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## 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 concentrations have been identified, the Guide can be used to help select an appropriate 3M™ Respirator for nearly 700 chemicals with Threshold Limit Values (TLV®s) 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 working conditions and with the benefits and limitations of respiratory protection products. If you have any questions related to proper selection and use of 3M respirators, or the

### Respirator Fit

The OSHA Respiratory Protection Standard (29 CFR 1910.134) requires fit testing for all tight-fitting respirators. Whether you select a maintenance-free or a reusable respirator, the wearer must obtain a satisfactory fit as indicated by a qualitative or quantitative fit test. Worker comfort must also be considered. Removal of the respirator, even for short periods of time, dramatically reduces the protection afforded by the respirator.

### 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.

### Supplied Air Respirators (airline)

- Continuous Flow
    - Loose-fitting facepiece (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** .....1000, unknown and IDLH atmospheres
- Pressure Demand SCBA** .....1000, 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

use of this Guide, contact your local 3M OH&ESD representative or call our 3M OH&ESD Technical Service Line at 1-800-243-4630.

## Respirator Program Management

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.

## Hazard Ratio

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

Assigned protection factors\* currently recommended by 3M are as follows:

### Air Purifying Respirators

- Half facepiece (maintenance-free and dual cartridge).....10
- Full facepiece .....50

### Powered Air Purifying Respirators

- Loose-fitting facepiece (e.g., H-200, Airstream™) .....25
- Half facepiece.....50
- Full facepiece, helmet, or hood .....1000

can invalidate established exposure limits and make respirator use ineffective for protection against certain workplace contaminants.

## Worker Activity

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.

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\*Assigned protection factors may vary for specific standards as promulgated by OSHA (e.g., continuous flow supplied air respirators are assigned a protection factor of 100 in the OSHA Asbestos Standards, 29 CFR 1910.1001 and 29 CFR 1926.1101). 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.

## Location Of Hazardous Area

When specifying supplied air respirators, consider the distance the worker must travel to get to an uncontaminated work area, as well as obstacles or equipment present in the area. If ladders or scaffolds must be climbed, an air purifying respirator or a combination air purifying/airline respirator may be appropriate.

## Respirator Characteristics, Capabilities, and Limitations

A respirator may not be able to help protect against all of the contaminants present in a particular work environment. Specific limitations are stated on the approval labels and are included with use instructions and limitations. These must be carefully reviewed for each respirator before use. General precautionary information is given below. Refer to respirator packaging or operating manuals for specific information.

**which they have been approved or recommended.**

## General Use Instructions

- Failure to follow all instructions and limitations on the use of these respirators and/or failure to wear them during all times of exposure can reduce respirator effectiveness and may result in sickness or death.
- Many of the contaminants that can be dangerous to a person's health include the ones that are so small they cannot be seen or smelled at dangerous levels.
- Before use of any respirator, the wearer must first be trained by the employer in proper respirator use in accordance with applicable safety and health standards.
- The OSHA Respiratory Protection Standard [29 CFR 1910.134(f)(1)] requires that the wearer of any tight-fitting respirator be fit tested.
- Leave the contaminated area immediately if dizziness or other distress



## ⚠️ WARNING

**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 OH&ESD 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 2001 published by the American



## ! WARNING

**No respirator is capable of preventing all airborne contaminants from entering the wearer's breathing zone. Respirators help protect against certain airborne contaminants by reducing airborne contaminant concentrations in the breathing zone to below the TLV or other recommended exposure level. Misuse of respirators may result in overexposure to the contaminant and cause sickness or death. For this reason, proper respirator selection, training, use, and maintenance are mandatory in order for the wearer to be properly protected.**

**Use these respirators only for those specific chemical compounds for**

occurs, if the respirator becomes damaged or breathing becomes difficult, if contaminants can be smelled or tasted, or if irritation occurs.

### 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, unless using an SCBA or combination airline/SCBA.
- Do not abuse or misuse any respirator.
- Do not use tight-fitting respirators with beards 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.

Conference of Governmental Industrial Hygienists (ACGIH). Pesticides and chemicals without established occupational exposure limits are not included. Call 3M OH&ESD Technical Service for assistance in selecting respirators for these chemicals.

### 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] Publication No. 90-117). It specifically refers to the acute respiratory exposure that poses an immediate threat of loss of life, immediate or delayed irreversible adverse effects on health, or acute eye exposure that would prevent escape from a hazardous atmosphere. The reasons NIOSH established an IDLH at a particular level for a specific chemical are described 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) and the concentration that would result in an oxygen deficient atmosphere should also be considered to be IDLH.

#### Odor Threshold\*

Odor thresholds can no longer be used as the primary indicator for changing gas and vapor cartridges as a result of the revised OSHA standard, 29 CFR 1910.134. The respirator program administrator, using

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., AIHA WEEL documentation). The method of defining and determining odor thresholds varies widely, thereby giving rise to a significant range of reported odor thresholds for many substances. Individuals may also respond differently to the same odor. At a given concentration, one person may smell and recognize the odor, while another person may barely notice it. The odor thresholds reported in the literature are typically determined for a single constituent, with no other chemicals present in the air. The single constituent situation rarely occurs in the workplace. Therefore, caution must be exercised in using these numbers. They may not be representative of odor detection capabilities of individual workers in your facilities. On the other hand, experience may indicate better warning properties than what is indicated by the reported value.

- The 2001 Workplace Environmental Exposure Levels (WEEL) from the American Industrial Hygiene Association is listed when it is the most stringent value or there is no TLV or PEL.
- The occupational exposure limits refer to **Time Weighted Average (TWA)** concentrations for a normal eight (8) hour workday and a forty (40) hour workweek, unless referenced as a ceiling or STEL.
- **Ceiling OELs** refer to concentrations that should not be exceeded during any part of the working exposure.
- **Short-Term Exposure Limit (STEL)** is a 15-minute time weighted average exposure which should not be exceeded at any time during a workday.
- **Skin** notations indicate the substance can be absorbed through the skin. In these cases, appropriate measures must 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

objective data and information, must now establish chemical cartridge change schedules. The established change schedule should 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

## OEL

- The occupational exposure limits listed are 2001 ACGIH **Threshold Limit Values** (TLVs), unless otherwise stated. The concentrations are expressed in ppm —parts per million (parts of contaminant per million parts of air) — unless specifically stated as mg/m<sup>3</sup> (milligrams of contaminant per cubic meter of air) or some other unit.
- An asterisk(\*) indicates that the TLV is lower than the PEL.
- The OSHA **Permissible Exposure Limit** (PEL) is listed when it is more stringent than the current TLV.

from ACGIH, 1330 Kemper Meadow Drive, Cincinnati, OH 45240.

## Synonyms

Several common synonyms are listed in this column.

## Respirator Recommendations (to 10X OEL)

This column lists the 3M recommended respirator for exposure levels not exceeding ten times (10X) the OEL. **Do not exceed maximum use concentrations established by regulatory agencies. When a chemical cartridge respirator is**

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### \*Odor Threshold References

1. Jensen, B., and P. Wolkoff. VOCBASE: Odor Thresholds, Mucous Membrane Irritation Thresholds and Physio-Chemical Parameters of Volatile Organic Compounds. [Computer Software]. National Institute of Occupational Health, Denmark, 1996.
2. Odor Thresholds for Chemicals with Established Occupational Health Standards. American Industrial Hygiene Association (1989).
3. Amooore, J.E. and E. Hautula. Odor as an Aid to Chemical Safety. *J. Appl. Toxicol.* 3(6):272-290 (1983).

4. Fazzuluri, F.A. Compilation of Odor and Taste Threshold Values Data. American Society for Testing and Materials (1978).
5. Verschueren, K. Handbook of Environmental Data on Organic Chemicals. pp. 12-21. Van Nostrand Reinhold, NY (1977).
6. Warning Properties of Industrial Chemicals—Occupational Health Resource Center, Oregon Lung Association.
7. Electrical Safety Practices, ISA Monograph #113 (1972).
8. Documentation of TLVs and BEIs. American Conference of Governmental Industrial

- Hygienists. 7th edition (2001).
9. Gemert, L.J. Van and A.H. Nettenbreijer. Compilation of Odor Threshold Values in Air and Water. CIVO-TNO, Netherlands (1977).
10. Gemert, L.J. Van. Compilation of Odor Threshold Values in Air, Supplement IV, CIVO-TNO, Zeist, Netherlands (1982).
11. Workplace Environmental Exposure Levels, American Industrial Hygiene Association (2001).
12. Ruth, J.H. Odor Thresholds and Irritation Levels of Several Chemical Substances: A Review. *Am. Ind. Hyg. Assoc. J.* 47(3):A-142-A-151 (1986).



**recommended (e.g., OV) it can only be used if a cartridge change schedule is established as described in 29 CFR 1910.134 (d)(3)(iii) (B)(2). If a change schedule is not established, an airline respirator must be used.** The SA code indicates that chemical cartridge respirators should not be used. Generally this is because of one of the three reasons described in the Comments column. These recommendations are valid only if the respirator selection process outlined on pages 11-14 is followed. The abbreviations used are explained in the Respirator Identification Key in the back pocket insert. All of these respirators have not been **specifically** tested against each compound listed. A review of chemical and physical properties of the materials, as well as adsorption or filtration characteristics of the respirators, forms the basis for the recommendations. The recommendations are for single substances. When two or more substances are present, a combination respirator may be appropriate.

## **Respirator Selection Criteria and How To Use This Guide** sections of this guide.

### Comments

Other information may be listed in this column:

- A. **Short service life** means predicted cartridge life of less than 30 minutes at concentrations of ten times (10X) the OEL. Actual service life will vary considerably, depending on concentration levels, temperature, humidity, work rate, etc. See the following literature references for specific details on the conditions and limitations of these estimates:
1. 3M Company. 3M Respirator Service Life. [Computer Software] 3M OH&ESD, [www.3M.com/occsafety](http://www.3M.com/occsafety).
  2. Smoot, D.M. Organic Vapor Respirator Service Life Prediction. Prepared Under NIOSH Contract No. 210-76-0108. Published October 1977.

approvals for that particular substance only. All respirators listed in this guide are NIOSH approved for specific substances and/or conditions.

- C. References to **warning** refer to odor or irritation warning properties of the substances. Where listed as unknown, no literature reference was located. Where listed as questionable, a wide range of reported odor thresholds exists. Air purifying respirators may be acceptable for these substances if you follow the requirements for establishing a change schedule acceptable to OSHA.
- D. These compounds have been identified as possibly existing in both particulate and vapor phase by a method published by Perez and Soderholm. For these compounds, 3M recommends that a gas/vapor cartridge be used in addition to the traditionally accepted particulate filter. It is the user's responsibility to determine whether both forms coexist. Both chemical properties and use conditions/processes can affect the

For example, with a spray paint that contains organic solvents and titanium dioxide, a respirator consisting of an organic vapor cartridge and a filter may be appropriate.

In cases where an air purifying respirator is not available for all of the substances of concern in a mixture, a supplied air respirator may be required. **In some cases, the respirator is preceded by an “(F)” designation. The Identification Key lists these respirators as full facepiece air purifying respirators. For concentrations not exceeding ten times (10X) the OEL, half facepiece respirators (maintenance-free or reusable) with equivalent filters or cartridges may be suitable if appropriate eye protection is provided.**

For concentrations greater than ten times (10X) the OEL, follow the protection fact or guidelines in specific OSHA standards, or refer to the instructions in the

3. Nelson, G.O. and C.A. Harder. Respirator Cartridge Efficiency Studies: V. Effect of Solvent Vapor. Am. Ind. Hyg. Assoc. J. 35(7): 391-410 (1974).

Typically, an airline respirator is recommended because the service life may be so short that the frequency required for changing the cartridges may not be practical.

References to **Ineffective sorbents** or **Unknown sorbent effectiveness** indicate 3M does not make chemical cartridge respirators appropriate for these substances at this time or it is not known how effective the sorbents would be for these materials. 3M does not recommend using a chemical cartridge respirator or attempting to establish a change schedule for these chemicals.

- B. References to a **respirator not being specifically approved** refer to

physical form in the workplace. Users should consider specific exposure data and workplace conditions before making their final selection. If a chemical cartridge is used, a change schedule must be established to replace the cartridges before the end of their service life.\*

- E. These compounds have been identified as possibly existing in both vapor and particulate phase in the workplace by Perez and Soderholm. 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, 3M recommends a filter for the 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

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\* See Perez, C. and S. C. Soderholm: Some Chemicals Requiring Special Consideration When Deciding Whether to Sample the Particle, Vapor, or Both Phases of an Atmosphere. Appl. Occup. Hyg. 6(10): 859-864 (1991).

use conditions/processes can affect the physical form in the workplace. Users should consider specific exposure data and workplace conditions before making their final selection.\*

- F. It is believed that an N-series filter is sufficient since these materials will not coat the filter fibers, but since this material may contain oil aerosols, an R- or P-series filter is recommended until further research or a regulatory agency takes a specific position.
- G. R- or P-series filters have been recommended pending more research as to how these materials affect the filter fibers.
- H. Listing of 3M **3510, 3530, 3550, or 3720** refers to a 3M™ Monitor which may be used to measure the amount of contaminant in the air. 3M Monitors may also be used to sample for other materials with analysis performed by a private laboratory. You should check with the laboratory to determine what other chemicals can be measured with

referred to as 42 CFR 84 because the respirator certification standards can be found in that part of the Code of Federal Regulations.

As a result of the standard, negative pressure particulate respirators approved under 30 CFR 11 can no longer be sold by respirator manufacturers as NIOSH approved. The 30 CFR 11 filter classifications of dust/mist, dust/fume/mist, high efficiency, paint spray and pesticide, etc., have been eliminated. New filters and accompanying terminology were established as a result of 42 CFR 84.

42 CFR 84 created nine new classes of filters (three series of filters with three levels of filter efficiency). The filter series are referred to as N, R, and P. The three different levels of filter efficiency are 95%, 99% and 99.97%, against the most difficult size particle to filter.

**R-Series Filters:** A filter intended 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 R-series filter should be used only for a single shift (or for 8 hours of continuous or intermittent use).

**R95 Particulate Filter** -At least 95% filter efficient when tested with ~0.3 µm DOP (Diethyl Phthalate) aerosol. 3M makes filtering facepiece respirators in this category.

**P-Series Filters:** A filter intended for removal of any particle including oil-based liquid aerosols. They may be used for any solid or liquid particulate airborne hazard. NIOSH recommends that respirator manufacturers establish time-use limitations for all P-series filters. 3M recommends that P-series filters should be used and reused for no more than 40 hours of use or 30 days, whichever occurs first, in atmospheres that contain only oil aerosols, unless the filter

the monitors. An estimate of the air borne concentration is needed for making appropriate respirator selection and establishing a cartridge change schedule.

Contact the toll free 3M OH&ESD Technical Service Line at **1-800-243-4630** if you have questions about the use of this Guide or the proper selection and use and limitations of any 3M respirators.

## Respirator Filter Definitions

### Background

Procedures for testing and certifying non-powered (negative pressure) particulate-removing respirators (air purifying respirators with particulate filters) were changed on July 10, 1995 by the National Institute for Occupational Safety and Health (NIOSH). These new procedures are often

### 3M 42 CFR 84 Filters

The 1998 3M Respirator Selection Guide included the new 42 CFR 84 filters/respirators for the first time. The new 3M filters are described as follows.

**N-Series Filters:** These filters are 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. Generally these filters should be used and reused subject only to considerations of hygiene, damage, and increased breathing resistance.

**N95 Particulate Filter** -At least 95% filter efficient when tested with ~0.3  $\mu\text{m}$  NaCl aerosol. 3M has replaceable filters and filtering facepiece respirators in this category.

**N100 Particulate Filter** -At least 99.97% filter efficient when tested with ~0.3  $\mu\text{m}$  NaCl aerosol. 3M has a filtering facepiece respirator in this category.

needs to be changed for hygiene reasons, is damaged, or becomes difficult to breathe through before the time limit is reached. When used in atmospheres containing non-oil aerosol, 3M P-series filters should be used and reused subject to conditions of hygiene, damage and increased breathing resistance.

**P95 Particulate Filter** -At least 95% filter efficient when tested with ~0.3  $\mu\text{m}$  DOP (Diocetyl Phthalate) aerosol. 3M makes replaceable filters and filtering facepiece respirators in this category.

**P100 Particulate Filter** -At least 99.97% filter efficient when tested with ~0.3  $\mu\text{m}$  DOP (Diocetyl Phthalate) aerosol. 3M makes replaceable filters and filtering facepieces in this category.

**Oil:** Any of numerous mineral, vegetable and synthetic substances and animal and vegetable fats that are generally slippery, combustible, viscous, liquid or liquefiable at room temperatures, soluble in various organic solvents such as ether but not in water.

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\* See Perez, C. and S. C. Soderholm: Some Chemicals Requiring Special Consideration When Deciding Whether to Sample the Particle, Vapor, or Both Phases of an Atmosphere. Appl. Occup. Hyg. 6(10): 859-864 (1991).

## 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 **TLV** column, then the respirator identified in the **Respirator Recommended** column may be selected. If a particulate filter respirator is recommended (any 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 efficiency but is acceptable for oil aerosols (see Oil definition). For example, if a 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 respirator with an N95 particulate filter. If an oil mist is present (air concentration greater than 0.1 mg/m<sup>3</sup>, but less than the occupational exposure limit) either an R- or P-series filter must 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 particulate filter. These codes can be

- 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 recommended. Consideration should be given to TWA, short term and peak (ceiling) exposures, while keeping in mind seasonal and worker variability and the specific 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 evaluating potential health effects. Record 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.

- available, check the Respirator Identification Key. If a PAPR is selected, use a HEPA filter if an N, R, or P-series filter is listed. If the Guide lists SA or SA(F) even though the hazard ratio is less than or equal to 10, an SA(F) must be used. A PAPR cannot be used. For example: For an exposure to vinyl toluene with a hazard ratio of 90, an SA(F) or (F)PAPR/OV must be selected. The (F)PAPR/OV is acceptable because the OV cartridge is listed in the Respirator Recommended column. The service life of the OV cartridge must be considered to determine if the (F)PAPR or SA(F) is the better selection given the high exposure concentrations. If the exposure was to 4-vinylcyclohexene, an SA(F) must be selected. A PAPR could not be selected. Record the respirator you selected in the last column of the form for that chemical. Go to Step 10.
8. Select either a supplied air respirator or a full facepiece respirator with filters and/or chemical cartridges listed in the Guide under the Respirator Recommended column. If the Guide lists SA or SA(F), you

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

If respiratory protection is desired 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 TLV column, you must follow the directions below for proper respirator selection. If you need help, call 3M Technical Service at 1-800-243-4630.

**Oil:** Any of numerous mineral, vegetable and synthetic substances and animal and vegetable fats that are generally slippery, combustible, viscous, liquid or liquefiable at room temperatures, soluble in various organic solvents such as ether but not in water.

