquid compound can penetrate the skin to cause systemic effects.

Substance	P.P.M. ^a	Approx. Mgt. per Cu. M.
Hexane (methyl isobutyl ketone)	100	410
Hydrochloric - Skin	1	1.3
Hydrogen bromide	3	10
Hydrogen chloride	9	7
Hydrogen cyanide - Skin	10	11
Hydrogen fluoride	3	2
Hydrogen peroxide, 3%	1	1.2
Hydrogen selenide	0.05	0.2
Hydrogen sulfide	20	50
Iodine	0.1	1
Isophorane	25	140
Isopropylamine	5	12
Methyl oxide	23	100
Methyl acetate	200	610
Methyl acrylonitrile	1,000	1,650
Methyl acrylate - Skin	10	55
Methyl dimethylmethane	1,000	3,100
Methyl alcohol (methanol)	200	250
Methyl cyanide - Skin	20	80
Methyl cellosolve (2-methoxyethanol)	25	80
Methyl cellosolve acetate (ethylene glycol monomethyl ether acetate)	25	130
Methyl chloride	100	230
Methyl chloroform (1,1,1-trichloroethane)	500	2,700
Methylcyclohexane	300	2,000
Methylcyclohexanol	100	420
Methylcyclohexanone	100	460
Methyl formate	100	250
Methyl isobutyl carbamate (methyl amyl alcohol)	25	100
n-Butyl methyl styrene	100	450
Methyl isobutyl chloride (dimethylmethane)	500	1,750
Monomethylamine - Skin	2	9
Naphthalene (coal tar)	300	800
Naphthalene (petroleum)	500	2,000
Nitric carbonyl	100	0.007
Nitric acid	10	35
para-Nitroaniline - Skin	1	6
Nitrobenzene - Skin	1	5
Nitroethane	100	310
Nitrogen dioxide	5	9
Nitroglycerin	0.5	5
Nitromethane	100	350
2-Nitropropane	25	90
Nitrobenzene - Skin	5	30
Octane	500	2,350
Ozone	0.1	0.2
Pentane	1,000	2,950
Pentachloride (methyl propyl ketone)	200	700
Perchloroethylene (tetrachloroethylene)	100	570
Phenol - Skin	5	19

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Substance	P.P.M. ^a	Approx. Mg. ^b per cu. M.
Phenylhydrazine - Skin	5	22
Phosgene (carbonyl chloride)	1	4
Phosphine	0.05	0.07
Phosphorus trichloride	0.5	3
Propyl acetate	200	840
Propyl alcohol (isopropyl alcohol)	400	980
Propyl ether (isopropyl ether)	500	2,000
Propylene dichloride (1,1-dichloropropane)	75	350
Propyleneimine - Skin	25	60
Propylene oxide	100	240
Pyridine	5	15
Quinone	0.1	0.4
Stibine	0.1	0.5
Stoddard solvent	500	2,900
Styrene monomer (phenylethylene)	100	420
Sulfur dioxide	5	15
Sulfur hexafluoride	2,000	6,000
Sulfur monochloride	1	6
Sulfur pentafluoride	0.025	0.25
1,1,2,2-Tetrachloroethane - Skin	5	35
Tetrahydrofuran	200	590
Tetrahydrofuran	3	8
Toluene (toluol) -	200	750
ortho-Toluidine - Skin	5	32
Toluene-2,3-dicyanate	0.02	0.14
Trichloroethylene	100	320
Triethylamine	25	100
Trifluoromethylacetone	1,000	6,300
Turpentine	100	560
Vinyl chloride (chloroethylene)	500	1,100
Vinyl toluene	100	180
Xylene (methyl)	200	870
Xylylene - Skin	5	25

^aParts of vapor or gas per million parts of air by volume at 25°C and 760 mm. Hg. (ASTM).

^bApproximate milligrams per cubic meter of air.

