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# 3M Respirator Selection Guide



## For more information

### In U.S.

Technical Assistance 1-800-243-4630

Customer Care Center 1-800-328-1667

[3M.com/PPESafety](https://www.3M.com/PPESafety)

### In Canada

Technical Assistance 1-800-267-4414

Customer Care 1-800-364-3577

[3M.ca/PPESafety](https://www.3M.ca/PPESafety)

## Respirator Selection Criteria

## Respirator Selection Criteria

The 3M™ Respirator Selection Guide includes a list of chemicals for which 3M respirators can be recommended. This information can be used to supplement general industrial hygiene knowledge. Once workplace contaminants and their

the guide can be used to help select an appropriate 3M™ Respirator for nearly 700 chemicals with Threshold Limit Values (TLVs®) or other recommended exposure limits. Because actual conditions vary from one worksite to another, this information is intended only as a guide. Selection of the most appropriate respirator will depend on the particular situation and should be made only by a person familiar with the

and limitations of respiratory protection products. If you have any questions related to proper selection and use of 3M respirators, or the use of this guide, contact

your local 3M PSD representative or call our 3M PSD Technical Service Line at 1-800-243-4630.

### Respirator Program Management

In the United States, where respirators are in use in the workplace, a formal respiratory protection program must be established covering the basic requirements outlined in the OSHA Respiratory Protection Standard (29 CFR 1910.134). Education and training must be properly emphasized and conducted periodically. Maintenance, cleaning, and storage programs must be established and routinely followed for reusable respirators.

### Respirator Fit

The OSHA Respiratory Protection

(disposable) respirator or a reusable

respirator, the wearer must obtain

comfort must also be considered. Removal of the respirator, even for short periods of time, dramatically reduces the

### Protection Factors

The respirator selected must have an assigned protection factor adequate for the particular workplace exposure. Divide the air contaminant concentration by the occupational exposure limit (OEL) to obtain a hazard ratio. Then select a respirator with an assigned protection factor greater than or equal to that hazard ratio.

### Hazard Ratio

$$= \frac{\text{Airborne Contaminant Concentration}}{\text{OEL}}$$

Assigned protection factors\* per OSHA 29 CFR 1910.134 are as follows:

### Air Purifying Respirators

disposable and reusable) ..... 10

- Full facepiece ..... 50

### Powered Air Purifying Respirators

Airstream™) ..... 25

- Half facepiece ..... 50
- Full facepiece, helmet, or hood ..... 1000

### Supplied Air Respirators (airline)

- Continuous Flow

(e.g., L-501) ..... 25

–Half facepiece ..... 50

–Full facepiece, helmet, or hood ..... 1000

- Pressure Demand with Full facepiece.. 1000

### Pressure Demand Airline with Escape

SCBA ..... 10,000

unknown and IDLH atmospheres

Pressure Demand SCBA ..... 10,000

unknown and IDLH atmospheres

### Effects From Skin or Eye Contact

If a chemical can be absorbed through the skin, skin protection may be required in addition to respiratory protection.

Eye protection may also be necessary if not provided by the respirator.

Failure to provide adequate skin or eye protection can invalidate established exposure limits and make respirator use

workplace contaminants.

### Human Factors

Consider the entire package of safety equipment required for the job. The respirator selected must be compatible with hard hats, goggles, glasses, welding hoods, faceshields, etc. In addition, the worker must be able to communicate and perform required job duties without removing the respirator. If strenuous work is to be performed, or if the respirator is to be worn for an extended period of time, it may be desirable to select a lightweight respirator with low breathing resistance. If a respirator does not have good worker acceptance and does not stay on the worker's face, it will not provide the protection needed.

\*Assigned protection factors may vary for specific standards as promulgated by OSHA. Where assigned protection factors in local, state, or federal standards are lower than those listed here, they should be used instead. For additional limitations of 3M respiratory protection products, refer to 3M respirator packaging and use instructions and limitations.

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## Location Of Hazardous Area

## General Use Limitations

- These respirators do not supply oxygen.
- Do not use when concentrations of contaminants are immediately dangerous to life or health, when concentrations are unknown, or in atmospheres containing less than 19.5% oxygen.
- Do not abuse or misuse any respirator.

or other facial hair or conditions that prevent direct contact between the face and the edge of the respirator.

- Do not use when concentrations exceed maximum use concentrations established by regulatory agencies.

These respirators help protect against airborne particles or gases and vapors only. Many of these substances can cause serious health effects, including sickness or death. Misuse of a respirator may result in sickness or death. For proper use, see a supervisor, refer to the respirator package, or call 3M PSD Technical Service at 1-800-243-4630.

## Format Explanation

### Chemical Name

Chemical names listed in this guide are generally those used in the Threshold Limit Values and Biological Exposure Indices for 2015 published by the American Conference of Governmental Industrial Hygienists (ACGIH). Pesticides and chemicals without established occupational exposure limits are not included. Call 3M PSD Technical Service for assistance in selecting respirators for these chemicals.

### CAS #

Chemical abstract service registry numbers were established by the American Chemical Society to harmonize

### Synonyms

Several common synonyms are listed in this column.

### IDLH Level

This is the concentration considered Immediately Dangerous to Life or Health (IDLH), as published by the National Institute for Occupational Safety and Health (NIOSH) (DHHS [NIOSH])

refers to the acute respiratory exposure that poses an immediate threat of loss of life, immediate or delayed irreversible effects.

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a hazardous atmosphere. The reasons NIOSH established an IDLH at a particular

in Documentation for Immediately Dangerous to Life or Health Concentrations (IDLHs), NTIS Publication No. PB-94-195047, May 1994. The 1994 IDLH values established by NIOSH used interim criteria, and OSHA stated in a May 21, 1996 memorandum that OSHA will use the older IDLH values while NIOSH conducts further study regarding the 1994 values. The 1990 IDLH values are used in this guide since OSHA uses these values for enforcement. For those substances with no IDLH listed, the manufacturer or supplier may have additional chemical information. The Chemical Referral Center operated by the Chemical Manufacturers Association can assist in providing telephone numbers for obtaining information from manufacturers. The lower explosive level (LEL) has been listed when an IDLH value was not located.

The concentration that would result in an  
be considered to be IDLH.

## OEL



be taken to prevent skin and eye contact to avoid invalidating the OEL.

- For a more detailed explanation of TLVs and their proper application, refer to the TLV booklet available for a nominal fee from ACGIH, 1330 Kemper Meadow Drive, Cincinnati, OH 45240.

### **Odor Threshold\***

Odor thresholds cannot be used as the primary indicator for changing gas and vapor cartridges as a result of OSHA standard, 29 CFR 1910.134. The respirator

program administrator, using objective data and information, must establish chemical cartridge change schedules. The established change schedule must result in replacing the cartridges with new ones before their service life is depleted under the conditions of that workplace. Reported odor thresholds will continue to be listed in the guide because odor can be useful as a secondary or backup indicator for cartridge change-out. The primary references for odor thresholds were VOCBASE and an

American Industrial Hygiene Association (AIHA) publication. When an odor threshold value was not published in either of these two sources, the other references were used. A few odor thresholds published in other documents were used when not listed in the references below (e.g., AIHAWHEEL

and determining odor thresholds varies



Comments

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selection.\* If a chemical cartridge is used, a change schedule must be established to replace the cartridges before the end of their service life.

as possibly existing in both vapor and particulate phase in the workplace. Even though these chemicals would be expected to be in the vapor phase, when other aerosols are present or there is high humidity, it is possible that the vapor may be adsorbed onto these coexisting particles or dissolved in available water droplets; therefore,

particulate phase be used in addition to the traditionally accepted chemical cartridge. It is the user's responsibility to determine whether both forms coexist.

Both chemical properties and use

physical form in the workplace. Users

data and workplace conditions before

## Respirator Filter Definitions

### 3M 42 CFR 84 Filters

#### N-Series Filters:

restricted to use in those atmospheres free of oil aerosols. They may be used for any solid or liquid airborne particulate hazard that does not contain oil.

and reused subject only to considerations of hygiene, damage, and increased breathing resistance.

#### N95 Particulate Filter -

tested with ~0.3  $\mu\text{m}$  NaCl aerosol.

#### N100 Particulate Filter -

tested with ~0.3  $\mu\text{m}$  NaCl aerosol.

#### R-Series Filters:

for removal of any particle including oil-based liquid aerosol. They may be used

for any solid or liquid airborne particulate hazard. If the atmosphere contains oil, the

single shift (or for 8 hours of continuous or intermittent use).

#### R95 Particulate Filter -

tested with ~0.3  $\mu\text{m}$  DOP (Diethyl Phthalate) aerosol.

#### P-Series Filters:

removal of any particle including oil-based liquid aerosols. They may be used for any solid or liquid particulate airborne hazard. NIOSH requires that respirator manufacturers establish

3M recommends that in atmospheres

should be used and reused for no more than 40 hours of use or 30 days,

needs to be changed for hygiene reasons,

breathe through before the time limit is reached. When used in atmospheres containing non-oil aerosol, 3M P-series

to conditions of hygiene, damage and increased breathing resistance.

#### P95 Particulate Filter -

tested with ~0.3  $\mu\text{m}$  DOP (Diethyl Phthalate) aerosol.

#### P100 Particulate Filter -

tested with ~0.3  $\mu\text{m}$  DOP (Diethyl Phthalate) aerosol.

**Oil:** Any of numerous mineral, vegetable and synthetic substances and animal and vegetable fats that are generally slippery, combustible,

soluble in various organic solvents such as ether but not in water.

## How to Use this Guide

If a respirator is being selected for a single compound listed in this guide with an air concentration not exceeding 10 times the value in the OEL

in the **Respirator** column may be selected. If a

respirator code with N95, N100, R95, P95 or P100 in it) and a mineral, vegetable or synthetic oil or other oily material is also present in the air, you must select a respirator that provides the same

respirator is being selected for beryllium dust at a concentration 2 times the exposure limit, the guide lists N95. This code indicates a half facepiece

mist is present (air concentration greater than 0.1 mg/m<sup>3</sup>, but less than the occupational

be selected, even though respiratory protection is not needed for the oil mist. Therefore, the minimum recommended respirator would be R95 or P95. These codes indicate a half facepiece respirator with an **R95** or **P95**

These codes can be found in the **Respirator**

**Codes and Descriptions** section located in the fold-out back cover of this guide.

If respiratory protection is required for an atmosphere with more than one chemical or for an air concentration that exceeds either the IDLH value or 10 times the value in the OEL column, you must follow the directions below for proper respirator selection. If you need help, call 3M Technical Service at 1-800-243-4630.

1. Identify the air contaminants present in the workplace. Include chemical name and form. Classify particulate contaminants as oil or non-oil material. If the chemical is data sheet (MSDS) can be helpful with this step. Consider particulate contaminants as oil if unknown or not sure. List the contaminants on the form contained in this guide or on your own form. Go to Step 2.
2. Determine the air concentration of the contaminant. Air sampling is highly recommended. Consideration should be

given to TWA, short term and peak (ceiling) exposures, while keeping in mind seasonal

process being used. If air sampling data are not available and sampling is not practical, historical information from similar processes or analogous operations may be helpful for calculating maximum exposures and

the airborne concentration(s) on the form provided or your own form. Go to Step 3.

3. Is the airborne concentration unknown?
  - a) If **yes**, go to Step 16.
  - b) If **no**, go to Step 4.
4. Is the oxygen concentration less than 19.5% or does the potential exist for the oxygen concentration to fall below 19.5%?
  - a) If **yes**, go to Step 16.
  - b) If **no**, go to Step 5.
5. Is the chemical listed in the guide?
  - a) If **yes**, go to Step 6.
  - b) If **no**, go to Step 15.

6. Record the IDLH value and the value from the OEL column on the form provided or on one you created. **Determine the hazard ratio (see page 1) and record.** Using this information, determine which condition describes your situation:
  - a) Does the airborne concentration exceed the IDLH value? If **yes**, go to Step 16.
  - b) Does the hazard ratio exceed (>) 1000?  
If **yes**, go to Step 16.
  - c) Does the hazard ratio exceed (>) 50?  
If **yes**, go to Step 7.
  - d) Does the hazard ratio exceed (>) 10?  
If **yes**, go to Step 8.
  - e) Is the hazard ratio less than or equal **yes**, go to Step 9.
  
7. If the hazard ratio exceeds 50, but is less than 1000: Select one of the following respirators: (1) a full facepiece, helmet or hood supplied air respirator or (2) a powered air purifying respirator (PAPR) with the same cartridge type as listed in the guide under the Respirator column.

lists SA or SA(F), a PAPR **cannot** be used. If a gas or vapor respirator is selected, cartridge change schedules based on objective data must be established. Otherwise supplied air respirators must be used. The service life of gas or vapor cartridges should be considered to determine if supplied air respirators are a better selection given the high exposure concentrations. Record the respirator you selected in the last column of the form for that chemical. Go to Step 10.

8. If the hazard ratio exceeds 10 but is less than respir-1.1 ( ) IJO -1.133 TDtor or (2) a  
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the same organ system are present, consideration should be given to the

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and documentation published by the American Conference of Governmental Industrial Hygienists for more information and the appropriate formula.

calculate the hazard ratio for the mixture.

b) If **no**, go to Step 11.

11. Are any of the respirators listed in the last

a) If **yes**, go to Step 12.

b) If **no**, go to Step 14.

12. respirator(s) listed?

a) If **yes**, go to Step 13.

b) If **no**, go to Step 14.

13. Is airborne oil mist present at a concentration greater than 0.1 mg/m<sup>3</sup> but less than the value in the OEL column of the guide? (If a respirator is not being selected for oil, the presence of the oil

must still be considered when choosing the

- a) If **yes**, a respirator with either an

8 hours use or after the respirator is loaded with or exposed to 200 mg of aerosol. The manufacturer's service time recommendation must be followed for

selected. Go to Step 14.