1. Identify the air contaminants present in the workplace. Include chemical name and form. Classify contaminants as oil or non-oil material. If the chemical is listed in this guide, it is classified. For help, see definition of oil. The material safety data sheet (MSDS) can be helpful with this step. Consider particulate contaminants oil if
  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 TLV column on the form provided or on one you created. Determine the hazard ratio (see page 2) 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 to ( $\leq$ ) 10? If **yes**, go to Step 9.
  7. 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 Recommended column. To determine what type of PAPRs are
- must select the respirator recommended. Do not use air purifying respirators. For example: For an exposure to benzene with a hazard ratio of 30 (15 ppm), an (F)OV could be selected. For the same exposure conditions to benzyl acetate, an SA must be selected. Record the respirator you selected in the last column of the form for that chemical. Go to Step 10.
9. Select the respirator listed in the Respirator Recommended column. Record the respirator you selected in the last column of the form for that chemical. Go to Step 10.
  10. Are any other air contaminants present at the same time?
    - a) If **yes**, go to Step 2 and repeat the procedure, recording the appropriate information for the next chemical. When two or more contaminants that act upon the same organ system are present, consideration should be given to the combined effect rather than individual effects. Consult the current edition of Exposure Indices published by the American Conference of Governmental Industrial Hygienists for more information and the appropriate

- formula. If combined effects are considered, calculate the hazard ratio for the mixture.
- b) If **no**, go to Step 11.
11. Are any of the respirators listed in the last column a particulate filter respirator (i.e., does it have an N, R or P filter?)?
- a) If **yes**, go to Step 12.  
b) If **no**, go to Step 14.
12. Are only N-series particulate filter respirator(s) listed?
- a) If **yes**, go to Step 13.  
b) If **no**, go to Step 14.
13. Is airborne oil mist present that has not been considered as a result of one of the following conditions: (1) was not listed as a contaminant or (2) is the oil mist concentration greater than 0.1 mg/m<sup>3</sup> but less than the value in the TLV column of the Guide? A respirator is not required for the oil. If a respirator is not being selected for the oil, the presence of the oil must still be considered when choosing the appropriate filter. a) If **yes**, a respirator with either an R- or P-series filter must be
14. Was more than one respirator type required for the specific exposure situation (i.e., is there more than one respirator code included in the list made in the last column of the form?)? A respirator must be selected that satisfies all of the 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 from the Identification Key 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)** from the Respirator Identification Key. Go to Step 17.
- and would like help, go to Step 17. If no exposure limit is known, go to Step 16.
16. These conditions (unknown, <19.5% O<sub>2</sub>, >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 SCBA should be sufficient to allow adequate time for escape. If 5 minutes is sufficient escape time, the 3M™ Air-Mate™ Combination Escape SCBA is acceptable (see Respirator Identification Key: Code SCBA). Record the respirator selected in the final row of the form. This is the minimum acceptable level of respiratory protection; the selection process is finished. If you need help, go to Step 17.
- Note: If a chemical cartridge respirator is selected, you must establish a change schedule based on objective information and data. The information relied upon and the basis for the

selected. R-series filters must be changed after 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 P-series filters. To choose a respirator that provides the same degree of protection as originally identified, but with an R- or P-series filter, consult the Respirator Identification Key. Record the respirator with the R- or P-series filter that is being selected. Go to Step 14.  
 b) If no, go to step 14.

- b) If **no**, record the respirator listed in the last column as the final respirator selected (bottom line). A respirator meeting this description can be found by locating the code on the Respirator Identification Key. Go to Step 17.
15. If the chemical is not listed in the Guide, an occupational exposure limit either does not exist or was not located. Since it is not known what an acceptable exposure level is, a respirator cannot be recommended. If you have an exposure level for the material

cartridge change schedule and the basis for reliance on the data must be described in the respiratory protection program.

17. Do you need help?  
 a) If **yes**, call 3M for assistance at 1-800-243-4630. Follow the recommendations given.  
 b) If **no**, order the selected respirator(s) from the local 3M Sales Representative or Distributor.

### Respirator Selection Form

Chemical Name	Air Concentration	IDLH	TLV/PEL /WEEL	Hazard Ratio	Respirator Recommended
<b>Respirator Selected:</b>					



NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Acetaldehyde</b>	10,000	0.186	<b>25*</b> <b>(ceiling)</b>	Ethanal, Acetic aldehyde	<b>(F)OV</b> <b>(F)Form</b>	Short OV service life
<b>Acetic acid</b>	1000	0.016	<b>10</b>	Glacial acetic acid, Methane carboxylic acid, Ethanoic acid, Vinegar acid	<b>(F)OV</b>	
<b>Acetic anhydride</b>	1000	0.029	<b>5</b>	Ethanoic anhydride, Acetic acid anhydride, Acetyl oxide	<b>(F)OV</b>	
<b>Acetone</b>	20,000	4.58	<b>500*</b>	2-Propanone, Dimethyl ketone, Ketone propane	<b>OV</b>	3M 3530 Monitor
<b>Acetone cyanohydrin</b>		3	<b>2</b> <b>-skin-</b> <b>(AIHAWHEEL)</b>	a-Hydroxy isobutyronitrile, 2-Propane cyanohydrin, 2-Cyano-2-propanol, 2-Methylactonitrile, 2-Hydroxy-2-methyl propanenitrile	<b>OV</b>	Poor warning. 4.7 ppm TLV-C.
<b>Acetonitrile</b>	4000	97.7	<b>40</b> <b>-skin-</b>	Methylcyanide	<b>OV</b>	Poor warning. 3M 3530 Monitor.
<b>Acetophenone</b>		0.363	<b>10</b>	Methyl phenyl ketone, Acetyl benzene, Benzoyl methide, Hypnone, 1-Phenylethanone	<b>OV</b>	See Comment E, page 8
<b>Acetylene dichloride</b>				(See 1,2-Dichloroethylene)		

<b>Acetylene tetrabromide</b>	10		<b>1</b>	Tetrabromoethane	<b>OV</b>	Warning unknown
<b>Acetylsalicylic acid</b>			<b>5 mg/m<sup>3</sup></b>	Aspirin	<b>N95</b>	
<b>Acrolein</b>	5	0.174	<b>0.1 (ceiling) -skin-</b>	Acrylic aldehyde, Acrylaldehyde, Propenal, Allylaldehyde	<b>(F)OV</b>	Poor warning
<b>Acrylamide</b>			<b>0.03 mg/m<sup>3</sup>* -skin-</b>	Propenamide, Acrylamide monomer, Acrylic amide	<b>OV/N95</b>	See Comment D, page 7
<b>Acrylic acid</b>		0.4	<b>2* -skin-</b>	Acroleic acid, Propenoic acid	<b>(F)OV</b>	
<b>Acrylonitrile</b>	500	16.6	<b>2 -skin-</b>	Propenenitrile, AN, Vinyl cyanide	<b>OV</b>	Poor warning. SA if cartridge not disposed of after shift, per 29 CFR 1910.1045. 3M 3510 Monitor.
<b>Adipic acid</b>			<b>5 mg/m<sup>3</sup></b>	Hexanedioic acid; 1,6-Hexanedioic acid; 1,4-butanedicarboxylic acid Adipinic Acid	<b>(F)N95</b>	
<b>Adiponitrile</b>			<b>2 -skin-</b>	Addipic acid dinitrile; Hexanedinitrile; 1,4-dicyanobutane; Tetramethylene cyanide	<b>OV</b>	Warning unknown
<b>Allyl alcohol</b>	150	0.47	<b>0.5* -skin-</b>	2-Propenol, 2-Propen-1-ol, Vinyl carbinol	<b>(F)OV</b>	3M 3510 Monitor

\* TLV is lower than PEL.

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Allyl chloride</b>	300	0.489	1	3-Chloropropene, 1-Chloro-2-propene	<b>OV</b>	
<b>Allyl glycidyl ether</b>	270		1	AGE; 1-Allyloxy-2,3-epoxy-propane	<b>(F)OV</b>	Warning unknown. PEL-10 ppm ceiling.
<b>Allyl isothiocyanate</b>		0.035	1 <b>(AIHAWHEEL)</b>	Oil of mustard, AITC, Allyl thiocarbanimide, 3-Isothiocyanate-1-propene, Allyl isosulfocyanate	<b>OV</b>	15 minute TWA. SA if used with acids.
<b>Allyl propyl disulfide</b>			2	Onion oil	<b>(F)OV</b>	Warning unknown
<b>a-Alumina</b>			<b>10 mg/m<sup>3</sup>*</b>	Activated aluminum oxide	<b>N95</b>	
<b>Aluminum (as Al)</b>						
–Metal and oxide dusts			<b>10 mg/m<sup>3</sup>*</b>		<b>N95</b>	
–Soluble salts and alkyls (NOC)			<b>2 mg/m<sup>3</sup>*</b>		<b>N95</b>	
–Welding fume and pyro powders			<b>5 mg/m<sup>3</sup>*</b>		<b>N95</b>	
<b>p-Aminobenzoic acid</b>			<b>5 mg/m<sup>3</sup></b> <b>(AIHAWHEEL)</b>	Aminobenzoic acid, 4-Aminobenzoic acid, PABA	<b>(F)N95</b>	
<b>2-Aminoethanol</b>				(See Ethanolamine)		

<b>2-Aminopyridine</b>	5		<b>0.5</b>	a-Aminopyridine	<b>OV</b>	Warning unknown
<b>Ammonia</b>	500	5.75	<b>25*</b>	Anhydrous ammonia	<b>(F)AM</b>	Irritation also provides warning
<b>Ammonium chloride</b>						
-Solids			<b>10 mg/m<sup>3</sup></b>		<b>N95</b>	
-Liquids			<b>10 mg/m<sup>3</sup></b>		<b>AM/N95</b>	
<b>Ammonium perfluorooctanoate</b>			<b>0.01 mg/m<sup>3</sup></b>		<b>OV/N95</b>	See Comment D, page 7
<b>n-Amyl acetate</b>				(See Pentyl acetate)		
<b>sec-Amyl acetate</b>				(See Pentyl acetate)		
<b>n-Amyl alcohol</b>		0.1-0.3	<b>100 (AIHAWHEEL)</b>	Amyl alcohol, 1-Pentanol, n-Butyl alcohol, Pentyl alcohol, Pentanol, n-Pentanol	<b>F(OV)</b>	
<b>Aniline</b>	100	0.676	<b>2* -skin-</b>	Aminobenzene, Phenylamine, Aniline oil	<b>OV</b>	
<b>Anisidine (o-, p- isomers)</b>						
-ortho-Anisidine	10		<b>0.1* -skin-</b>	o-Methoxyaniline (oil), p-Methoxyaniline (solid)	<b>OV/P95</b>	
-para-Anisidine					<b>OV/N95</b>	
<b>Antimony and compounds (as Sb)</b>	80 mg/m <sup>3</sup>		<b>0.5 mg/m<sup>3</sup></b>		<b>N95</b>	
<b>Arsenic, elemental and inorganic compounds (except arsine) (as As)</b>	100 mg/m <sup>3</sup>		<b>0.01 mg/m<sup>3</sup> (PEL)</b>		<b>N100</b>	

\* TLV is lower than PEL.

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Arsine</b>	6	<1.0	<b>0.05 ppm</b>	Hydrogen arsenide, Arsenic trihydride	<b>SA(F)</b>	Poor warning. Unknown sorbent effectiveness.
<b>Asbestos</b>			<b>0.1 fiber/cc (PEL)</b>	Chrysotile, Amosite, Crocidolite, Tremolite, Anthophyllite, Actinolite	<b>N100</b>	Dual cartridge as per 29 CFR 1910.1001, 1915.1001 and 1926.1101
<b>Asphalt (petroleum; bitumen) fumes (as benzene-soluble aerosol)</b>			<b>0.5 mg/m<sup>3</sup> inhalable</b>	Asphaltum, Bitumen, Hot mix asphalt, Mineral pitch, Petroleum asphalt	<b>OV/P95</b>	R or P95 alone may be suitable for some applications. See Comment F, page 9.
<b>Barium soluble compounds (as Ba)</b>	1100 mg/m <sup>3</sup>		<b>0.5 mg/m<sup>3</sup></b>		<b>N95</b>	
<b>Barium sulfate</b>			<b>10 mg/m<sup>3</sup>*</b>		<b>N95</b>	
<b>Benzaldehyde</b>		0.042	<b>2 (AIHAWHEEL)</b>	Benzoic aldehyde, Oil of bitter almond, Benzenecarbonal	<b>F(OV)</b>	
<b>Benzene</b>	3000	8.65	<b>0.5*</b>	Benzol, Coal tar naphtha	<b>OV</b>	Poor warning. SA if cartridges are not replaced at the start of each shift, per 29 CFR 1910.1028. 3M 3510 Monitor.

<b>Benzophenone</b>			<b>5 mg/m<sup>3</sup> (AIHAWHEEL)</b>	Benzoyl benzene, Diphenyl ketone, Diphenyl methanone, Phenyl ketone  (See Quinone)	<b>OV/N95</b>	See Comment D, page 7
<b>p-Benzoquinone</b>						
<b>Benzotrichloride</b>			<b>0.1 (ceiling) -skin-</b>	Toluene trichloride, Benzenyl trichloride, Benzoic trichloride, Phenyl chloroform, Trichloromethylbenzene	<b>(F)OV</b>	Warning unknown
<b>Benzoyl chloride</b>	0.007		<b>0.5 (ceiling)</b>	a-Chlorobenzaldehyde, Benzene carbonyl chloride, Benzoic acid chloride	<b>(F)OV/AG (F)MG</b>	
<b>Benzoyl peroxide</b>	7000 mg/m <sup>3</sup>		<b>5 mg/m<sup>3</sup></b>	Dibenzoyl peroxide	<b>OV/N95</b>	See Comment D, page 7
<b>Benzyl acetate</b>	0.145		<b>10</b>	Acetic acid benzyl ester, Acetic acid phenylmethyl ester, Phenylmethyl acetate	<b>OV/N95</b>	
<b>Benzyl alcohol</b>	5.55		<b>10 (AIHAWHEEL)</b>	a-Hydroxytoluene, Phenylmethanol, Phenylcarbinol	<b>(F)OV</b>	
<b>Benzyl chloride</b>	10	0.034	<b>1</b>	a-Chlorotoluene	<b>(F)OV/AG</b>	See Comment E, page 8. 3M 3510 Monitor.
<b>Beryllium and compounds (as Be)</b>	10 mg/m <sup>3</sup>		<b>0.002 mg/m<sup>3</sup></b>		<b>N95</b>	
<b>Biphenyl</b>	47.6	0.0093	<b>0.2</b>	Diphenyl, Phenylbenzene	<b>OV/N95</b>	

\* TLV is lower than PEL.

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Bis(2-dimethylamino-ethyl) ether</b>			<b>0.05 ppm -skin-</b>	DMAEE; Ethylamine, 2,2'-Oxybis (N.N-dimethyl)-; Niax [R] Catalyst A-99	<b>(FOV)</b>	
<b>Bismuth telluride</b>			<b>10 mg/m<sup>3</sup>*</b>	Bismuth sesquitelluride	<b>N95</b>	
<b>Bismuth telluride (Se-doped)</b>			<b>5 mg/m<sup>3</sup></b>		<b>N95</b>	
<b>Borates, tetra, sodium salts</b>						
–Anhydrous and pentahydrate			<b>1 mg/m<sup>3</sup></b>		<b>N95</b>	
–Decahydrate			<b>5 mg/m<sup>3</sup></b>		<b>N95</b>	
<b>Boron oxide</b>			<b>10 mg/m<sup>3</sup>*</b>	Anhydrous boric acid, Boric anhydride, Boric oxide	<b>N95</b>	
<b>Boron tribromide</b>			<b>1 (ceiling)</b>	Boron bromide	<b>(F)AG</b>	Warning unknown
<b>Boron trifluoride</b>	100	1.5	<b>1 (ceiling)</b>		<b>(F)AG</b>	Poor warning
<b>Bromine</b>	10	0.066	<b>0.1</b>		<b>(F)OV/AG</b>	0.2 ppm TLV-STEL. Irritation also provides warning.
<b>Bromine pentafluoride</b>			<b>0.1</b>		<b>AG</b>	Warning unknown

<b>Bromochloromethane</b>			(See Chlorobromomethane)		
<b>Bromoform</b>		0.447	<b>0.5 -skin-</b>	Tribromomethane	<b>(F)OV</b> 3M 3510 Monitor
<b>1,3-Butadiene</b>	20,000	0.455	<b>1 (PEL)</b>	Butadiene, Divinyl, Biethylene, Erythrene	<b>OV</b> Cartridges must be replaced, per 29CFR 1910.1051
<b>Butane</b>		204	<b>800</b>	n-Butane	<b>SA</b> Short OV service life
<b>n-Butanethiol</b>			(See Butyl mercaptan)		
<b>2-Butanone</b>			(See Methyl ethyl ketone)		
<b>2-Butoxyethanol</b>	700	0.001	<b>20* -skin-</b>	Butyl Cellosolve®, Ethylene glycol monobutylether	<b>(F)OV</b> See Comment E, page 8
<b>n-Butyl acetate</b>	10,000	0.007	<b>150</b>	Butyl acetate, Butyl ethanoate, Acetic acid butyl ester	<b>(F)OV</b> See Comment E, page 8. 3M 3510 Monitor.
<b>sec-Butyl acetate</b>	10,000	3-7	<b>200</b>	1-Methylpropylacetate	<b>(F)OV</b> See Comment E, page 8. 3M 3510 Monitor.
<b>tert-Butyl acetate</b>	10,000	4-47	<b>200</b>	Acetic acid tert-butyl ester	<b>(F)OV</b> 3M 3510 Monitor
<b>Butyl acrylate</b>		0.003	<b>2</b>	2-Propenoic acid butyl ester, Butyl-2-propenoate	<b>OV</b> 3M 3510 Monitor
<b>n-Butyl alcohol</b>	8000	0.03	<b>50* (ceiling) -skin-</b>	1-Butanol, Propylcarbinol, n-Butanol	<b>(F)OV</b> 25 ppm TLV-ceiling proposed. 3M 3510 Monitor.

\* TLV is lower than PEL.



NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>sec-Butyl alcohol</b>	10,000	1	<b>100</b>	2-Butanol, Methyl ethyl carbinol	<b>(F)OV</b>	3M 3510 Monitor
<b>tert-Butyl alcohol</b>	8000	21.5	<b>100</b>	2-Methyl-2-propanol, TBA, Trimethyl-carbinol	<b>(F)OV</b>	3M 3510 Monitor
<b>Butylamine</b>	2000	0.053	<b>5 (ceiling) -skin-</b>	n-Butylamine, 1-Aminobutane	<b>AM</b>	Not specifically approved, but better service life than OV
<b>Butylated hydroxytoluene (as inhalable aerosol and/or vapor)</b>			<b>2 mg/m<sup>3</sup></b>	BHT; DBPD; 2,6-Di-tert-butyl-p-cresol 2,6-bis(1,1-Dimethylethyl)-4-methylphenol	<b>F(OV)/N95</b>	
<b>4-tert-Butylcatechol</b>			<b>2 mg/m<sup>3</sup> -skin- (AIHAWHEEL)</b>	p-tert-Butylcatechol; 4-(1,1-Dimethylethyl)-1,2-benzenediol; 4-tert-Butyl pyrocatechol; 4-tert-Butyl 1-1,2-dihydroxy benzene	<b>(F)N95</b>	
<b>tert-Butyl chromate (as CrO<sub>3</sub>)</b>	30 mg/m <sup>3</sup>		<b>0.1 mg/m<sup>3</sup> (ceiling) -skin-</b>	Chromic acid, di-tert-Butyl ester	<b>N95</b>	
<b>Butylene oxide</b>		0.06	<b>2 (AIHAWHEEL)</b>	1,2-Epoxybutane; 1-Butene oxide; 1,2-Butene oxide; 1,2-Butylene oxide; Epoxy-butane; BO	<b>OV</b>	

<b>n-Butyl glycidyl ether</b>	3500		<b>25*</b>	BGE; 1,2-Epoxy-3-butoxy-propane	<b>OV</b>	Warning unknown. 3M 3510 Monitor.
<b>n-Butyl lactate</b>		7.06	<b>5</b>	Lactic acid butylester	<b>OV</b>	Irritation also provides warning
<b>Butyl mercaptan</b>	2500	0.001	<b>0.5*</b>	n-Butanethiol, 1-Mercaptobutane	<b>OV</b>	
<b>o-sec-Butylphenol</b>			<b>5 -skin-</b>	2-sec-Butylphenol	<b>OV/P95</b>	
<b>p-tert-Butyltoluene</b>	1000	5.02	<b>1*</b>	1-Methyl-4-tert-butylbenzene	<b>OV</b>	Poor warning. 3M 3510 Monitor.
<b>Butyraldehyde</b>		0.009	<b>25 (AIHAWHEEL)</b>	Butal, Butaldehyde, Butalyde, Butanol, Butanaldehyde, Butyl aldehyde, Butyral butyric aldehyde	<b>(F)FORM</b>	Not specifically approved, but better service life than OV
<b>Cadmium, elemental and compounds (as Cd)</b>	50 mg/m <sup>3</sup> dust 9 mg/m <sup>3</sup> fume		<b>0.005 mg/m<sup>3</sup> (PEL)</b>		<b>N100</b>	0.002 mg/m <sup>3</sup> TLV- TWA for respirable dust
<b>Calcium arsenate (as As)</b>	100 mg/m <sup>3</sup>		<b>0.01 mg/m<sup>3</sup> (PEL)</b>	Tricalcium arsenate, Tricalcium o-arsenate, Cucumber dust	<b>N100</b>	
<b>Calcium carbonate</b>			<b>10 mg/m<sup>3</sup>*</b>	Marble, Limestone	<b>N95</b>	
<b>Calcium chromate</b>			<b>0.001 mg/m<sup>3</sup></b>	Calcium chrome yellow	<b>N95</b>	
<b>Calcium cyanamide</b>			<b>0.5 mg/m<sup>3</sup></b>	Lime nitrogen, Calcium carbimide	<b>N95</b>	
<b>Calcium fluoride (as F)</b>			<b>2.5 mg/m<sup>3</sup></b>	Fluorite, Fluorspar	<b>N95</b>	

\* TLV is lower than PEL.

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Calcium hydroxide</b>			<b>5 mg/m<sup>3</sup>*</b>	Calcium hydrate, Hydrated lime, Caustic lime	<b>N95</b>	
<b>Calcium oxide</b>			<b>2 mg/m<sup>3</sup>*</b>	Quicklime, Pebble lime	<b>N95</b>	
<b>Calcium silicate</b>			<b>10 mg/m<sup>3</sup>*</b>	Calcium metasilicate, Portland cement, Wallastonite	<b>N95</b>	
<b>Calcium sulfate</b>			<b>2 mg/m<sup>3</sup></b>	Gypsum, Plaster of Paris	<b>N95</b>	
<b>Camphor</b>	33	0.051	<b>2</b>	2-Camphonone, Synthetic camphor, Gum camphor, Laurel camphor	<b>(F)OV/N95</b>	3M 3510 Monitor
<b>Caprolactam –Vapor –Dust and mist</b>		0.064	<b>5 1 mg/m<sup>3</sup></b>	Aminocaproic lactam, 2-Oxohexamethyleneimine	<b>OV/N95 OV/N95</b>	
<b>Carbon black</b>			<b>3.5 mg/m<sup>3</sup></b>	Channel black, Lamp black, Furnace black, Thermal black, Acetylene black	<b>N95</b>	
<b>Carbon dioxide</b>	50,000	74,000	<b>5,000</b>	Carbonic acid gas, Dry ice	<b>SA</b>	Poor warning. Ineffective sorbents.
<b>Carbon disulfide</b>	500	0.096	<b>10* -skin-</b>	Carbon bisulfide	<b>OV</b>	
<b>Carbon monoxide</b>	1500	100,000	<b>25*</b>	Monoxide	<b>SA</b>	Poor warning. Ineffective sorbents.

<b>Carbon tetrabromide</b>			<b>0.1</b>	Tetrabromomethane	<b>(F)OV</b>	Warning unknown
<b>Carbon tetrachloride</b>	300	40.7	<b>5* -skin-</b>	Tetrachloromethane	<b>(F)OV</b>	Poor warning. 3M 3510 Monitor.
<b>Carbonyl chloride</b>				(See Phosgene)		
<b>Carbonyl fluoride</b>			<b>2</b>	Fluoroformyl fluoride, Carbon oxyfluoride	<b>(F)MG</b>	Warning unknown
<b>Catechol</b>			<b>5 -skin-</b>	Pyrocatechol	<b>OV/N95</b>	
<b>Cellulose</b>			<b>10 mg/m<sup>3</sup>*</b>	Paper fiber	<b>N95</b>	
<b>Cesium fluoride</b>			<b>2.5 mg/m<sup>3</sup></b>		<b>N95</b>	
<b>Cesium hydroxide</b>			<b>2 mg/m<sup>3</sup></b>	Cesium hydrate	<b>N95</b>	
<b>Chloramphenicol</b>			<b>0.5 mg/m<sup>3</sup> (AIHAWHEEL)</b>	Chloromycetin; Levomycetin; [R-(R*,R*)]-2,2-dichloro-N-[2-hydroxy-1-(hydroxy methyl)-2-(4-nitrophenyl)ethyl] acetamide	<b>N95</b>	
<b>Chlorinated diphenyl oxide</b>			<b>0.5 mg/m<sup>3</sup></b>	Hexachlorodiphenyl oxide	<b>OV/P95</b>	Warning unknown
<b>Chlorine</b>	30	0.05	<b>0.5</b>		<b>(F)AG</b>	Irritation also provides warning. PEL-1 ppm ceiling.
<b>Chlorine dioxide</b>	10	9.24	<b>0.1</b>	Chlorine oxide, Chlorine peroxide	<b>AG</b>	
<b>Chlorine trifluoride</b>	20		<b>0.1 (ceiling)</b>	Chlorine fluoride	<b>MG</b>	Warning unknown
<b>Chloroacetaldehyde</b>	100	0.917	<b>0.05* -skin-</b>	2-Chloroethanal, Chloroacetaldehyde (40% aqueous)	<b>(F)OV</b>	Poor warning

\* TLV is lower than PEL.

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Chloroacetone</b>			<b>1 (ceiling) -skin-</b>	Monochloroacetone, 1-Chloro-2-propanone, Chloracetone	<b>(F)OV</b>	Warning unknown
<b>a-Chloroacetophenone</b>	16	0.026	<b>0.05</b>	Phenacyl chloride, Chloromethyl phenyl ketone, Phenyl chloromethyl ketone (tear gas)	<b>(F)OV/N95</b>	Irritation also provides warning
<b>Chloroacetyl chloride</b>			<b>0.05 -skin-</b>	Chloroacetyl chloride	<b>(F)OV/AG</b>	Warning unknown
<b>Chlorobenzene</b>	2400	0.741	<b>10*</b>	Monochlorobenzene, Chlorobenzol, Phenyl chloride, MCB	<b>OV</b>	3M 3510 Monitor
<b>o-Chlorobenzylidene malononitrile</b>	0.25		<b>0.05 (ceiling) -skin-</b>	OCBM, CS	<b>OV/N95</b>	5X OEL maximum. Low IDLH.
<b>Chlorobromomethane</b>	5000	399	<b>200</b>	Bromochloromethane, Methylene chlorobromide, CBM, Halon™ 1011	<b>OV</b>	Poor warning. Short OV service life.
<b>1-Chloro-1,1-difluoroethane</b>			<b>1000 (AIHAWHEEL)</b>	HCFC-142b, Dymel®142b, Genetron™ 142b, Chlorodifluoroethane, a-chloroethylidene fluoride	<b>SA</b>	Short OV service life
<b>2-Chloro-1,3-butadiene</b>				(See B-Chloroprene)		
<b>Chlorodifluoromethane</b>			<b>1,000</b>	Freon™22	<b>SA</b>	Warning unknown. Ineffective sorbents.

<b>Chlorodiphenyl (42% chlorine)</b>	10 mg/m <sup>3</sup>		<b>1 mg/m<sup>3</sup> -skin-</b>	Polychlorinated biphenyl, PCB	<b>(F)OV/P95</b>	See Comment D, page 7
<b>Chlorodiphenyl (54% chlorine)</b>	5 mg/m <sup>3</sup>		<b>0.5 mg/m<sup>3</sup> -skin-</b>	Polychlorinated biphenyl, PCB	<b>(F)OV/P95</b>	See Comment D, page 7
<b>1-Chloro,2,3-epoxy- propane</b>				(See Epichlorohydrin)		
<b>2-Chloroethanol</b>				(See Ethylene chlorohydrin)		
<b>Chloroethylene</b>				(See Vinyl chloride)		
<b>Chloroform</b>	1000	11.7	<b>10*</b>	Trichloromethane	<b>OV</b>	Poor warning. 3M 3510 Monitor.
<b>bis-(2-Chloroisopropyl) ether</b>			<b>3 (AIHAWHEEL)</b>	DCIPE, Dichloroisopropyl ether	<b>(F)OV</b>	Warning unknown
<b>bis-Chloromethyl ether</b>			<b>0.001</b>	Dichloromethylether, BCME, Chloro (chloromethoxy) methane, Chloromethyl ether	<b>(F)OV</b>	Warning unknown
<b>Chloropentafluoro- ethane</b>			<b>1000</b>	FC-115, Monochloropentafluoroethane	<b>SA</b>	Warning unknown. Short service life.
<b>Chloropicrin</b>	4	1.08	<b>0.1</b>	Nitrotrichloromethane, Trichloronitromethane, Nitrochloroform	<b>(F)OV</b>	Irritation also provides warning
<b>B-Chloroprene</b>	400	14.9	<b>10* -skin-</b>	2-Chloro-1,3-Butadiene; Chlorobutadiene; beta-Chloroprene	<b>(F)OV</b>	Poor warning
<b>2-Chloropropionic acid</b>			<b>0.1 -skin-</b>	a-Chloropropionic acid	<b>OV/AG</b>	Warning unknown

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>o-Chlorostyrene</b>			<b>50</b>	1-Chloro-2-ethenylbenzene, 2-Chlorostyrene	<b>OV</b>	Warning unknown. 3M 3510 Monitor.
<b>Chlorosulfonic acid</b>			<b>0.3 (AIHAWHEEL)</b>	CSA, Chlorosulfuric acid	<b>(F)AG/N95</b>	HCl, SO <sub>2</sub> hydrolysis products
<b>2-Chloro-1,1,1,2-tetrafluoroethane</b>			<b>1000 (AIHAWHEEL)</b>	Chlorotetrafluoroethane, HCFC124, HFA124, Fluorocarbon 124	<b>SA</b>	Short OV service life
<b>o-Chlorotoluene</b>		0.219	<b>50</b>	2-Chloro-1-methylbenzene	<b>OV</b>	3M 3510 Monitor
<b>Chlorotrifluoroethylene</b>			<b>5 (AIHAWHEEL)</b>	CFE, CTFE, Trifluorovinylchloride, Trifluorochloroethylene	<b>SA</b>	Short OV service life
<b>Chromates of lead and zinc (as Cr)</b>				(See Lead, Zinc chromate)		
<b>Chromium, metal and inorganic compounds (asCr)</b>						
–Metal and Cr III compounds			<b>0.5 mg/m<sup>3</sup></b>		<b>N95</b>	
–Water-soluble Cr VI compounds, NOC (includes Chromic acid)	30 mg/m <sup>3</sup>		<b>0.05 mg/m<sup>3</sup></b>		<b>N95</b>	
–Insoluble Cr VI compounds, NOC			<b>0.01 mg/m<sup>3</sup></b>		<b>N95</b>	

<b>Chromyl chloride</b>		<b>0.025</b>	Chromium oxychloride, Chlorochromic anhydride	<b>AG</b>	Warning unknown
<b>Coal dust</b>					
-Bituminous or lignite		<b>0.9 mg/m<sup>3*</sup></b> <b>(respirable)</b>		<b>N95</b>	≥5% quartz 0.1 mg/m <sup>3</sup> TLV
-Anthracite		<b>0.4 mg/m<sup>3*</sup></b> <b>(respirable)</b>		<b>N95</b>	≥5% quartz 0.1 mg/m <sup>3</sup> TLV
<b>Coal tar pitch volatiles (as Benzene solubles)</b>	700 mg/m <sup>3</sup>	<b>0.2 mg/m<sup>3</sup></b>		<b>R or P95</b>	8247, 8577 or respirators with 2076HF, 2078, 2096 or 2097 filters specifically recommended. See Comment F, page 9.
<b>Cobalt, elemental and inorganic compounds (as Co)</b>	20 mg/m <sup>3</sup>	<b>0.02 mg/m<sup>3*</sup></b>		<b>N95</b>	
<b>Cobalt carbonyl (as Co)</b>		<b>0.1 mg/m<sup>3</sup></b>		<b>SA</b>	Ineffective sorbents
<b>Cobalt hydrocarbonyl (as Co)</b>		<b>0.1 mg/m<sup>3</sup></b>		<b>SA</b>	Ineffective sorbents
<b>Coke oven emissions</b>		<b>0.15 mg/m<sup>3</sup></b>		<b>R or P95</b>	8247, 8577 or respirators with 2076HF, 2078, 2096 or 2097 filters specifically recommended. See Comment F, page 9.

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Copper (as Cu)</b> –Dust and mist –Fume			<b>1 mg/m<sup>3</sup></b> <b>0.1 mg/m<sup>3</sup></b> <b>(PEL)</b>		<b>N95</b> <b>N95</b>	
<b>Cotton dust (raw)</b>			<b>0.2 mg/m<sup>3*</sup></b>		<b>N95</b>	5X PEL maximum for disposables, per OSHA cotton dust standard. If oil aerosol present, use R or P95.
<b>Cresol (all isomers)</b>	250	0.00005-0.0079	<b>5</b> <b>-skin-</b>	Cresylic acid	<b>OV/P95</b>	
<b>Cristobalite</b>				(See Silica, crystalline)		
<b>Crotonaldehyde</b>	400	0.135	<b>0.3</b> <b>(ceiling)</b>	B-Methylacrolein, Propylene aldehyde, Crotonaldehyde	<b>(F)OV</b>	
<b>Cryolite (as F)</b>			<b>2.5 mg/m<sup>3</sup></b>	Greenland spar, Ictone	<b>N95</b>	
<b>Cumene</b>	8000	0.024	<b>50</b>	Isopropyl benzene, 2-Phenyl propane, Cumol	<b>OV</b>	3M 3510 Monitor
<b>Cumene hydroperoxide</b>		0.005	<b>1</b> <b>-skin-</b> <b>(AIHAWHEEL)</b>	Isopropylbenzene hydroperoxide; CHP; a,a'-Dimethylbenzyl hydroperoxide; Cumyl hydroperoxide	<b>(F)OV</b>	

<b>Cyanamide</b>			<b>2 mg/m<sup>3</sup></b>	Cyanogenamide, Carbodiimide	<b>N95</b>	
<b>Cyanides (as CN)</b>	50 mg/m <sup>3</sup>		<b>5 mg/m<sup>3</sup> (ceiling) -skin-</b>		<b>SA</b>	Poor warning
<b>Cyanogen</b>		231	<b>10</b>	Dicyan, Oxalonitrile	<b>SA</b>	Poor warning. Unknown sorbent effectiveness.
<b>Cyanogen chloride</b>		0.976	<b>0.3 (ceiling)</b>	CNCl	<b>SA(F)</b>	Poor warning. Short service life.
<b>Cyclohexane</b>	10,000	83.8	<b>300</b>	Hexahydrobenzene, Hexamethylene	<b>(F)OV</b>	Irritation also provides warning. 3M 3510 Monitor.
<b>Cyclohexanol</b>	3500	0.068	<b>50 -skin-</b>	Hexalin, Hydralin, Hydroxycyclohexane, Anol, Hexahydrophenol, Cyclohexyl alcohol	<b>OV</b>	See Comment E, page 8. 3M 3510 Monitor.
<b>Cyclohexanone</b>	5000	0.019	<b>25* -skin-</b>	Pimelic ketone, Cyclohexyl ketone	<b>OV</b>	3M 3510 Monitor
<b>Cyclohexene</b>	10,000	0.363	<b>300</b>	Benzene tetrahydride	<b>OV</b>	3M 3510 Monitor
<b>Cyclohexylamine</b>		2.66	<b>10</b>	Hexahydroaniline, Aminocyclohexane	<b>(F)OV</b>	
<b>Cyclonite</b>			<b>0.5 mg/m<sup>3</sup> -skin-</b>	RDX; sym-Trimethylene trinitramine; Hexahydro-1,3,5-trinitro-sym-triazine	<b>N95</b>	
<b>Cyclopentadiene</b>	2000	3.8	<b>75</b>	1,3-Cyclopentadiene	<b>OV</b>	

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Cyclopentane</b>			<b>600</b>	Pentamethylene	<b>SA</b>	Warning unknown. Short OV service life.
<b>Decaborane</b>	20	0.06	<b>0.05 -skin-</b>		<b>SA</b>	Poor warning. Unknown sorbent effectiveness.
<b>Decabromodiphenyl oxide</b>			<b>5 mg/m<sup>3</sup> (AIHAWHEEL)</b>	DBDPO, Decabromodiphenyl ether, bis-(pentabromophenyl) ether	<b>N95</b>	
<b>1-Decene</b>		7	<b>100 (AIHAWHEEL)</b>	Decylene, alpha-decene	<b>OV</b>	
<b>Diacetone alcohol</b>	2100	0.891	<b>50</b>	Diacetone, 4-Hydroxy-4-methyl-2-pentanone, 2-Methyl-2-pentanol-4-one	<b>(F)OV</b>	3M 3510 Monitor
<b>Diallylamine</b>		2-9	<b>1 -skin- (AIHAWHEEL)</b>	N-2-propenyl-2-propen-1-amine, Di-2-propenylamine	<b>OV</b>	Poor warning
<b>1,2-Diaminoethane</b>				(See Ethylenediamine)		
<b>Diatomaceous earth (uncalcined)</b>				(See Silica)		
<b>Diazomethane</b>	2		<b>0.2</b>	Azimethylene, Diazirine	<b>SA</b>	Warning unknown. Unknown sorbent effectiveness.

<b>Diborane</b>	40	1.8-3.5	<b>0.1</b>	Boroethane	<b>SA</b>	Poor warning. Unknown sorbent effectiveness.
<b>Dibromochloropropane</b>			<b>1 ppb (PEL)</b>	1-Chloro-2,3-dibromopropane; DBCP; 1,2-Dibromo-3-chloropropane	<b>SA(F)</b>	Warning unknown. OSHA requires SA(F); no change schedule allowed.
<b>1,2-Dibromoethane</b>				(See Ethylene dibromide)		
<b>Dibutylamine</b>		0.1	<b>5 (ceiling) -skin- (AIHAWHEEL)</b>	1-Butanamine, n-Butyl, Di-n-butylamine, DNBA	<b>F(OV)</b>	See Comment E, page 8
<b>2-N-Dibutylaminoethanol</b>			<b>0.5 -skin-</b>	Dibutylaminoethanol; N,N-dibutyl-N-(2-hydroxyethyl) amine	<b>(F)OV</b>	Warning unknown
<b>Dibutyl phenyl phosphate</b>			<b>0.3 -skin-</b>	DBPP	<b>R or P95</b>	OV/P95 may be preferable if heat involved
<b>Dibutyl phosphate</b>	125		<b>1</b>	Dibutyl acid-o-phosphate, Di-n-butyl hydrogen phosphate, Dibutyl phosphoric acid	<b>OV/P95</b>	
<b>Dibutyl phthalate</b>	9300 mg/m <sup>3</sup>		<b>5 mg/m<sup>3</sup></b>	DBP; Dibutyl; 1,2-Benzene-dicarboxylate	<b>OV/P95</b>	See Comment D, page 7
<b>Dichloroacetylene</b>			<b>0.1 (ceiling)</b>	Dichloroethyne	<b>SA(F)</b>	Warning unknown. Short OV service life.

