

Table of Sorbents for Contaminants Listed in ACGIH 1970 Threshold Limit Values

American Industrial Hygiene Association and the American Conference of Governmental
Industrial Hygienists Joint Committee on Respirators

Introductory Statement

THE AIHA-ACGIH RESPIRATOR COMMITTEE has prepared this table of sorbents for airborne contaminants in response to questions from users of respirators. There is an apparent mystery about what is in a gas mask or chemical cartridge respirator that magically purifies the inspired air. Therefore, the primary purpose of this table is to serve as an educational aid to respirator users by eliminating some of the mystery about respiratory protection. The table may also be used in the laboratory to aid in selecting sorbents for gases and vapors.

This printing updates the first list of sorbents that appears on pages 56 to 58 in *Respiratory Protective Devices Manual*, published by AIHA-ACGIH in 1963. The manual lists gases and vapors for which ACGIH assigned TLV values in 1961. This new table includes all contaminants in the 1970 TLV list. As emphasized in the Manual, the actual capacity of a sorbent for any specific contaminant is dependent upon many factors. Any list of sorbents must therefore be interpreted only as a guide. Users should refer to respirator manufacturers for information on specific respirators for specific contaminants.

Sorbent Code

1. Activated carbon
2. Soda lime
3. Combination of activated carbon and soda lime
4. Silica gel
5. Hiopealite (with drier)
6. Impregnated carbon; example, carbon treated with metallic salt to absorb ammonia

7. Special sorbent (manufacturers proprietary mix)
8. Filter, for highly toxic dusts
9. Filter, for toxic dusts

Notes:

- (1) Where two or more sorbent code numbers are listed after a substance, the sorbents are in decreasing order of preference. Where a plus (+) sign is used, both are required.
- (2) Very strong oxidizing substances in low concentrations may be sorbed by activated or impregnated carbon; however, carbon should not be used because of a possible explosion hazard with these combinations. For respiratory protection against very strong oxidizers, a self-contained breathing apparatus should be used.

List of Contaminants with Sorbent Code

Substance	Sorbent
Abate	9
Acetaldehyde	①
Acetic acid	①2
Acetic anhydride	3.2
Acetone	①
Acetonitrile	3①
Acetylene dichloride, see 1,2-	
Dichloroethylene	①
Acetylene tetrabromide	①
Acrolein	①
Acrylamide - Skin	①6
Acrylonitrile - Skin	3①
Aldrin - Skin	8+1
Allyl alcohol - Skin	1
Allyl chloride	1,3
Allyl glycidyl ether (AGE)	1
Allyl propyl disulfide	3

