PLAINTIFF'S
EXHIBIT
USX-79

Tubular ops
General 1957-1965

Mr. G. M. Reilly
Director of Safety
National Tube Division
B U I L D I N G

July 1, 1959

Kenneth M. Morse, Director
Industrial Hygiene

Toxic Limits

As per your request, may I suggest you consider including the following information with your transmission of the enclosed tables of "Threshold Limit Values for 1958."

The enclosed list of "Threshold Limits" are known under a variety of names, such as "maximum allowable concentrations," "toxic limits," etc. They are not exact delineations between hazard and non-hazard conditions, since they are derived from a variety of sources. Some are based upon studies with human subjects, others upon opinions derived by interpolating from animal experimental data, while still others are based merely upon unsupported opinions from industrial medical and hygiene authorities. However, the fact remains that these limits are often incorporated into state codes or used by state inspectors as exact numbers above which a condition is dangerous. Therefore, in actual practice, it is important to maintain air concentrations of these gases, vapors, dusts or mists within such levels where possible or protect workers by approved respiratory devices.

These data are the maximum degree of air contamination to which one should be exposed upon a continuous 8-hour daily and 40-hour weekly basis. The data, therefore, are degrees of air contamination which will prevent the development of chronic poisoning arising from continuous day to day exposures. It is our opinion that short-term exposures also should be maintained within such limits where practicable, because of the absence of good data on safe concentrations for preventing acute (sudden) poisoning. This approach is considered to be the best course of action because the human body does not respond in a direct arithmetic relationship with the amount of contaminant in the air. In other words, it would not be prudent to expose an individual for one hour to eight times the values shown in the enclosed table without respiratory protection. Furthermore, state inspectors would no doubt consider such exposures as hazardous to health.

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Threshold Limit Values for 1958

Adopted at the 20th Annual Meeting of the American Conference of Governmental Industrial Hygienists Atlantic City, April 19-22, 1958

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Threshold limits should be used as guides in the control of health hazards and should not be regarded as fine lines between safe and dangerous concentrations. They represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect. The values listed refer to time-weighted average concentrations for a normal work day. The amount by which these figures may be exceeded for short periods without injury to health depends upon a number of factors, such as the nature of the contaminant, whether very high concentrations even for short periods produce acute poisoning, whether the effects are cumulative, the frequency with which high concentrations occur, and the duration of such periods. All must be taken into consideration in arriving at a decision as to whether a hazardous situation exists. Special consideration should be given to the application of these values in the evaluation of the health hazards which may be associated with exposure to combinations of two or more substances.

Threshold limits are based on the best available information from industrial experience, from experimental studies, and, when possible, from a combination of the two. These values are based on various criteria of toxic effects or on marked discomfort: thus, they should not be used as a common denominator of toxicity, nor should they be considered as the sole criterion in proving or disproving diagnosis of suspected occupational disease.

These limits are intended for use in the field of industrial hygiene and should be employed by persons trained in this field. They are not intended for use, or for modification for use, in the evaluation or control of community air pollution or air-pollution nuisances.

These values are reviewed annually by the Committee on Threshold Limits for changes, revisions, or additions as further information becomes available. The Committee welcomes the suggestion of substances to be added to the list and also comments, references, or reports of experience with these materials.

Submitted for publication May 5, 1958.

RECOMMENDED VALUES

Gases and Vapors

Substance	PPM *	Approx. Mg. per Cu. M. †	Substance	PPM *	Approx Mg. per Cu. M. †
Acetaldehyde	200	360	Allyl propyl disulfide	2	12
Acetic acid	10	25	Ammonia	100	70
Acetic anhydride	5	20	Amyl acetate	200	1,050
Acetone	1,000	2,400	Amyl alcohol (isoamyl alcohol)	100	360
Acrolein	0.5	1.2	Aniline	5	19
Acrylonitrile	20	45	Arsine	<0.05	0.2
Allyl alcohol	5	12	Benzene (benzol)	25	80
Allyl chloride	5	15			