- b) If **no**, go to Step 14.

14. Was more than one respirator type (i.e., is there more than one respirator code included in the list made in the last column of the form?)? A respirator

requirements listed in the last column.

- a) If **yes**, note all respirators recommended. If your list contains more than one respirator and all are air-purifying respirators, select the one with the highest assigned protection factor (see page 2) and one that

removes all of the contaminants, if available. If **SA** or **SA(F)** is one of the respirators listed in the last column, this respirator must be selected over all others. If any of the respirator codes contain the **(F)** designation, respirators with half facepieces cannot be used. If no air-purifying respirator will provide the protection required, select **SA** or **SA(F)**. Go to Step 17.

b) If **no**, record the respirator listed in

selected (bottom line). Go to Step 17.

15. If the chemical is not listed in the guide, either it is a pesticide or an occupational exposure limit was not located. If an acceptable exposure level is not known, a respirator cannot be recommended. If you have an exposure level for the material and would like help, go to Step 17. If no exposure limit is known, go to Step 16.
16. These conditions (unknown, <19.5% oxygen, airborne concentration >IDLH) are generally considered as IDLH or the hazard ratio exceeds 1000. Select either a positive pressure self-contained breathing



apparatus (SCBA) or combination  
respirator consisting of a positive pressure  
supplied air respirator with an auxiliary  
SCBA. The rated duration of the auxiliary

adequate time for escape. Record the

form. This is the minimum acceptable  
level of respiratory protection; the D8583>19 <004400380035>-C 8SCB?&D9

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Acetaldehyde 75-07-0	Acetic aldehyde, Ethanal	10000	TWA=200 (OSHA) C=25	0.186	(F)OV (F)MG	Multigas cartridge recommended for longer service life
Acetic acid 64-19-7	Ethanoic acid, Glacial acetic acid, Methane carboxylic acid, Vinegar acid	1000	TWA=10 STEL=15	0.016	(F)OV/AG	
Acetic anhydride 108-24-7	Acetic acid anhydride, Acetyl oxide, Ethanoic anhydride	1000	TWA=1 STEL=3	0.029	(F)OV	
Acetone 67-64-1	2-Propanone, Dimethyl ketone, Ketone propane	20000	TWA=250 STEL=500	4.58	OV	Short service life 3M 3530 Monitor
Acetone cyanohydrin 75-86-5	2-Cyano-2-propanol, 2-Hydroxy-2-methyl propanenitrile, 2-Methylactonile, 2-Propane cyanohydrin, a-Hydroxy isobutyronitrile	22000	TWA=2 (AIHA) STEL=5 (AIHA) C=5 mg/m <sup>3</sup> (as CN) -skin-	3	OV	
Acetonitrile 75-05-8	Cyanomethane, Ethane nitrile, Ethyl nitrile, Methanecarbonitrile, Methyl cyanide	4000	TWA=20 -skin-	97.7	OV	3M 3530 Monitor

Acetophenone 98-86-2	1-Phenylethanone, Acetyl benzene, Benzoyl methide, Methyl phenyl ketone	TWA=10	0.363	OV	See comment E, page 9
Acetylsalicylic acid 50-78-2	Aspirin	TWA=5 mg/m <sup>3</sup>		N95	
Acrolein 107-02-8	Acrylaldehyde, Acrylic aldehyde,				

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Adiponitrile 111-69-3	1,4-Dicyanobutane, Addipic acid dinitrile, Hexanedinitrile, Tetramethylene cyanide	17000	TWA=2 -skin-		OV	
Allyl alcohol 107-18-6	2-Propen-1-ol, 2-Propenol, Vinyl carbinol	150	TWA=0.5 -skin-	0.47	(F)OV	3M 3510 Monitor
Allyl Bromide 106-95-6	1-Bromo-2-propene; 1-Propene; 3-bromo-; 2-Propenyl bromide; 3-Bromo-1-propene; 3-Bromopropene; 3-Bromopropylene	44000	TWA=0.1, STEL=0.2, -skin-		(F)OV	
Allyl chloride 107-05-1	1-Chloro-2-propene, 3-Chloropropene	300	TWA=1 STEL=2 -skin-	0.489	OV	Short service life
Allyl glycidyl ether 106-92-3	1-Allyloxy-2,3-epoxy-propane, AGE	270	TWA=1 C=10 (OSHA)		(F)OV	
Allyl isothiocyanate 57-06-7	AITC, Allyl isosulfocyanate, Allyl thiocarbanimide, Oil of mustard, 3-Isothiocyanate-1-propene		STEL=1 (AIHA) -skin-	0.035	OV	SA if used with acids
2179-59-1			TWA=0.5		(F)OV	

alpha-Alumina 1344-28-1			TWA=15 mg/m <sup>3</sup> (OSHA)		N95	
Aluminum metal and insoluble compounds 7429-90-5			TWA=15 mg/m <sup>3</sup> (OSHA) TWA=1 mg/m <sup>3</sup> (respirable fraction)		N95	
p-Aminobenzoic acid 150-13-0	4-Aminobenzoic acid, Aminobenzoic acid, PABA		TWA=5 mg/m <sup>3</sup> (AIHA)		(F)N95	
2-Aminopyridine 504-29-0	a-Aminopyridine	5	TWA=0.5		OV	
Aminotri (methylenephosphonic acid) 6419-19-8	ATMP, Briquest 301-32S, Briquest 302-500, Dequest 2000, Dequest 2001, Nitrilotrimethanephosphonic acid, NTF, NTMP, NTPA		TWA=10 mg/m <sup>3</sup> (AIHA)		AG/N95	If heated, AG cartridge may be needed
Ammonia 7664-41-7	Anhydrous ammonia	500	TWA=25 STEL=35	5.75	(F)AM	Irritation also provides warning
Ammonium chloride (liquids) 12125-02-9			TWA=10 mg/m <sup>3</sup> STEL=20 mg/m <sup>3</sup>		AM/N95	
Ammonium chloride (solids) 12125-02-9			TWA=10 mg/m <sup>3</sup> STEL=20 mg/m <sup>3</sup>		N95	

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Ammonium 3825-26-1			TWA=0.01 mg/m <sup>3</sup> -skin-		OV/N95	See comment D, page 8
n-Amyl alcohol 71-41-0	1-Pentanol, Amyl alcohol, n-Butyl carbinol, n-Pentanol, Pentanol, Pentyl alcohol		TWA=100 (AIHA)	0.1-0.3	(F)OV	
tert-Amyl methyl ether 994-05-8	TAME		TWA=20		OV	
Aniline 62-53-3	Aminobenzene, Aniline oil, Phenylamine	100	TWA=2 -skin-	0.676	OV	
o-Anisidine 90-04-0	2-Methoxyaniline, o-Aminoanisole, o-Anisidine, o-Methoxyaniline (oil)	50 mg/m <sup>3</sup>	TWA=0.5 mg/m <sup>3</sup> -skin-		OV/P95	
p-Anisidine 104-94-9	4-Methoxyaniline,					

Arsenic, elemental 7440-38-2		100 mg/m <sup>3</sup>	TWA=0.01 mg/m <sup>3</sup>		N100	
Arsenic, inorganic compounds (except arsine) (as As)		100 mg/m <sup>3</sup>	TWA=0.01 mg/m <sup>3</sup>		MG/N100	No half mask respirators for arsenic trichloride because of skin adsorption. N100 may be appropriate if vapor concentrations are below exposure limits.
Arsenic, organic compounds (as As)			TWA=0.5 mg/m <sup>3</sup> (OSHA)		OV/N100	MG/N100 may be required for certain organic arsenic compounds
Arsine 7784-42-1	Arsenic hydride, Arsenic trihydride, Arseniuretted hydrogen, Arsenous hydride, Hydrogen arsenide	6	TWA=0.005	<1.0	(F)SA	Unknown sorbent
Asbestos 1332-21-4	Actinolite, Amosite, Anthophyllite, Chrysotile, Crocidolite, Tremolite		TWA= 0.1 f/cc		N100	Dual cartridge as per 29 CFR 1910.1001, 1915.1001 and 1926.1101
Asphalt (petroleum; bitumen) fumes 8052-42-4	Asphaltic bitumen, Asphaltum, Bitumen, Hot mix asphalt, Mineral pitch, Petroleum asphalt, Road asphalt, Road tar		TWA=0.5 mg/m <sup>3</sup> (inhalable fraction as benzene-soluble aerosol)		OV/P95	R or P95 alone may be suitable for some applications. See Comment F, page 9.





Benzoyl chloride 98-88-4	a-Chlorobenzaldehyde, Benzene carbonyl chloride, Benzoic acid chloride		C=0.5	0.007	(F)OV/AG (F)MG	
Benzoyl peroxide 94-36-0	Dibenzoyl peroxide	7000 mg/m <sup>3</sup>	TWA=5 mg/m <sup>3</sup>		OV/N95	See comment D, page 8
Benzyl acetate 140-11-4	Acetic acid benzyl ester, Acetic acid phenylmethyl ester, Phenylmethyl acetate		TWA=10	0.145	OV/N95	
Benzyl alcohol 100-51-6	a-Hydroxytoluene, Phenylcarbinol, Phenylmethanol		TWA=10 (AIHA)	5.55	(F)OV	
Benzyl chloride 100-44-7	a-Chlorotoluene	10	TWA=1	0.034	(F)OV/AG	See comment E, page 9. 3M 3510 Monitor.
Beryllium and compounds (as Be) 7440-41-7		10 mg/m <sup>3</sup>	TWA=0.00005 mg/m <sup>3</sup> (inhalable fraction) C=0.005 mg/m <sup>3</sup> (OSHA) -skin-		N95	
Biphenyl 92-52-4	Diphenyl, Phenylbenzene	300 mg/m <sup>3</sup>	TWA=0.2	0.009	OV/N95	

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Bismuth telluride (undoped) 1304-82-1	Bismuth sesquiterelluride		TWA=10 mg/m <sup>3</sup> TWA=5 mg/m <sup>3</sup> (OSHA, respirable fraction)		N95	
Bismuth telluride (Se-doped) (as Bi <sub>2</sub> Te <sub>3</sub> )			TWA=5 mg/m <sup>3</sup>		N95	
Boric acid 10043-35-3	Borofax, Boron trihydroxide,  Kjel-sorb, Orthoboric acid, Three elephant, Trihydroxyborane		TWA=2 mg/m <sup>3</sup> (inhalable fraction) STEL=6 mg/m <sup>3</sup> (inhalable fraction)		N95	
Boron oxide 1303-86-2	Anhydrous boric acid, Boric anhydride, Boric oxide		TWA=10 mg/m <sup>3</sup>		N95	
Boron tribromide 10294-33-4	Boron bromide		C=1		(F)AG	
7637-07-2		100	C=1	1.5	(F)AG	
Bromine 7726-95-6		10	TWA=0.1 STEL=0.2	0.066	(F)AG	Irritation also provides warning

Bromine			TWA=0.1		AG	
7789-30-2						
Bromoform 75-25-2	Tribromomethane		TWA=0.5	0.447	(F)OV	3M 3510 Monitor
1-Bromopropane 106-94-5	n-Propylbromide, Propylbromide		TWA=0.1		OV	
1,3-Butadiene 106-99-0	Biethylene, Divinyl, Erythrene	20000	TWA=1 (OSHA) STEL=5 (OSHA)	0.455	OV	Cartridges must be replaced, per 29 CFR 1910.1051
Butane 106-97-8	n-Butane, Methylethyl methane	16000	STEL=1000	204	SA	Short OV service life
1-Butene 106-98-9	1-Butylene, a-Butene, a-Butylene, But-1-ene, Ethylethylene		TWA=250		OV	Short service life
2-Butene (mixture of trans- and cis-) 107-01-7	b-Butene, b-Butylene, Dimethylethylene, Pseudobutylene		TWA=250		OV	Short service life
cis-2-Butene 590-18-1	b-cis-Butylene, cis-1,2- Dimethylethylene, cis-Butene, cis-Butene-2		TWA=250		OV	Short service life

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
trans-2-Butene 624-64-6	2-Butene,(E)-; 2-trans-Butene, b-trans-Butylene, trans-1,2- Dimethylethylene, trans-Butene		TWA=250		OV	Short service life
2-Butoxyethanol 111-76-2	Butyl Cellosolve®, Ethylene glycol monobutylether	700	TWA=20	0.001	(F)OV	See comment E, page 9
2-Butoxyethyl acetate 112-07-2	Acetic acid, 2-butoxyethyl ester; 2-Butoxyethanol acetate; Butyl Cellusolve acetate; Butylglycol acetate; EGBA; Ektasolve EB acetate; Ethylene glycol monobutyl ether acetate; Glycol monobutyl ether acetate	8800	TWA=20		OV	
n-Butyl acetate 123-86-4	Acetic acid butyl ester, Butyl acetate, Butyl ethanoate	10000	TWA=150 STEL=200	0.007	(F)OV	See comment E, page 9. 3M 3510 Monitor.
sec-Butyl acetate 105-46-4	1-Methylpropylacetate	10000	TWA=200	3-7	(F)OV	See comment E, page 9. 3M 3510 Monitor.
tert-Butyl acetate 540-88-5	Acetic acid tert-butyl ester	10000	TWA=200	4-47	(F)OV	3M 3510 Monitor
Butyl acrylate 141-32-2	2-Propenoic acid butyl ester, Butyl 2-propenoate	15000	TWA=2	0.003	OV	3M 3510 Monitor

n-Butyl alcohol 71-36-3	1-Butanol, 1-Hydroxybutane, Butyl alcohol, Butyl hydroxide, Butyric alcohol, Methylolpropane, n-Butanol, n-Propyl carbinol, Propyl methanol	8000	TWA=20	0.03	(F)OV	3M 3510 Monitor
sec-Butyl alcohol 78-92-2	2-Butanol, Methyl ethyl carbinol	10000	TWA=100	1	(F)OV	3M 3510 Monitor
tert-Butyl alcohol 75-65-0	2-Methyl-2-propanol, TBA, Trimethyl carbinol	8000	TWA=100	21.5	(F)OV	3M 3510 Monitor
Butylamine 109-73-9	1-Aminobutane, n-Butylamine	2000	C=5 -skin-	0.053	AM	approved, but longer service life than OV
Butylated hydroxytoluene						