Substance	Sorbent	Substance	Sorbent
2-Aminocetanol, see Ethanolamine		Carbon black	9
2-Aminopyridine	1,7	Carbon dioxide	2
Aminonia	7,6,4	Carbon disulfide - Skin	1
Ammonium sulfamate (Ammate)	9	Carbon monoxide	5
n-Amyl acetate	1	Carbon tetrachloride - Skin	1
sec-Amyl acetate	1	Chlordane - Skin	9+1
Aniline - Skin	1,7	Chlorinated camphene - Skin	1
Anisidine (σ, p -isomers) - Skin	9+1	Chlorinated diphenyl oxide	1
Antimony & compounds (as Sb)	9	Chlorine	3,6
ANTU (Alpha naphthyl thiourea)	9+1	Chlorine dioxide	2,7
Arsenic & compounds (as As)	6+9	Chlorine trifluoride	2,7
Arsine	6,7	Chloroacetaldehyde	1
Asinphos-methyl - Skin	9+1	Chloracetophenone (phenacylchloride)	1
Barium (soluble compounds)	9+6	Chlorobenzene (monochlorobenzene)	1
Benzene (benzol) - Skin	1	O-Chlorobenzylidene malononitrile (OCBM)	3,1
Benizidine - Skin	9+1	Chlorobromomethane	1
p-Benzquinone, see Quinone		2-Chloro-1,3-butadiene, see Chloroprene	
Benzoyl peroxide	9+1	Chlorodiphenyl (42% chlorine) - Skin	1,3
Benzyl chloride	1,3	Chlorodiphenyl (54% chlorine) - Skin	1,3
Beryllium	8	1-Chloro-2,3-epoxypropane, see Epichlorohydrin	
Biphenyl, see Diphenyl		2-Chloroethanol, see Ethylene chlorohydrin	
Boron oxide	9	Chloroethylene, see Vinyl chloride	
Boron tribromide	5+3	Chloroform (trichloromethane)	1
Boron Trifluoride	5+3	1-Chloro-1-nitropropane	1
Bromine	3	Chloropicrin	1
Bromine pentafluoride	2,7	Chloroprene (2-chloro-1,3-butadiene) - Skin	1
Chloroform - Skin	1	Chromic acid and chromates (as CrO ₃)	8+2
Butadiene (1,3-butadiene)	1	Chromium, soluble chromic or chromous salts as Cr	9
Butanethiol, see Butyl mercaptan		Metal & insol. salts	9
2-Butanone	1	Coal tar pitch volatiles (benzene soluble fraction) anthracene, BaP, phenanthrene, acridine, chrysene, pyridine)	9+1
2-Butoxy ethanol (Butyl cellosolve) - Skin	1	Cobalt, metal fume & dust	8
Butyl acetate (n-Butyl acetate)	1	Copper fume	8
n-Butyl acetate	1	Dusts and mists	9
see-Butyl acetate	1	Cotton dust (raw)	9
tert-Butyl acetate	1	Crag herbicide	9+1
Butyl alcohol	1	Cresol (all isomers) - Skin	1
see-Butyl alcohol	1	Crotonaldehyde	1
tert-Butyl alcohol	1	Cumene - Skin	1
Butylamine - Skin	7,6,4	Cyanide (as CN) - Skin	9+2
tert-Butyl chromate (as CrO ₃) - Skin	8	Cyanogen	3
n-Butyl glycidyl ether (BGE)	1	Cyclohexane	1
Butyl mercaptan	1	Cyclohexanol	1
p-tert-Butyltoluene	1	Cyclohexanone	1
Cadmium (metal dust and soluble salts)	9,6		
Cadmium oxide fume	8		
Calcium arsenate	9		
Calcium oxide	9		
Camphor	9+1		
Carbaryl (Sevin)	9+1		