THRESHOLD LIMIT VALUES FOR 1958

Substance	PPM *	Approx. Mg. per Cu. M. †
Benzyl chloride	1	5
Bromine	1	7
Butadiene (1,3-butadiene)	1,000	2,200
Butanone (methyl ethyl ketone)	250	740
Butyl acetate (n-butyl acetate)	200	950
Butyl alcohol (n-butanol)	100	300
Butylamine	5	15
Butyl cellosolve (2-butoxyethanol)	50	240
Carbon dioxide	5,000	9,000
Carbon disulfide	20	60
Carbon monoxide	100	110
Carbon tetrachloride	25	160
Cellosolve (2-ethoxyethanol)	200	740
Cellosolve acetate (2-ethoxyethyl acetate)	100	540
Chlorine	1	3
Chlorine trifluoride	0.1	0.4
Chlorobenzene (monochlorobenzene)	75	350
Chloroform (trichloromethane)	100	490
1-Chloro-1-nitropropane	20	100
Chloropicrin	1	7
Chloroprene (2-chloro-1,3-butadiene)	25	90
Cresol (all isomers)	5	22
Cyclohexane	400	1,400
Cyclohexanol	100	410
Cyclohexanone	100	400
Cyclohexene	400	1,350
Cyclopropane	400	690
Decaborane	0.05	0.3
Diacetone alcohol (4-hydroxy-4-methyl-2-pentanone)	50	240
Diborane	0.1	0.1
o-Dichlorobenzene	50	300
Dichlorodifluoromethane	1,000	4,950
1,1-Dichloroethane	100	400
1,2-Dichloroethane (ethylene dichloride)	100	400
1,2-Dichloroethylene	200	790
Dichloroethyl ether	15	90
Dichloromonofluoromethane	1,000	4,200
1,1-Dichloro-1-nitroethane	10	60
Dichlorotetrafluoroethane	1,000	7,000
Diethylamine	25	75
Difluorodibromomethane	100	860
Diisobutyl ketone	50	290

Substance	PPM *	Approx. Mg. per Cu. M. †
Dimethylaniline (N-dimethylaniline)	5	25
Dimethylsulfate	1	5
Dioxane (diethylene dioxide)	100	360
Ethyl acetate	400	1,400
Ethyl acrylate	25	100
Ethyl alcohol (ethanol)	1,000	1,900
Ethylamine	25	45
Ethylbenzene	200	870
Ethyl bromide	200	890
Ethyl chloride	1,000	2,600
Ethyl ether	400	1,200
Ethyl formate	100	300
Ethyl silicate	100	850
Ethylene chlorohydrin	5	16
Ethylenediamine	10	30
Ethylene dibromide (1,2-dibromoethane)	25	190
Ethylene imine	5	9
Ethylene oxide	50	90
Fluorine	0.1	0.2
Fluorotrichloromethane	1,000	5,600
Formaldehyde	5	6
Furfural	5	20
Gasoline	500	2,000
Heptane (n-heptane)	500	2,000
Hexane (n-hexane)	500	1,800
Hexanone (methyl butyl ketone)	100	410
Hexone (methyl isobutyl ketone)	100	410
Hydrazine	1	1.3
Hydrogen bromide	5	17
Hydrogen chloride	5	7
Hydrogen cyanide	10	11
Hydrogen fluoride	3	2
Hydrogen peroxide, 90%	1	1.4
Hydrogen selenide	0.05	0.2
Hydrogen sulfide	20	30
Iodine	0.1	1
Isophorone	25	140
Isopropylamine	5	12
Mesityl oxide	25	100
Methyl acetate	200	610
Methyl acetylene	1,000	1,650
Methyl acrylate	10	35
Methyl alcohol (methanol)	200	260
Methyl bromide	20	80
Methyl cellosolve (2-methoxyethanol)	25	80
Methyl cellosolve acetate (ethylene glycol monomethyl ether acetate)	25	120
Methyl chloride	100	210