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Dusts, Fumes and Mists

Substance	Mg. per Cu. M.
Alibis (1, 1, 1, 3, 6, 10-hexachloro-1, 4, 4a, 5, 8, 8a-hexahydro-1, 4, 5, 8-dimethanonaphthalene) - Skin	0.25
Arsenate (ammonium arsenate)	15
Anthracene	0.5
ANTU (alpha-naphthyl-thiourea)	0.5
Arsenic	0.5
Barium (soluble compounds)	0.5
Beryllium	0.002
Cadmium oxide fume	0.1
Calcium arsenate	0.1
Chlordane (1, 2, 4, 5, 6, 7, 8-octachloro-1a, 4, 7, 7a-tetrahydro-4, 7-methanonaphthalene)	2
Chlorinated camphene, 60%	0.5
Chlorinated diphenyl oxide	0.5
Chlorodiphenyl (42% chlorine) - Skin	1
Chlorodiphenyl (54% chlorine) - Skin	0.5
Chromic Acid and chromates (as CrO ₃)	0.1
Cruy herbicide sodium 2-(2, 4-dichlorophenoxy) ethanol hydrogen sulfate)	15
Cyanide (as CN) - Skin	5
2, 4-D (2, 4-dichlorophenoxyacetic acid)	10
DDT (2, 2-bis (p-chlorophenyl)-1, 1, 1-trichloroethane)	1
Dieldrin (1, 2, 3, 4, 10, 10-hexachloro-6, 7-epoxy-1, 4, 4a, 5, 6, 7, 8, 8a-octahydro-1, 4, 5, 8-dimethanonaphthalene) - Skin	0.25
Dinitrobenzene - Skin	1
Dinitrochloro - Skin	1.5
Dinitro-o-cresol - Skin	0.2
DENT (0, 0-diethyl 0-p-nitrophenyl Thiocarbonyl phosphorothioate) - Skin	0.5
Terbam (terric dimethyl dithiocarbamate)	15
Fluorinated dust	1
Fluoride	2.5
Hydroquinone	2
Iron oxide fume	15
Lead	0.2
Lead arsenate	0.15
Lindane (hexachlorocyclohexane, gamma isomer)	0.5
Lithium hydride	0.025
Magnesium oxide fume	15
Maldathion (0, 0-dimethyl 0-thiophosphate of diethyl mercaptosuccinate) - Skin	15
Manganate	5
Mercury	0.1
Mercury (organic compounds) - Skin	0.01
Methoxychlor (1, 1, 1-trichloro-2-methoxyphenyl)-1, 1, 1-trichloroethane)	15
Molybdenum (soluble compounds)	5
(insoluble compounds)	15
Miscelene - Skin	0.5
Parathion (0, 0-diethyl 0-p-nitrophenyl Chlorophosphate) - Skin	0.1
Pentachloronaphthalene - Skin	0.5
Pentachlorophenol - Skin	0.5
Phosphoric acid	1
Phosphorus (yellow)	0.5
Phosphorus pentachloride	1
Phosphorus pentoxide	1
Picric acid - Skin	0.1

Substance	Mg. per ^c Cu. M.
Pyrethrum	2
Rotenone	5
Selenium compounds (as Se)	0.1
Sodium lauracetate (1080) - Skin	0.1
Sodium hydrosulfide	2
Strychnine	0.15
Sulfuric acid	1
TEBP (tetraethyl diethoxyphosphate) - Skin	0.2
TEPP (tetraethyl pyrophosphate) - Skin	0.05
Tellurium	0.1
Tedryl (2, 4, 6-trinitrophenylmethylnitroamine) - Skin	1.5
Thallium (soluble compounds)	0.1
Thiram (tetramethyl thiourea disulfide)	5
Titanium dioxide	15
Trichloronaphthalene - Skin	5
Tricresolene - Skin	1.5
Urazon (soluble compounds)	0.05
(insoluble compounds)	0.25
Vanadium	
V ₂ O ₅ dust	0.2
V ₂ O ₅ fume	0.1
Warfarin (3-(4'-acetoxyphenyl)-4-hydroxycoumarin)	0.5
Yttrium	5
Zinc oxide fume	15
Zirconium compounds (as Zr)	5

Milligrams of dust, fume, or mist per cubic meter of air.

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Mineral and Non-Metallic Inorganic Dusts

Substance	M.P.P.C.F. ^d
Silica	50
Quartz	50
High (above 80% free silica)	50
Medium (5 to 80% free silica)	20
Low (below 5% free silica)	10
Cristobalite (above 5%)	5
Amorphous	20
Silicates	
Asbestos	5
Mica	20
Portland Cement	50
Serpentine	20
Talc	20
Miscellaneous:	
Aluminum Oxide	50
Calcite	50
Dolomite	50
Limestone	50
Marble	50
Gilson Gabbro	50
Other inert dusts	10

^d Millions of particles per cubic foot of air based on impinger samples examined by light-field techniques.

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RULES AND REGULATIONS
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF HEALTH

CHAPTER 4

Article 432

Regulations Establishing Threshold Limits in Places of Employment*

(Adopted October 27, 1961)

Section 1. Purpose

The purpose of these regulations and standards is to prescribe minimum requirements and standards for the maintenance of occupational health in places of employment in Pennsylvania.

Section 2. Application

These regulations and standards shall apply to every place of employment.

Section 3. Definitions

- A. "Atmospheric contaminant" shall mean a harmful substance or material in air usually occurring in the form of a dust, fume, gas, vapor, or mist.
- B. "Department" shall mean the Department of Health, Commonwealth of Pennsylvania.
- C. "Dust" shall mean finely divided solid particles dispersed in air and having been formed by mechanical means such as grinding, crushing, blasting, and drilling.
- D. "Fume" shall mean solid particles dispersed in air resulting from some chemical or physical process that involved a change of state, such as combustion, sublimation, or evaporation and condensation.
- E. "Gas" shall mean a formless fluid occupying the space of enclosure.
- F. "General or dilution ventilation" shall mean ventilation provided to dilute the concentration of dusts, fumes, gases, vapors, or mists in the atmosphere of all or part of the place of employment.
- G. "Local exhaust ventilation" shall mean that type of ventilation in which suction is applied at the point of generation of dusts, fumes, gases, vapors, and mists.