Cadmium and  
compounds (as Cd)

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Carbon black 1333-86-4	Acetylene black, Channel black, Furnace black, Lamp black, Thermal black		TWA=3 mg/m <sup>3</sup> (inhalable fraction)		N95										
Carbon dioxide 124-38-9	Carbonic acid gas, Dry ice	50000	TWA=5000 STEL=30000	74,000	SA										
75-15-0	bisulfur, Carbon bisulphide, Carbon disulphide, Carbon  anhydride, Sulphocarbonic Carbonic acid gas, Dry ice Carbonic														
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NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Catechol 120-80-9	Pyrocatechol	14000	TWA=5 -skin-		OV/N95	
Cellulose 9004-34-6			TWA=10 mg/m <sup>3</sup> TWA= 5 mg/m <sup>3</sup> (OSHA, respirable fraction)		N95	
13400-13-0			TWA=2.5 mg/m <sup>3</sup>		N95	
Cesium hydroxide 21351-79-1	Cesum hydrate		TWA=2 mg/m <sup>3</sup>		N95	
Chloramphenicol 56-75-7	[R-(R*,R*)]-2,2-dichloro-N- [2,hydroxy-1-(hydroxy methyl)-2- (4-nitrophenyl)ethyl] acetamide; Chloromycetin; Levomycetin		TWA=0.5 mg/m <sup>3</sup> (AIHA)		N95	
Chlorinated diphenyl oxide 31242-93-0	Hexachlorodiphenyl oxide		TWA=0.5 mg/m <sup>3</sup>		OV/P95	
Chlorine 7782-50-5		30	TWA=0.5 STEL=1 C=1 (OSHA)	0.05	(F)AG	Irritation also provides warning

Chlorine dioxide 10049-04-4	Chlorine oxide, Chlorine peroxide	10	TWA=0.1 STEL=0.3	9.24	AG	
7790-91-2		20	C=0.1		MG	
Chloroacetaldehyde 107-20-0	2-Chloroethanal, Chloroacetaldehyde (40% aqueous)	100	C=1	0.917	(F)OV	
Chloroacetone 78-95-5	Chloracetone, 1-Chloro-2- propanone, Monochloroacetone		C=1 -skin-		(F)OV	
Chloroacetyl chloride 79-04-9	Chloracetyl chloride		TWA=0.05 STEL=0.15 -skin-		(F)OV/AG	
Chlorobenzene 108-90-7	Chlorobenzol, MCB, Monochlorobenzene, Phenyl chloride	2400	TWA=10	0.741	OV	3M 3510 Monitor
Chlorobromomethane 74-97-5	Bromochloromethane, CBM, Halon™ 1011, Methylene chlorobromide	5000	TWA=200	399	OV	
1-Chloro-1,1- 75-68-3	Dymel® 142b, Genetron™ 142b, HCFC-142b		TWA=1000 (AIHA)		SA	Short OV service life

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
75-45-6	Freon® 22		TWA=1000		SA	
Chlorodiphenyl (42% chlorine) 53469-21-9	PCB, Polychlorinated biphenyl	10 mg/m <sup>3</sup>	TWA=1 mg/m <sup>3</sup> -skin-		(F)OV/P95	See comment D, page 8
Chlorodiphenyl (54% chlorine) 11097-69-1	PCB, Polychlorinated biphenyl	5 mg/m <sup>3</sup>	TWA=0.5 mg/m <sup>3</sup> -skin-		(F)OV/P95	See comment D, page 8
Chloroform 67-66-3	Trichloromethane	1000	TWA=10 C=50 (OSHA)	11.7	OV	Short service life 3M 3510 Monitor
bis-(2-						

Chloropenta- 76-15-3	FC-115,		TWA=1000		SA	Short OV service life
Chloropicrin 76-06-2	Nitrochloroform, Nitrotrichloromethane, Trichloronitromethane	4	TWA=0.1	1.08	(F)SA	Irritation also provides warning
b-Chloroprene 126-99-8	2-Chloro-1,3-butadiene, beta- Chloroprene, Chlorobutadiene	400	TWA=10 -skin-	14.9	(F)OV	Short service life
2-Chloropropane 75-29-6	2-CP, 2-Propyl chloride, Isoprid, Isopropyl chloride		TWA=50 (AIHA)		OV	Short service life
1-Chloro-2-propanol 127-00-4	1-Chloro-2-hydroxypropane, 1-Chloroisopropyl alcohol, sec- Propylene chlorohydrin		TWA=1 -skin-		OV	
2-Chloro-1-propanol 78-89-7	1-Hydroxy-2-chloropropane, 2-Chloropropanol, 2-Chloropropyl alcohol, Propylene chlorohydrin		TWA=1 -skin-		OV	
2-Chloropropionic acid 598-78-7	a-Chloropropionic acid		TWA=0.1 -skin-		OV/AG	
o-Chlorostyrene 2039-87-4	1-Chloro-2-ethenylbenzene, 2-Chlorostyrene		TWA=50 STEL=75		OV	3M 3510 Monitor



Chromium compounds, water soluble Cr VI compounds (not (as Cr) 7440-47-3	Chromic acid	30 mg/m <sup>3</sup>	TWA=0.005 mg/m <sup>3</sup> (OSHA)	N95	
Chromyl chloride 14977-61-8	Chloro-chromic anhydride, Chromium oxychloride		TWA=0.025	AG	
Citral 5392-40-5	2,6-Octadienal-3,7-dimethyl; 3,7-Dimethyl-2,6-octadienal		TWA=5 (inhalable fraction and vapor) -skin- 0.03	OV/P95	
Coal dust, Anthracite			TWA=0.4 mg/m <sup>3</sup> (respirable fraction)	N95	May also contain crystalline silica (quartz)
Coal dust, Bituminous or Lignite			TWA=0.9 mg/m <sup>3</sup> (respirable fraction)	N95	May also contain crystalline silica (quartz)
Coal tar pitch volatiles (as Benzene solubles) 65996-93-2	Particulate polycyclic aromatic hydrocarbons, PPAH	700 mg/m <sup>3</sup>	TWA=0.2 mg/m <sup>3</sup>	R95 P95	Respirators with nuisance level organic vapor or acid gas recommended. See Comment F, page 9.

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Cobalt, elemental and inorganic compounds (as Co) 7440-48-4		20 mg/m <sup>3</sup>	TWA=0.02 mg/m <sup>3</sup>		N95	
Cobalt carbonyl (as Co) 10210-68-1			TWA=0.1 mg/m <sup>3</sup>		SA	
Cobalt hydrT9TfO Tw -52.771 -2111.78 00 8 382.8195 191.3077 Tm(SA)Tj35nQ 1 Tf-0.015 Tc 0.015 Tw 6.402 0Lg3 ng3 ng3 ngn ]TJ0 Tw TO 1 Tf0 Tw 7.9						



Cotton dust, raw			TWA=0.1 mg/m <sup>3</sup> (thoracic fraction)		N95	5X PEL maximum for disposables, per OSHA cotton dust standard. If oil aerosol present, use R or P95.
Cresol (all isomers) 1319-77-3	Cresylic acid	250	TWA=20 mg/m <sup>3</sup> (inhalable fraction and vapor) -skin-	0.00005- 0.0079	OV/P95	
Crotonaldehyde 4170-30-3	b-Methylacrolein, Crotonic aldehyde, Propylene aldehyde	400	TWA=2 (OSHA) C=0.3	0.135	(F)OV	
Cryolite (as F) 15096-52-3	Greenland spar, Icetone	500 mg/m <sup>3</sup>	TWA=2.5 mg/m <sup>3</sup>		N95	
Cumene 98-82-8	2-Phenyl propane, Cumol, Isopropyl benzene	8000	TWA=50	0.024	OV	3M 3510 Monitor
Cumene hydroperoxide 80-15-9	a,a'-Dimethylbenzyl hydroperoxide, CHP, Cumyl hydroperoxide, Isopropyl benzene hydroperoxide		TWA=1 (AIHA) -skin-	0.005	(F)OV	
Cyanamide 420-04-2	Carbodiimide, Cyanogenamide		TWA=2 mg/m <sup>3</sup>		N95	

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Cyanides (as CN)		50 mg/m <sup>3</sup>	TWA=5 mg/m <sup>3</sup> (OSHA) -skin-		SA	
Cyanogen 460-19-5	Dicyan, Oxalonnitrile	66000	TWA=10	231	MG	
Cyanogen bromide 506-68-3	Bromine cyanide		C=0.3		(F)SA	
Cyanogen chloride 506-77-4	CNCl		C=0.3	0.976	(F)SA	Short OV service life
Cyclohexane 110-82-7	Hexahydrobenzene, Hexamethylene	10000	TWA=100	83.8	(F)OV	Irritation also provides warning. 3M 3510 Monitor.
Cyclohexanol 108-93-0	Anol, Cyclohexyl alcohol, Hexahydrophenol, Hexalin, Hydralin, Hydroxycyclohexane	3500	TWA=50 -skin-	0.068	OV	See comment E, page 9. 3M 3510 Monitor.
Cyclohexanone 108-94-1	Cyclohexyl ketone, Pimelic ketone	5000	TWA=20 STEL=50 -skin-	0.019	OV	3M 3510 Monitor

Cyclohexene 110-83-8	Benzene tetrahydride	10000	TWA=300	0.363	OV	3M 3510 Monitor
Cyclohexylamine 108-91-8	Aminocyclohexane, Hexahydroaniline	15000	TWA=10	2.66	(F)OV	
Cyclonite 121-82-4	Hexahydro-1,3,5-trinitro-sym- triazine, RDX, sym-Trimethylene trinitramine		TWA=0.5 mg/m <sup>3</sup> -skin-		N95	
Cyclopentadiene 542-92-7	1,3-Cyclopentadiene	2000	TWA=75	3.8	OV	Short service life
Cyclopentane 287-92-3	Pentamethylene	11000	TWA=600		SA	Short OV service life
Decaborane 17702-41-9		100 mg/m <sup>3</sup>	TWA=0.05 STEL=0.15 -skin-	0.06	SA	Unknown sorbent
Decabromodiphenyl oxide 1163-19-5	bis-(Pentabromophenyl) ether, DBDPO, Decabromodiphenyl ether		TWA=5 mg/m <sup>3</sup> (AIHA)		N95	
1-Decene 872-05-9	a-Decene, Decylene	5000	TWA=100 (AIHA)	7	OV	
Dehydrolinalool 29171-20-8			TWA=2 (AIHA)		OV	

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Diacetone alcohol 123-42-2	2-Methyl-2-pentanol-4-one, 4-Hydroxy-4-methyl- 2-pentanone, Diacetone	2100	TWA=50	0.891	(F)OV	3M 3510 Monitor
Diacetyl 431-03-8	Biacetyl, 2,3-Butanedione, Dimethylglyoxal, Dimethyl diketone, 2,3-Diketobutane		TWA=0.01 STEL=0.02		OV/P95	
Diallylamine 124-02-7	Di-2-propenylamine, N-2- propenyl-2-propen-1-amine		TWA=1 (AIHA) -skin-	2-9	OV	
Diazomethane 334-88-3	Azimethylene, Diazirine	2	TWA=0.2		SA	Unknown sorbent
Diborane 19287-45-7	Boroethane	40	TWA=0.1	1.8-3.5	SA	Unknown sorbent
Dibromochloro- propane 96-12-8	1,2-Dibromo-3-chloropropane, 1-Chloro-2,3-dibromopropane, DBCP		TWA=0.001 (OSHA)		(F)SA	OSHA requires (F)SA; no change schedule allowed
Dibromoneopenyl Glycol 3296-90-0	Dibromopentaerythritol		TWA=0.2 mg/m <sup>3</sup> (AIHA)		(F)R95/P95	R95/P95 acceptable with appropriate eye/ face protection

Dibutylamine  
111-92-2

1-Butanamine, n-butyl; Di-n-  
butylamine; DNBA

C=5 (AIHA)  
-skin-

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NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

<b>Chemical Name CAS #</b>	<b>Synonym</b>	<b>IDLH (ppm)</b>	<b>OEL (ppm)</b>	<b>Odor Threshold (ppm)</b>	<b>Respirator (to 10x OEL)</b>	<b>Comments</b>

Dichloroethyl ether 111-44-4	2,2'-Dichlorodiethyl ether; bis- (2-Chloroethyl) ether	250	TWA=5 STEL=10 C=15 (OSHA) -skin-	0.049	(F)OV
1,1-Dichloro-1- 1717-00-6	Fluorocarbon 141b, HCFC 141b, HFA 141b		TWA=500 (AIHA) STEL=3000 (AIHA 5 minute)		SA Short OV service life
75-43-4	Freon®				