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>o-Dichlorobenzene</b>	1000	0.072	<b>25</b>	1,2-Dichlorobenzene; o-Dichlorobenzol  Monitor.	<b>(F)OV</b>	See Comment E, page 8. PEL-50 ppm ceiling. 3M 3510
<b>p-Dichlorobenzene</b>	1000	0.048	<b>10*</b>	1,4-Dichlorobenzene; Dichloricide; PDCB	<b>(F)OV/N95</b>	3M 3510 Monitor
<b>1,4-Dichloro-2-butene</b>			<b>0.005 -skin-</b>	2-Butylenedichloride; DCB; 1,4-DCB; Dichlorobutene	<b>(F)OV</b>	Warning unknown
<b>Dichlorodifluoromethane</b>	50,000		<b>1000</b>	Refrigerant 12, Freon™ 12	<b>SA</b>	Warning unknown. Short OV service life.
<b>1,3-Dichloro-5,5-dimethylhydantoin</b>		0.01	<b>0.2 mg/m<sup>3</sup></b>	Halane, Dactin	<b>OV/N95</b>	
<b>1,1-Dichloroethane</b>	4000	255	<b>100</b>	Ethylidene chloride	<b>OV</b>	Poor warning
<b>1,2-Dichloroethane</b>				(See Ethylene dichloride)		
<b>1,1-Dichloroethylene</b>				(See Vinylidene chloride)		
<b>1,2-Dichloroethylene</b>	4000	19.1	<b>200</b>	Acetylene dichloride, Dioform	<b>OV</b>	
<b>Dichloroethyl ether</b>	250	0.049	<b>5 -skin-</b>	bis-(2-Chloroethyl) ether; 2,2'-Dichlorodiethyl ether	<b>(F)OV</b>	PEL-15 ppm ceiling
<b>Dichlorofluoromethane</b>	50,000		<b>10*</b>	Refrigerant 21, Freon™ 21, Dichloromonofluoromethane	<b>SA</b>	Warning unknown. Short OV service life.

<b>1,1-Dichloro-1-fluoroethane</b>			<b>500</b> (AIHAWHEEL)	HCFC141b, HFA141b, Fluorocarbon 141b	<b>SA</b>	Short OV service life
<b>Dichloromethane</b>				(See Methylene chloride)		
<b>1,1-Dichloro-1-nitroethane</b>	150		<b>2</b>		<b>OV</b>	Warning unknown. PEL-10 ppm ceiling.
<b>1,2-Dichloropropane</b>				(See Propylene dichloride)		
<b>1,3-Dichloropropene</b>			<b>1</b> <b>-skin-</b>	1,3-Dichloropropylene	<b>(F)OV</b>	Warning unknown
<b>2,2-Dichloropropionic acid</b>			<b>1</b>	Dalapon™	<b>(F)OV</b>	Warning unknown
<b>Dichlorotetrafluoroethane</b>	50,000		<b>1000</b>	Freon™ 114, Refrigerant 114, Halon™ 242, FC-114	<b>SA</b>	Warning unknown. Short OV service life.
<b>Dicyclopentadiene</b>	0.03		<b>5</b>		<b>OV/N95</b>	
<b>Dicyclopentadienyl iron</b>			<b>10 mg/m<sup>3</sup>*</b>	bis-Cyclopentadienyl iron	<b>N95</b>	
<b>Diethanolamine</b>		0.025	<b>0.46</b> <b>-skin-</b>	DEA, di-(2-Hydroxyethyl) amine	<b>OV</b>	See Comment E, page 8
<b>Diethylamine</b>	2000	0.186	<b>5*</b> <b>-skin-</b>		<b>(F)AM</b> <b>(F)OV</b>	AM not specifically approved
<b>Diethylaminoethanol</b>	500	0.034	<b>10</b> <b>-skin-</b>	2-Diethylaminoethyl alcohol; N,N-Diethylethanolamine	<b>OV</b>	
<b>Diethylene glycol</b>			<b>10 mg/m<sup>3</sup></b> (AIHAWHEEL)	DEG; Diglycol; 2,2'-Dihydroxy- diethyl ether	<b>R or P95</b>	See Comments D and G, pages 7 & 9

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Diethylene glycol monoethyl ether		0.708	25 (AIHAWHEEL)	2-(2-Ethoxyethoxy) ethanol, DiGGE, Diethylene glycol ethyl ether, Glycol ether DE, Carbitol, Dioxitol	OV	
Diethylene triamine		9.3	1 -skin-		(F)OV	Poor warning
Diethyl ether				(See Ethyl ether)		
Di-2-ethylhexyl phthalate				(See Di-sec-octyl phthalate)		
Diethyl ketone		0.316	200	Metacetone, Propione, 3-Pentanone, Ethyl propionyl	OV	
Diethyl phthalate			5 mg/m <sup>3</sup>	Ethylphthalate, DEP	R or P95	
Difluorodibromomethane	2500		100	Dibromodifluoromethane, Freon™ 12B2, DFBM	OV	Warning unknown
1,1-Difluoroethane			1000 (AIHAWHEEL)	HFC-152a, Freon® 152a, Dymel® 152a, Genetron™ 152a, Ethylidene fluoride	SA	Ineffective sorbents
Difluoromethane			1000 (AIHAWHEEL)	Refrigerant 32; R32; Hydrofluorocarbon 32	SA	Warning unknown. Ineffective sorbents.
Diglycidyl ether	25	4.61	0.1	di-(Epoxypropyl) ether; bis-(2,3-Epoxypropyl)-ether; 2-Epoxypropyl ether; Diallyl ether dioxide; DGE	(F)OV	Poor warning

<b>Dihydroxybenzene</b>				(See Hydroquinone)		
<b>Diisobutylene</b>			<b>75</b> <b>(AIHAWHEEL)</b>	Diisobutene	<b>OV</b>	
<b>Diisobutyl ketone</b>	2000	0.339	<b>25*</b>	2,6-Dimethyl-4-heptanone; sym-Diisopropylacetone; Isovalerone; Valerone	<b>(F)OV</b>	See Comment E, page 8. 3M 3510 Monitor.
<b>Diisopropylamine</b>	1000	0.398	<b>5</b> <b>-skin-</b>		<b>(F)OV</b>	
<b>Dimethoxymethane</b>				(See Methylal)		
<b>Dimethyl acetamide</b>	400	47.9	<b>10</b> <b>-skin-</b>	N,N-Dimethyl acetamide; DMAC	<b>OV</b>	Poor warning
<b>Dimethylamine</b>	2000	0.081	<b>5*</b>	Anhydrous dimethylamine	<b>AM</b>	AM not specifically approved. Short OV service life.
<b>Dimethylaminobenzene</b>				(See Xylidine)		
<b>Dimethylaniline</b>	100	0.219	<b>5</b> <b>-skin-</b>	N,N-Dimethylaniline	<b>OV</b>	
<b>Dimethyldichlorosilane</b>			<b>2</b> <b>(ceiling)</b> <b>(AIHAWHEEL)</b>	Dichlorodimethylsilane	<b>OV/AG</b>	Warning unknown
<b>Dimethylethoxysilane</b>			<b>0.5</b>	Ethoxydimethyl silane	<b>SA(F)</b>	Unknown sorbent effectiveness
<b>Dimethylbenzene</b>				(See Xylene)		

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Dimethyl ether</b>		0.3-9.0	<b>1000 (AIHAWHEEL)</b>	Methyl ether, Wood ether	<b>SA</b>	Very short OV service life
<b>Dimethyl formamide</b>	3500	100	<b>10 -skin-</b>	N,N-Dimethyl formamide; DMF	<b>OV</b>	Poor warning
<b>2,6-Dimethyl-4-heptanone</b>				(See Diisobutyl ketone)		
<b>1,1-Dimethylhydrazine</b>	50	8.79	<b>0.01 -skin-</b>	unsym-Dimethylhydrazine, UDMH	<b>SA(F)</b>	Poor warning. Unknown sorbent effectiveness.
<b>Dimethylphthalate</b>	9300 mg/m <sup>3</sup>		<b>5 mg/m<sup>3</sup></b>	DMP	<b>OV/P95</b>	See Comment D, page 7
<b>1,1-Dimethylpropyl acetate</b>				(See Pentyl acetate)		
<b>Dimethylsulfate</b>	10		<b>0.1* -skin-</b>	Methyl sulfate	<b>(F)OV</b>	Poor warning
<b>Dimethyl terephthalate</b>			<b>5 mg/m<sup>3</sup> (total dust) (AIHAWHEEL)</b>		<b>OV/N95</b>	
<b>Dinitrobenzene</b>	29		<b>0.15* -skin-</b>	o-Dinitrobenzene, 1,2-Dinitrobenzene; m-Dinitrobenzene; 1,3-Dinitrobenzene; p-Dinitrobenzene, 1,4-Dinitrobenzene	<b>OV/N95</b>	

<b>3,5-Dinitro-o-toluamide</b>			<b>5 mg/m<sup>3</sup></b>	Dinitolmide	<b>N95</b>	
<b>Dinitrotoluene</b>	200 mg/m <sup>3</sup>		<b>0.2 mg/m<sup>3</sup> -skin-</b>	DNT	<b>OV/N95</b>	See Comment D, page 7
<b>Dioxane</b>	2000	7.78	<b>20* -skin-</b>	Diethylene dioxide; Diethylene ether; p-Dioxane; 1,4-Dioxane	<b>OV</b>	3M 3510 Monitor
<b>Diphenyl</b>				(See Biphenyl)		
<b>Diphenylamine</b>		0.022	<b>10 mg/m<sup>3</sup></b>	DPA, N-phenylaniline	<b>N95</b>	OV/N95 may be preferable when odor is a problem
<b>4,4-Diphenylmethane diisocyanate</b>				(See Methylenebisphenyl isocyanate)		
<b>Dipropylene glycol methyl ether</b>		1000	<b>100 -skin-</b>	Dipropylene glycol monomethyl ether, Dowanol™ 50B	<b>OV</b>	Poor warning
<b>Dipropyl ketone</b>			<b>50</b>	Butyrane, 4-Heptanone	<b>OV</b>	Warning unknown
<b>Di-sec-octyl phthalate</b>			<b>5 mg/m<sup>3</sup></b>	DOP, bis-(2-Ethylhexyl)phthalate, Di-2-ethylhexyl phthalate, DEHP	<b>R or P95</b>	
<b>Divinyl benzene</b>			<b>10</b>	DVB, Vinylstyrene	<b>(F)OV</b>	Warning unknown
<b>Emery</b>			<b>10 mg/m<sup>3</sup>*</b>	Corundum	<b>N95</b>	
<b>Enflurane</b>			<b>75</b>	2-Chloro-1,1,2-trifluoroethyl-difluoromethyl ether; Ethrane	<b>SA</b>	Warning unknown. Short OV service life. 3M 3510 Monitor.

\* TLV is lower than PEL.

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Epichlorohydrin</b>	250	0.934	<b>0.5* -skin-</b>	1-Chloro-2,3-epoxy-propane; 2-Chloropropylene oxide; g-Chloropropylene oxide	<b>(F)OV</b>	Poor warning. 3M 3510 Monitor.
<b>1,2-Epoxypropane</b>				(See Propylene oxide)		
<b>2,3-Epoxy-1-propanol</b>				(See Glycidol)		
<b>Erythromycin</b>			<b>3 mg/m<sup>3</sup> (AIHAWHEEL)</b>	Dotycin, Erycin, Eriocinum, E-Mycin™, Pentadecanoic acid	<b>N95</b>	
<b>Ethanolamine</b>	1000	2.59	<b>3</b>	Ethylolamine, Monoethanolamine, B-Aminoethyl alcohol, 2-Aminoethanol, 2-Hydroxyethylamine	<b>OV</b>	
<b>2-Ethoxyethanol</b>	6000	1.22	<b>5* -skin-</b>	Ethylene glycol monoethyl ether, Glycol monoethyl ether, Cellosolve® solvent	<b>OV</b>	3M 3510 Monitor
<b>2-Ethoxyethyl acetate</b>	2500	0.182	<b>5* -skin-</b>	Cellosolve® acetate, Ethylene glycol monoethyl ether acetate	<b>OV</b>	3M 3510 Monitor
<b>Ethyl acetate</b>	10,000	0.61	<b>400</b>	Acetic ester, Acetic ether, Ethyl ethanoate	<b>(F)OV</b>	3M 3510 Monitor
<b>Ethyl acrylate</b>	2000	0.0009	<b>5* -skin-</b>	Acrylic acid, Ethyl ester	<b>(F)OV</b>	3M 3510 Monitor
<b>Ethyl alcohol</b>	15,000	0.136	<b>1000</b>	Ethanol	<b>OV</b>	Short OV service life at 10X OEL

<b>Ethylamine</b>	4000	0.324	<b>5*</b> <b>-skin-</b>	Anhydrous ethylamine, Aminoethane, Monoethylamine	<b>(F)AM</b>	AM not specifically approved. Short OV service life.
<b>Ethyl amyl ketone</b>	3000	6	<b>25</b>	EAK, 5-Methyl-3-heptanone	<b>(F)OV</b>	
<b>Ethyl benzene</b>	2000	2.3	<b>100</b>	Phenylethane, Ethylbenzol	<b>OV</b>	See Comment E, page 8. 3M 3510 Monitor.
<b>Ethyl bromide</b>	3500	3.09	<b>5*</b> <b>-skin-</b>	Bromoethane	<b>SA</b>	Short OV service life
<b>Ethyl butyl ketone</b>	3000	0.1-10	<b>50</b>	3-Heptanone	<b>OV</b>	See Comment E, page 8
<b>Ethyl chloride</b>	20,000	4.07	<b>100</b> <b>-skin-</b>	Chloroethane, Monochloroethane, Hydrochloric ether	<b>SA</b>	Very short OV service life
<b>Ethyl cyanoacrylate</b>			<b>0.2</b>	2-Cyanoacrylic acid, ethyl ester; 2-Cyano-2 propenoic acid, ethyl ester; ECA; Ethyl alpha-cyanoacrylate; Ethyl 2-cyanoacrylate; Ethyl 2-cyano- 2-propenoate	<b>OV</b>	Warning unknown
<b>Ethyl tert-butyl ether</b>			<b>5</b>	tert-Butyl ethyl ether; 1.1-Dimethyl- ethyl ether; ETBE; 2-Ethoxy-2- methylpropane; Ethyl tert-butyl oxide; Ethyl 1,1-dimethylethyl ether	<b>OV</b>	
<b>Ethylene chlorohydrin</b>	10	0.402	<b>1*</b> <b>(ceiling)</b> <b>-skin-</b>	2-Chloroethanol, 2-Chloroethyl alcohol	<b>OV</b>	3M 3510 Monitor

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Ethylenediamine	2000	4.27	10	1,2-Diaminoethane; 1,2-Ethanediamine	(F)OV	
Ethylene dibromide	400	9.84	20 (PEL) -skin-	1,2-Dibromoethane	(F)OV	
Ethylene dichloride	1000	11.2	10*	Ethylene chloride; 1,2-Dichloroethane	OV	Poor warning. 3M 3510 Monitor.
Ethylene glycol, aerosol		60.3 mg/m <sup>3</sup>	100 mg/m <sup>3</sup> (ceiling)	Ethylene alcohol; Glycol; 1,2-Ethanediol	OV/P95	See Comments D and G, pages 7 & 9
Ethylene glycol dinitrate	82		0.05* -skin-	Glycol dinitrate, Nitroglycol	OV	Warning unknown. PEL-0.2 ppm ceiling.
Ethylene glycol methyl ether acetate				(See 2-Methoxyethyl acetate)		
Ethyleneimine	100	1.5	0.5 -skin-	Ethyleimine, Dimethylenimine, Dihydroazirine, Azirane, Aziridine, Aminoethylene	SA(F)	Poor warning. OSHA requires SA(F); see 29 CFR 1910.1003.
Ethylene oxide	800	851	1	Dimethylene oxide; 1,2-Epoxy ethane; Oxirane	SA(F)	Poor warning. OSHA requires SA(F); no change schedule allowed. 3M 3550 Monitor.