- H. "Mist" shall mean liquid droplets suspended in air.
- I. "Place of employment" shall mean a location or site where an individual possesses employment in a trade, occupation, or profession for the sake of monetary gain.
- J. (amended August 18, 1964) "Threshold Limit Value" shall mean the maximum average atmospheric concentration of contaminant to which workers may be exposed for an eight hour working day. (These values are set forth in Table 1 hereof, which table is a part of these regulations.)
- K. "Vapor" shall mean any liquid, except water, which when held in suspension in air will revert to its original liquid state after release from heat, chemical action, or pressure conditions.
- L. (added August 18, 1964) "Short-Term Limit" shall mean the maximum atmospheric concentration of a contaminant to which a workman may be exposed for a specified short-time period. The concentration represents an upper limit of exposure for the specified time and assumes that there are sufficient recovery periods between episodes for recuperation. The daily average exposure to the contaminant, including these episodes, shall be such that the threshold limit value set forth in Table 1 shall not be exceeded. (These values are set forth in Table 2 hereof, which table is a part of these regulations.)
- M. (added January 25, 1968) "Confined space" shall mean any tank, vessel or area so enclosed that adequate dilution ventilation will not be obtained by natural air movement.

* Adopted pursuant to the provisions of the Administrative Code of 1929: Act of April 9, 1929, P.L. 177, as amended.

Section 4. Employer's Duties

- A. Every employer shall install and provide such control measures and protective equipment as is required for the protection of health.
- B. Every employer shall inform and periodically instruct his employees regarding known hazards and proper methods for utilizing industrial hygiene control measures which are provided.
- C. When it is necessary for an employer to provide protective equipment, such employer shall provide an approved means for cleaning and sterilizing such protective equipment, and the employer shall cause such equipment to be maintained in a clean and sanitary condition. Respiratory equipment shall not be passed from one man to another until such equipment is clean and sterilized. When filter or cartridge type respirators are used, such employee shall have such respirator for his own exclusive use. Respiratory equipment and replacement units shall be stored, when not in use, in approved containers.
- D. (amended August 20, 1963) When employees are exposed to compounds capable of causing occupational disease by inhalation and/or skin or mucous membrane absorption, the department may require their employer to provide physical examinations and other tests for them at periodic intervals.

Section 5. Threshold Limit Values and Short-Term Limits

- A. (amended August 18, 1964) No employee shall be exposed to atmospheric concentrations of contaminants which concentrations may give rise to occupational disease. Tables 1 and 2 shall be used for the determination of permissible levels.
- B. Exposures to atmospheric contaminants or adverse environmental conditions not referred to in Section 5A shall be controlled when necessary to protect health.

Section 6. Air Recirculation and Discharge

- A. No air from any local exhaust ventilation system may be recirculated without express approval by the Department.

- B. The discharge of air from any exhaust system shall be such that no air contamination will enter any window, door, or other opening of any work area in quantities sufficient to create a health hazard to or in such area.

Section 7. Confined Space

(amended January 25, 1968)

No individual shall be permitted to enter any confined space unless another workman supplied with emergency protective equipment is stationed outside the confined space to summon help and to assist the workman and until one of the three following conditions have been met:

- A. It has been ascertained by air sampling that the atmosphere in the confined space contains an adequate quantity of oxygen and that harmful atmospheric contaminants have been diluted to safe concentrations prior to and during occupancy; or
- B. The workman is equipped with a supplied-air respirator or self-contained breathing apparatus, a safety harness, a safety line and protective clothing, where necessary; or
- C. It is ascertained that no harmful contaminants are present and mechanically induced dilution ventilation is used before entry and during occupancy to insure an adequate quantity of oxygen in the confined space.

Section 8. Housekeeping

- A. The interiors, exteriors, and environs of buildings where hazardous materials are used, stored, or handled, shall be cleaned and maintained in such a manner as to prevent harmful exposure to hazardous materials.
- B. Employees engaged in such cleaning operations and all others who may be exposed shall wear protective equipment as is required. The cleaning operations should be done by suction apparatus.
- C. Where wet processes are used, reasonable drainage should be maintained. False floors, platforms, mats, or other means of safe footing should be provided.

Section 9. Labeling

Adequate identification, warning, and caution labels shall be applied to all containers of hazardous chemicals.