Substance	PPM *	Approx. Mg. per Cu. M. †
Methylal (dimethoxy-methane)	1,000	3,100
Methyl chloroform (1,1,1-trichloroethane)	500	2,700
Methylcyclohexane	500	2,000
Methylcyclohexanol	100	470
Methylcyclohexanone	100	460
Methyl formate	100	250
Methyl isobutyl carbinol (methyl amyl alcohol)	25	100
Methylene chloride (dichloromethane)	500	1,750
Naphtha (coal tar)	200	800
Naphtha (petroleum)	500	2,000
Nickel carbonyl	0.001	0.007
Nitric acid	10	25
p-Nitroaniline	1	6
Nitrobenzene	1	5
Nitroethane	100	310
Nitrogen dioxide	5	9
Nitroglycerin	0.5	5
Nitromethane	100	250
2-Nitropropane	50	180
Nitrotoluene	5	30
Octane	500	2,350
Ozone	0.1	0.2
Pentane	1,000	2,950
Pentanone (methyl propyl ketone)	200	700
Perchlorethylene (tetrachloroethylene)	200	1,350
Phenol	5	19
Phenylhydrazine	5	22
Phosgene (carbonyl chloride)	1	4
Phosphine	0.05	0.07
Phophorus trichloride	0.5	3
Propyl acetate	200	840
Propyl alcohol (isopropyl alcohol)	400	980
Propyl ether (isopropyl ether)	500	2,100
Propylene dichloride (1,2-dichloropropane)	75	350
Propylene imine	25	60
Pyridine	10	30
Quinone	0.1	0.4
Stibine	0.1	0.5
Stoddard solvent	500	2,900
Styrene monomer (phenylethylene)	100	420
Sulfur dioxide	5	13
Sulfur hexafluoride	1,000	6,000
Sulfur monochloride	1	6
Sulfur pentafluoride	0.025	0.25
p-Tertiarybutyltoluene	10	60
1,1,2,2-Tetrachloroethane	5	35
Tetrahydrofuran	200	590
Tetranitromethane	1	8
Toluene (toluol)	200	750
o-Toluidine	5	22
Trichloroethylene	200	1,050
Trifluoromonobromo-methane	1,000	6,100
Turpentine	100	560
Vinyl chloride (chloroethylene)	500	1,300
Xylene (xylol)	200	870

* Parts of vapor or gas per million parts of air by volume.
† Approximate milligrams per cubic meter of air.

Toxic Dusts, Fumes, and Mists

Substance	Mg. per Cu. M.‡
Aldrin (1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4,5,8-dimethanonaphthalene)	0.25
Ammate (ammonium sulfamate)	15
Antimony	0.5
ANTU (alpha-naphthyl-thiourea)	0.3
Arsenic	0.5
Barium (soluble compounds)	0.5
Cadmium oxide fume	0.1
Calcium arsenate	0.1
Chlordane (1,2,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-4,7-methanoindane)	2
Chlorinated camphene, 60%	0.5
Chlorinated diphenyl oxide	0.5
Chlorodiphenyl (42% chlorine)	1
Chlorodiphenyl (54% chlorine)	0.5
Chromic acid and chromates (as CrO_3)	0.1
Crag herbicide (sodium 2-[2,4-dichlorophenoxy] ethanol hydrogen sulfate)	15
Cyanide (as CN)	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-dimethano-naphthalene)	0.25
Dinitrobenzene	1
Dinitrotoluene	1.5
Dinitro-o-cresol	0.2
EPN (O-ethyl O-p-nitrophenyl thionobenzenephosphonate)	0.5
Ferbam (ferric dimethyl dithiocarbamate)	15

THRESHOLD LIMIT VALUES FOR 1958

Substance	PPM*	Mg. per Cu. M.‡
Ferrovanadium dust		1
Fluoride		2.5
Hydroquinone		2
Iron oxide fume		15
Lead		0.2
Lead arsenate		0.15
Lindane (hexachlorocyclohexane, gamma isomer)		0.5
Magnesium oxide fume		15
Malathion (O,O-dimethyl dithiophosphate of diethyl mercaptosuccinate)		15
Manganese		6
Mercury		0.1
Mercury (organic compounds)		0.01
Methoxychlor (2,2-di-*p*-methoxyphenyl-1,1,1-trichloroethane)		15
Molybdenum		
(soluble compounds)		5
(insoluble compounds)		15
Nicotine		0.5
Parathion (O,O-diethyl O-*p*-nitrophenyl thiophosphate)		0.1
Pentachloronaphthalene		0.5
Pentachlorophenol		0.5
Phosphorus (yellow)		0.1
Phosphorus pentachloride		1
Phosphorus pentasulfide		1
Picric acid		0.1
Pyrethrum		2
Rotenone		5
Selenium compounds (as Se)		0.1
Sodium fluoroacetate (1080)		0.1
Sodium hydroxide		2
Strychnine		0.15
Sulfuric acid		1
TEDP (tetraethyl dithionopyrophosphate)		0.2
TEPP (tetraethyl pyrophosphate)		0.05
Tellurium		0.1
Tetryl (2,4,6-trinitrophenylmethylnitramine)		1.5
Thiram (tetramethyl thiuram disulfide)		5
Thallium (soluble compounds)		0.1
Titanium dioxide		15
Trichloronaphthalene		5
Trinitrotoluene		1.5
Uranium		
(soluble compounds)		0.05
(insoluble compounds)		0.25
Vanadium		
(V_2O_5 dust)		0.5
(V_2O_5 fume)		0.1
Warfarin (3-[α acetonylbenzyl]-4-hydroxycoumarin)		0.5
Zinc oxide fumes		15
Zirconium compounds (as Zr)		5