<b>Ethyl ether</b>	19,000	2.29	<b>400</b>	Diethyl ether, Ethyl oxide, Ether	<b>OV</b>	Short service life. 3M 3530 Monitor.
<b>Ethyl formate</b>	8000	18.6	<b>100</b>	Ethyl methanoate, Formic acid ethyl ester	<b>(F)OV</b>	Short service life
<b>Ethylidene chloride</b>				(See 1,1-Dichloroethane)		
<b>Ethylidene norbornene</b>		0.074	<b>5 (ceiling)</b>	ENB	<b>(F)OV</b>	
<b>Ethyl mercaptan</b>	2500	0.001	<b>0.5*</b>	Ethanethiol, Ethyl sulfhydrate	<b>OV</b>	
<b>N-Ethylmorpholine</b>	2000	0.275	<b>5* -skin-</b>	4-Ethylmorpholine	<b>(F)OV</b>	
<b>Ethyl silicate</b>	1000	3.6	<b>10*</b>	Tetraethyl silicate, Ethyl orthosilicate, Tetraethoxysilane	<b>OV</b>	
<b>Ferric/Ferrous salts, soluble</b>				(See Iron salts)		
<b>Ferrovandium, dust</b>			<b>1 mg/m<sup>3</sup></b>		<b>N95</b>	
<b>Fibrous glass, dust</b>				(See Synthetic vitreous fibers - Continuous filament glass fibers)		
<b>Flour dust (as inhalable particles)</b>			<b>0.5 mg/m<sup>3</sup></b>		<b>N95</b>	
<b>Fluorides (as F)</b>	500 mg/m <sup>3</sup>		<b>2.5 mg/m<sup>3</sup></b>	Synonyms vary depending upon specific compound	<b>N95</b>	

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Fluorine</b>	25	0.126	<b>0.1 (PEL)</b>		<b>SA(F)</b>	Poor warning. Unknown reaction products with sorbent.
<b>Fluorotrichloromethane</b>				(See Trichlorofluoromethane)		
<b>Formaldehyde</b>	30	0.871	<b>0.3* (ceiling)</b>	Methylene oxide, Formalin	<b>(F)FORM</b>	Irritation also provides warning. 3M 3720 Monitor.
<b>Formamide</b>		80	<b>10* -skin-</b>	Methanamide	<b>OV</b>	Poor warning
<b>Formic acid</b>	30	28.2	<b>5</b>	Hydrogencarboxylic acid, Methanoic acid	<b>(F)OV</b>	Poor warning. 6X OEL maximum. Low IDLH.
<b>Furfural</b>	250	0.058	<b>2* -skin-</b>	2-Furaldehyde, Furfuraldehyde, Fural, 2-Furancarboxaldehyde	<b>(F)OV</b>	3M 3510 Monitor
<b>Furfuryl alcohol</b>	250	7.83	<b>10* -skin-</b>	2-Hydroxymethylfuran, 2-Furyl-methanol	<b>(F)OV</b>	See Comment E, page 8
<b>Gasoline</b>		0.3	<b>300</b>	Petrol	<b>(F)OV</b>	
<b>Germanium tetrahydride</b>			<b>0.2</b>	Germane, Germanium hydride	<b>SA(F)</b>	Warning unknown. Unknown sorbent effectiveness.
<b>Glass, fibrous or dust</b>				(See Synthetic vitreous fibers)		

<b>Glutaraldehyde</b>	0.038	<b>0.05 (ceiling)</b>	1,5-Pentanedial	<b>(F)OV</b>	See Comment E, page 8
<b>Glycerin, mist</b>		<b>10 mg/m<sup>3</sup>*</b>	Glycerol	<b>R or P95</b>	
<b>Glycidol</b>	500	<b>2*</b>	2-Hydroxymethyloxiran; Hydroxymethyl ethylene oxide; Epoxypropyl alcohol; 3-Hydroxy- propylene oxide; 2,3-Epoxy-1- propanol	<b>OV</b>	Warning unknown
<b>Glycidyl methacrylate</b>		<b>0.5 (AIHAWHEEL) -skin-</b>	GMA	<b>OV</b>	
<b>Glycol monoethyl ether</b>			(See 2-Ethoxyethanol)		
<b>Glyoxal (as inhalable aerosol and/or vapor)</b>		<b>0.1 mg/m<sup>3</sup></b>	Ethanedial, Biformyl, Diformyl, Oxaldehyde, 1,2-Ethanedione	<b>(F)OV/N95</b>	Short OV service for vapor at 10X OEL
<b>Grain dust (oat, wheat, barley)</b>		<b>4 mg/m<sup>3</sup>* (respirable)</b>		<b>N95</b>	
<b>Graphite (natural)</b>		<b>2.5 mg/m<sup>3</sup>* (respirable)</b>	Plumbago, Potelot, Corbo minerals, Black lead, Silver lead	<b>N95</b>	
<b>Graphite (synthetic)</b>		<b>2 mg/m<sup>3</sup>* (respirable)</b>		<b>N95</b>	
<b>Gypsum</b>			(See Calcium sulfate)		
<b>Hafnium and compounds (as Hf)</b>		<b>0.5 mg/m<sup>3</sup></b>		<b>N95</b>	

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Halothane</b>		33	<b>50</b>	2-Bromo-2-chloro-1,1,1-trifluoroethane	<b>OV</b>	3M 3510 Monitor
<b>Heptane</b>	5000	9.77	<b>400*</b>	Normal heptane, n-Heptane	<b>OV</b>	3M 3510 Monitor
<b>2-Heptanone</b>				(See Methyl n-amyl ketone)		
<b>3-Heptanone</b>				(See Ethyl butyl ketone)		
<b>Hexachlorobenzene</b>		0.463 mg/m <sup>3</sup>	<b>0.002 mg/m<sup>3</sup>-skin-</b>	Perchlorobenzene	<b>N95</b>	
<b>Hexachlorobutadiene</b>			<b>0.02 -skin-</b>	Hexachloro-1,3-butadiene; perchlorobutadiene	<b>(F)OV</b>	Warning unknown
<b>Hexachlorocyclopentadiene</b>		0.03	<b>0.01</b>		<b>(F)OV</b>	Poor warning
<b>Hexachloroethane</b>	300	0.15	<b>1 -skin-</b>	Perchloroethane	<b>OV/N95</b>	
<b>Hexachloronaphthalene</b>	2 mg/m <sup>3</sup>		<b>0.2 mg/m<sup>3</sup>-skin-</b>	Halowax™ 1014	<b>OV/N95</b>	See Comment D, page 7
<b>1,4-Hexadiene</b>			<b>10 (AIHAWHEEL)</b>		<b>OV</b>	Warning unknown
<b>Hexafluoroacetone</b>			<b>0.1 -skin-</b>	1,1,1,3,3,3-Hexafluoro-2-propanone	<b>SA</b>	Warning unknown. Short OV service life.

<b>1,1,1,3,3,3-Hexafluoropropane</b>			<b>1000</b> <b>(AIHAWHEEL)</b>	HFC-236 fa; FC-236 fa; hydrofluorocarbon 236 fa; FE-13	<b>SA</b>	Ineffective sorbents
<b>Hexamethylenediamine</b>		~0.0032 mg/m <sup>3</sup>	<b>5 mg/m<sup>3</sup></b> <b>(AIHAWHEEL)</b>	1,6-Hexanediamine; 1,6-Diaminohexane; HMDA; HMD	<b>OV/N95</b>	See Comment D, page 7
<b>Hexamethylene diisocyanate</b>		0.01	<b>0.005</b>	HDI; HMDI	<b>OV/N95</b>	Poor warning
<b>Hexane (n-Hexane)</b>	5000	21.9	<b>50*</b> <b>-skin-</b>	Hexyl hydride, Normal hexane	<b>OV</b>	3M 3510 Monitor
<b>Hexane (other isomers)</b>		65-248	<b>500</b>		<b>OV</b>	3M 3510 Monitor
<b>Hexanediol diacrylate</b>			<b>1 mg/m<sup>3</sup></b> <b>(AIHAWHEEL)</b>	HDODA; Propenoic acid, 1,6-hexanediol ester	<b>OV/P95</b>	See Comment D, page 7
<b>2-Hexanone</b>				(See Methyl n-butyl ketone)		
<b>1-Hexene</b>			<b>30</b>	Butyl ethylene; Hexene; Hex-1-ene; Hexene-n-1; Hexylene	<b>OV</b>	Warning unknown
<b>Hexone</b>				(See Methyl isobutyl ketone)		
<b>sec-Hexyl acetate</b>	4000	0.219	<b>50</b>	1,3-Dimethylbutyl acetate; Methylamyl acetate; Methylisoamyl acetate; Methylisobutyl carbinol	<b>(F)OV</b>	See Comment E, page 8
<b>Hexylene glycol</b>		49.9	<b>25</b> <b>(ceiling)</b>	4-Methyl-2,4-pentanediol	<b>(F)OV</b>	Irritation also provides warning

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>HFE-7100</b>			<b>750 (AIHAWHEEL)</b>	Mixture of 1-Methoxy-1,1,2,2,3,3,4,4,4-nonafluorobutane (40%) and 1-Methoxy-2-Trifluoromethyl-1,1,2,3,3,3-hexafluoropropane (60%); Mixture of 1-Methoxyperfluorobutane (40%) and 1-Methoxyperfluoroisobutane (60%)	<b>OV</b>	Warning unknown
<b>Hydrazine</b>	80	3.6	<b>0.01* -skin-</b>	Anhydrous hydrazine	<b>SA(F)</b>	Poor warning
<b>Hydrogenated terphenyls</b>			<b>0.5</b>		<b>R or P95</b>	
<b>Hydrogen bromide</b>	50	1.99	<b>3 (ceiling)</b>	Hydrobromic acid, HBr	<b>AG</b>	Not specifically approved for HBr
<b>Hydrogen chloride</b>	100	6.31	<b>5 (ceiling)</b>	Hydrochloric acid, HCl, Muriatic acid	<b>AG</b>	Irritation also provides warning
<b>Hydrogen cyanide</b>	50	0.603	<b>4.7* (ceiling) -skin-</b>	Hydrocyanic acid, Prussic acid	<b>SA(F)</b>	10X OEL maximum. Low IDLH.
<b>Hydrogen fluoride</b>	30	0.036	<b>3 (ceiling)</b>	Anhydrofluoric acid, HF	<b>(F)HF</b>	10X OEL maximum. Low IDLH.
<b>Hydrogen peroxide</b>	75		<b>1</b>	Peroxide, Hydrogen dioxide	<b>SA(F)</b>	Warning unknown. Unknown sorbent effectiveness.

<b>Hydrogen selenide (as Se)</b>	2	0.3	<b>0.05</b>	Selenium hydride	<b>(F)MG</b>	Poor warning
<b>Hydrogen sulfide</b>	300	0.0005	<b>10*</b>	Sulfuretted hydrogen, H <sub>2</sub> S, Hydrosulfuric acid, Hepatic gas	<b>SA AG-escape only</b>	Poor warning (olfactory fatigue)
<b>Hydroquinone</b>			<b>2 mg/m<sup>3</sup></b>	Quinol; Dihydroxybenzene; 1,4-Benzenediol	<b>(F)OV/N95</b>	See Comment D, page 7
<b>4-Hydroxy-4-methyl-2-pentanone</b>				(See Diacetone alcohol)		
<b>2-Hydroxypropyl acrylate</b>			<b>0.5 -skin-</b>	HPA	<b>OV</b>	Warning unknown
<b>Indene</b>		0.009	<b>10</b>	Indonaphthene	<b>OV</b>	
<b>Indium and compounds (as In)</b>			<b>0.1 mg/m<sup>3</sup></b>		<b>N95</b>	
<b>Iodine</b>	10		<b>0.1 (ceiling)</b>		<b>(F)MG</b>	Warning unknown
<b>Iodoform</b>		0.000019-1.1	<b>0.6</b>	Triiodomethane	<b>(F)OV</b>	Questionable warning
<b>Iron oxide, dust and fume (as Fe)</b>			<b>5 mg/m<sup>3*</sup></b>	Ferric oxide fume	<b>N95</b>	
<b>Iron pentacarbonyl (as Fe)</b>			<b>0.1</b>	Iron carbonyl	<b>SA</b>	Warning unknown. Unknown sorbent effectiveness.

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Iron salts, soluble (as Fe)			1 mg/m <sup>3</sup>	Ferrous sulfate and chloride; Ferric chloride, nitrate and sulfate	N95	
Isoamyl acetate		0.004		(See Pentyl acetate)		
Isoamyl alcohol	10,000	0.045	100	3-Methyl-1-butanol, Isobutyl carbinol, Isopentyl alcohol, Fusel oil	(F)OV	See Comment E, page 8
Isobutyl acetate	7500	0.479	150	2-Methylpropyl acetate	(F)OV	
Isobutyl alcohol	8000	0.832	50*	Isobutanol, IBA, 2-Methyl-1-propanol, Isopropylcarbinol	(F)OV	3M 3510 Monitor
Isocyanuric acid			10 mg/m <sup>3</sup> (total) (AIHAWHEEL) 5 mg/m <sup>3</sup> (respirable) (AIHAWHEEL)	Cyanuric acid, s-Triazinetriol, s-Triazine-2,4,6(1H,3H,5H)-trione	N95	AM/N95 may be preferable, if wet
Isooctyl alcohol			50 -skin-	Isooctanol	OV	Warning unknown
Isophorone	800	0.631	5* (ceiling)	3,5,5-Trimethyl-2-cyclohexene-1-one	OV	See Comment E, page 8. 3M 3510 Monitor.
Isophorone diisocyanate			0.005	IPDI	OV/N95	Warning unknown

<b>Isophthalic acid</b>			<b>5 mg/m<sup>3</sup> (respirable) (AIHAWHEEL)</b>	1,3-Dicarboxylic acid; m-Phthalic acid; IA; IPA	<b>N95</b>	
<b>Isoprene</b>			<b>50 (AIHAWHEEL)</b>	2-Methyl-1,3-butadiene	<b>OV</b>	Warning unknown
<b>Isopropoxyethanol</b>		0.738	<b>25 -skin-</b>	IPE, Isopropyl glycol, Ethylene glycol monoisopropyl ether, Isopropyl Cellosolve®	<b>OV</b>	
<b>Isopropyl acetate</b>	16,000	2.4	<b>250</b>	Isopropyl ester of acetic acid, sec-Propyl acetate	<b>(F)OV</b>	3M 3510 Monitor
<b>Isopropyl alcohol</b>	12,000	0.442	<b>400</b>	Isopropanol, IPA, 2-Propanol, sec-Propyl alcohol	<b>(F)OV</b>	Irritation also provides warning. 3M 3530 Monitor.
<b>Isopropylamine</b>	4000	0.6	<b>5</b>	Monoisopropylamine, 2-Aminopropane	<b>(F)AM (F)OV</b>	AM not specifically approved
<b>N-Isopropylaniline</b>			<b>2 -skin-</b>	o-Isopropylaniline, o-Amino-isopropylbenzene	<b>OV</b>	Warning unknown
<b>Isopropyl ether</b>	10,000	0.055	<b>250*</b>	Diisopropyl ether	<b>OV</b>	
<b>Isopropyl glycidyl ether</b>	1000	297	<b>50</b>	Isopropoxymethyl-oxiran; 1,2-Epoxy-3-isopropoxy-propane; Isopropyl epoxypropyl ether; IGE	<b>(F)OV</b>	Poor warning
<b>Kaolin</b>			<b>2 mg/m<sup>3</sup> (respirable)</b>	China clay, Aluminum silicate	<b>N95</b>	

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Ketene</b>			<b>0.5</b>	Carbomethene, Ethenone	<b>SA(F)</b>	Warning unknown. Ineffective sorbents.
<b>Lacquer thinner</b>				(See specific ingredients)		
<b>Lead, elemental and inorganic compounds (as Pb)</b>	700 mg/m <sup>3</sup>		<b>0.05 mg/m<sup>3</sup></b>		<b>N100</b>	
<b>Lead arsenate (as As)</b>			<b>0.01 mg/m<sup>3</sup> (PEL)</b>		<b>N100</b>	
<b>Lead chromate (as Cr)</b>			<b>0.012 mg/m<sup>3</sup>*</b>	Chrome orange, Red lead chromate	<b>N100</b>	
<b>Limestone</b>				(See Calcium carbonate)		
<b>d-Limonene</b>		0.437	<b>30 (AIHAWHEEL)</b>	1-methyl-4(1-methylethenyl) cyclohexene; 4-isopropyl-1-methylcyclohexene; p-mentha-1,8-diene; Cinene; Cajeputene	<b>OV</b>	
<b>Lithium fluoride (as F)</b>			<b>2.5 mg/m<sup>3</sup></b>		<b>N95</b>	
<b>Lithium hydride</b>	55 mg/m <sup>3</sup>		<b>0.025 mg/m<sup>3</sup></b>		<b>N95</b>	
<b>Lithium hydroxide</b>			<b>1 mg/m<sup>3</sup> (ceiling) (AIHAWHEEL)</b>	Lithium hydroxide monohydrate	<b>N95</b>	

<b>Lithium oxide</b>		<b>1 mg/m<sup>3</sup> (ceiling) (AIHAWHEEL)</b>	Dilithium oxide, Lithium monoxide	<b>N95</b>	
<b>LPG</b>	19,000	<b>1000</b>	Liquefied petroleum gas, Bottled gas	<b>SA</b>	Warning unknown. Mixture with compounds with short OV service life.
<b>Magnesite</b>		<b>10 mg/m<sup>3*</sup></b>	Magnesium carbonate	<b>N95</b>	
<b>Magnesium oxide fume</b>		<b>10 mg/m<sup>3*</sup></b>	Magnesia fume	<b>N95</b>	
<b>Maleic anhydride</b>	0.318	<b>0.1</b>		<b>(F)OV/N95</b>	Poor warning
<b>Manganese, elemental and inorganic compounds (as Mn)</b>		<b>0.2 mg/m<sup>3*</sup></b>		<b>N95</b>	
<b>Manganese cyclopentadienyl tricarbonyl</b>		<b>0.1 mg/m<sup>3</sup> -skin-</b>	MCT	<b>SA</b>	Properties of vapor unknown
<b>Marble</b>			(See Calcium carbonate)		
<b>Melamine</b>		<b>10 mg/m<sup>3</sup> (inhalable) (AIHAWHEEL)</b>	1,3,5-Triazine-2,4,6-triamine; 2,4,6-Triamino-1,3,5-Triazine, Cyanuramide	<b>N95</b>	
		<b>5 mg/m<sup>3</sup> (respirable) (AIHAWHEEL)</b>		<b>N95</b>	

\* TLV is lower than PEL.



NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>2-Mercaptobenzo-thiazole</b>		12 mg/m <sup>3</sup>	<b>5 mg/m<sup>3</sup> -skin- (AIHAWHEEL)</b>	Mercaptobenzothiazole; 2(3H)-Benzothiazolyl mercaptan; Benzothiazole-2-thione	<b>N95</b>	
<b>Mercaptoethanol</b>		0.639	<b>0.2 -skin- (AIHAWHEEL)</b>	2-Mercaptoethanol, 2ME, 1-Hydroxy-2-mercaptoethane, 2-Hydroxy-1-ethanethiol, 2-Hydroxyethylmercaptan, 2 Thioethanol, Thioethyleneglycol, Thioglycol	<b>OV</b>	Poor warning
<b>Mercury (as Hg)</b>						
<b>–Vapor</b>	28 mg/m <sup>3</sup>		<b>0.025 mg/m<sup>3</sup>* -skin-</b>	Quicksilver, Hg	<b>Hg</b>	
<b>–Alkyl compounds</b>	10 mg/m <sup>3</sup>		<b>0.01 mg/m<sup>3</sup> -skin-</b>		<b>SA</b>	
<b>–Aryl compounds</b>	28 mg/m <sup>3</sup>		<b>0.1 mg/m<sup>3</sup> (PEL) (ceiling) -skin-</b>		<b>N95</b>	Dust with essentially no vapor pressure only
<b>–Inorganic compounds</b>	28 mg/m <sup>3</sup>		<b>0.025 mg/m<sup>3</sup>*</b>		<b>N95</b>	Dust with essentially no vapor pressure only. Hg/N95 for volatile liquids.

<b>Mesityl oxide</b>	5000	0.056	<b>15*</b>	Isobutenyl methyl ketone, Methyl isobutenyl ketone, Isopropylidene acetone	<b>(F)OV</b>	3M 3510 Monitor
<b>Methacrylic acid</b>			<b>20 -skin-</b>	a-Methacrylic acid	<b>(F)OV</b>	Warning unknown
<b>Methanethiol</b>				(See Methyl mercaptan)		
<b>2-Methoxyethanol</b>	2000	0.11	<b>5* -skin-</b>	Ethylene glycol monomethyl ether, Methyl Cellosolve®	<b>OV</b>	3M 3510 Monitor
<b>2-Methoxyethyl acetate</b>	4000	1.07	<b>5* -skin-</b>	Ethylene glycol methyl ether acetate, Ethylene glycol monomethyl ether acetate, Methyl Cellosolve® acetate	<b>OV</b>	3M 3510 Monitor
<b>4-Methoxyphenol</b>			<b>5 mg/m<sup>3</sup></b>	p-Methoxyphenol, Hydroquinone monomethyl ether	<b>N95</b>	
<b>3-Methoxypropyl amine</b>		2.7	<b>5 (AIHAWHEEL)</b>	1-Propanimine, 3-Methoxy	<b>(F)OV (F)AM</b>	Irritation also provides warning. AM not specifically approved.
<b>Methyl acetate</b>	10,000	6.17	<b>200</b>	Acetic acid, methyl ester; Methyl acetic ester; Methyl ethanoate	<b>OV</b>	
<b>Methyl acetylene</b>	15,000		<b>1000</b>	Propyne, Allylene	<b>SA</b>	Warning unknown. Very short OV service life.