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Dicyclopentadiene 77-73-6		8000	TWA=5	0.03	OV/N95	
Dicyclopentadienyl iron (as Fe) 102-54-5	bis-Cyclopentadienyl iron		TWA=10 mg/m <sup>3</sup> TWA=5 mg/m <sup>3</sup> (OSHA, respirable fraction)		N95	
Diesel fuel (as total hydrocarbons) 68334-30-5 68476-30-2 68476-31-3 68476-34-6 77650-28-3	Astral oil, Coal oil, Fuel oil, Gas oil, Home heating oil, Marine diesel fuel		TWA=100 (inhalable fraction and vapor) -skin-		OV/P95	
Diethanolamine 111-42-2	2,2'-Dihydroxydiethylamine, Butadiene Dioxide, DEA, Diolamine, N,N-Diethanolamine, di-(2-Hydroxyethyl)amine, 2,2'-Iminobisethanol	16000	TWA=1 mg/m <sup>3</sup> (inhalable fraction and vapor) -skin-	0.025	OV/N95	See comment E, page 9



Diethylamine 109-89-7		2000	TWA=5 STEL=15 -skin-	0.186	(F)AM (F)OV	approved, but 3M recommended for longer service life
2-Diethylaminoethanol 100-37-8	2-Diethylaminoethyl alcohol, N,N-Diethylethanolamine	500	TWA=2 -skin-	0.034	OV	
Diethylbenzenes, mixed 25340-17-4	1,2-Diethylbenzene, 1,3-Diethylbenzene, 1,4-Diethylbenzene, DEB, Dowtherm™ J		TWA=5 (AIHA)	12	OV	
Diethylene glycol 111-46-6	2,2'-Dihydroxydiethyl ether, DEG, Digycol		TWA=10 mg/m <sup>3</sup> (AIHA)		R95 P95	See comments D and G, pages 8-9
Diethylene glycol monobutyl ether 112-34-5	Butoxy diethylene glycol, Butoxydiglycol, Butyl Carbitol®		TWA=10 (inhalable fraction and vapor)		(F)OV/P95	See comment D, page 8
Diethylene glycol monoethyl ether 111-90-0	2-(2-Ethoxyethoxy) ethanol, Carbitol®, DiEGEE, Diethylene glycol ethyl ether, Dioxitol, Ethyl Carbitol®, Glycol ether DE	12000	TWA=25 (AIHA)	0.708	OV	
Diethylene triamine 111-40-0		20000	TWA=1 -skin-	9.3	(F)OV	
N,N- Diethylhydroxylamine 3710-84-7	DEHA		TWA=2		OV	



a-Diisobutylene 107-39-1	2,4,4-Trimethyl-1-pentene, a-Diisobutene		TWA=75 (AIHA)		OV	
b-Diisobutylene 107-40-4	2,4,4-Trimethyl-2-pentene, b-Diisobutene		TWA=75 (AIHA)		OV	
Diisobutyl ketone 108-83-8	2,6-Dimethyl-4-heptanone, Isovalerone, sym- Diisopropylacetone, Valerone	2000	TWA=25	0.339	(F)OV	See comment E, page 9. 3M 3510 Monitor.
Diisopropylamine 108-18-9		1000	TWA=5 -skin-	0.398	(F)OV	
Dimethyl acetamide 127-19-5	DMAC, N,N-Dimethyl acetamide	400	TWA=10 -skin-	47.9	OV	
Dimethylamine 124-40-3	Anhydrous dimethylamine	2000	TWA=5 STEL=15	0.081	AM	

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Dimethyl carbamoyl chloride 79-44-7	Chloroformic acid dimethylamide, Dimethyl carbamic chloride, Dimethylcarbamyl chloride, DMCC		TWA=0.005 -skin-		(F)MG	
Dimethyldichlorosilane 75-78-5	Dichlorodimethylsilane		C=2 (AIHA)		OV/AG	
624-92-0	2,3-Dithiabutane, Dimethyldisulphide, DMDS		TWA=0.5 -skin-		OV/AG	
Dimethyl ether 115-10-6	Methyl ether, Wood ether	34000	TWA=1000 (AIHA)	0.3-9.0	SA	Short OV service life
Dimethylethoxysilane 14857-34-2	Ethoxydimethyl silane		TWA=0.5 STEL=1.5		(F)SA	Unknown sorbent
Dimethyl formamide 68-12-2	DMF, N,N-Dimethyl formamide	3500	TWA=10 -skin-	100	OV	
1,1-Dimethylhydrazine 57-14-7	UDMH, unsym-Dimethylhydrazine	50	TWA=0.01 -skin-	8.79	(F)AM	

Dimethylphthalate  
131-11-3

DMP

9300 mg/m<sup>3</sup> TWA=5 mg/m<sup>3</sup>

OV/P95

See comment D,  
page 8

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75-18-3

DMS; Methane, thiobis; Thiobis

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NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Dinitrotoluene 25321-14-6	DNT	200 mg/m <sup>3</sup>	TWA=0.2 mg/m <sup>3</sup> -skin-		OV/N95	See comment D, page 8
Di-sec-octyl phthalate 117-81-7	bis(2-Ethylhexyl) phthalate, DEHP, Di-2-ethylhexyl phthalate, DOP	3000	TWA=5 mg/m <sup>3</sup>		R95 P95	
1,3-Dioxalane 646-06-0	1,3-Dioxacyclopentane; 1,3-Dioxalan; 1,3-Dioxole, dihydroethylene glycol formal; Dioxalane; Formal glycol; Glycol methylene ether; Glycolformal		TWA=20		OV	
Dioxane 123-91-1	1,4-Dioxane, Diethylene dioxide, Diethylene ether, p-Dioxane	2000	TWA=20 -skin-	7.78	OV	3M 3510 Monitor
Diphenylamine 122-39-4	DPA, N-Phenylaniline		TWA=10 mg/m <sup>3</sup>	0.022	N95	OV/N95 may be preferable when odor is a problem
Dipropylene glycol methyl ether 34590-94-8	bis(2-Methoxypropyl) ether, Dipropylene glycol monomethyl ether, Dowanol™ 50B	11000	TWA=100 STEL=150 -skin-	1,000	OV	

Dipropyl ketone 123-19-3	4-Heptanone, Butyrate		TWA=50		OV	
Divinyl benzene 1321-74-0	DVB, Vinylstyrene	11000	TWA=10		(F)OV	
Dodecyl mercaptan 112-55-0	1-Dodecanethiol, 1-Mercaptododecane, n-Dodecyl mercaptan, n-Lauryl mercaptan		TWA=0.1		OV	needed with oily aerosols
Dowtherm™ Q	1,1-Diphenylethane with ethylated benzenes		TWA=1 (AIHA)		OV/P95	
Emery 1302-74-5	Corundum		TWA=15 mg/m <sup>3</sup> (OSHA) TWA=1 mg/m <sup>3</sup> (respirable fraction)		N95	
13838-16-9			TWA=75		SA	Short OV service life. 3M 3510 monitor.
Epichlorohydrin 106-89-8	1-Chloro,2,3-epoxypropane, 2-Chloropropylene oxide, gamma-Chloropropylene oxide	250	TWA=0.5 -skin-	0.934	(F)OV	3M 3510 Monitor
Erythromycin 114-07-8	Dotycin, E-Mycin™, Erycynum, Erycin, Pentadecanoic acid		TWA=3 mg/m <sup>3</sup> (AIHA)		N95	

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Ethane 74-84-0	Ethylhydride, Methyl methane					Simple asphyxiant, oxygen displacing gas
Ethanolamine 141-43-5	2-Aminoethanol, 2-Hydroxyethylamine, β-Aminoethyl alcohol, Ethylolamine, Monoethanolamine	1000	TWA=3 STEL=6	2.59	OV	
2-Ethoxyethanol 110-80-5	Cellosolve® solvent, Ethylene glycol monoethyl ether, Glycol monoethyl ether	6000	TWA=5 -skin-	1.22	OV	3M 3510 Monitor
2-Ethoxyethyl acetate 111-15-9	Cellosolve® acetate, Ethylene glycol monoethyl ether acetate	2500	TWA=5 -skin-	0.182	OV	3M 3510 Monitor
Ethyl acetate 141-78-6	Acetic ester, Acetic ether, Ethyl ethanoate	10000	TWA=400	0.61	(F)OV	3M 3510 Monitor
Ethyl acrylate 140-88-5	Acrylic acid ethyl ester	2000	TWA=5 STEL=15 -skin-	0.001	(F)OV	3M 3510 Monitor



Ethyl alcohol 64-17-5	Ethanol	15000	STEL=1000	0.136	OV	Short OV service life
Ethylamine 75-04-7	Aminoethane, Anhydrous ethylamine, Monoethylamine	4000	TWA=5 STEL=15 -skin-	0.324	(F)AM	approved, but 3M recommended for longer service life
Ethyl amyl ketone 541-85-5	5-Methyl-3-heptanone, EAK	3000	TWA=10	6	(F)OV	
Ethyl benzene 100-41-4	Ethylbenzol, Phenylethane	2000	TWA=20	2.3	OV	See comment E, page 9. 3M 3510 Monitor.
Ethyl bromide 74-96-4	Bromoethane	3500	TWA=5 -skin-	3.09	SA	Short OV service life
Ethyl butyl ketone 106-35-4	3-Heptanone	3000	TWA=50 STEL=75	0.1-10	OV	See comment E, page 9
Ethyl chloride 75-00-3	Chloroethane, Hydrochloric ether, Monochloroethane	20000	TWA=100 -skin-	<del>Ethanol</del> 4.07	SA	Short OV service life

Ethyl cyanoacrylate



Ethylene glycol dinitrate 628-96-6	Glycol dinitrate, Nitroglycol	500 mg/m <sup>3</sup>	TWA=0.05 C=0.2 (OSHA) -skin-		OV	
Ethyleneimine 151-56-4	Aminoethylene, Azirane, Aziridine, Dihydroazirine, Dimethylenimine, Ethyleimine	100	TWA=0.05 STEL=0.1 -skin-	1.5	(F)MG	OSHA requires SA with hood for certain

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Ethyl isocyanate 109-90-0	Isocyanatoethene; Isocyanic acid, ethyl ester		TWA= 0.02 ppm STEL= 0.06 ppm -skin-		OV	Short service life
Ethyl mercaptan 75-08-1	Ethanethiol, Ethyl sulfhydrate	2500	TWA=0.5 C=10 (OSHA)	0.001	OV	Short service life
N-Ethylmorpholine 100-74-3	4-Ethylmorpholine	2000	TWA=5 -skin-	0.275	(F)OV	
Ethyl silicate 78-10-4	Ethyl orthosilicate, Tetraethoxy-silane, Tetraethyl silicate	1000	TWA=10	3.6	OV	
Ferrovandium dust 12604-58-9						

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NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Glutaraldehyde 111-30-8	1,5-Pentanedial		C=0.05	0.038	(F)OV	See comment E, page 9
Glycerin mist 56-81-5	Glycerol		TWA= 5 mg/m <sup>3</sup> (OSHA, respirable fraction)		R95 P95	
Glycidol 556-52-5	2,3-Epoxy-1-propanol; 2-Hydroxymethyloxiran; 3-Hydroxypropylene oxide; Epoxypropyl alcohol; Hydroxymethyl ethylene oxide	500	TWA=2		OV	
Glycidyl methacrylate 106-91-2	1-Propanol, 2-3, epoxy-, ethacrylate; 2,3-Epoxypropyl methacrylate; 2-Methyl-2- propenoic acid, oxiranylmethyl ester; GMA; Methacrylic acid, 2,3-Epoxypropyl ester		TWA=0.5 (AIHA) -skin-		OV	
Glyoxal 107-22-2	1,2-Ethanedione, Biformyl, Diformyl, Ethanedial, Glyoxalaldehyde, Oxalaldehyde		TWA=0.1 mg/m <sup>3</sup> (inhalable fraction and vapor)		(F)OV/N95	Short OV service life at 10X OEL
Grain dust (oat, wheat, barley)			TWA=4 mg/m <sup>3</sup>		N95	

Graphite (natural) 7782-42-5	Black lead, Corbo minerals, Plumbago, Potelot, Silver lead		TWA=2 mg/m <sup>3</sup> (respirable fraction)		N95	
Graphite (synthetic) 7440-44-0			TWA=15 mg/m <sup>3</sup> (OSHA) TWA=2 mg/m <sup>3</sup> (respirable fraction)		N95	
Hafnium and compounds (as Hf) 7440-58-6			TWA=0.5 mg/m <sup>3</sup>		N95	
Halothane 151-67-7	2-Bromo-2-chloro-1,1,1-		TWA=50	33	OV	Short service life. 3M 3510 Monitor.
Heptane (all isomers) 142-82-5 590-35-2 565-59-3 108-08-7 591-76-4 589-34-4	n-Heptane, normal Heptane	5000	TWA=400 STEL=500	9.77	OV	3M 3510 Monitor
Hexachlorobenzene 118-74-1	Perchlorobenzene		TWA=0.002 mg/m <sup>3</sup> -skin-	0.463 mg/m <sup>3</sup>	N95	
Hexachlorobutadiene 87-68-3	Hexachloro-1,3-butadiene; Perchlorobutadiene		TWA=0.02 -skin-		(F)OV	

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Hexachlorocyclo- pentadiene 77-47-4			TWA=0.01	0.03	(F)OV	
Hexachloroethane 67-72-1	Perchloroethane	300	TWA=1 -skin-	0.15	OV/N95	
Hexachloro- naphthalene 1335-87-1	Halowax™ 1014	2 mg/m <sup>3</sup>	TWA=0.2 mg/m <sup>3</sup> -skin-		OV/N95	See comment D, page 8
1,4-Hexadiene 592-45-0	1-Allylpropene		TWA=10 (AIHA)		OV	
684-16-2	propanone		TWA=0.1 -skin-		SA	Short OV service life
1,1,1,3,3,3-						





NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

<b>Chemical Name CAS #</b>	<b>Synonym</b>	<b>IDLH (ppm)</b>	<b>OEL (ppm)</b>	<b>Odor Threshold (ppm)</b>	<b>Respirator (to 10x OEL)</b>	<b>Comments</b>





Iodides			TWA=0.01 (inhalable fraction and vapor)	(F)MG/N95	See comment E, page 9
Iodine 7553-56-2		10	TWA=0.01 (inhalable fraction and vapor) STEL=0.1 vapor and aerosol	(F)MG/N95	See comment E, page 9
Iodoform 75-47-8	Triiodomethane		TWA=0.6	0.000019-1.1(F)OV	
Iron oxide 1309-37-1	Burnt sienna, Burnt umber, Ferric oxide, Hematite, Jeweler's rouge, Rouge		TWA=5 mg/m <sup>3</sup> (respirable fraction)	N95	
Iron oxide fume 1309-37-1	Ferric oxide fume		TWA=10 mg/m <sup>3</sup> (OSHA) TWA= 5 mg/m <sup>3</sup> (respirable fraction)	N95	
Iron pentacarbonyl (as Fe) 13463-40-6	Iron carbonyl		TWA=0.1 STEL=0.2	SA	Unknown sorbent
Iron salts, soluble (as Fe)	Ferric chloride; Ferric nitrate; Ferric sulfate; Ferric/Ferrous salts, soluble; Ferrous chloride; Ferrous sulfate		TWA=1 mg/m <sup>3</sup>	N95	

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Isoamyl alcohol 123-51-3	3-Methyl-1-butanol, Fusel oil, Isobutyl carbinol, Isopentyl alcohol	10000	TWA=100 STEL=125	0.045	(F)OV	See comment E, page 9
Isobutane 75-28-5	2-Methyl propane, Methylpropane	16000	STEL=1000		SA	Short OV service life
Isobutene 115-11-7	1,1-Dimethylethene, 1,1-Dimethylethylene, 2-Methylpropene, 2-Methylpropylene, Isobutylene		TWA=250		OV	Short service life
Isobutyl acetate 110-19-0	2-Methylpropyl acetate	7500	TWA=150	0.479	(F)OV	
Isobutyl alcohol 78-83-1	2-Methyl-1-propanol, IBA, Isobutanol, Isopropylcarbinol	8000	TWA=50	0.832	(F)OV	3M 3510 Monitor
Isobutyl nitrite 542-56-3	IBN; Nitrous acid, 2-methylpropyl ester; Nitrous acid, isobutyl ester		C=1 (inhalable fraction and vapor)		OV/N95	See comment E, page 9

Isobutyraldehyde 78-84-2	2-Methyl-1-propanal, 2-Methylpropanal, 2-Methylpropionaldehyde, Isobutanal, Isobutyl aldehyde, Isobutyric aldehyde, Valine aldehyde		TWA=25 (AIHA)		OV	Short service life
Isocyanuric acid 108-80-5	Cyanuric acid; s-Triazine- 2,4,6(1H,3H,5H)-trione; s-Triazinetriol		TWA=10 mg/m <sup>3</sup> (AIHA) TWA=5 mg/m <sup>3</sup> (AIHA, respirable fraction)		N95	AM/N95 may be preferable if wet
Isooctyl alcohol 26952-21-6	Isooctanol	9000	TWA=50 -skin-		OV	
Isophorone 78-59-1	3,5,5-Trimethyl-2-cyclohexene- 1-one	800	C=5	0.631	OV	See comment E, page 9. 3M 3510 Monitor.
Isophorone diisocyanate 4098-71-9	IPDI		TWA=0.005		OV/N95	
Isophthalic acid 121-91-5	1,3-Benzenedicarboxylic acidazine-					

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Isopropoxyethanol 109-59-1	Ethylene glycol monoisopropyl ether, IPE, Isopropyl Cellosolve®, Isopropyl glycol		TWA=25 -skin-	0.738	OV	
Isopropyl acetate 108-21-4	Isopropyl ester of acetic acid, sec-Propyl acetate	16000	TWA=100 STEL=200	0.05-4.1	(F)OV	3M 3510 Monitor
Isopropylamine 75-31-0	2-Aminopropane, Monoisopropylamine	4000	TWA=5 STEL=10	0.6	(F)AM (F)OV	approved, but 3M recommended for longer service life
N-Isopropylaniline 768-52-5	o-Aminoisopropylbenzene, o-Isopropylaniline		TWA=2 -skin-		OV	
Isopropyl ether 108-20-3	Diisopropyl ether	10000	TWA=250 STEL=310	0.055	OV	
Isopropyl glycidyl ether 4016-14-2	1,2-Epoxy-3-isopropoxypropane, IGE, Isopropoxymethyl-oxiran, Isopropyl epoxypropyl ether	1000	TWA=50 STEL=75	297	(F)OV	



Kaolin (particles with no asbestos and <1% crystalline silica) 1332-58-7	Aluminium silicate, China clay		TWA= 2 mg/m <sup>3</sup> (respirable fraction)	N95	
Kerosene (applications with negligible aerosol) 8008-20-6 64712-81-0	Deobase, Diesel No.1, Fuel oil No.1, JP-4, JP-5, JP-8, Kerosine, Hydrotreated kerosene	7000	TWA= 200 mg/m <sup>3</sup> (as total hydrocarbon vapor) -skin-	OV/P95	When aerosols present, add a particulate
Ketene 463-51-4	Carbomethene, Ethenone		TWA=0.5 STEL=1.5	(F)SA	
Lead arsenate (as As) 3687-31-8		100 mg/m <sup>3</sup>	TWA=0.01 mg/m <sup>3</sup>	N100	
Lead chromate (as Cr) 7758-97-6	Chromates of lead, Chrome orange, Red lead chromate	30 mg/m <sup>3</sup>	TWA=0.012 mg/m <sup>3</sup>	N100	
Lead, elemental and inorganic compounds (as Pb) 7439-92-1		700 mg/m <sup>3</sup>	TWA=0.05 mg/m <sup>3</sup>	N100	



Magnesite 546-93-0	Magnesium carbonate		TWA=15 mg/m <sup>3</sup> (OSHA) TWA= 5 mg/m <sup>3</sup> (OSHA, respirable fraction)	N95	
Magnesium oxide fume 1309-48-4	Magnesia fume		TWA=10 mg/m <sup>3</sup> (inhalable fraction)	N95	
Maleic anhydride 108-31-6	2,5-Furandione, cis- Butenedioic anhydride, Maleic acid anhydride	14000	TWA=0.01 (Inhalable 0.318 fraction and vapor)	(F)OV/N95	
Manganese cyclopentadienyl tricarbonyl 12079-65-1	MCT		TWA=0.1 mg/m <sup>3</sup> -skin-	SA	Properties of vapor unknown
Manganese, elemental and inorganic compounds (as Mn) 7439-96-5			TWA=0.1 mg/m <sup>3</sup> (inhalable fraction) TWA=0.02 mg/m <sup>3</sup> (respirable fraction) C= 5 mg/m <sup>3</sup> (OSHA)	N95	
Melamine 108-78-1	1,3,5-Triazine-2,4,6-triamine; 2,4,6-Triamino-1,3,5-triazine; Cyanuramide		TWA=10 mg/m <sup>3</sup> (AIHA, inhalable fraction) TWA=5 mg/m <sup>3</sup> (AIHA, respirable fraction)	N95	

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
2-Mercaptobenzo- thiazole 149-30-4	2-Benzothiazolethiol, 2-Benzothiazolylmercaptan, Benzothiazole-2-thione, Mercaptobenzothiazole		TWA=5 mg/m <sup>3</sup> (AIHA) -skin-	12 mg/m <sup>3</sup>	N95	
Mercaptoethanol 60-24-2	1-Hydroxy-2-mercaptoethane, 2-Hydroxy-1-ethanethiol, 2-Hydroxyethylmercaptan, 2ME, 2-Mercaptoethanol, 2-Thioethanol, Thioethyleneglycol, Thioglycol		TWA=0.2 (AIHA)	0.12-0.64	OV	
Mercury, alkyl compounds (as Hg)		10 mg/m <sup>3</sup>	TWA=0.1 mg/m <sup>3</sup> -skin-		SA	
Mercury, aryl compounds (as Hg)		28 mg/m				

Mesityl oxide 141-79-7	Isobutenyl methyl ketone, Isopropylidene acetone, Methyl isobutenyl ketone	5000	TWA=15 STEL=25	0.056	(F)OV	3M 3510 Monitor
Methacrylic acid 79-41-4	a-Methacrylic acid		TWA=20		(F)OV	
Methane 74-82-8	Biogas, Fire damp, Marsh gas, Methyl hydride, R 50 (refrigerant)					Simple asphyxiant, oxygen displacing gas
2-Methoxyethanol 109-86-4	Ethylene glycol monomethyl ether, Methyl Cellosolve®	2000	TWA=0.1 -skin-	0.11	OV	3M 3510 Monitor
2-Methoxyethyl acetate 110-49-6	Ethylene glycol methyl ether acetate, Ethylene glycol monomethyl ether acetate, Methyl Cellosolve® acetate	4000	TWA=0.1 -skin-	1.07	OV	3M 3510 Monitor
4-Methoxyphenol 150-76-5	Hydroquinone monomethyl ether, p-Methoxyphenol		TWA=5 mg/m <sup>3</sup>		N95	
3-Methoxypropyl amine 5332-73-0	1-Propanimine, 3-methoxy		TWA=5 (AIHA) STEL=15 (AIHA)	2.7	(F)OV (F)AM	Irritation also provides warning. AM may be preferred, but not
Methyl acetate 79-20-9	Acetic acid methyl ester, Methyl acetic ester, Methyl ethanoate	10000	TWA=200 STEL=250	6.17	OV	Short service life

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Methyl acetylene 74-99-7	Allylene, Propyne	15000	TWA=1000		SA	Short OV service life
Methyl acetylene propadiene mixture 59355-75-8	MAPP gas, Methyl acetylene- allene mixture, Propyne-allene mixture	15000	TWA=1000 STEL=1250	100	SA	Short OV service life
Methyl acrylate 96-33-3	Methyl propenoate	1000	TWA=2 -skin-	0.263	(F)OV	3M 3510 Monitor
Methylacrylonitrile 126-98-7	2-Methyl-2-propenenitrile, Isoprene cyanide	20000	TWA=1 -skin-	6.8	SA	
Methylal 109-87-5	Dimethoxymethane, Dimethylacetal formaldehyde, Formal, Methyl formal	15000	TWA=1000		SA	
Methyl alcohol 67-56-1	Carbinol, Methanol, Wood alcohol	25000	TWA=200 STEL=250 -skin-	141	SA	Short OV service life
Methylamine 74-89-5	Monomethylamine	100	TWA=5 STEL=15	0.019	(F)AM	



NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Methyl chloroform 71-55-6	1,1,1-Trichloroethane	1000	TWA=350 STEL=450	22.4	OV	3M 3510 Monitor
Methyl 2-cyanoacrylate 137-05-3	Mecrylate		TWA=0.2	2.16	(F)OV	
Methylcyclohexane 108-87-2	Cyclohexylmethane, Hexahydrotoluene	10000	TWA=400	500-630	OV	
Methylcyclohexanol 25639-42-3	Hexahydrocresols	10000	TWA=50	490	OV	
o-Methylcyclo- hexanone 583-60-8	2-Methylcyclohexanone	2500	TWA=50 STEL=75 -skin-		(F)OV	Irritation also provides warning
2-Methylcyclo- pentadienyl manganese tricarbonyl (as Mn) 12108-13-3			TWA=0.2 mg/m <sup>3</sup> -skin-		OV/N95	SA preferable if heat involved
Methylene bisphenyl isocyanate 101-68-8	4,4-Diphenylmethane diisocyanate, MDI, Methylene- bis-(4-phenyl isocyanate)	100 mg/m <sup>3</sup>	TWA=0.005 C=0.02 (OSHA)	0.384	OV/N95	



Methylene chloride 75-09-2	Dichloromethane, Methylene dichloride	5000	TWA=25 (OSHA) STEL=125 (OSHA)	0.912	(F)SA	OSHA requires (F)SA; no change schedule allowed. Short OV service life. 3M 3530 Monitor.
4,4'-Methylene-bis-(2-chloroaniline) 101-14-4	4,4'-Methylene-bis-(2-chlorobenzamine), DACPM, MOCA		TWA=0.01 -skin-		OV	
Methylene-bis(4-cyclohexylisocyanate) 5124-30-1			TWA=0.005		OV/N95	
4,4'-Methylene dianiline 101-77-9	4,4'-Diaminodiphenylmethane, MDA		TWA=0.01 (OSHA) STEL=0.1 (OSHA) -skin-		N100	Use OV/N100 if heat is involved. See 29 CFR 1910.1050.
Methyl ethyl ketone 78-93-3	2-Butanone, MEK	3000	TWA=200 STEL=300	0.27	(F)OV	3M 3510 Monitor
Methyl ethyl ketone peroxide 1338-23-4	MEKP		C=0.2		(F)OV	
Methyl ethyl ketoxime 96-29-7	2-Butanone oxime, MEKO		TWA=10 (AIHA)		OV	

