October 14, 1958

INTERNAL CORRESPONDENCE

FROM LESTER V. CRALLEY — TO INDUSTRIAL HYGIENE COMMITTEE

PITTSBURGH

#14

The attached Threshold Limit Values for 1958 are essentially the same as those for 1957. The value for nitric acid has been raised from 5 to 10 ppm by volume and a new tentative limit of 1.0 mg. per cubic meter of air has been set for phosphoric acid.

Also enclosed is a publication of the Michigan Department of Health on the proper use of hand and automatic degreasers.

L. V. Cralley

LVC:DB
Encls. 2

Industrial Hygiene Committee

| | | | |
|---|---|---|---|
| R. S. Adams | - Olean | D. F. Shantz | - Richmond |
| F. B. Colby | - Garwood | C. S. Short | - N.K. |
| E. N. Goas | - Cressona | C. L. Teubert | - Chicago |
| W. E. Goza | - Pt.Comfort | E. M. Trimble | - Bauxite M. |
| F. P. Haluska | - Cleveland | J. F. Welborn | - Bridgeport |
| N. A. Hayes | - Badin | R. E. Whitson | - Bauxite Al. |
| G. W. Hutton | - Wenatchee | W.V.M.Williams | - Alcoa Sm. |
| ~~F. H. Hayette~~ | - Davenport | E. B. Youngblut | - Edgewater |
| J. F. LaClair | - Lancaster | | |
| J. H. Long | - E.St.Louis | | |
| A. B. Masters | - Lafayette | | |
| R. H. Moore | - Rosiclare | | |
| J. J. Moroney | - Massena | | |
| W. L. Mowe | - Mobile | | |
| C. G. Orr | - Alcoa Fab. | | |
| R. E. Paine | - Vernon | | |
| R. L. Parsons | - Warrick | | |
| A. W. Petrey | - Vancouver | | |
| J. W. Schachtele | - Chillicothe | | |
| W. C. Seipp | - Detroit | | |
| H. A. Semken | - Rockdale | | |

(See next page)

cc/encls:

| | |
|---|---|
| A. L. Alexander | - Alcoa Sm. |
| C. T. Bardo | - Massena |
| C. G. Bell | - Cleveland |
| R. H. Brown | - Mobile |
| J. D. Burns | - Warrick |
| Frank Cox | - Alcoa Fab. |
| B. H. Droz | - Wenatchee |
| A. L. Gantt | - Badin |
| O. L. Goelet | - Detroit |
| G. L. Hunting | - Vancouver |
| W. G. Martin | - Rockdale |
| ~~A. B. Masters~~ | ~~- Lafayette~~ |
| ~~John Miner~~ | ~~- Buffalo~~ |
| E. J. Mulligan | - Pt. Comfort |
| F. H. Regehr | - Vernon |
| A. W. Westfall | - E. St. Louis |
| G. D. Wheeler | - Pt. Comfort |
| L. L. White | - Bauxite Al. |
| T. B. Donney & J. M. Plunkett | - ARL - N.K. |
| C. L. Bradshaw & W. R. Gilliland | - Pgh. |

# 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*

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 | | | |

| 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 |
| 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 $CrO_4$) | 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 |

| 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) Dipropyleneglycolmethylether | 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.

William L. Ball, H. E. Stokinger, Hervey B. Elkins, W. H. Reinhart
W. Clark Cooper, Keith H. Jacobson, Allan L. Coleman, *Chairman*