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Methyl acetylene propadiene mixture</b>	15,000	100	<b>1000</b>	MAPP gas, Methyl acetylene-allene mixture, Propyne-allene mixture	<b>SA</b>	Very short OV service life
<b>Methyl acrylate</b>	1000	0.263	<b>2 -skin-</b>	Methyl propenoate	<b>(F)OV</b>	3M 3510 Monitor
<b>Methylacrylonitrile</b>		6.8	<b>1 -skin-</b>	2-Methyl-2-propenenitrile, Isoprene cyanide	<b>SA</b>	Poor warning
<b>Methylal</b>	15,000		<b>1000</b>	Dimethoxymethane, Methyl formal, Formal, Dimethylacetal formaldehyde	<b>SA</b>	Warning unknown
<b>Methyl alcohol</b>	25,000	141	<b>200 -skin-</b>	Methanol, Wood alcohol, Carbinol	<b>SA</b>	Very short OV service life
<b>Methylamine</b>	100	0.019	<b>5*</b>	Monomethylamine	<b>(F)AM</b>	
<b>Methyl amyl alcohol</b>	2000	1.1	<b>25 -skin-</b>	Methyl isobutyl carbinol	<b>OV</b>	
<b>Methyl n-amyl ketone</b>	4000	0.141	<b>50*</b>	n-Amyl methyl ketone, 2-Heptanone	<b>OV</b>	See Comment E, page 8
<b>Methylaniline</b>	100	1.74	<b>0.5* -skin-</b>	Monomethyl aniline, MA, N-Methyl aniline	<b>OV</b>	Poor warning
<b>Methyl bromide</b>	2000		<b>1* -skin-</b>	Bromomethane	<b>SA(F)</b>	Warning unknown. Very short OV service life.

<b>2-Methylbutyl acetate</b>				(See Pentyl acetate)		
<b>Methyl n-butyl ketone</b>	5000	0.166	<b>5*</b> <b>-skin-</b>	2-Hexanone, MBK	<b>OV</b>	3M 3510 Monitor
<b>Methyl Cellosolve®</b>				(See 2-Methoxyethanol)		
<b>Methyl Cellosolve® acetate</b>				(See 2-Methoxyethyl acetate)		
<b>Methyl chloride</b>	10,000	10.2	<b>50*</b> <b>-skin-</b>	Chloromethane	<b>SA</b>	Very short OV service life
<b>Methyl chloroform</b>	1000	22.4	<b>350</b>	1,1,1-Trichloroethane	<b>OV</b>	3M 3510 Monitor
<b>Methyl 2-cyanoacrylate</b>		2.16	<b>0.2</b>	Mecrylate	<b>(F)OV</b>	Poor warning
<b>Methylcyclohexane</b>	10,000	500-630	<b>400*</b>	Cyclohexylmethane, Hexahydrotoluene	<b>OV</b>	Poor warning
<b>Methylcyclohexanol</b>	10,000	490	<b>50*</b>	Hexahydrocresols	<b>OV</b>	Poor warning
<b>o-Methylcyclohexanone</b>	2500		<b>50*</b> <b>-skin-</b>	2-Methylcyclohexanone	<b>(F)OV</b>	Irritation also provides warning
<b>2-Methylcyclopentadienyl manganese tricarbonyl (as Mn)</b>			<b>0.2 mg/m<sup>3</sup></b> <b>-skin-</b>		<b>OV/N95</b>	SA preferable if heat involved
<b>Methylenebisphenyl isocyanate</b>	9.7	0.384	<b>0.005*</b>	MDI; 4,4'-Diphenylmethane diisocyanate; Methylene-bis-(4-phenyl isocyanate)	<b>OV/N95</b>	Poor warning

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Methylene chloride</b>	5000	0.912	<b>25 (PEL)</b>	Dichloromethane, Methylene dichloride	<b>SA(F)</b>	OSHA requires SA(F); no change schedule allowed. Short OV service life. 3M 3530 Monitor.
<b>4,4'-Methylene-bis-(2-chloroaniline)</b>			<b>0.01 -skin-</b>	MOCA; DACPM; 4,4'-Methylene-bis-(2-chlorobenzamine)	<b>OV</b>	Warning unknown
<b>Methylene-bis-(4-cyclohexylisocyanate)</b>			<b>0.005</b>		<b>OV/N95</b>	Warning unknown
<b>4,4'-Methylene dianiline</b>			<b>0.01 (PEL) -skin-</b>	4,4'-Diaminodiphenylmethane; MDA	<b>N100</b>	Warning unknown. Use OV/N100 if heat is involved. See 29 CFR 1910.1050.
<b>Methyl ethyl ketone</b>	3000	0.27	<b>200</b>	MEK, 2-Butanone	<b>(F)OV</b>	3M 3510 Monitor
<b>Methyl ethyl ketone peroxide</b>			<b>0.2 (ceiling)</b>	MEKP	<b>(F)OV</b>	Warning unknown
<b>Methyl ethyl ketoxime</b>			<b>10 (AIHAWHEEL)</b>	2-Butanone oxime, MEKO	<b>OV</b>	Warning unknown
<b>Methyl formate</b>	5000	93.3	<b>100</b>	Methyl methanoate, Formic acid, Methyl ester	<b>SA</b>	Short OV service life
<b>5-Methyl-3-heptanone</b>				(See Ethyl amyl ketone)		

<b>Methyl hydrazine</b>	50	1.71	<b>0.01 -skin-</b>	Monomethyl hydrazine	<b>SA(F)</b>	Poor warning. Unknown sorbent effectiveness.
<b>Methyl iodide</b>	800		<b>2 -skin-</b>	Iodomethane	<b>SA(F)</b>	Warning unknown. Short OV service life.
<b>Methyl isoamyl ketone</b>		0.042	<b>50*</b>	5-Methyl-2-hexanone, 2-Methyl-5-hexanone, MIAK	<b>(F)OV</b>	
<b>Methyl isobutyl carbinol</b>				(See Methyl amyl alcohol)		
<b>Methyl isobutyl ketone</b>	3000	0.121	<b>50*</b>	MIBK, Hexone	<b>(F)OV</b>	3M 3510 Monitor
<b>Methyl isocyanate</b>	20	2.1	<b>0.02 -skin-</b>	Isocyanic acid, methyl ester	<b>SA</b>	Poor warning. Unknown sorbent effectiveness.
<b>Methyl isopropyl ketone</b>		4.47	<b>200</b>	MIPK, 3-Methyl-2-butanone	<b>(F)OV</b>	
<b>Methyl mercaptan</b>	400	0.001	<b>0.5*</b>	Methanethiol	<b>OV</b>	Very short OV service life
<b>Methyl methacrylate</b>	4000	0.085	<b>50</b>	Methacrylic acid, methyl ester	<b>OV</b>	3M 3510 Monitor
<b>Methyl propyl ketone</b>	5000	1.55	<b>200</b>	MPK, 2-Pentanone, Ethyl acetone	<b>(F)OV</b>	3M 3510 Monitor
<b>n-Methyl-2-pyrrolidone</b>			<b>10 -skin- (AIHAWHEEL)</b>	NMP; 1-Methyl-2-pyrrolidone; m-Pyrol; n-Methyl pyrrolidone	<b>OV</b>	Warning unknown
<b>Methyl silicate</b>			<b>1</b>	Tetramethoxy silane	<b>(F)OV</b>	Warning unknown

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>a-Methyl styrene</b>	5000	0.003	<b>50</b>	1-Methyl-1-phenyl-ethylene, AMS	<b>OV</b>	See Comment E, page 8. PEL-100 ppm ceiling.
<b>Methyl tert-butyl ether</b>		0.053	<b>40</b>	2-Methoxy-2-methyl-propane; tert-Butyl methyl ether; MTBE; 2,2-MMOP	<b>OV</b>	3M 3510 Monitor
<b>Methyltrichlorosilane</b>			<b>1 (ceiling) (AIHAWHEEL)</b>	Trichloromethylsilane	<b>(F)AG/N95</b>	Irritation provides warning
<b>Methyl vinyl ketone</b>		0.2	<b>0.2 (ceiling) -skin-</b>	Acetyl ethylene; 3-Buten-2-one; 3-Butene-2-one; Butenone; d(3)-2-Butenone; Methylene acetone; Methyl vinyl acetone; g-Oxo-a-Butylene	<b>OV</b>	
<b>Mica (less than 1% quartz)</b>			<b>3 mg/m<sup>3</sup>* (respirable)</b>		<b>N95</b>	
<b>Mineral spirits</b>				(See Stoddard solvent)		
<b>Mineral (rock), wool fiber</b>				(See Synthetic vitreous fibers—Glass, Rock or Slag wool fibers)		

<b>Molybdenum (as Mo)</b>						
–Soluble compounds						
(as respirable particulate)			<b>0.5 mg/m<sup>3</sup></b>			<b>N95</b>
–Insoluble compounds						
(as inhalable particulate)			<b>10 mg/m<sup>3</sup></b>			<b>N95</b>
(as respirable particulate)			<b>3 mg/m<sup>3</sup></b>			<b>N95</b>
<b>Monochloroacetic acid</b>	0.288mg/m <sup>3</sup>		<b>1 mg/m<sup>3</sup></b> <b>(AIHAWHEEL)</b>	MCA, MCAA, Chloroethanoic acid		<b>(F)OV/N95</b>
<b>Monochlorobenzene</b>				(See Chlorobenzene)		
<b>Monomethyl aniline</b>				(See Methyl aniline)		
<b>Monomethyl hydrazine</b>				(See Methyl hydrazine)		
<b>Morpholine</b>	8000	0.036	<b>20</b> <b>-skin-</b>	Tetrahydro-1,4-oxazine; Diethylenimide oxide		<b>(F)OV</b>
<b>Naphtha (coal tar)</b>	10,000		<b>100</b> <b>(PEL)</b>	Naphtha, Crude solvent coal tar naphtha, High solvent naphtha, Rubber solvent		<b>(F)OV</b> Odor variable. Irritation also provides warning.
<b>Naphthalene</b>	500	0.015	<b>10</b>	White tar, Naphthalin		<b>OV</b> 3M 3510 Monitor. See Comment E, page 8.
<b>Nickel (as Ni)</b>						
–Elemental/metal						
			<b>1.5 mg/m<sup>3</sup></b> <b>(inhalable)</b>			<b>N95</b>
–Insoluble compounds						
			<b>0.2 mg/m<sup>3</sup></b> <b>(inhalable)</b>			<b>N95</b>
–Soluble compounds						
			<b>0.1 mg/m<sup>3</sup></b> <b>(inhalable)</b>			<b>N95</b>

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Nickel carbonyl	7	0.5-3.0	0.001 (PEL)	Nickel tetracarbonyl	SA(F)	0.05 ppm TLV-TWA. Unknown sorbent effectiveness.
Nickel subsulfide			0.1 mg/m <sup>3</sup> (inhalable)		N95	
Nicotine	35 mg/m <sup>3</sup>		0.5 mg/m <sup>3</sup> -skin-	3-(1-Methyl-2-pyrrolidyl) pyridine	OV/P95	See Comment D, page 7
Nitric acid	100	0.267	2	Aqua fortis, White fuming nitric acid (WFNA), Red fuming nitric acid (RFNA), Hydrogen nitrate	SA(F)	Ineffective sorbents
Nitric oxide	100		25	Nitrogen monoxide, NO	SA	Ineffective sorbents
p-Nitroaniline	300 mg/m <sup>3</sup>		3 mg/m <sup>3</sup> * -skin-	Azoic diazo component 37, p-Aminonitro-benzene, Fast red GG base, 4-Nitroaniline, PNA	OV/N95	See Comment D, page 7
Nitrobenzene	200	0.044	1 -skin-	Nitrobenzol, Oil of mirbane	OV	
p-Nitrochlorobenzene	344		0.1* -skin-	PNCB, PCNB, 4-Chloronitrobenzene, p-Chloronitrobenzene, 1-Chloro-4-nitrobenzene	OV	Warning unknown
Nitroethane	1000	2.11	100		(F)OV	

<b>Nitrogen dioxide</b>	50	0.186	<b>3</b>	Nitrogen tetroxide, NTO, Dinitrogen tetroxide, Nitrogen peroxide	<b>SA</b>	Ineffective sorbents. PEL-5 ppm ceiling.
<b>Nitrogen trifluoride</b>	2000		<b>10</b>	Nitrogen fluoride	<b>SA</b>	Warning unknown. Unknown sorbent effectiveness.
<b>Nitroglycerin (NG)</b>	53		<b>0.05* -skin-</b>	Glyceryl trinitrate, Trinitroglycerin	<b>OV</b>	Warning unknown
<b>Nitromethane</b>	1000	3.5	<b>20</b>	Nitrocarbol	<b>OV</b>	
<b>1-Nitropropane</b>	2300	7.09	<b>25</b>		<b>OV</b>	
<b>2-Nitropropane</b>	2300	4.85	<b>10*</b>	sec-Nitropropane	<b>OV</b>	
<b>Nitrotoluene</b>	200	0.017	<b>2* -skin-</b>	Nitrotoluol	<b>OV/N95</b>	See Comment D, page 7
<b>Nitrotrichloromethane</b>				(See Chloropicrin)		
<b>Nitrous oxide</b>			<b>50</b>	Dinitrogen monoxide	<b>SA</b>	Warning unknown. ineffective sorbents.
<b>Nonane</b>		1.26	<b>200</b>	n-Nonane	<b>OV</b>	
<b>Nuisance particulates –Inhalable particulate –Respirable particulate</b>			<b>10 mg/m<sup>3</sup>* 3 mg/m<sup>3</sup>*</b>	Particulates not otherwise classified (PNOC)	<b>N95 N95</b>	This category includes many materials. For oils, an R or P95 filter/respirator is recommended.
<b>Octachloronaphthalene</b>			<b>0.1 mg/m<sup>3</sup> -skin-</b>	Halowax™ 1051	<b>OV/N95</b>	See Comment D, page 7

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Octane (all isomers)</b>	5000	5.75	<b>300*</b>	Normal octane; Isooctane	<b>OV</b>	3M 3510 Monitor
<b>1-Octanol</b>		0.006	<b>50 (AIHAWHEEL)</b>	Alcohol C-8, Capryl alcohol, Heptyl carbinol, n-Octanol, 1-Hydroxyoctane, N-Octyl alcohol	<b>OV</b>	
<b>1-Octene</b>		2	<b>75 (AIHAWHEEL)</b>	a-Octylene, a-Octene	<b>OV</b>	
<b>Oil mist (mineral)</b>			<b>5 mg/m<sup>3</sup></b>	White mineral oil, Cutting oil, Heat-treating oil, Hydraulic oil, Cable oil, Lubricating oil	<b>R or P95</b>	As sampled by method that does not collect vapor. 0.005 mg/m <sup>3</sup> TLV-TWA proposed for oils that contain PNAs.
<b>Osmium tetroxide (as Os)</b>	0.1	0.002	<b>0.0002*</b>	Osmic acid	<b>SA(F)</b>	Poor warning. Unknown sorbent effectiveness.
<b>Oxalic acid</b>	500 mg/m <sup>3</sup>		<b>1 mg/m<sup>3</sup></b>	Oxalic acid dihydrate, Ethane dioic acid	<b>OV/N95</b>	See Comment D, page 7
<b>p,p'-Oxybis(Benzene-sulfonyl hydrazide)</b>			<b>0.1 mg/m<sup>3</sup></b>	Benzenesulfonic acid, 4,4'-Oxybis-dihydrazide; OBSH; Diphenyl ether 4,4'-disulfohydrazide	<b>N95</b>	
<b>Oxygen difluoride</b>	0.5	0.098	<b>0.05 (ceiling)</b>	Difluorine monoxide, Fluorine monoxide	<b>SA</b>	Poor warning. Unknown sorbent effectiveness.

<b>Ozone</b>	10	0.051		Triatomic oxygen		
–Heavy work			<b>0.05</b>		<b>OZ</b>	6000 with 2078 or 2097 filters recommended by 3M for 10X OEL. Not NIOSH approved for ozone.
–Moderate work			<b>0.08</b>		<b>OZ</b>	
–Light work			<b>0.1</b>		<b>OZ</b>	
<b>Paraffin wax fume</b>			<b>2 mg/m<sup>3</sup></b>		<b>N95</b>	
<b>Particulate polycyclic aromatic hydrocarbons (PPAH)</b>				(See Coal tar pitch volatiles)		
<b>PCBs</b>				(See Chlorodiphenyl)		
<b>Pentaborane</b>	3	0.97	<b>0.005</b>	Stable pentaborane, Pentaboron nonahydride	<b>SA</b>	Poor warning. Unknown sorbent effectiveness.
<b>Pentachloronaphthalene</b>			<b>0.5 mg/m<sup>3</sup></b>	Halowax™ 1013	<b>OV/N95</b>	See Comment D, page 7
<b>Pentaerythritol</b>			<b>10 mg/m<sup>3</sup>*</b>	Tetramethylolmethane	<b>N95</b>	
<b>Pentaerythritol triacrylate</b>			<b>1 mg/m<sup>3</sup></b> <b>(AIHAWHEEL)</b>	PETA; 2-Propenoic acid, 2-(hydroxymethyl)-2-[[[(1-oxo-2-propenyl) oxy] methyl]-1,3-propanediylester	<b>OV/P95</b>	See Comment D, page 7
<b>1,1,1,2,2-Pentafluoroethane</b>			<b>1000</b> <b>(AIHAWHEEL)</b>	Pentafluoroethane; HFC-125; Fluorocarbon 125	<b>SA</b>	Ineffective sorbents
<b>Pentane, all isomers</b>	15,000	31.6	<b>600*</b>	Normal pentane	<b>OV</b>	
<b>2-Pentanone</b>				(See Methyl propyl ketone)		

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>1,1,1,3,3-Pentafluoropropane</b>			<b>300 (AIHAWHEEL)</b>	HFC-245fa, R-245fa, Genetron 245fa	<b>SA</b>	
<b>Pentyl acetate (all isomers)</b>	3000-9000 (depending on compound)		<b>50</b>	Isoamyl acetate, 1-pentanol acetate, 2-pentanol acetate, 3-Pentyl acetate, 2-Methylbutyl acetate, 1,1-Dimethylpropyl acetate	<b>OV</b>	See Coment E, page 8. 3M 3510 Monitor.
<b>Perchloroethylene</b>	500	6.17	<b>25*</b>	Tetrachloroethylene, Perk	<b>(F)OV</b>	
<b>Perchloromethyl mercaptan</b>	10	0.097	<b>0.1</b>	PMM, Trichloromethyl sulfur chloride	<b>OV</b>	
<b>Perchloryl fluoride</b>	385	11	<b>3</b>	Chlorine oxyfluoride	<b>SA</b>	Poor warning. Unknown sorbent effectiveness.
<b>Perfluoroisobutylene</b>			<b>0.01 (ceiling)</b>	Octafluoroisobutylene, Octafluoro-sec-butene, PFIB	<b>SA</b>	Warning unknown. Short OV service life.
<b>Perlite</b>			<b>10 mg/m<sup>3</sup>*</b>	Sodium potassium aluminum silicate	<b>N95</b>	
<b>Persulfates</b>						
-Ammonium			<b>0.1 mg/m<sup>3</sup></b>		<b>N95</b>	
-Potassium			<b>0.1 mg/m<sup>3</sup></b>		<b>(F)N95</b>	
-Sodium			<b>0.1 mg/m<sup>3</sup></b>		<b>(F)N95</b>	

**Pesticides**

(Call 3M at 1-800-243-4630)

<b>Petroleum distillates (naphtha)</b>	10,000		<b>500 (PEL)</b>	Petroleum naphtha, Aliphatic petroleum naphtha, Petroleum ether (95 to 115°C), Naphtha (See Gasoline, Stoddard solvent and VM&P Naphtha)	<b>OV</b>	Odor variable
<b>Phenacyl chloride</b>				(See a-Chloroacetophenone)		
<b>Phenol</b>	250	0.011	<b>5 -skin-</b>	Carbolic acid, Monohydroxy benzene	<b>OV/N95</b>	
<b>m-Phenylenediamine</b>			<b>0.1 mg/m<sup>3</sup></b>	1,3-Benzenediamine; m-Diaminobenzene	<b>OV/N95</b>	SA preferable if heat involved
<b>o-Phenylenediamine</b>			<b>0.1 mg/m<sup>3</sup></b>	1,2-Benzenediamine; o-Diaminobenzene; Orthamine	<b>OV/N95</b>	SA preferable if heat involved
<b>p-Phenylenediamine</b>			<b>0.1 mg/m<sup>3</sup> -skin-</b>	p-Diaminobenzene; 1,4-Diaminobenzene	<b>OV/N95</b>	SA preferable if heat involved
<b>Phenyl ether, vapor</b>		0.03	<b>1</b>	Diphenyl ether, Diphenyl oxide	<b>OV</b>	See Comment E, page 8. 3M 3510 Monitor.
<b>Phenyl ether-biphenyl mixture, vapor</b>		0.001-0.01	<b>1 (PEL)</b>	Dowtherm™ A, Diphenyl oxide-diphenyl mixture	<b>OV</b>	See Comment E, page 8
<b>Phenylethylene</b>				(See Styrene)		
<b>Phenyl glycidyl ether</b>			<b>0.1* -skin-</b>	Glycidyl phenyl ether; Phenyl epoxypropyl ether; 1,2-Epoxy-3-phenoxy propane; PGE	<b>OV</b>	Warning unknown
<b>Phenylhydrazine</b>	295		<b>0.1* -skin-</b>	Hydrazinobenzene	<b>(F)OV</b>	Warning unknown
<b>Phenyl mercaptan</b>		0.031	<b>0.5</b>	Benzenethiol, Thiophenol	<b>OV</b>	

\* TLV is lower than PEL.