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Methyl formate 107-31-3	Formic acid methyl ester, Methyl methanoate	5000	TWA=50 STEL=100	93.3	SA	Short OV service life
Methyl hydrazine 60-34-4	Monomethyl hydrazine	50	TWA=0.01 C=0.2 (OSHA) -skin-	1.71	(F)AM	
Methyl iodide 74-88-4	Iodomethane	800	TWA=2 -skin-		(F)SA	Short OV service life. Use recommended by 3M, for methyl iodide.
Methyl isoamyl ketone 110-12-3	2-Methyl-5-hexanone, 5-Methyl-2-hexanone, MIAK	10000	TWA=20 STEL=50	0.042	(F)OV	
Methyl isobutyl ketone 108-10-1	Hexone, MIBK	3000	TWA=20 STEL=75	0.121	(F)OV	3M 3510 Monitor
Methyl isocyanate 624-83-9	Isocyanic acid,methyl ester	20	TWA=0.02 STEL=0.06 -skin-	2.1	SA	Unknown sorbent
Methyl isopropyl ketone 563-80-4	3-Methyl-2-butanone, MIPK		TWA=20	4.47	(F)OV	

Methyl mercaptan 74-93-1	Mercaptomethane, Methanethiol, Methyl sulfhydrate, Thiomethyl alcohol	400	TWA=0.5 C=10 (OSHA)	0.001	OV	Short service life
Methyl methacrylate 80-62-6	2-Methyl-2-propenoic acid methyl ester; Methacrylic acid,methyl ester; Methyl alpha- methyl-acrylate; Methyl-2- methyl-2-propenoate; Methyl-2- methylpropenoate; MMA	4000	TWA=50 STEL=100	0.085	OV	3M 3510 Monitor
1-Methylnaphthalene 90-12-0	a-Methyl naphthalene, a-Methylnaphthalene		TWA=0.5 -skin-		OV/R95 OV/P95	
2-Methylnaphthalene 91-57-6	b-Methyl naphthalene, b-Methylnaphthalene		TWA=0.5 -skin-		OV/R95 OV/P95	
Methyl propyl ketone 107-87-9	2-Pentanone, Ethyl acetone, MPK	5000	STEL=150	1.55	(F)OV	3M 3510 Monitor
n-Methyl-2- pyrrolidone 872-50-4	1-Methyl-2-pyrrolidone, m-Pyrol, n-Methyl Pyrrolidone, NMP		TWA=10 (AIHA) -skin-		OV	
Methyl silicate 681-84-5	Tetramethoxy silane		TWA=1		(F)OV	
a-Methyl styrene 98-83-9	1-Methyl-1-phenylethylene, AMS	5000	TWA=10	0.003	OV	See comment E, page 9

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Methyltrichlorosilane 75-79-6	Trichloromethylsilane		C=1 (AIHA)		(F)AG/N95	Irritation also provides warning
Methyl vinyl ketone 78-94-4	3-Buten-2-one, 3-Butene-2-one, Acetyl ethylene, d(3)-2-Butenone, g-Oxo-a-Butylene, Methyl vinyl acetone, Methylene acetone	21000	C=0.2 -skin-	0.2	OV	
Mica (less than 1% quartz) 12001-26-2			TWA=3 mg/m <sup>3</sup> (respirable fraction)		N95	
Mineral oil (pure, highly and severely)	USP mineral oil, White mineral oil		TWA= 5 mg/m <sup>3</sup> (inhalable particulate matter)		R95 P95	
8012-95-1						
Molybdenum and insoluble compounds (as Mo) 7439-98-7			TWA=10 mg/m <sup>3</sup> (inhalable fraction) TWA=3 mg/m <sup>3</sup> (respirable fraction)		N95	

Molybdenum, soluble compounds (as Mo) 7439-98-7			TWA=0.5 mg/m <sup>3</sup> (respirable fraction)		N95	
Monochloroacetic acid 79-11-8	Chloroethanoic acid, MCAA		TWA=0.5 (inhalable fraction and vapor) -skin-		(F)OV/N95	
Morpholine 110-91-8	Diethylenimide oxide, Tetrahyrdo-1,4-oxazine	8000	TWA=20 -skin-	0.036	(F)OV	
Naphtha (coal tar) 8030-30-6	Crude solvent coal tar naphtha, High solvent naphtha, Naphtha, Rubber solvent	10000	TWA=100 (OSHA)		(F)OV	Odor variable. Irritation also provides warning.
Naphthalene 91-20-3	Naphthalin, White tar	500	TWA=10 -skin-	0.015	OV	3M 3510 Monitor. See comment E, page 9.
Natural gas 8006-14-2						Simple asphyxiant, oxygen displacing gas.
Natural rubber latex 9006-04-6	Caoutchouc, India rubber, Natural latex, Natural rubber, NRL, Polyisoprene, Rubber		TWA=0.0001 mg/m <sup>3</sup> (inhalable fraction) -skin-		N95	
Nickel carbonyl (as Ni) 13463-39-3	Nickel tetracarbonyl	7	TWA=0.001 (OSHA) C=0.05	0.5-3.0	(F)SA	Unknown sorbent

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Nickel, elemental/metal compounds (as Ni) 7440-02-0			TWA=1 mg/m <sup>3</sup> (OSHA) TWA=1.5 mg/m <sup>3</sup> (inhalable fraction)		N95	
Nickel, insoluble inorganic compounds  (as Ni)			TWA=1 mg/m <sup>3</sup> (OSHA) TWA=0.2 mg/m <sup>3</sup> (inhalable fraction)		N95	
Nickel, soluble inorganic compounds (not  (as Ni)			TWA=1 mg/m <sup>3</sup> (OSHA) TWA=0.1 mg/m <sup>3</sup> (inhalable fraction)		N95	
 (as Ni) 12035-72-2			TWA=0.1 mg/m <sup>3</sup> (inhalable fraction)		N95	
Nicotine 54-11-5	3-(1-Methyl-2-pyrrolidyl) pyridine	35 mg/m <sup>3</sup>	TWA=0.5 mg/m <sup>3</sup> -skin-		OV/P95	See comment D, page 8
Nitric acid 7697-37-2	Aqua fortis, Hydrogen nitrate, Red fuming nitric acid, RFNA, WFNA, White fuming nitric acid	100	TWA=2 STEL=4	0.267	(F)SA	

Nitric oxide 10102-43-9	Nitrogen monoxide, NO	100	TWA=25		SA	
p-Nitroaniline 100-01-6	1-Amino-4-nitrobenzene, 4-Nitroaniline, Azoic diazo component 37, Fast Red GG base, p-Aminonitro-benzene, PNA	300 mg/m <sup>3</sup>	TWA=3 mg/m <sup>3</sup> -skin-		OV/N95	See comment D, page 8
Nitrobenzene 98-95-3	Nitrobenzol, Oil of mirbane	200	TWA=1 -skin-	0.044	OV	
p-Nitrochlorobenzene 100-00-5	1-Chloro-4-nitrobenzene, 4-Chloronitrobenzene, PCNB, PNCB, p-Nitrochlorobenzene	1000 mg/m <sup>3</sup>	TWA=0.1 -skin-		OV	
Nitroethane 79-24-3		1000	TWA=100	2.11	(F)OV	
Nitrogen dioxide 10102-44-0	Nitrogen peroxide	50	TWA=0.2 C=5 (OSHA)	0.186	SA	
		2000	TWA=10		SA	Unknown sorbent
7783-54-2						
Nitroglycerin (NG) 55-63-0	Glyceryl trinitrate, Trinitroglycerin	500 mg/m <sup>3</sup>	TWA=0.05 C=0.2 (OSHA) -skin-		OV	
Nitromethane 75-52-5	Nitrocarbolic acid	1000	TWA=20	3.5	OV	

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
1-Nitropropane 108-03-2		2300	TWA=25	7.09	OV	
2-Nitropropane 79-46-9	sec-Nitropropane	2300	TWA=10	4.85	OV	
Nitrotoluene 88-72-2 99-08-1 99-99-0	Nitrotoluol	200	TWA=2 -skin-	0.017	OV/N95	See comment D, page 8
5-Nitro-o-toluidine 99-55-8	2-Methyl-5-nitrobenzenamine, 5-Nitro-2-toluidine, Azoic Diazo Compound 12		TWA=1 mg/m <sup>3</sup> (inhalable fraction)		OV/R95 OV/P95	
Nitrous oxide 10024-97-2	Dinitrogen monoxide		TWA=50		SA	
Nonane 111-84-2	n-Nonane	8000	TWA=200	1.26	OV	
Octachloro- naphthalene 2234-13-1	Halowax™ 1051		TWA=0.1 mg/m <sup>3</sup> STEL=0.3 mg/m <sup>3</sup> -skin-		OV/N95	See comment D, page 8



Octane, all isomers 111-65-9 540-84-1	n-Octane, Isooctane	5000	TWA=300	5.75	OV	3M 3510 Monitor
1-Octanol 111-87-5	1-Hydroxyoctane, Alcohol C-8, Capryl alcohol, Heptyl carbinol, n-Octanol, n-Octyl alcohol		TWA=50 (AIHA)	0.006	OV	
1-Octene 111-66-0	a-Octene, a-Octylene	8000	TWA=75 (AIHA)	2	OV	
Osmium tetroxide (as Os) 20816-12-0	Osmic acid	1 mg/m <sup>3</sup>	TWA=0.0002 STEL=0.0006	0.002	(F)SA	Unknown sorbent
Oxalic acid 144-62-7 6153-56-6	Ethane dioic acid, Oxalic acid dihydrate	500 mg/m <sup>3</sup>	TWA=1 mg/m <sup>3</sup> STEL=2 mg/m <sup>3</sup>		OV/N95	See comment D, page 8
p,p-Oxybis (benzenesulfonyl hydrazide) 80-51-3	Benzenesulfonic acid, 4,4-Oxybis-dihydrazide; Celogen®; Diphenyl ether 4,4'-disulfohydrazide; OBSH					

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Ozone 10028-15-6		10	TWA=0.1 (light work) TWA=0.08 (medium work) TWA=0.05 (heavy work)	0.051	OZ	Respirators with nuisance level organic vapor relief recommended by 3M up to 10X OEL. Not NIOSH approved for ozone.
8002-74-2			TWA=2 mg/m <sup>3</sup>		N95	
Particulates Not Otherwise Regulated	Nuisance particulates		TWA=15 mg/m <sup>3</sup> (total dust, OSHA) TWA=10 mg/m <sup>3</sup> (inhalable fraction) TWA=3 mg/m <sup>3</sup> (respirable fraction)		N95	This category includes many materials. For oils, an R or P95 recommended.
Pentaborane 19624-22-7	Pentaboron nonahydride, Stable pentaborane	3	TWA=0.005 STEL=0.015	0.97	SA	Unknown sorbent
Pentachloro- naphthalene 1321-64-8	Halowax™ 1013		TWA=0.5 mg/m <sup>3</sup> -skin-		OV/N95	See comment D, page 8

Pentaerythritol 115-77-5	Tetramethylolmethane		TWA=10 mg/m <sup>3</sup> TWA= 5 mg/m <sup>3</sup> (OSHA, respirable fraction)		N95	
Pentaerythritol triacylate 3524-68-3	2-Propenoic acid, 2-(hydroxymethyl)-2-[[[(1-oxo- 2-propenyl)oxy]methyl]-1,3- propanediyl-ester, PETA		TWA=1 mg/m <sup>3</sup> (AIHA)		OV/P95	See comment D, page 8
1,1,1,2,2- 354-33-6	Fluorocarbon 125, HFC-125,		TWA=1000 (AIHA)		SA	
1,1,1,3,3- 460-73-1	Genetron™ 245fa, HFC-245fa, R-245fa		TWA=300 (AIHA)		SA	
Pentane, all isomers 109-66-0 78-78-4 463-82-1	n-Pentane	15000	TWA=1000	31.6	OV	Short service life
2,4-Pentanedione 123-54-6	Acetylacetone, Diacetylmethane		TWA=25 -skin-		OV	

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Pentyl acetate, all isomers 628-63-7 626-38-0 620-11-1 625-16-1 123-92-2 624-41-9	2-Acetoxy pentane, 3-Amyl acetate, n-Amyl acetate, sec- Amyl acetate, tert-Amyl acetate, Banana oil, 1,1-Dimethylpropyl acetate, Isoamyl acetate, Isopentyl acetate, 3-Methyl-1- butanol acetate, 1-Methylbutyl acetate, 2-Methylbutyl acetate, 3-Methylbutyl acetate, 2-Methylbutyl ethanoate, 1-Pentanol acetate, 2-Pentanol acetate, 1-Pentyl acetate, 2-Pentyl acetate, 3-Pentyl acetate, Pentyl acetate	3000-9000	TWA=50 STEL=100	0.004 for Isoamyl acetate	OV	See comment E, page 9. 3M 3510 Monitor.
Peracetic acid 79-21-0	Acetic peroxide, Peroxyacetic acid		STEL= 0.4ppm (Inhalable fraction and vapor)		(F)OV/AG	See Technical Data Bulletin #185
Perchloroethylene 127-18-4	Perk, Tetrachloroethylene	500	TWA=25 STEL=100	6.17	(F)OV	
Perchloromethyl mercaptan 594-42-3	PMM, Trichloromethyl sulfur chloride	10	TWA=0.1	0.097	OV	

7616-94-6		385	TWA=3 STEL=6	11	SA	Unknown sorbent
ethylene 19430-93-4	1-Hexane,3,3,4,4,5,5,6,6,6-		TWA=100		OV	Short service life
382-21-8			C=0.01		SA	Short OV service life? FwdcW% FwdcW%