REGULATIONS FOR THRESHOLD LIMITS

Table 1. Threshold Limit Values

Substance	8-hour maximum average exposure	
	P.P.M. ^a	Mg. per Cu. M. ^b
Acetaldehyde	200	—
Acetic acid	10	—
Acetic anhydride	5	—
Acetone	1,000	—
Acetonitrile	40	—
Acetylene tetrabromide	1	—
Acrolein	0.1	—
Acrylamide—Skin	—	0.3
Acrylonitrile—Skin	20	—
Aldrin (1, 2, 3, 4, 10, 10-hexa- chloro-1, 4, 4a, 5, 8, 8a-hexa- hydro-1, 4, 5, 8-dimethano- naphthalene)—Skin	—	0.25
Allyl alcohol—Skin	2	—
Allyl chloride	1	—
Allyl glycidyl ether (AGE)	10	—
Allyl propyl disulfide	2	—
2-Aminopyridine	0.5	—
Ammonia	50	—
Ammonium sulfamate (Ammate)	—	15
Amyl acetate	100	—
sec-Amyl acetate	125	—
Amyl alcohol (isoamyl alcohol)	100	—
Aniline—Skin	5	—
Anisidine (o-, p-isomers)—Skin	—	0.5
Antimony	—	0.5
ANTU (alpha naphthyl thiourea)	—	0.3
Arsenic	—	0.5
Arsine	0.05	—
Azinphos-methyl—Skin	—	0.2
Barium (soluble compounds)	—	0.5
Benzene (benzol)—Skin	25	—
Benzoyl peroxide	—	5
Benzyl chloride	1	—
Beryllium	—	0.002
Boron oxide	—	15
Boron trifluoride	1	—
Bromine	0.1	—
Bromoform—Skin	0.5	—
Butadiene (1,3-butadiene)	1,000	—
2-Butanone (methyl ethyl ketone)	200	—
2-Butoxy ethanol (Butyl Cellosolve)—Skin	50	—
n-Butyl acetate	200	—
sec-Butyl acetate	200	—
tert. Butyl acetate	200	—
Butyl alcohol	100	—
tert. Butyl alcohol	100	—
Butylamine—Skin	5	—

Substance	8-hour maximum average exposure	
	P.P.M. ^a	Mg. per Cu. M. ^b
tert. Butyl chromate (as CrO ₃)—Skin	—	0.1
n-Butyl glycidyl ether (BGE)	50	—
Butyl mercaptan	10	—
p-tert. Butyltoluene	10	—
Cadmium (Metal dust and soluble salts)	—	0.2
Cadmium oxide fume	—	0.1
Calcium arsenate	—	1
Calcium oxide	—	5
Camphor	—	2
Carbaryl (Sevin)	—	5
Carbon black	—	3.5
Carbon dioxide	5,000	—
Carbon disulfide—Skin	20	—
Carbon monoxide	50	—
Carbon tetrachloride—Skin	10	—
Chlordane (1,2,4,5,6,7,8,8- octachloro-3a,4,7,7a-tetra- hydro-4,7-methanoindene)—Skin	—	0.5
Chlorinated camphene, 60%—Skin	—	0.5
Chlorinated diphenyl oxide	—	0.5
Chlorine	1	—
Chlorine dioxide	0.1	—
Chlorine trifluoride	0.1	—
Chloroacetaldehyde	1	—
Chlorobenzene (monochloro- benzene)	75	—
O-Chlorobenzylidene malononitrile (OCBM)	0.05	—
Chlorobromomethane	200	—
Chlorodiphenyl (42% Chlorine) —Skin	—	1
Chlorodiphenyl (54% Chlorine) —Skin	—	0.5
Chloroform (trichloromethane)	50	—
1-Chloro-1-nitropropane	20	—
Chloropicrin	0.1	—
Chloroprene (2-chloro- 1,3-butadiene)—Skin	25	—
Chromic acid and chromates (as CrO ₃)	—	0.1
Coal tar pitch volatiles (benzene soluble fraction)	—	0.2
Cobalt	—	0.5
Copper fume	—	0.1
Copper dusts and mists	—	1
Cotton dust (raw)	—	1

REGULATIONS FOR THRESHOLD LIMITS

Table 1. (Continued)