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Phenylphosphine</b>			<b>0.05 (ceiling)</b>		<b>OV</b>	Warning unknown
<b>Phosgene</b>	2	0.55	<b>0.1</b>	Carbonyl chloride, Carbon oxochloride, Chloroformyl chloride	<b>MG</b>	Poor warning
<b>Phosphine</b>	200	0.14	<b>0.3</b>	Hydrogen phosphide, Phosphorus hydride, Phosphorated hydrogen	<b>SA</b>	Unknown sorbent effectiveness. Fumigant.
<b>Phosphoric acid</b>	10,000 mg/m <sup>3</sup>		<b>1 mg/m<sup>3</sup></b>	White phosphoric acid, o-phosphoric acid, m-phosphoric acid	<b>(F)N95</b>	N95 with appropriate eye and face protection also acceptable
<b>Phosphorus (yellow)</b>			<b>0.1 mg/m<sup>3</sup></b>	White phosphorus, WP	<b>SA</b>	If no phosphorus vapor or phosphine gas present, N95
<b>Phosphorus oxychloride</b>			<b>0.1</b>	Phosphoryl chloride	<b>(F)AG</b>	Warning unknown
<b>Phosphorus pentachloride</b>	200 mg/m <sup>3</sup>		<b>0.1*</b>	Phosphoric chloride	<b>AG</b>	Warning unknown
<b>Phosphorus pentasulfide</b>	750 mg/m <sup>3</sup>		<b>1 mg/m<sup>3</sup></b>	Phosphoric sulfide	<b>N95</b>	
<b>Phosphorus trichloride</b>	50		<b>0.2</b>	Phosphorus chloride	<b>(F)AG</b>	Warning unknown
<b>Phthalic anhydride</b>	1650	0.052	<b>1*</b>	PAN; 1,3-Isobenzofurandione	<b>OV/N95</b>	

<b>m-Phthalodinitrile</b>		<b>5 mg/m<sup>3</sup></b>	Isophthalodinitrile, IPN, m-Dicyanobenzene	<b>N95</b>	
<b>2-Picoline</b>	0.003	<b>2</b> <b>-skin-</b> <b>(AIHAWHEEL)</b>	a-Picoline, 2-Methyl-pyridine	<b>OV</b>	
<b>3-Picoline</b>		<b>2</b> <b>-skin-</b> <b>(AIHAWHEEL)</b>	b-Picoline, 3-Methyl-pyridine	<b>OV</b>	Warning unknown
<b>4-Picoline</b>		<b>2</b> <b>-skin-</b> <b>(AIHAWHEEL)</b>	g-Picoline, 4-Methyl-pyridine	<b>OV</b>	Warning unknown
<b>Picric acid</b>	0.0005 mg/m <sup>3</sup>	<b>0.1 mg/m<sup>3</sup></b> <b>-skin-</b>	2,4,6-Trinitrophenol, Lyddite, Pertite, Shimose, Melinite	<b>N95</b>	
<b>Piperazine dihydrochloride</b>		<b>5 mg/m<sup>3</sup></b>	Dihydrochloride salt of diethylenediamine	<b>N95</b>	
<b>Piperidine</b>	0.372	<b>1</b> <b>(AIHAWHEEL)</b>	Hexahydropyridine	<b>(F)OV</b>	
<b>Plaster of Paris</b>			(See Calcium sulfate)		
<b>Platinum (as Pt)</b>		<b>1 mg/m<sup>3</sup></b>		<b>N95</b>	
<b>-Metal</b>		<b>0.002 mg/m<sup>3</sup></b>		<b>(F)N95</b>	
<b>-Soluble salts</b>					
<b>Polychlorinated biphenyls</b>			(See Chlorodiphenyls)		
<b>Polyethylene glycols</b>		<b>10 mg/m<sup>3</sup></b> <b>(AIHAWHEEL)</b>	PEG, Polyoxyethylene, PGE	<b>R or P95</b>	See Comment G, page 9

\* TLV is lower than PEL.



NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Polypropylene glycols</b>			<b>10 mg/m<sup>3</sup> (AIHAWHEEL)</b>	PPG	<b>R or P95</b>	See Comment G, page 9
<b>Portland cement (less than 1% quartz)</b>			<b>10 mg/m<sup>3</sup>*</b>	Hydraulic cement, Cement, Portland cement silicate	<b>N95</b>	
<b>Potassium bromate</b>			<b>0.1 mg/m<sup>3</sup> (AIHAWHEEL)</b>	Bromic acid, Potassium salt	<b>N95</b>	
<b>Potassium hydroxide</b>			<b>2 mg/m<sup>3</sup> (ceiling)</b>	Caustic potash, Lye, Potassium hydrate	<b>N95</b>	
<b>Propane</b>	20,000	2690	<b>1,000 (PEL)</b>	Dimethyl methane	<b>SA</b>	Poor warning. Ineffective sorbents.
<b>Propargyl alcohol</b>		0.015	<b>1 -skin-</b>	2-Propyn-1-ol	<b>OV</b>	
<b>Propargyl bromide</b>		<2	<b>0.1 -skin- (AIHAWHEEL)</b>	Bromopropyne; Propyne, 3-bromo; 1-Bromo-2-propyne; 3-Bromopropyne, gamma-Bromoallylene	<b>OV</b>	Questionable warning properties
<b>2-Propenoic Acid, Isooctyl ester</b>		<1	<b>5 (AIHAWHEEL)</b>	Isooctyl acrylate; IOA	<b>OV</b>	
<b>B-Propiolactone</b>			<b>0.5</b>	Hydroacrylic acid, beta-lactone; 3-Hydroxypropionic acid; Propiolactone; 3-Hydroxy-beta-lactone; beta-Proprolactone; BPL	<b>(F)OV</b>	Warning unknown

<b>Propionic acid</b>		0.037	<b>10</b>	Methylacetic acid, Ethylformic acid	<b>(F)OV</b>	
<b>n-Propyl acetate</b>	8000	0.575	<b>200</b>	Propylacetate; Acetic acid, n-propyl ester	<b>(F)OV</b>	3M 3510 Monitor
<b>Propyl alcohol</b>	4000	2.4	<b>200 -skin-</b>	n-Propyl alcohol, 1-Propanol, Ethyl carbinol	<b>(F)OV</b>	See Comment E, page 8
<b>Propylene dichloride</b>	2000	0.851	<b>75</b>	1,2-Dichloropropane	<b>OV</b>	3M 3510 Monitor
<b>Propylene glycol –Vapor and aerosol</b>			<b>50 (AIHAWHEEL)</b>	1,2-Propanediol; 1,2-Dihydroxypropane; Methyl glycol	<b>OV/P95</b>	See Comment G, page 9
<b>–Aerosol only</b>			<b>10 mg/m<sup>3</sup> (AIHAWHEEL)</b>		<b>R or P95</b>	See Comment G, page 9
<b>Propylene glycol dinitrate</b>		0.231	<b>0.05 -skin-</b>	1,2-Propylene glycol dinitrate; 1,2-Propanediol dinitrate	<b>(F)OV</b>	Poor warning
<b>Propylene glycol monomethyl ether</b>		0.003	<b>100</b>	1-Methoxy-2-propanol	<b>OV</b>	3M 3510 Monitor
<b>Propylene glycol monomethyl ether acetate</b>			<b>100 (AIHAWHEEL)</b>	Glycol ether PM acetate, PGMEA, 1-Methoxy-2-propanol acetate	<b>OV</b>	Warning unknown. 3M 3510 Monitor.
<b>Propylene imine</b>	500		<b>2* -skin-</b>	2-Methylaziridine	<b>(F)OV</b>	Warning unknown
<b>Propylene oxide</b>	2000	33.1	<b>2</b>	1,2-Epoxypropane; Propene oxide; Methyloxirane; 2,3-Epoxypropane; 1,2-Propylene oxide	<b>OV</b>	Poor warning. 3M 3550 Monitor.
<b>n-Propyl nitrate</b>	2000	50	<b>25</b>	Nitric acid n-propylester	<b>OV</b>	Poor warning
<b>Propyne</b>				(See Methyl acetylene)		

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Pyridine</b>	3600	0.085	<b>5</b>	Azabenzene, Azine	<b>OV</b>	
<b>Pyrocatechol</b>				(See Catechol)		
<b>Quartz</b>				(See Silica, crystalline)		
<b>Quinoline</b>		0.015	<b>0.1 (AIHAWHEEL)</b>	Chinoline, Leukoline, 1-Benzazine, 1-Azana-phthalene, Lencol	<b>(F)OV</b>	
<b>Quinone</b>	66	0.012	<b>0.1</b>	p-Benzoquinone	<b>(F)OV/N95</b>	
<b>RDX</b>				(See Cyclonite)		
<b>Resorcinol</b>			<b>10</b>	m-Dihydroxybenzene; 1,3-Benzenediol	<b>N95</b>	OV/N95 may be preferable if heat is involved
<b>Rhodium (as Rh) –Metal</b>			<b>0.1 mg/m<sup>3</sup> (PEL)</b>		<b>N95</b>	
<b>–Insoluble compounds</b>			<b>0.1 mg/m<sup>3</sup> (PEL)</b>		<b>N95</b>	
<b>–Soluble compounds</b>			<b>0.001 mg/m<sup>3</sup> (PEL)</b>		<b>N95</b>	
<b>Rouge</b>			<b>10 mg/m<sup>3</sup>*</b>	Red iron oxide, Red oxide, Blended red oxides	<b>N95</b>	
<b>Rubber solvent</b>				(See Naphtha [coal tar])		

<b>Selenium and compounds (as Se)</b>		<b>0.2 mg/m<sup>3</sup></b>		<b>N95</b>
<b>Selenium hexafluoride</b>	5	<b>0.05</b>		<b>SA</b>
Warning unknown. Unknown sorbent effectiveness.				
<b>Silane</b>			(See Silicon tetrahydride)	
<b>Silica, amorphous</b>				
–Diatomaceous earth				
Inhalable particulate		<b>10 mg/m<sup>3</sup></b>	Diatomite, Silicon dioxide	<b>N95</b>
Respirable particulate		<b>3 mg/m<sup>3</sup>*</b>	(amorphous), Diatomaceous silica	<b>N95</b>
–Precipitated silica		<b>10 mg/m<sup>3</sup></b>		<b>N95</b>
–Silica, fume		<b>2 mg/m<sup>3</sup></b> (respirable)	By-product of electro-metallurgical processes	<b>N95</b>
–Silica, fused		<b>0.1 mg/m<sup>3</sup></b> (respirable)		<b>N95</b>
–Silica gel		<b>10 mg/m<sup>3</sup></b>		<b>N95</b>
<b>Silica, crystalline</b>				
–Cristobalite		<b>0.05 mg/m<sup>3</sup></b> (respirable)		<b>N95</b>
–Quartz		<b>0.05 mg/m<sup>3</sup></b> (respirable)		<b>N95</b>
–Tridymite		<b>0.05 mg/m<sup>3</sup></b> (respirable)		<b>N95</b>
–Tripoli		<b>0.1 mg/m<sup>3</sup></b> (respirable)		<b>N95</b>
<b>Silicon</b>		<b>10 mg/m<sup>3</sup>*</b>		<b>N95</b>

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Silicon carbide</b>			<b>10 mg/m<sup>3</sup>*</b>	Carbon silicide, Carborundum	<b>N95</b>	
<b>Silicon tetrahydride</b>			<b>5</b>	Silane	<b>SA</b>	Warning unknown
<b>Silver, metal and soluble compounds (as Ag)</b>			<b>0.01 mg/m<sup>3</sup> (PEL)</b>		<b>N95</b>	
<b>Soapstone</b>			<b>3 mg/m<sup>3</sup> (respirable)</b>	Massive talc, Steatite, Soapstone silicate	<b>N95</b>	
<b>Sodium azide</b> –as Sodium azide			<b>0.29 mg/m<sup>3</sup> (ceiling)</b>	Hydrazoic acid	<b>N95</b>	
–as Hydrazoic acid vapor			<b>0.11 (ceiling)</b>		<b>SA</b>	Warning unknown. Unknown sorbent effectiveness.
<b>Sodium bisulfite</b>			<b>5 mg/m<sup>3</sup></b>	Sodium hydrogen sulfite	<b>AG/N95</b>	N95 alone suitable if irritation eliminated
<b>Sodium fluoroacetate</b>	5 mg/m <sup>3</sup>		<b>0.05 mg/m<sup>3</sup> -skin-</b>	1080, Sodium monofluoroacetate, SFA	<b>N95</b>	
<b>Sodium hydroxide</b>	250 mg/m <sup>3</sup>		<b>2 mg/m<sup>3</sup> (ceiling)</b>	Caustic soda, Soda lye, Lye	<b>N95</b>	
<b>Sodium hypochlorite</b>			<b>2 mg/m<sup>3</sup> (AIHAWHEEL)</b>	Hypochlorous acid, sodium salt; Sodium oxychloride	<b>N95</b>	15 minute TWA
<b>Sodium metabisulfite</b>			<b>5 mg/m<sup>3</sup></b>	Sodium pyrosulfite	<b>AG/N95</b>	N95 alone suitable if irritation eliminated

<b>Starch</b>			<b>10 mg/m<sup>3</sup>*</b>	Corn starch	<b>N95</b>	
<b>Stearates</b>			<b>10 mg/m<sup>3</sup></b>	Aluminum stearate, Calcium stearate, Glyceryl stearate, Lithium stearate, Potassium stearate, Zinc stearate	<b>N95</b>	
<b>Stibine</b>	40		<b>0.1</b>	Hydrogen antimonide, Antimony trihydride	<b>SA</b>	Warning unknown. Unknown sorbent effectiveness.
<b>Stoddard solvent</b>	5150	1-30	<b>100*</b>	Dry cleaning safety solvent, Mineral spirits	<b>OV</b>	3M 3510 Monitor
<b>Strontium chromate (as Cr)</b>			<b>0.0005 mg/m<sup>3</sup></b>	Strontium yellow, C.I. pigment yellow 32	<b>N95</b>	
<b>Strychnine</b>	3 mg/m <sup>3</sup>		<b>0.15 mg/m<sup>3</sup></b>		<b>N95</b>	
<b>Styrene</b>	5000	3.44	<b>20*</b>	Phenylethylene, Vinyl benzene, Cinnamene, Styrene monomer	<b>OV</b>	3M 3510 Monitor
<b>Subtilisins</b>			<b>0.00006 mg/m<sup>3</sup> (ceiling)</b>	Proteolytic enzymes as 100% crystalline enzyme	<b>SA</b>	Difficult to measure 10X OEL. N95 acceptable with suitable air sampling data.
<b>Sucrose</b>			<b>10 mg/m<sup>3</sup>*</b>	Table sugar, Saccharose	<b>N95</b>	
<b>Sulfur dioxide</b>	100	0.708	<b>2*</b>	SO <sub>2</sub>	<b>AG</b>	Irritation and taste also provide warning

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Sulfur hexafluoride</b>			<b>1000</b>	SF <sub>6</sub>	<b>SA</b>	Warning unknown. Unknown sorbent effectiveness.
<b>Sulfuric acid</b>	80 mg/m <sup>3</sup>	0.15	<b>1 mg/m<sup>3</sup></b>	Oil of vitriol	<b>(F)N95</b>	N95 with appropriate eye protection acceptable if irritation prevented
<b>Sulfur monochloride</b>	10	0.001	<b>1 (ceiling)</b>	Sulfur chloride, Sulfur subchloride	<b>(F)AG</b>	
<b>Sulfur pentafluoride</b>	1		<b>0.01 (ceiling)</b>	Disulfur decafluoride	<b>AG</b>	Warning unknown
<b>Sulfur tetrafluoride</b>			<b>0.1 (ceiling)</b>		<b>AG</b>	Warning unknown
<b>Sulfuryl fluoride</b>	1000		<b>5</b>		<b>SA</b>	Warning unknown. Unknown sorbent effectiveness.