Substance	Sorbent	Substance	Sorbent
Cyclohexene	1	Dimethylformamide - Skin	1
Cyclopentadiene	1	2,6-Dimethylheptanone, see Diisobutyl ketone	
2,4-D	9+1	1,1-Dimethylhydrazine - Skin	7,6,4
DDT - Skin	9+1	Dimethylphthalate	1
DDVP - Skin	9+1	Dimethylsulfate - Skin	1,3
Decaborane - Skin	9+7	Dinitrobenzene (all isomers) - Skin	9+3
Demeton - Skin	8+1	Dinitro- <i>o</i> -cresol - Skin	9+3
Diacetone alcohol (4-methyl-2-pentanone)	1	Dinitrotoluene - Skin	9+3
1,2-Diaminoethane (Diazomethane), see Ethylenediamine		Dioxane (diethylene dioxide) - Skin	1
Diborane	7	Diphenyl	1
1,2-Dibromoethane (ethylene dibromide) - Skin	1	Diphenyl amine	9+1, 7
Dibutyl phosphate	8+1	Diphenylmethane diisocyanate, see methylene bisphenyl isocyanate (MDI)	
Dibutylphthalate	1	Dipropylene glycol methylether - Skin	1
Dichloroacetylene	3,7	Di- <i>sec</i> -octyl phthalate (Di-2-ethylhexylphthalate)	1+8,9
<i>o</i> -Dichlorobenzene	1	Endosulfan (Thiodan®)	8+1
<i>p</i> -Dichlorobenzene	1	Endrin - Skin	8+1
Dichlorodifluoromethane	1	Epichlorohydrin - Skin	1
1,3-Dichloro-5-dimethyl hydantoin	3	EPN - Skin	9+1
1,1-Dichloroethane	1	1,2-Epoxypropane, see Propylene-oxide	
1,2-Dichloroethane	1	2,3-Epoxy-1-propanol, see Glycidol	
1-2-Dichloroethylene	1	Ethanethiol, see Ethylmercaptan	
Dichloroethyl ether - Skin	1	Ethanolamine	7,6,4
Dichloromethane, see Methylene chloride		2-Ethoxyethanol - Skin	1
Dichloromonofluoromethane	1	2-Ethoxyethylacetate (Cellosolve acetate) - Skin	1
1,1-Dichloro-1-nitroethane	3	Ethyl acetate	1
1,2-Dichloropropane, see Propylenedichloride		Ethyl acrylate - Skin	1
Dichlorotetrafluoroethane	1	Ethyl alcohol (Ethanol)	1
Dieldrin - Skin	9+1	Ethylamine	7,6,4
Diethylamine	7,6,4	Ethyl <i>sec</i> -amyl ketone (5-methyl-3-heptanone)	1
Diethylamino ethanol - Skin	7	Ethyl benzene	1
Diethylene triamine - Skin	7,6,4	Ethyl bromide	1
Diethylether, see Ethyl ether		Ethyl butyl ketone (3-Heptanone)	1
Diffuradibromomethane	1	Ethyl chloride	1
Diglycidyl ether (DGE)	1	Ethyl ether	1
Dihydroxybenzene, see Hydroquinone		Ethyl formate	1
Diisobutyl ketone	1	Ethyl mercaptan	1
Diisopropylamine - Skin	7,6,4	Ethyl silicate	1
Diphenyl amine	9+7	Ethylene chlorohydrin - Skin	1
Dimethoxymethane, see Methylal		Ethylenediamine	7,6,4
Dimethyl acetamide - Skin	1	Ethylene dibromide, see 1,2-Dibromoethane	
Dimethylamine	7,6,4	Ethylene dichloride, see 1,2-Dichloroethane	
Dimethylaminobenzene, see Nylidene		Ethylene glycol dinitrate and/or Nitroglycerin - Skin	1
Dimethylaniline (N-dimethylaniline) - Skin	7		
Dimethylbenzene, see Xylene	1		
Dimethyl-1,2-dibromo-2,2-dichloroethyl phosphate, (Dibrom)	9+1		

Substance	Sorbent	Substance	Sorbent
Ethylene glycol monomethylether acetate, see Methyl cellosolve acetate		Isopropylether	1
Ethylene imine - Skin	7,6,4	Isopropyl glycidyl ether (IGE)	1
Ethylene oxide	1	Ketene	1
Ethylidene chloride, see 1,1-Dichloroethane	1	Lead	9
N-Ethylmorpholine - Skin	1	Lead arsenate	8
Ferbain	9+3	Lindane - Skin	9
Ferrovandium dust	9	Lithium hydride	8
Fluoride (as F) ...	9+3	L. P. G. (Liquified petroleum gas)	1
Fluorine	3,2	Magnesium oxide fume	9
Fluorotrichloromethane	1	Malathion - Skin	9+1
Formaldehyde	1	Maleic anhydride	9+3
Formic acid	1	Manganese	9
Furfural - Skin	1	Mercury - Skin	6,7
Furfuryl alcohol	1	Mercury (organic compounds) - Skin	8+6,7
Gasoline	1	Mesityl oxide	1
Glycidol (2,3-Epoxy-1-propanol)	1	Methanethiol, see Methyl mercaptan	
Glycol monoethylether, see 2-Ethoxyethanol		Methoxychlor	9+1
Guthion, see Azinphosmethyl		2-Methoxyethanol, see Methyl cellosolve	
Hafnium	9	Methyl acetate	1
Heptachlor - Skin	9	Methyl acetylene (propyne)	1
Heptane (n-heptane)	1	Methyl acetylene-propadiene mixture (MAPP)	1
Hexachloroethane - Skin	1	Methyl acrylate - Skin	1
Hexachloronaphthalene - Skin	9+1	Methylal (dimethoxymethane)	1
Hexane (n-hexane)	1	Methyl alcohol (methanol)	1
2-Hexanone	1	Methylamine	7,6,4
Hexone	1	Methyl amyl alcohol, see Methyl isobutyl carbinol	
sec-Hexyl acetate	1	Methyl isoamyl ketone	1
Hydrazine - Skin	7,6,4	Methyl n-amyl ketone (2-Heptanone)	1
Hydrogen bromide	2,3+9	Methyl bromide - Skin	1
Hydrogen chloride	2,3+9	Methyl butyl ketone, see 2-Hexanone	
Hydrogen cyanide - Skin	2,7	Methyl cellosolve - Skin	1
Hydrogen fluoride	2,3,7	Methyl cellosolve acetate - Skin	1
Hydrogen peroxide, 90%	2,7	Methyl chloride	1
Hydrogen selenide	6	Methyl chloroform	1
Hydrogen sulfide	3,6	Methylcyclohexane	1
Hydroquinone	9+1	Methylcyclohexanol	1
Indene	1	o-Methylcyclohexanone - Skin	1
Indium and compounds, as In	8	Methyl ethyl ketone (MEK), see 2-Butanone	
Iodine	9+1	Methyl formate	1
Iron oxide fume	9	Methyl iodide - Skin	1
Iron salts, soluble, as Fe	9	Methyl isobutyl carbinol - Skin	1
Isoamyl acetate	1	Methyl isobutyl ketone, see Hexone	
Isoamyl alcohol	1	Methyl isocyanate - Skin	1
Isobutyl acetate	1	Methyl mercaptan	1
Isobutyl alcohol	1	Methyl methacrylate	1
Isophorone	1	Methyl propyl ketone, see 2-Pentanone	
Isopropyl acetate	1		
Isopropyl alcohol	1		
Isopropylamine	7,6,4		