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
m-Phenylenediamine 108-45-2	1,3-Benzenediamine, m-Diaminobenzene		TWA=0.1 mg/m <sup>3</sup>		OV/N95	SA preferable if heat involved
o-Phenylenediamine 95-54-5	1,2-Benzenediamine, o-Diaminobenzene, Orthamine		TWA=0.1 mg/m <sup>3</sup>		OV/N95	SA preferable if heat involved
p-Phenylenediamine 106-50-3	1,4-Diaminobenzene, p-Diaminobenzene		TWA=0.1 mg/m <sup>3</sup>		OV/N95	SA preferable if heat involved
Phenyl ether, vapor 101-84-8	Diphenyl ether, Diphenyl oxide	7000	TWA=1 STEL=2	0.03	OV	See comment E, page 9. 3M 3510 Monitor.
Phenyl ether-biphenyl mixture vapor 8004-13-5	Diphenyl oxide-diphenyl mixture, Dowtherm™ A		TWA=1 (OSHA)	0.001-0.01	OV	See comment E, page 9
Phenyl glycidyl ether 122-60-1	1,2-Epoxy-3-phenoxy propane, Glycidyl phenyl ether, Oxirane, PGE, Phenoxyethyl, Phenoxypropoxide, Phenyl epoxypropyl ether		TWA=0.1 -skin-		OV	
Phenylhydrazine 100-63-0	Hydrazinobenzene	295	TWA=0.1 -skin-		(F)OV	

Phenyl isocyanate 103-71-9	Isocyanatobenzene, Carbamil, Phenyl carbamide		TWA=0.005 STEL=0.015		OV	
Phenyl mercaptan 108-98-5	Benzenethiol, Thiophenol		TWA=0.1	0.001	OV	
Phenylphosphine 638-21-1			C=0.05		OV	
Phosgene 75-44-5	Carbon oxychloride, Carbonyl chloride, Chloroformyl chloride	2	TWA=0.1	0.55	SA	
Phosphine 7803-51-2	Hydrogen phosphide, Phosphorated hydrogen, Phosphorus hydride	200	TWA=0.3 STEL=1	0.14	SA	Hg recommended for certain applications. See Technical Data Bulletin #212.
2-Phosphono-1,2,4- butanetricarboxylic acid 37971-36-1	PBTC		TWA=10 (AIHA)		N95	
Phosphoric acid 7664-38-2	m-Phosphoric acid, o-Phosphoric acid, White phosphoric acid	10000 mg/m <sup>3</sup>	TWA=1 mg/m <sup>3</sup> STEL=3 mg/m <sup>3</sup>		(F)N95	N95 acceptable with appropriate eye/face protection
Phosphorus (yellow) 12185-10-3	White phosphorus, WP		TWA=0.1 mg/m <sup>3</sup>		SA	If no phosphorus vapor or phosphine gas

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments



2-Picoline 109-06-8	2-Methyl-pyridine, a-Picoline		TWA=2 (AIHA) STEL=5 (AIHA) -skin-	0.003	OV	
3-Picoline 108-99-6	3-Methyl-pyridine, b-Picoline		TWA=2 (AIHA) STEL=5 (AIHA) -skin-		OV	
4-Picoline 108-99-4	4-Methyl-pyridine, g-Picoline		TWA=2 (AIHA) STEL=5 (AIHA) -skin-		OV	
Picric acid 88-89-1	2,4,6-Trinitrophenol, Lyddite, Melinite, Pertite, Shimose	100 mg/m <sup>3</sup>	TWA=0.1 mg/m <sup>3</sup>	0.0005 mg/m <sup>3</sup>	N95	
Piperazine and salts 110-85-0	1,4-Piperazine, 1,4-Diazacyclohexane, Diethylenediamine, Hexahydropyrazine, Piperazidine		TWA=0.03 (inhalable fraction and vapor)		OV/N95	See comment D, page 8
Piperidine 110-89-4	Hexahydropyridine		TWA=1 (AIHA) -skin-	0.372	(F)OV	
Platinum metal (as Pt) 7440-06-4			TWA=1 mg/m <sup>3</sup>		N95	
Platinum soluble salts (as Pt)			TWA=0.002 mg/m <sup>3</sup>		(F)N95	

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Polyethylene glycols 25322-68-3	PEG, PGE, Polyoxyethylene		TWA=10 mg/m <sup>3</sup> (AIHA)		R95 P95	See comment G, page 9
Polypropylene glycols 25322-69-4	PPG		TWA=10 mg/m <sup>3</sup> (AIHA)		R95 P95	See comment G, page 9
Polyvinyl chloride 9002-86-2	Cloroethene polymer, Cloroethylene homopolymer, Cloroethylene polymer, Polychloroethylene, PVC, Vinyl chloride homoploymer, Vinyl chloride polymer		TWA=1 mg/m <sup>3</sup> (respirable fraction)		N95	
Portland cement (containing no asbestos and <1% crystalline silica) 65997-15-1	Cement, Hyraulic cement, Portland cement silicate		TWA=1 mg/m <sup>3</sup> (respirable fraction)		N95	
Potassium bromate 7758-01-2	Bromic acid potassium salt		TWA=0.1 mg/m <sup>3</sup> (AIHA)		N95	
Potassium hydroxide 1310-58-3	Caustic potash, Lye, Potassium hydrate		C=2 mg/m <sup>3</sup>		N95	



NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Propionaldehyde 123-38-6	1-Propanal, Methylacetaldehyde, Propylaldehyde		TWA=20	0.145	SA	Short OV service life
Propionic acid 79-09-4	Ethylformic acid, Methylacetic acid	29000	TWA=10	0.037	(F)OV	
n-Propyl acetate 109-60-4	Acetic acid n-propyl ester, Propyl acetate	8000	TWA=200 STEL=250	0.575	(F)OV	3M 3510 Monitor
Propylene 115-07-1	1-Propene, 1-Propylene, Methylethene, Methylethylene, Propene		TWA=500	17	SA	
Propylene dichloride 78-87-5	1,2-Dichloropropane	2000	TWA=10	0.851	OV	3M 3510 Monitor
Propylene glycol (aerosol only) 57-55-6	1,2-Dihydroxy propane, 1,2-Propanediol, Methyl glycol		TWA=10 mg/m <sup>3</sup> (AIHA)		R95 P95	See comment G, page 9
Propylene glycol (vapor and aerosol) 57-55-6	1,2-Dihydroxy propane, 1,2-Propanediol, Methyl glycol	24000	TWA=10 mg/m <sup>3</sup> (AIHA)		OV/P95	See comment G, page 9

Propylene glycol dinitrate 6423-43-4	1,2-Propanediol dinitrate, 1,2-Propylene glycol dinitrate		TWA=0.05 -skin-	0.231	(F)OV	
Propylene glycol monomethyl ether	1-Methoxy-2-propanol	16000	TWA=50 STEL=100	0.003	OV	3M 3510 Monitor
Propylene glycol monomethyl ether acetate 108-65-6	1-Methoxy-2-acetoxypropane, 1-Methoxy-2-propanol acetate, 2-Methoxy-1-methylethyl acetate, Glycol ether PM acetate, PGMEA	15000	TWA=50 (AIHA)		OV	3M 3510 Monitor
Propyleneimine 75-55-8	2-Methylaziridine	500	TWA=0.2 STEL=0.4 -skin-		(F)OV	
Propylene oxide 75-56-9	1,2-Epoxypropane, 1,2-Propylene oxide, 2,3-Epoxypropane, Methyloxirane, Propene oxide	2000	TWA=2	33.1	OV	Short service life. 3M 3550 Monitor.
n-Propyl nitrate 627-13-4						

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Quinone 106-51-4	Benzoquinone, p-Benzoquinone	300 mg/m <sup>3</sup>	TWA=0.1	0.012	(F)OV/N95	
Resorcinol 108-46-3	1,3-Benzenediol, m-Dihydroxybenzene	14000	TWA=10 STEL=20		N95	OV/N95 may be preferable if heat is involved
Rhodium, metal and insoluble compounds 7440-16-6			TWA=0.1 mg/m <sup>3</sup> (OSHA)		N95	
Rhodium, soluble compounds (as Rh)			TWA=0.001 mg/m <sup>3</sup> (OSHA)		N95	
Selenium & compounds, (as Se) 7782-49-2			TWA=0.2 mg/m <sup>3</sup>		N95	
7783-79-1		5	TWA=0.05		SA	Unknown sorbent
Silica, amorphous (diatomaceous earth) 61790-53-2	Diatomite, Silicon dioxide		TWA=0.8 mg/m <sup>3</sup> (OSHA)		N95	Assuming 100% SiO <sub>2</sub> (80 mg/m <sup>3</sup> divided by %SiO <sub>2</sub> )

Silica, crystalline  
14808-60-7  
1317-95-9  
14464-46-1

Crystallized silicon dioxide,  
Cristobalite, a-Quartz, Silica,  
Tripoli

TWA=0.025 mg/m<sup>3</sup>

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NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

<b>Chemical Name</b>		<b>IDLH</b>	<b>OEL</b>	<b>Odor</b>	<b>Respirator</b>	
<b>CAS #</b>	<b>Synonym</b>	<b>(ppm)</b>	<b>(ppm)</b>	<b>Threshold</b>	<b>(to 10x OEL)</b>	<b>Comments</b>
<b>(ppm)</b>				<b>(ppm)</b>		

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Sodium borate,  
decahydrate  
1303-96-4

Borascu; Borates, tetrasodium  
salts, decahydrate; Borax;  
Borocin; Disodium diborate  
decahydrate; Disodium  
tetraborate decahydrate;  
Sodium pyroborate decahydrate;  
Sodium tetraborate, decahydrate

TWA=2 mg/m<sup>3</sup>  
(inhalable fraction)  
STEL=6 mg/m

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decahydrate

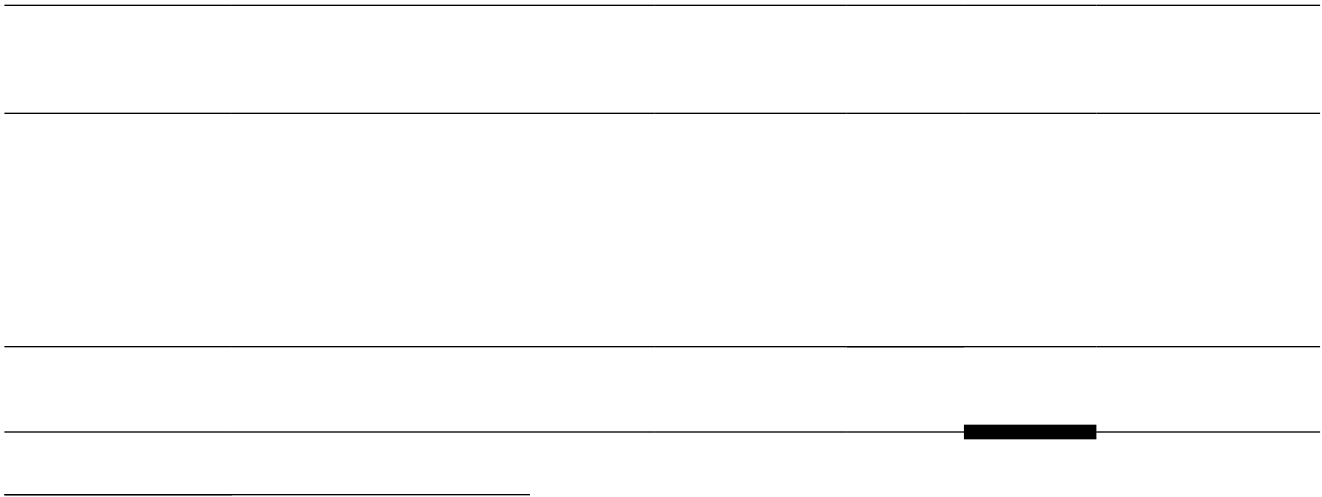
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NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
7681-57-4			TWA=5 mg/m <sup>3</sup>		AG/N95	N95 alone may be suitable if irritation eliminated
Starch 9005-25-8	Corn starch		TWA=10 mg/m <sup>3</sup> TWA= 5 mg/m <sup>3</sup> (OSHA, respirable fraction)		N95	
Stearates 646-29-7	Aluminium stearate, Calcium stearate, Glyceryl stearate, Lithium stearate, Potassium stearate, Zinc stearate		TWA=10 mg/m <sup>3</sup>		N95	
Stibine 7803-52-3	Antimony trihydride, Hydrogen antimonide	40	TWA=0.1		SA	Unknown sorbent
Stoddard solvent 8052-41-3	Dry cleaning safety solvent, Mineral spirits	29500 mg/m <sup>3</sup>	TWA=100	1-30	OV	3M 3510 Monitor
Strontium chromate (as Cr) 7789-06-2	C.I. pigment yellow 32, Strontium yellow		TWA=0.0005 mg/m <sup>3</sup>		N95	
Strychnine 57-24-9		3 mg/m <sup>3</sup>	TWA=0.15 mg/m <sup>3</sup>		N95	



NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
7783-60-0			C=0.1		AG	
2699-79-8		1000	TWA=5 STEL=10		SA	Unknown sorbent
Synthetic vitreous	Fibrous glass, dust; Glass,		TWA=5 mg/m <sup>3</sup> (inhalable fraction) TWA=1 f/cc		N95	
Synthetic vitreous			TWA=1 f/cc		N95	
Synthetic vitreous			TWA=0.2 f/cc		N95	
Synthetic vitreous			TWA=1 f/cc		N95	
Synthetic vitreous			TWA=1 f/cc		N95	

Synthetic vitreous		TWA=1 f/cc	N95	
Talc (containing no asbestos and <1% crystalline silica) 14807-96-6	Hydrous magnesium silicate, Non-asbestiform talc, Non-	TWA=2 mg/m <sup>3</sup> (respirable fraction)	N95	
Tantalum, metal and oxide dusts (as Ta) 7440-25-7		TWA=5 mg/m <sup>3</sup> (OSHA)	N95	
Tellurium and compounds (as Te, excluding hydrogen telluride) 13494-80-9		TWA=0.1 mg/m <sup>3</sup>	N95	
(as Te) 7783-80-4	1	TWA=0.02	SA	Unknown sorbent
Terephthalic acid 100-21-0	1,4 Benzenedicarboxylic acids, Benzene-p-dicarboxylic acid, p-Phthalic acid, Tephthol, TPA	TWA=10 mg/m <sup>3</sup>	N95	
Terphenyls 26140-60-3	Diphenyl benzenes, Mixed terphenyls, m-Terphenyl, o-Terphenyl, p-Terphenyl	C=5 mg/m <sup>3</sup>	N95	OV/N95 may be preferable if heat is involved