Substance	8-hour maximum average exposure		Substance	8-hour maximum average exposure	
	P.P.M. ^a	Mg. per ^b Cu. M.		P.P.M. ^a	Mg. per ^b Cu. M.
Crag (R) herbicide (sodium 2-[2,4-dichlorophenoxy] ethanol hydrogen sulfate)	—	15	Diglycidyl ether (DGE)	0.5	—
Cresol (all isomers)—Skin	5	—	Diisobutyl ketone	50	—
Crotonaldehyde	2	—	Dimethyl acetamide—Skin	10	—
Cumene—Skin	50	—	Dimethylamine	10	—
Cyanide (as CN)—Skin	—	5	Dimethylaniline (n-dimethyl- aniline)—Skin	5	—
Cyclohexane	300	—	Dimethyl 1,2-dibromo-2,2- dichloroethyl phosphate	—	3
Cyclohexanol	50	—	Dimethylformamide—Skin	10	—
Cyclohexanone	50	—	1,1-Dimethylhydrazine—Skin	0.5	—
Cyclohexene	300	—	Dimethylsulfate—Skin	1	—
Cyclopentadiene	75	—	Dinitrobenzene (all isomers)—Skin	—	1
2,4-D (2,4-dichlorophenoxy- acetic acid)	—	10	Dinitro-o-cresol—Skin	—	0.2
DDT (2,2-bis (p-chlorophenyl)- 1,1,1-trichloroethane)—Skin	—	1	Dinitrotoluene—Skin	—	1.5
Decaborane—Skin	0.05	—	Dioxane (diethylene dioxide)— Skin	100	—
Demeton (systox)—Skin	—	0.1	Dipropylene glycol methyl ether— Skin	100	—
Diacetone alcohol (4-hydroxy- 4-methyl-2-pentanone)	50	—	Di sec. octyl phthalate (Di-2-ethylhexyl-phthalate)	—	5
Diazomethane	0.2	—	Endrin (1,2,3,4,10,10-hexa- chloro-6,7-epoxy-1,4,4a,5, 6,7,8,8a-octa hydro-1,4,-endo- 5,8,-dimethanonaphthalene)— Skin	—	0.1
Diborane	0.1	—	Epichlorhydrin—Skin	5	—
1,2-Dibromoethane (Ethylene dibromide)—Skin	25	—	EPN (o-ethyl o-p-nitrophenyl thionobenzenephosphonate)— Skin	—	0.5
o-Dichlorobenzene	50	—	Ethanolamine	3	—
p-Dichlorobenzene	75	—	2-Ethoxyethanol (cellosolve)—Skin	200	—
Dichlorodifluoromethane	1,000	—	2-Ethoxyethylacetate (cellosolve acetate)—Skin	100	—
1,3-Dichloro-5,5-dimerhyl hydantoin	—	0.2	Ethyl acetate	400	—
1,1-Dichloroethane	100	—	Ethyl acrylate—Skin	25	—
1,2-Dichloroethane (Ethylene dichloride)	50	—	Ethyl alcohol (ethanol)	1,000	—
1,2-Dichloroethylene	200	—	Ethylamine	10	—
Dichloroethyl ether—Skin	15	—	Ethyl sec-amyl ketone	25	—
Dichloromonofluoromethane	1,000	—	Ethylbenzene	100	—
1,1-Dichloro-1-nitroethane	10	—	Ethyl bromide	200	—
Dichlorotetrafluoroethane	1,000	—	Ethyl butyl ketone (3-Heptanone)	50	—
DDVP (o,o-Dimethyl-2,2- dichlorovinyl phosphate)—Skin	—	1	Ethyl chloride	1,000	—
Dieldrin (1,2,3,4,10,10-hexa- chloro-6,7-epoxy-1,4,4a,5,6,7, 8,8a-octahydro-1,4,5,8- dimethanonaphthalene)—Skin	—	0.25	Ethyl ether	400	—
Diethylamine	25	—	Ethyl formate	100	—
Diethylaminoethanol—Skin	10	—	Ethyl mercaptan	10	—
Di fluorodibromomethane	100	—			

REGULATIONS FOR THRESHOLD LIMITS

Table 1. (Continued)

Substance	8-hour maximum average exposure		Substance	8-hour maximum average exposure	
	P.P.M. ^a	Mg. per ^b Cu. M.		P.P.M. ^a	Mg. per Cu. M.
n-Ethylmorpholine—Skin	20	—	Isophorone	25	—
Ethyl silicate	100	—	Isopropyl acetate	250	—
Ethylene chlorohydrin—Skin	5	—	Isopropylamine	5	—
Ethylenediamine	10	—	Isopropyl glycidyl ether (IGE)	50	—
Ethylene glycol dinitrate			Ketene	0.5	—
(Combined EGDN + NG)—Skin	0.2	—	Lead	—	0.2
Ethylene glycol monomethyl			Lead arsenate	—	0.15
ether acetate (methyl			Lindane (hexachlorocyclohexane,		
cellosolve acetate)	25	—	gamma isomer)—Skin	—	0.5
Ethylene imine—Skin	0.5	—	Lithium hydride	—	0.025
Ethylene oxide	50	—	L.P.G. (liquified petroleum		
Ferbam (ferric dimethyl			gas)	1,000	—
dithiocarbamate)	—	15	Magnesium oxide fume	—	15
Ferrovandium dust	—	1	Malathion (o,o-dimethyl		
Fluoride (as F)	—	2.5	dithiophosphate of diethyl		
Fluorine	0.1	—	mercaptosuccinate)—Skin	—	15
Fluorotrichloromethane	1,000	—	Manganese	—	5
Formaldehyde	5	—	Mercury—Skin	—	0.1
Formic acid	5	—	Mercury (organic compounds)—		
Furfural—Skin	5	—	Skin	—	0.01
Furfuryl alcohol	50	—	Mesityl oxide	25	—
Glycidol (2,3-Epoxy-1-propanol)	50	—	Methoxychlor (2,2-di-p-methoxy-		
Hafnium	—	0.5	phenyl-1,1,1-trichloroethane)	—	15
Heptachlor (1,4,5,6,7,8,8a-hepta-			2-Methoxy-ethanol (methyl		
chloro-3a,4,7,7a-tetrahydro-			cellosolve)	25	—
4,7-methanoindane)—Skin	—	0.5	Methyl acetate	200	—
Heptane (n-heptane)	500	—	Methyl acetylene (propine)	1,000	—
Hexachloroethane—Skin	1	—	Methyl acetylene-propadiene		
Hexane (n-hexane)	500	—	mixture (MAPP)	1,000	—
Hexanone (methyl butyl ketone)	100	—	Methyl acrylate—Skin	10	—
Hexone (methyl isobutyl ketone)	100	—	Methylal (dimethoxymethane)	1,000	—
sec-Hexyl acetate	50	—	Methyl alcohol	200	—
Hydrazine—Skin	1	—	Methylamine	10	—
Hydrogen bromide	3	—	Methyl (n-amyl) ketone		
Hydrogen chloride	5	—	(2-Heptanone)	100	—
Hydrogen cyanide—Skin	10	—	Methyl bromide—Skin	20	—
Hydrogen fluoride	3	—	Methyl chloride	100	—
Hydrogen peroxide, 90%	1	—	Methyl chloroform (1,1,1-		
Hydrogen selenide	0.05	—	trichloroethane)	350	—
Hydrogen sulfide	10	—	Methylcyclohexane	500	—
Hydroquinone	—	2	Methylcyclohexanol	100	—
Inert or nuisance particulates	—	15	Methylcyclohexanone	100	—
Iodine	0.1	—	Methylene bis phenyl		
Iron oxide fume	—	10	isocyanate (MDI)	—	0.2
Isoamyl acetate	100	—	Methylene chloride		
Isobutyl acetate	150	—	(dichloromethane)	500	—
			Methyl formate	100	—