Substance	Sorbent	Substance	Sorbent
Methyl silicate	1	Phenol - Skin	1
Methyl styrene	1	p-Phenylenediamine - Skin	7
Methylene bisphenyl isocyanate (MDI)	8+1	Phenylether (vapor)	1
Methylene chloride (Dichloromethane)	1	Phenylether-biphenyl mixture (vapor)	1
Molybdenum (soluble compounds)	9	Phenylethylene, see Styrene	
(insoluble compounds)	9	Phenyl glycidyl ether (PGE)	1
Monomethyl aniline - Skin	1,7	Phenylhydrazine - Skin	7,6,4
Monomethyl hydrazine - Skin	7,6,4	Phosdrin (Mevinphos) - Skin	8+1
Morpholine - Skin	1	Phosgene (Carbonyl chloride)	6,6
Naphtha (coal tar)	1	Phosphine	6
Naphthalene	1	Phosphoric acid	9+1
β -Naphthylamine	7,6,4	Phosphorus (yellow)	8+2
Nickel carbonyl	8+5	Phosphorus pentachloride	9+3
Nickel, metal and soluble compounds	9	Phosphorus pentasulfide	9+3
Nicotine - Skin	1	Phosphorus trichloride	9+3
Nitric acid	2,3	Phthalic anhydride	3
Nitric oxide	3	Picric acid - Skin	8+3
p-Nitroaniline - Skin	1	Pival (2-Pivalyl-1,3-indandione)	8
Nitrobenzene - Skin	1	Platinum (soluble salts)	8
p-Nitro-chlorobenzene - Skin	1	Polytetrafluoroethylene decomposition products	8+3
Nitroethane	1	Propane	1
Nitrogen dioxide	2,7	β -Propiolactone	1
Nitrogen trifluoride	2,7	Propargyl alcohol - Skin	1
Nitroglycerin - Skin	1	n-Propyl acetate	1
Nitromethane	1	Propyl alcohol	1
1-Nitropropane	1	n-Propyl nitrate	1,7
2-Nitropropane	1	Propylene dichloride	1
N,N-Dimethyldimethylamine (Dimethyl-nitrosamine) - Skin	7,6,4	Propylene imine - Skin	1
Nitrotoluene - Skin	1	Propylene oxide	1
Nitrotrichloromethane, see Chloropicrin		Propyne, see Methylacetylene	
Octachloronaphthalene - Skin	1	Pyrethrum	9
Octane	1	Pyridine	1
Oil mist (mineral)	9+1	Quinone	1
Osmium tetroxide	8	RDX - Skin	8
Oxalic acid	9+3	Rhodium, metal fume and dusts, Soluble salts	8
Oxygen difluoride	3,6	Ronnel	9+1
Ozone	7	Rotenone (commercial)	9+1
Paraquat - Skin	9+7	Selenium compounds (as Se)	8
Parathion - Skin	8+1	Selenium hexafluoride	3
Pentaborane	7,1	Silver, metal and soluble compounds	8
Pentachloronaphthalene - Skin	9+1	Sodium fluoroacetate (1080) - Skin	8
Pentachlorophenol - Skin	9+1	Sodium hydroxide	9
Pentane	1	Stibine	6
2-Pentanone	1	Stoddard solvent	1
Perchloroethylene	1	Strychnine	8
Perchloromethyl mercaptan	1	Styrene monomer (Phenylethylene)	1
Perchloryl fluoride	2,7	Sulfur dioxide	2
Petroleum distillates (Naphtha)	1		