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
1,1,2,2-Tetrabromoethane 79-27-6	Acetylene tetrabromide, Muthmann's liquid, Tetrabromoethane, Tetrabromoethylene	10	TWA=0.1 (inhalable fraction and vapor)	1	OV/N95	See comment E, page 9
1,1,1,2-Tetrachloro-2,2- 76-11-9	tetrachloroethane; Freon® 112a; Halocarbon 112a; Refrigerant 112a	15000	TWA=100		OV	
1,1,2,2-Tetrachloro- 76-12-0	Freon® 112, Halocarbon 112, Refrigerant 112	15000	TWA=50		OV	
1,1,2,2-Tetrachloroethane 79-34-5	Acetylene tetrachloride	150	TWA=1 -skin-	0.21	OV	3M 3510 Monitor
Tetrachloro- naphthalene 1335-88-2	Halowax™, Nibren wax, Seekay wax		TWA=2 mg/m <sup>3</sup>		OV/N95	See comment D, page 8
2,3,5,6-Tetrachloropyridine 2402-79-1	Pyridine 2,3,5,6-tetrachloro-		TWA=5 mg/m <sup>3</sup> (AIHA)		OV/N95	See comment D, page 8

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NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
2,3,3,3- 754-12-1			TWA=500 (AIHA)		SA	
Tetrahydrofuran 109-99-9	Diethylene oxide, Tetramethylene oxide, THF	20000	TWA=50 STEL=100 -skin-	3.8	OV	3M 3510 Monitor
Tetrahydrofurfuryl alcohol 97-99-4	Tetrahydro-2-furancarbinol, Tetrahydro-2-furanmethanol, Tetrahydro-2-furylmethanol, THFA		TWA=0.5 (AIHA)		OV	
Tetrakis (hydroxymethyl) phosphonium chloride 124-64-1	Proban CC, Pyroset TKC, Retardol C, Tetrahydroxymethyl phosphonium chloride, THPC		TWA=2 mg/m <sup>3</sup>		N95	
Tetrakis (hydroxymethyl) phosphonium sulfate 55566-30-8	bis tetrakis-(hydroxymethyl) phosphonium sulfate, Octakis (hydroxymethyl) phosphonium sulfate, Pyroset TKO, Retardol S, THPS		TWA=2 mg/m <sup>3</sup>		N95	



Tetramethyl lead (as Pb) 75-74-1	Lead tetramethyl, TML	40 mg/m <sup>3</sup>	TWA=0.075 mg/m <sup>3</sup> (OSHA) -skin-	OV
Tetramethyl succinonitrile, vapor 3333-52-6	TMSN	5	TWA=0.5 -skin-	OV
Tetranitromethane 509-14-8	Tetan	5	TWA=0.005	OV
Tetryl 479-45-8	2,4,6- Trinitrophenylmethylnitramine, Nitramine, N-Methyl-N- 2,4,6-tetranitroaniline, Tetralite		TWA=1.5 mg/m <sup>3</sup>	N95
Thallium, elemental and soluble compounds (as Tl) 7440-28-0	Thallium acetate, Thallium carbonate, Thallium hydroxide	20 mg/m <sup>3</sup>	TWA=0.02 mg/m <sup>3</sup> (inhalable fraction) -skin-	N95
4,4'-Thiobis(6-tert- butyl-m-cresol) 96-69-5	4,4'-Thiobis(3-methyl-6-tert- butyl phenol)		TWA=15 mg/m <sup>3</sup> (OSHA) TWA=1 mg/m <sup>3</sup> (inhalable fraction) TWA=5 mg/m <sup>3</sup> (OSHA, respirable fraction)	N95

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Thioglycolic acid 68-11-1	Mercaptoacetic acid, Thioranic acid	59000	TWA=1 -skin-		(F)OV	
Thionyl chloride 7719-09-7	Sulfur oxychloride, Sulfurous oxychloride		C=0.2		(F)AG	
Thiram 137-26-8	TMT, TMTD, TMTDS	1500 mg/m <sup>3</sup>	TWA=0.05 mg/m <sup>3</sup> (inhalable fraction and vapor)		OV/N95	
Tin, metal and inorganic compounds (except SnH <sub>4</sub> ) (as Sn) 7440-31-5		400 mg/m <sup>3</sup>	TWA=2 mg/m <sup>3</sup>		N95	
Tin, organic compounds (as Sn)			TWA=0.1 mg/m			

Toluene 108-88-3	Aantisal 1a, Methacide, Methyl benzene, Methylbenzol, Monomethyl benzene, Phenyl methane, Tol, Toluol, Tolu-sol	2000	TWA=20 C=300 (OSHA)	0.16	OV	3M 3510 Monitor
Toluene diamine 25376-45-8 95-80-7	Diaminotoluene, TDA, Tolyenediamine		TWA=0.005 (AIHA) -skin-		N95	
Toluene-2,6- diisocyanate 91-08-7	2,6-TDI, 2,6-Toluene diisocyanate	10	TWA=0.005 STEL=0.02	0.17	OV/N95	
Toluene-2,4- diisocyanate 584-84-9	2,4-TDI, 2,4-Toluene diisocyanate		TWA=0.005 STEL=0.02	0.17	OV/N95	
p-Toluenesulfonyl chloride 98-59-9	4-Methyl-benzenesulfonyl chloride, Tosyl chloride		C=5 mg/m <sup>3</sup> (AIHA)		(F)OV/AG/ N95	See comment D, page 8. HCl and p-toluene sulfuric acid produced by hydrolysis.
m-Toluidine 108-44-1	m-Aminotoluene		TWA=2 -skin-	0.46-5.9	(F)OV	
o-Toluidine 95-53-4	1-Methyl-1,2-aminobenzene; 2-Methylaniline; o-Aminotoluene; o-Methylaniline	100	TWA=2 -skin-	0.025-6.6	(F)OV	

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
p-Toluidine 106-49-0	p-Aminotoluene		TWA=2 -skin-	0.027-3.2	(F)OV	
Tributyl phosphate 126-73-8	TBP, Tri-n-butyl phosphate	125	TWA=5 mg/ m <sup>3</sup> (Inhalable fraction and vapor)		OV/P95	
Trichloroacetic acid 76-03-9	TCA		TWA=0.5	0.295	(F)OV/AG	Irritation also provides warning
1,2,4-Trichlorobenzene 120-82-1		25000	C=5	2.91	OV	
1,1,2-Trichloroethane 79-00-5	b-Trichloroethane, Vinyl trichloride	500	TWA=10 -skin-		(F)OV	3M 3510 Monitor
Trichloroethylene 79-01-6	1,1,2-TCE, 1-Chloro-2,2- dichloroethylene, Ethylene trichloride, TCE, Triclene™	1000	TWA=10 STEL=25 C=200 (OSHA)	1.36	OV	3M 3510 Monitor
75-69-4	CFC-11, Fluorotrichloromethane, Freon™ 11, Refrigerant 11,	10000	TWA=1000 (OSHA) C=1000	16.3	SA	Short OV service life

Trichloronaphthalene 1321-65-9	Halowax™, Nibren wax, Seekay wax		TWA=5 mg/m <sup>3</sup> -skin-		OV/N95	See comment D, page 8
1,2,3-Trichloropropane 96-18-4	Allyl trichloride, Glycerin trichlorohydrin, Glycerol trichlorohydrin, Trichlorohydrin	1000	TWA=0.005 -skin-	100	(F)OV	
Trichlorosilane 10025-78-2	Silicochloroform		C=0.5 (AIHA)		(F)AG	
1,1,2-Trichloro-1,2,2- 76-13-1	FC-113, Freon® 113, Halocarbon 113, Refrigerant 113, TTE	4500	TWA=1000 STEL=1250	487	SA	Short OV service life. 3M 3530 Monitor.
Triethanolamine 102-71-6	2,2,2-Nitrioltriethanol, Daltogen, Sterolamide, TEA, Trihydroxytriethylamine		TWA=5 mg/m <sup>3</sup>		OV/P95	See comment D, page 8
Triethoxysilane 998-30-1	Silane, triethoxy-		TWA=0.05 (AIHA)		(F)SA	Unknown sorbent
Triethylamine 121-44-8	N,N-Diethylanamine, N-Triethylamine, TEA	1000	TWA=0.5 STEL=1	0.001	(F)OV	approved, but 3M recommended for longer service life
Triethylene glycol diacrylate 1680-21-3	2-Propenoic acid, 2-ethanediylobis-(oxy-2,1- ethanediylobis) ester; TREGDA		TWA=1 mg/m <sup>3</sup> (AIHA)		OV/P95	

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Triethylenetetramine 112-24-3	1,4,7,10-Tetraazadecane; 1,8-Diamino-3,6-diazaoctane; 3,6-Diazaoctane-1,8-diamine; N, N'-bis(2-aminoethyl)-1,2,ethane diamine; TECZA; TETA, Trientine		TWA=1 (AIHA) -skin-		OV	See comment E, page 9.
Triethylphosphate 78-40-0	Phosphoric acid triethyl ester	17000	TWA=7.45 mg/m <sup>3</sup> (AIHA)		OV/P95	
methane 75-63-8	Freon® 13B1, Halocarbon 13B1, Halon™ 1301, Refrigerant 13B1	50000	TWA=1000	16.3	SA	Short OV service life
dichloroethane 306-83-2	FC-123, HCFC-123,		TWA=50 (AIHA)		SA	Short OV service life
420-46-2	FC-143a, HFC-143a,		TWA=1000 (AIHA)		SA	
75-89-8		55000	TWA=0.3 (AIHA)		SA	
1,3,5-Triglycidyl-s- triazinetriene 2451-62-9	1,3,5-Triazine-2,4,6-(1H,3H,5H)- trione, Araldite PT-810, TEPIC		TWA=0.05 mg/m <sup>3</sup>		N95	



NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
2,4,6-Trinitrotoluene (TNT) 118-96-7	sym-Trinitrotoluene, TNT, Trinitrotoluene, Trinitrotoluol	1000 mg/m <sup>3</sup>	TWA=0.1 mg/m <sup>3</sup> -skin-		OV/N95	See comment D, page 8
Triorthocresyl phosphate 78-30-8	o-Trityl phosphate, TCP, TOCP, Tricresylphosphate	40 mg/m <sup>3</sup>	TWA=0.1 mg/m <sup>3</sup> -skin-		R95 P95	
Triphenyl phosphate 115-86-6	Phenyl phosphate, TPP		TWA=3 mg/m <sup>3</sup>		N95	



Turpentine 8006-64-2	Gum spirits, Gum turpentine, Turps, Wood turpentine	1500	TWA=20	100-200	(F)OV	See comment E, page 9
Uranium, insoluble compounds (as U) 7440-61-1		30 mg/m <sup>3</sup>	TWA=0.2 mg/m <sup>3</sup> STEL=0.6 mg/m <sup>3</sup>		N95	See 10 CFR 20 subpart H
Uranium, soluble compounds (as U) 7440-61-1		20 mg/m <sup>3</sup>	TWA=0.05 mg/m <sup>3</sup> (OSHA)		N95	AG/N95 if halides. See 10 CFR 20 subpart H
Urea 57-13-6	Carbamide, Carbonyldiamide, Carbonyldiamine, Isourea		TWA=10 mg/m <sup>3</sup> (AIHA)		N95	AM/N95 may be preferable if heat is involved
n-Valeraldehyde 110-62-3	Pentanal, Valeric aldehyde		TWA=50	0.006	(F)OV	
Vanadium pentoxide 1314-62-1	Vanadic anhydride, Vanadium oxide	70 mg/m <sup>3</sup>	TWA= 0.05 mg/m <sup>3</sup> (inhalable fraction) C=0.5 mg/m <sup>3</sup> (OSHA, respirable fraction)		N95	
Vanadium pentoxide fume 1314-62-1		70 mg/m <sup>3</sup>	TWA=0.05 mg/m <sup>3</sup> (inhalable fraction) C=0.1 mg/m <sup>3</sup> (OSHA)		N95	
Vanillin 121-33-5	Vanilla, Vanillaldehyde, Vanillic aldehyde		TWA=10 mg/m <sup>3</sup> (AIHA)		N95	

NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments
Vegetable oil			TWA=15 mg/m <sup>3</sup> (OSHA) TWA= 5 mg/m <sup>3</sup> (OSHA, respirable fraction)		R95 P95	
Vinyl acetate 108-05-4	1-Acetoxyethylene, Ethenyl acetate	26000	TWA=10 STEL=15	0.603	(F)OVe 174.3(F)O25 84817965024-5082623	

75-02-5	Fluoroethene, Fluoroethylene,	26000	TWA=1		SA	Short OV service life
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Vinylidene chloride 75-35-4	1,1-Dichloroethylene, VDC	65000	TWA=5	35.5	OV	Short service life
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75-38-7

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NOTE: For explanation of column headings and abbreviations, refer to Format Explanation starting on page 4.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Odor Threshold (ppm)	Respirator (to 10x OEL)	Comments

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## Respirator Codes and Descriptions

- (F) Full Facepiece (with appropriate cartridges and filters)
  - AG Acid Gas Respirator
  - AM Ammonia/Methylamine Respirator
- FORM

**For more information:**

**In U.S.**

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