REGULATIONS FOR THRESHOLD LIMITS

Table 1. (Continued)

Substance	8-hour maximum average exposure		Substance	8-hour maximum average exposure	
	P.P.M. ^a	Mg. per ^b Cu. M.		P.P.M. ^a	Mg. per ^b Cu. M.
Methyl iodide—Skin	5	—	Pentanone (methyl propyl ketone)	200	—
Methyl isobutyl carbinol (methyl amyl alcohol)—Skin	25	—	Perchloroethylene (tetrachloroethylene)	100	—
Methyl isocyanate—Skin	0.02	—	Perchloromethyl mercaptan	0.1	—
Methyl mercaptan	10	—	Perchloryl fluoride	3	—
Methyl methacrylate	100	—	Phenol—Skin	5	—
α Methyl styrene	100	—	p-Phenylene diamine—Skin	—	0.1
Monomethyl aniline—Skin	2	—	Phenyl ether (vapor)	1	—
Monomethyl hydrazine—Skin	0.2	—	Phenyl glycidyl ether (PGE)	50	—
Molybdenum (soluble com- pounds)	—	5	Phenylhydrazine—Skin	5	—
(insoluble compounds)	—	15	Phosdrin (2-carbomethoxy-1- methyl vinyl dimethyl phosphate)—Skin	—	0.1
Morpholine—Skin	20	—	Phosgene	0.1	—
Naphtha (coal tar)	200	—	Phosphine	0.3	—
Naphtha (petroleum)	500	—	Phosphoric acid	—	1
Naphthalene	10	—	Phosphorus (yellow)	—	0.1
Nickel, metal and soluble compounds	—	1	Phosphorus pentachloride	—	1
Nickel carbonyl	0.001	—	Phosphorus pentasulfide	—	1
Nicotine—Skin	—	0.5	Phosphorus trichloride	0.5	—
Nitric acid	2	—	Phthalic anhydride	2	—
p-Nitroaniline—Skin	1	—	Picric acid—Skin	—	0.1
Nitrobenzene—Skin	1	—	Pival	—	0.1
p-Nitrochlorobenzene—Skin	—	1	Platinum (soluble salts)	—	0.002
Nitroethane	100	—	Propane	1,000	—
Nitrogen dioxide	5	—	Propyl acetate	200	—
Nitrogen trifluoride	10	—	Propyl alcohol (isopropyl alcohol)	400	—
Nitroglycerin (combined EGDN + NG)—Skin	0.2	—	Propyl ether (isopropyl ether)	500	—
Nitromethane	100	—	n-Propyl nitrate	25	—
1-Nitropropane	25	—	Propylene dichloride (1,2-dichloropropane)	75	—
2-Nitropropane	25	—	Propylene imine—Skin	2	—
Nitrotoluene—Skin	5	—	Propylene oxide	100	—
Octane	500	—	Pyrethrum	—	5
Oil mist (mineral)	—	5	Pyridine	5	—
Osmium tetroxide	—	0.002	Quinone	0.1	—
Oxalic acid	—	1	Rhodium — Metal fume and dusts	—	0.1
Oxygen difluoride	0.05	—	Soluble salts	—	0.001
Ozone	0.1	—	Rorenone (commercial)	—	5
Parathion (o,o-diethyl-o-p- nitrophenyl thiophosphate)— Skin	—	0.1	Selenium compounds (as Se)	—	0.2
Pentaborane	0.005	—	Selenium hexafluoride	0.05	—
Pentachloronaphthalene—Skin	—	0.5	Silver, metal and soluble compounds	—	0.01
Pentachlorophenol—Skin	—	0.5	Sodium fluoroacetate (1080)— Skin	—	0.05
Pentane	1,000	—			

REGULATIONS FOR THRESHOLD LIMITS

Table 1. (Continued)