Substance	Sorbent	Substance	Sorbent
Sulfur hexafluoride	3	Tributyl phosphate	9+3
Sulfuric acid	2	1,1,1-Trichloroethane, see Methyl chloroform	
Sulfur monochloride	9+3	1,1,2-Trichloroethane - Skin	1
Sulfur pentafluoride	3	Trichloroethylene	1
Sulfuryl fluoride	7,3	Trichloromethane, see Chloroform	
Systox, see Demeton		Trichloronaphthalene - Skin	9+1
2,4,5-T	9	1,2,3-Trichloropropane	1
Tantalum	9	1,1,2-Trichloro-1,2,2-trifluoroethane	1
TEBP - Skin	8+1	Triethylamine	7,6,4
Teflon decomposition products	8+3	Trifluoromonobromomethane	1
Tellurium	8	Trimethyl benzene	1
Tellurium hexafluoride	3	2,4,6-Trinitrophenol, see picric acid	
TEPP - Skin	8	2,4,6-Trinitrophenylmethylisocyanate, see Tetryl	
Terphenyls	1	Trinitrotoluene - Skin	9+1
1,1,1,2-Tetrachloro-2,2-difluoroethane	1	Triorthocresyl phosphate	8+3
1,1,2,2-Tetrachloro-1,2-difluoroethane	1	Triphenyl phosphate	9+3
1,1,2,2-Tetrachloroethane - Skin	1	Tungsten & compounds, as W Soluble	9
Tetrachloroethylene, see Perchloroethylene		Insoluble	9
Tetrachloromethane, see Carbon tetrachloride		Turpentine	1
Tetrachloronaphthalene - Skin	9+1	Uranium (natural) soluble & insoluble	
Tetraethyl lead (as Pb) - Skin	8+1	compounds as U	8
Tetrahydrofuran	1	Vanadium (V_2O_5 dust)	8
Tetramethyl lead (TML) (as Pb)		(V_2O_5 fume)	8
- Skin	8+1	Vinyl benzene, see Styrene	
Tetramethyl succinonitrile - Skin	1	Vinyl chloride	1
Tetranitromethane	3	Vinylcyanide, see Acrylonitrile	
Tetryl (2,4,6-Trinitrophenyl-methylisocyanate) - Skin	9+3	Vinyl toluene	1
Thallium (soluble compounds) - Skin	8	Warfarin	8
Thiram	9+1	Xylene (Xylol)	1
Tin (inorganic compounds, except SnH_4 and SnO_2)	9	Xylidine - Skin	1
Tin (organic compounds)	8+1	Yttrium	9
Titanium dioxide	9	Zinc chloride fume	9
Toluene (toluol)	1	Zinc oxide fume	9
Toluene-2,4-diisocyanate (TDI)	9+1	Zirconium compounds (as Zr)	9
o-Toluidine - Skin	1		
Toxaphene, see Chlorinated camphene			

Received February 15, 1971