Radioactivity: For permissible concentrations of radioisotopes in air, see "Maximum Permissible Amounts of Radioisotopes in the Human Body and Maximum Permissible Concentration in Air and Water," Handbook 52, U. S. Department of Commerce, National Bureau of Standards, March, 1953. In addition, see "Permissible Dose from External Sources of Ionizing Radiation," Handbook 59, U. S. Department of Commerce, National Bureau of Standards, Sept. 24, 1954.

Revision of the two publications mentioned above is in progress.

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

Mineral Dusts

Substance	MPPCF§
Aluminum oxide	50
Asbestos	5
Dust (nuisance, no free silica)	50
Mica (below 5% free silica)	20
Portland cement	50
Talc	20
Silica	
high (above 50% free SiO_2)	5
medium (5 to 50% free SiO_2)	20
low (below 5% free SiO_2)	50
Silicon carbide	50
Soapstone (below 5% free SiO_2)	20

§ Millions of particles per cubic foot of air.

TENTATIVE VALUES

Substance	PPM‖	Approx. Mg. per Cu. M.¶
(x) Acetylene tetrabromide	1	14
(x) Allyl glycidyl ether (AGE)	10	45
(x) Beryllium		2γ/m³
(x) Boron trifluoride	1	3
(x) n-Butyl glycidyl ether (BGE)	50	270
(x) Butyl mercaptan	10	35
Chlorine dioxide	0.1	0.3
(x) Chloroacetaldehyde	1	3
(x) Chlorobromomethane ($ClBrCH_2$)	400	2,100
(x) Diglycidyl ether (DGE)	10	55

Substance	PPM ‖	Approx. Mg. per Cu. M.†
(x) Dimethyl formamide	20	60
1,1-Dimethyl hydrazine	0.5	1
(x) Dipropylaneglycolmethylether	100	600
(x) Ethyl mercaptan	250	640
(x) Furfuryl alcohol	50	200
(x) Glycidol	50	150
sec-Hexyl acetate	100	590
(x) Isopropyl glycidyl ether (IGE)	50	240
(x) Lithium hydride		25γ/m³
(x) Methyl mercaptan	50	100
(x) α Methyl styrene	100	480
(x) Monomethyl aniline	2	9
(x) Paradichlorobenzene	75	450
(x) Perchloromethyl mercaptan	0.1	0.8
(x) Phenyl glycidyl ether (PGE)	50	310
Phosphoric acid		1
n-Propyl nitrate	25	110
(x) Propylene oxide	100	240
(x) Tertiary butyl alcohol	100	300
(x) Tolylene-2,4-diisocyanate	0.1	0.7
1,2,3-Trichloropropane	50	300
(x) Triethyl amine	25	100
Triorthocresyl phosphate		0.1
(x) Vinyl toluene	100	480
(x) Yttrium and inorganic compounds		5
(x) Xylidine	5	25
(x) Teflon decomposition products	*	*
(x) Pentaborane (B_5H_9)	*	*

‖ Parts of vapor or gas per million parts of air by volume.
† Approximate milligrams per cubic meter of air.
(x) These values appeared on the tentative list for 1957.
* Until more data are forthcoming, it is important that atmospheric concentrations of these materials to which workers are exposed must be kept as near 0 as possible.