Substance	8-hour maximum average exposure		Substance	8-hour maximum average exposure	
	P.P.M. ^a	Mg. per Cu. M. ^b		P.P.M. ^a	Mg. per Cu. M. ^b
Sodium hydroxide	—	2	1, 1, 2-Trichloroethane—Skin	10	—
Sibine	0.1	—	Trichloroethylene	100	—
Stoddard solvent	500	—	Trichloronaphthalene—Skin	—	5
Strychnine	—	0.15	1, 2, 3-Trichloropropane	50	—
Styrene monomer (phenylethylene)	100	—	1, 1, 2-Trichloro 1, 2, 2-trifluoroethane	1,000	—
Sulfur dioxide	5	—	Triethylamine	25	—
Sulfur hexafluoride	1,000	—	Trifluoromonomobromomethane	1,000	—
Sulfuric acid	—	1	Trinitrotoluene—Skin	—	1.5
Sulfur monochloride	1	—	Triorthocresyl phosphate	—	0.1
Sulfur pentafluoride	0.025	—	Triphenyl phosphate	—	3
Sulfuryl fluoride	5	—	Turpentine	100	—
2, 4, 5T (2, 4, 5-Trichloro- phenoxy-acetic acid)	—	10	Uranium		
Tantalum	—	5	(soluble compounds)	—	0.05
TEDP (tetraethyl dithiono- pyrophosphate)—Skin	—	0.2	(insoluble compounds)	—	0.25
Tellurium	—	0.1	Vanadium		
Tellurium hexafluoride	0.02	—	(V ₂ O ₅ dust)	—	0.5
TEPP (tetraethyl pyrophosphate) —Skin	—	0.05	(V ₂ O ₅ fume)	—	0.1
1, 1, 2, 2-Tetrachloroethane— Skin	5	—	Vinyl chloride (chloroethylene)	500	—
1, 1, 2, 2-Tetrachloro- 1, 2-difluoroethane	500	—	Vinyl toluene	100	—
1, 1, 1, 2-Tetrachloro-2, 2-difluoroethane	500	—	Warfarin (3-[acetonylbenzyl]-4- hydroxycoumarin)	—	0.1
Tetraethyl lead (as Pb)—Skin	—	0.075	Xylene (xylol)	100	—
Tetrahydrofuran	200	—	Xylidine—Skin	5	—
Tetramethyl lead (TML) (as Pb)—Skin	—	0.075	Yttrium	—	1
Tetramethyl succinonitrile— Skin	0.5	—	Zinc oxide fume	—	5
Tetranitromethane	1	—	Zirconium compounds (as Zr)	—	5
Tetryl (2, 4, 6-trinitrophenyl- methylnitramine)—Skin	—	1.5			
Thallium (soluble compounds) —Skin	—	0.1			
Thiram (tetramethyl thiuram disulfide)	—	5			
Tin (inorganic compounds)	—	2			
(organic compounds)	—	0.1			
Titanium dioxide	—	15			
Toluene (toluol)	200	—			
Toluene-2, 4-diisocyanate	0.02	—			
o-Toluidine—Skin	5	—			

NOTE: The word "Skin" following a substance' name indicates that the substance can penetrate the skin to cause systemic effects.

^aParts of vapor or gas per million parts of air by volume at 25°C and 760 mm. Hg. pressure.

^bMilligrams of particulate per cubic meter of air.

REGULATIONS FOR THRESHOLD LIMITS

Table 1. (Continued)

Mineral Dusts	
Substance	M.P.P.C.F. ^c
Silica	
Crystalline	
Quartz (threshold limit calculated from the formula)	250
	%SiO ₂ +5
Cristobalite (same)	
Amorphous, including natural diatomaceous earth	20
Graphite	15
Silicates (less than 1% crystalline silica)	
Asbestos	5
Mica	20
Soapstone	20
Talc	20
Tremolite	5
Portland cement	50
Miscellaneous (less than 1% crystalline silica)	50

^cMillions of particles per cubic foot of air based on impinger samples counted by light-field techniques.

REGULATIONS FOR THRESHOLD LIMITS

Table 2. Short-Term Limits

Maximum average exposure for the time period specified				Maximum average exposure for the time period specified			
Substance	P.P.M. ^a	Mg. per ^b Cu. M.	Time in minutes	Substance	P.P.M. ^a	Mg. per ^b Cu. M.	Time minutes
Acetic acid	40	—	5	1,2-Dichloroethane			
Acetone	1,000	—	30	(Ethylene dichloride)	200	—	30
Acrolein	0.5	—	5	Dichloroethyl ether	35	—	30
Acrylonitrile	40	—	30	1,1-Dichloro-1-			
Allyl alcohol	5	—	30	nitroethane	10	—	30
Allyl glycidyl ether				Dieldrin	—	1	30
(AGE)	10	—	5	Diethyl amine	100	—	30
Ammonia	100	—	30	Diglycidyl ether	0.5	—	5
Amyl acetate	200	—	30	Diisobutyl ketone	50	—	30
Amyl alcohol	150	—	30	Dimethylamine	20	—	5
Aniline	50	—	30	Endrin	—	0.5	30
Benzene	75	—	30	EPN	—	2.5	30
Benzoyl peroxide	—	10	15	Ethyl acetate	1,000	—	15
Beryllium	—	0.025	5	Ethyl acrylate	50	—	15
Boron trifluoride	1	—	5	Ethyl alcohol	5,000	—	15
Bromine	0.4	—	30	Ethylamine	25	—	30
2-Butanone (MEK)	300	—	5	Ethyl benzene	200	—	30
2-Butoxy ethanol				Ethylene diamine	20	—	5
(butyl cellosolve)	200	—	5	Ethylene glycol			
Butyl acetate	300	—	30	dinitrate and			
Butyl alcohol	150	—	30	Nitroglycerin	0.2	—	30
tert. Butyl alcohol	150	—	30	Ethylene glycol			
Butylamine	5	—	5	monomethyl ether			
tert. Butyl chromate	—	0.1	30	acetate (Methyl			
Cadmium oxide fume	—	0.3	30	Cellosolve acetate)	50	—	30
Calcium oxide	—	10	30	Ethyl ether	1,000	—	30
Carbaryl (Sevin)	—	30	30	Ethylene imine	5	—	30
Carbon disulfide	100	—	30	Ethylene oxide	200	—	30
Carbon monoxide	400	—	15	N-Ethylmorpholine	20	—	15
Carbon tetrachloride	25	—	30	Fluoride	—	10	30
Chlordane	—	2	30	Fluorine	0.5	—	5
Chlorine	3	—	5	Formaldehyde	5	—	5
Chlorine trifluoride	0.1	—	5	Furfural	15	—	15
Chloroacetaldehyde	1	—	5	Furfural alcohol	50	—	15
Chloroform	400	—	30	Gasoline	500	—	30
Cobalt	—	0.5	30	Heptachlor	—	2	30
Copper fume	—	0.1	30	Heptane	500	—	30
Cyanide (as CN)	—	5	30	Hexane	500	—	30
Cyclopentadiene	200	—	15	Hexanone (MBK)	200	—	30
DDVP	—	3	30	Hexone (MIBK)	400	—	5
Demeton (Systox)	—	0.5	30	Hydrazine	1	—	30
Diacetone alcohol	150	—	30	Hydrogen chloride	5	—	5
o-Dichlorobenzene	50	—	15	Hydrogen cyanide	20	—	30
1,3-Dichloro-5,5-				Hydrogen fluoride	3	—	15
Dimethylhydantoin	—	0.5	15	Hydrogen sulfide	20	—	5
1,1-Dichloroethane	200	—	30	Iodine	0.1	—	5

REGULATIONS FOR THRESHOLD LIMITS

Table 2. (Continued)

Maximum average exposure for the time period specified				Maximum average exposure for the time period specified			
Substance	P.P.M. ^a	Mg. per ^b Cu. M.	Time in minutes	Substance	P.P.M. ^a	Mg. per ^b Cu. M.	Time in minutes
Isopropyl glycidyl ether (IGE)	100	—	30	Toluene-2,4-diiso- cyanate (TDI)	0.02	—	5
Lindane	—	1	30	Trichloroethylene	200	—	30
Manganese	—	5	30	Triethyl amine	100	—	30
Melvinphos (Phosdrin)	—	0.5	30	Trinitrotoluene	—	5	30
Methyl acetate	400	—	5	Vanadium (V ₂ O ₅ dust and/or fume)	—	0.5	30
Methyl acrylate	25	—	30	Vinyl chloride	500	—	5
Methyl bromide	20	—	5	Vinyl toluene	400	—	5
Methyl cellosolve	50	—	30	Xylene	300	—	30
Methyl chloride	100	—	5	Zinc oxide fume	—	10	30
Methyl chloroform (1,1,1-trichloroethane)	1,500	—	5				
Methylene bis phenyl- isocyanate (MDI)	—	0.25	5				
Methylene chloride (Dichloromethane)	1,000	—	30				
Methyl mercaptan	20	—	5				
Methyl methacrylate	200	—	15				
Methyl styrene	100	—	30				
Morpholine	20	—	15				
Naphtha (petroleum)	500	—	30				
Naphthalene	15	—	5				
Nickel carbonyl	0.04	—	5				
Nitric acid	15	—	5				
Nitrogen dioxide	25	—	5				
Octane	500	—	30				
Ozone	1	—	30				
Parathion	—	0.5	30				
Perchloroethylene	200	—	30				
Phosgene	1	—	5				
Phosphine	1	—	30				
Phthalic anhydride	4	—	5				
Propyl alcohol	400	—	30				
Pyridine	10	—	30				
Selenium compounds (as Se)	—	0.3	30				
Styrene monomer	100	—	5				
Sulfur dioxide	20	—	5				
Sulfuric acid	—	3	5				
TEDP	—	1	30				
TEPP	—	0.25	30				
1,1,2,2-Tetrachloro- ethane	10	—	30				
Tetrahydrofuran	500	—	30				
Tin (inorganic com- pounds)	—	5	30				
Toluene	600	—	30				

^aParts of vapor or gas per million parts of air by volume at 25°C and 760 mm. Hg. pressure.

^bMilligrams of particulate per cubic meter of air.