<b>Synthetic vitreous fibers</b>					
–Continuous filament glass fibers	1 f/cc			<b>N95</b>	
–Glass wool fibers	1 f/cc			<b>N95</b>	
–Refractory ceramic fibers	0.2 f/cc			<b>N95</b>	
–Rock wool fibers	1 f/cc			<b>N95</b>	
–Slag wool fibers	1 f/cc			<b>N95</b>	
–Special purpose glass fibers	1 f/cc			<b>N95</b>	
<b>Talc (containing no asbestos)</b>	<b>2 mg/m<sup>3*</sup> (respirable)</b>	Hydrous magnesium silicate, Steatite talc, Non-fibrous talc, Non-asbestiform talc		<b>N95</b>	
<b>Talc (containing asbestos)</b>		(See Asbestos)			
<b>Tantalum, metal and oxide dusts (as Ta)</b>	<b>5 mg/m<sup>3</sup></b>			<b>N95</b>	
<b>Tellurium and compounds (as Te)</b>	<b>0.1 mg/m<sup>3</sup></b>			<b>N95</b>	
<b>Tellurium hexafluoride (as Te)</b>	<b>0.02</b>			<b>SA</b>	Warning unknown. Unknown sorbent effectiveness.
<b>Terephthalic acid</b>	<b>10 mg/m<sup>3</sup></b>	p-Phthalic acid; TPA; Benzene-p-dicarboxylic acid; 1,4 Benzenedicarboxylic acids, Tephthol		<b>N95</b>	
<b>Terphenyls</b>	<b>0.5* (ceiling)</b>	o-Terphenyl, m-Terphenyl, p-Terphenyl, Mixed terphenyls, Diphenyl benzenes		<b>N95</b>	OV/N95 may be preferable if heat involved

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>1,1,1,2-Tetrachloro-2,2-difluoroethane</b>	15,000		<b>500</b>	Refrigerant 112a; Halocarbon 112a; 2,2-Difluoro-1, 1,1,2-tetrachloroethane; Freon™ 112a	<b>OV</b>	Warning unknown
<b>1,1,1,2-Tetrachloro-1,2-difluoroethane</b>	15,000		<b>500</b>	Refrigerant 112, Halocarbon 112, Freon™ 112	<b>OV</b>	Warning unknown
<b>1,1,1,2-Tetrachloroethane</b>	150	0.21	<b>1* -skin-</b>	Acetylene tetrachloride	<b>OV</b>	3M 3510 Monitor
<b>Tetrachloroethylene</b>				(See Perchloroethylene)		
<b>Tetrachloromethane</b>				(See Carbon tetrachloride)		
<b>Tetrachloronaphthalene</b>			<b>2 mg/m<sup>3</sup></b>	Halowax™, Seekay wax, Nibren wax	<b>OV/N95</b>	See Comment D, page 7
<b>2,3,5,6-Tetrachloropyridine</b>			<b>5 mg/m<sup>3</sup> (AIHAWHEEL)</b>	Pyridine, 2,3,5,6-tetrachloro	<b>OV/N95</b>	See Comment D, page 7
<b>Tetrachlorosilane</b>			<b>1 (ceiling) (AIHAWHEEL)</b>	Silicon tetrachloride, Silicon chloride	<b>AG/N95</b>	Warning unknown. Reacts rapidly with moisture yielding HCl and silica.
<b>Tetraethylene glycol diacrylate</b>			<b>1 mg/m<sup>3</sup> (AIHAWHEEL)</b>	TTEGDA; 2-Propionic acid, oxy-bis-(2,1-ethane-dioxy-2,1-ethanediol) ester	<b>OV/P95</b>	See Comment D, page 7

<b>Tetraethyl lead (as Pb)</b>	40 mg/m <sup>3</sup>		<b>0.075 mg/m<sup>3</sup> (PEL) -skin-</b>	TEL, Lead tetraethyl, Motor fuel anti-knock compound	<b>OV</b>	Warning unknown
<b>1,1,1,2-Tetrafluoroethane</b>			<b>1000 (AIHAWHEEL)</b>	Tetrafluoroethane, HFC134a, HFA134a, Fluorocarbon 134a	<b>SA</b>	Ineffective sorbents
<b>Tetrafluoroethylene</b>			<b>2</b>	Perfluoroethene; Perfluoroethylene; TFE Tetrafluoroethene; 1,1,2,2-Tetrafluoroethylene	<b>SA</b>	
<b>Tetrahydrofuran</b>	20,000	3.8	<b>200</b>	Diethylene oxide, Tetramethylene oxide, THF	<b>OV</b>	3M 3510 Monitor
<b>Tetrahydrofurfuryl alcohol</b>			<b>2 (AIHAWHEEL)</b>	Tetrahydro-2-furanmethanol; Tetrahydro-2-furancarbinol; Tetrahydro-2 furylmethanol	<b>OV</b>	Warning unknown
<b>Tetramethyl lead (as Pb)</b>	40 mg/m <sup>3</sup>		<b>0.075 mg/m<sup>3</sup> (PEL) -skin-</b>	TML, Lead tetramethyl, Motor fuel anti-knock compound	<b>OV</b>	Warning unknown
<b>Tetramethyl succinonitrile, vapor</b>	5		<b>0.5 -skin-</b>	TMSN	<b>OV</b>	Warning unknown
<b>Tetranitromethane</b>	5		<b>0.005*</b>	Tetan	<b>OV</b>	Warning unknown
<b>Tetrasodium pyrophosphate</b>			<b>5 mg/m<sup>3</sup></b>	Sodium pyrophosphate	<b>N95</b>	

\* TLV is lower than PEL.

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Tetryl</b>			<b>1.5 mg/m<sup>3</sup></b>	2,4,6-Trinitrophenyl-methylnitramine; N-Methyl-N-2,4,6-tetranitroaniline; Nitramine; Tetralite	<b>N95</b>	
<b>Thallium</b> –Elemental and soluble compounds (as Tl)	20 mg/m <sup>3</sup>		<b>0.1 mg/m<sup>3</sup></b> -skin-	Thallium acetate, Thallium carbonate, Thallium hydroxide, etc.	<b>N95</b>	
<b>4,4'-Thiobis(6-tert-butyl-m-cresol)</b>			<b>10 mg/m<sup>3*</sup></b>	4,4'-Thiobis(3-methyl-6-tert-butyl phenol)	<b>N95</b>	
<b>Thioglycolic acid</b>			<b>1</b> -skin-	Mercaptoacetic acid, Thioranic acid	<b>(F)OV</b>	Warning unknown
<b>Thionyl chloride</b>			<b>1</b> (ceiling)	Sulfurous oxychloride, Sulfur oxychloride	<b>(F)AG</b>	Warning unknown
<b>Tin (as Sn)</b> –Metal and inorganic compounds (except SnH <sub>4</sub> ) –Organic compounds	400 mg/m <sup>3</sup>		<b>2 mg/m<sup>3</sup></b>  <b>0.1 mg/m<sup>3</sup></b> -skin-		<b>N95</b>  <b>OV/N95</b>	  See Comment D, page 7
<b>Titanium dioxide</b>			<b>10 mg/m<sup>3*</sup></b>	Rutile, Anatase, Brookite	<b>N95</b>	

<b>Titanium tetrachloride</b>			<b>0.5 mg/m<sup>3</sup> (AIHAWHEEL)</b>	Titanium chloride	<b>AG/N95</b>	
<b>Toluene</b>	2000	0.16	<b>50* -skin-</b>	Toluol, Phenyl methane, Methyl benzene	<b>OV</b>	3M 3510 Monitor
<b>Toluene diamine</b>			<b>0.005 -skin- (AIHAWHEEL)</b>	Diaminotoluene; TDA; Tolyenediamine	<b>N95</b>	
<b>Toluene-2,4-diisocyanate</b>	10	2.14	<b>0.005*</b>	TDI; 2,4-Toluene diisocyanate	<b>OV/N95</b>	Poor warning
<b>p-Toluenesulfonyl chloride</b>			<b>5 mg/m<sup>3</sup> (ceiling) (AIHAWHEEL)</b>	4-Methyl-benzenesulfonyl chloride, Tosyl chloride	<b>(F)OV/AG/N95</b>	See Comment D, page 7. HCl and p-toluene sulfuric acid produced by hydrolysis.
<b>m-Toluidine</b>		0.46-5.9	<b>2 -skin-</b>	m-Aminotoluene	<b>(F)OV</b>	Questionable warning
<b>o-Toluidine</b>	100	0.025-6.6	<b>2* -skin-</b>	o-Aminotoluene; o-Methylaniline; 1-Methyl-1,2-amino-benzene; 2-Methylaniline	<b>(F)OV</b>	Questionable warning
<b>p-Toluidine</b>		0.027-3.2	<b>2 -skin-</b>	p-Aminotoluene	<b>(F)OV</b>	Questionable warning
<b>Tributyl phosphate</b>	125		<b>0.2*</b>	Tri-n-butyl phosphate, TBP	<b>OV/P95</b>	

\* TLV is lower than PEL.

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Trichloroacetic acid		0.295	1	TCA	OV/AG	Irritation also provides warning
1,2,4-Trichlorobenzene		2.91	5 (ceiling)		OV	
1,1,1-Trichloroethane				(See Methyl chloroform)		
1,1,2-Trichloroethane	500		10 -skin-	Vinyl trichloride, b-Trichloroethane	(F)OV	Warning unknown. 3M 3510 Monitor.
Trichloroethylene	1000	1.36	50*	Ethylene trichloride, Triclene™	OV	3M 3510 Monitor
Trichlorofluoromethane	10,000	16.3	1000 (ceiling)	FC-11, Freon™ 11, Fluorotrichloromethane, Trichloromonofluoromethane	SA	Short OV service life
Trichloronaphthalene			5 mg/m <sup>3</sup> -skin-	Halowax™, Seekay wax, Nibren wax	OV/N95	See Comment D, page 7
Trichloronitromethane				(See Chloropicrin)		
1,2,3-Trichloropropane	1000	100	10* -skin-	Allyl trichloride, Glycerol trichlorohydrin, Glycerin trichlorohydrin, Trichlorohydrin	(F)OV	Poor warning
Trichlorosilane			0.5 (ceiling)	Silicochloroform	(F)AG	Warning unknown

<b>1,1,2-Trichloro-1,2,2-trifluoroethane</b>	4500	487	<b>1000</b>	Halocarbon 113, Refrigerant 113, TTE, Freon™ 113, FC-113	<b>SA</b>	Short OV service life. 3M 3530 Monitor.
<b>Tridymite</b>				(See Silica, crystalline)		
<b>Triethanolamine</b>			<b>5 mg/m<sup>3</sup></b>	Daltogen; 2,2',2"-Nitrilo-triethanol; Sterolamide; TEA; Trihydroxytriethylamine	<b>OV/P95</b>	Warning unknown. See Comment D, page 7.
<b>Triethoxysilane</b>			<b>0.05 (AIHAWHEEL)</b>	Silane, triethoxy	<b>SA(F)</b>	Unknown sorbent effectiveness
<b>Triethylamine</b>	1000	0.309	<b>1* -skin-</b>		<b>(F)AM (F)OV</b>	AM not specifically approved
<b>Triethylene glycol diacrylate</b>			<b>1 mg/m<sup>3</sup> (AIHAWHEEL)</b>	TREGDA; 2-Propenoic acid, 2-ethanediyl-bis-(oxy-2,1-ethanediyl) ester	<b>OV/P95</b>	
<b>Triethylenetetramine</b>			<b>1 -skin-</b>	N,N'-bis(2-aminoethyl)-1,2,ethane diamine; 1,4,7,10-Tetraazadecane; 1,8-diamino-3,6-diazaoctane; 3,6-diazaoctane-1,8-diamine; Trientine; TETA; TECZA	<b>OV</b>	See Comment E, page 8. R or P filter, if filter is required.
<b>Trifluorobromomethane</b>	50,000	16.3	<b>1000</b>	Halon™ 1301, Halocarbon 13B1, Refrigerant 13B1, Bromotrifluoromethane, Freon™ 13B1	<b>SA</b>	Short OV service life
<b>1,1,1-Trifluoro-2,2-dichloroethane</b>			<b>50</b>	HCFC-123; FC-123; Hydrofluorocarbon 123	<b>SA</b>	Short OV service life

\* TLV is lower than PEL.

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
1,1,1-Trifluoroethane			1000 (AIHAWHEEL)	HFC-143a; FC-143a; Hydrofluorocarbon 143a	SA	Ineffective sorbents
2,2,2-Trifluoroethanol			0.3 (AIHAWHEEL)	Ethanol, 2,2,2-Trifluoro; 2,2,2-Trifluoroethyl alcohol; TFE	SA	Warning unknown. Ineffective sorbent.
1,3,5-Triglycidyl-s-triazinetrione			0.05 mg/m <sup>3</sup>	Araldite PT-810; TEPIC; 1,3,5-Triazine-2,4,6-(1H,3H,5H)-trione	N95	
Trimellitic anhydride			0.04 mg/m <sup>3</sup> (ceiling)	TMA	OV/N95	Chemical manufacturer's recommendation. See Comment D, page 7.
Trimethoxysilane			0.05 (AIHAWHEEL)		(F)OV	Warning unknown
Trimethylamine		0.001	5*	N,N-Dimethyl methanamine; TMA	(F)AM	AM not specifically approved
Trimethyl benzene		2.4	25	Mesitylene, Pseudocumene, Hemimellitene	OV	3M 3510 Monitor
Trimethylchlorosilane			5 (ceiling) (AIHAWHEEL)	Chlorotrimethylsilane; trimethylchloro silicane; monochlorotrimethylsilicon	(F)OV/AG	

Trimethyl phosphite	0.001	2	Phosphorus acid trimethylester, Methyl phosphite	(F)OV	
Trimethylolpropane triacrylate		1 mg/m <sup>3</sup> (AIHAWHEEL)	2-Propenoic acid, 2-ethyl-2(((1-oxo-2-propenyl) oxy) methyl)-1,3-propanediyl ester	OV/P95	
Trimethylolpropane trimethacrylate		1 mg/m <sup>3</sup> (AIHAWHEEL)	Acrylic acid, triester w/2-ethyl 2 (hydroxymethyl) 1,3 propanediol	OV/P95	
2,4,6-Trinitrophenol			(See Picric acid)		
2,4,6-Trinitrotoluene (TNT)	1000 mg/m <sup>3</sup>	0.1 mg/m <sup>3</sup> * -skin-	TNT, Trinitrotoluol, Trinitrotoluene, sym-Trinitrotoluene	OV/N95	See Comment D, page 7
Triorthocresyl phosphate	40 mg/m <sup>3</sup>	0.1 mg/m <sup>3</sup> -skin-	o-Tritolyl phosphate, TCP, TOCP tricresylphosphate	R or P95	
Triphenyl amine		5 mg/m <sup>3</sup>		N95	
Triphenyl phosphate	1000 mg/m <sup>3</sup>	3 mg/m <sup>3</sup>	Phenyl phosphate, TPP	N95	OV/N95 preferable if heat involved
Tripoli			(See Silica, crystalline)		
Trisodium phosphate		5 mg/m <sup>3</sup> (AIHAWHEEL)	TSP, Sodium o-phosphate	(F)N95	N95 acceptable with appropriate eye/face protection. 15 min TWA.
Tungsten (as W)					
–Insoluble compounds		5 mg/m <sup>3</sup>		N95	
–Soluble compounds		1 mg/m <sup>3</sup>		N95	

\* TLV is lower than PEL.



NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
<b>Turpentine (wood)</b>	1500	50-200	<b>100</b>	Gumspirits, Turps, Wood turpentine, Gum turpentine	<b>(F)OV</b>	See Comment E, page 8
<b>Uranium (as U)</b>						
<b>-Insoluble compounds</b>	30 mg/m <sup>3</sup>		<b>0.05 mg/m<sup>3</sup> (PEL)</b>		<b>N95</b>	See 10 CFR 20 Subpart H
<b>-Soluble compounds</b>	20 mg/m <sup>3</sup>		<b>0.05 mg/m<sup>3</sup> (PEL)</b>		<b>AG/N95</b>	Halides
					<b>N95</b>	Other
<b>Urea</b>			<b>10 mg/m<sup>3</sup> (AIHAWHEEL)</b>	Carbamide, Carbonyldiamide, Carbonyldiamine, isourea	<b>N95</b>	AM/N95 may be preferable if heat is involved
<b>n-Valeraldehyde</b>		0.006	<b>50</b>	Pentanal, Valeric aldehyde	<b>(F)OV</b>	
<b>Vanadium pentoxide, respirable dust or fume (as V<sub>2</sub>O<sub>5</sub>)</b>	70 mg/m <sup>3</sup>		<b>0.05 mg/m<sup>3</sup>* (respirable)</b>	Vanadic anhydride, Vanadium oxide	<b>N95</b>	
<b>Vegetable oil, mists</b>			<b>10 mg/m<sup>3</sup>*</b>		<b>R or P95</b>	
<b>Vinyl acetate</b>		0.603	<b>10</b>	1-Acetoxyethylene, Ethenyl acetate	<b>(F)OV</b>	3M 3510 Monitor
<b>Vinyl benzene</b>				(See Styrene)		
<b>Vinyl bromide</b>			<b>0.5</b>	Bromoethylene	<b>SA(F)</b>	Warning unknown. Short OV service life.

<b>Vinyl chloride</b>	0.253	<b>1 (PEL)</b>	Chloroethylene, Chloroethene, Monochloroethylene, VC, Vinyl chloride monomer, VCM	<b>SA</b>	OSHA allows OV for very short use periods. See 29 CFR 1910.1017.	
<b>Vinyl cyanide</b>			(See Acrylonitrile)			
<b>4-Vinylcyclohexene</b>		<b>0.1</b>	4-Vinyl-1-cyclohexene; 4-Vinylcyclohexene-1-butadiene dimer; 4-Ethenyl-1-1-cyclohexene; 1-Vinylcyclohexene-3,4-vinylcyclohex-1-ene; VCH	<b>OV</b>	Warning unknown	
<b>Vinyl cyclohexene dioxide</b>		<b>0.1 -skin-</b>	Vinylcyclohexane dioxide, Vinylhexane dioxide	<b>(F)OV</b>	Warning unknown	
<b>Vinyl fluoride</b>		<b>1</b>	Fluoroethene, Fluoroethylene, Monofluoroethylene	<b>SA</b>	Warning unknown. Short service life.	
<b>Vinylidene chloride</b>	35.5	<b>1 (PEL)</b>	1,1-Dichloroethylene; VDC	<b>OV</b>	Poor warning	
<b>Vinylidene fluoride</b>		<b>500</b>	1,1-Difluoroethene; 1,1-Difluoroethylene; Ethene, 1,1-difluoro; Ethylene, 1,1-difluoro; Halocarbon 1132A; VDF; Vinylidene difluoride	<b>SA</b>	Warning unknown. Ineffective sorbents.	
<b>Vinyl toluene</b>	5000	10	<b>50*</b>	Methylstyrene, Tolyethylene	<b>(F)OV</b>	See Comment E, page 8. 3M 3510 Monitor.

\* TLV is lower than PEL.

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
VM & P Naphtha		1-40	300	Varnish Makers' & Painters' Naphtha, Ligroin	(F)OV	3M 3510 Monitor
Welding fumes (not otherwise classified)			5 mg/m <sup>3</sup>		N95	
Wood, dust –Certain hard woods as beech and oak			1 mg/m <sup>3</sup> *		N95	
–Soft woods			5 mg/m <sup>3</sup>		N95	
Xylene (o-, m-, and p-isomers)	1000	0.851 0.324 0.49	100	1,2-Dimethyl-benzene; 1,3-Dimethyl-benzene; 1,4-Dimethyl-benzene	OV	3M 3510 Monitor
m-Xylene a,a'-diamine			0.1 mg/m <sup>3</sup> (ceiling) -skin-	MXDA	OV/N95	See Comment D, page 7
Xylidine	150	0.005- 0.06	0.5* -skin-	Aminodimethyl benzene, Aminoxylene dimethylaniline, Dimethylaminobenzene	OV	
Yttrium, metal and compounds (as Y)			1 mg/m <sup>3</sup>	Specific compound	N95	
Zinc chloride, fume	4800 mg/m <sup>3</sup>		1 mg/m <sup>3</sup>		N95	

<b>Zinc chromate (as Cr)</b>		<b>0.01 mg/m<sup>3*</sup></b>	Basic zinc chromate, Zinc potassium chromate, Zinc yellow	<b>N95</b>
<b>Zinc oxide</b>				
–Dust	2500 mg/m <sup>3</sup>	<b>10 mg/m<sup>3*</sup></b>	Calamine, Chinese white, Zinc white	<b>N95</b>
–Fume	2500 mg/m <sup>3</sup>	<b>5 mg/m<sup>3</sup></b>		<b>N95</b>
<b>Zinc stearate</b>		<b>10 mg/m<sup>3*</sup></b>	Synpro stearate, Zinc distearate, Dermarone	<b>N95</b>
<b>Zirconium and compounds (as Zr)</b>	500 mg/m <sup>3</sup>	<b>5 mg/m<sup>3</sup></b>		<b>N95</b>

\* TLV is lower than PEL.

## 3M™ Software Library

3M offers the only software library that helps you choose the right respirator and comply with respiratory protection and hearing conservation regulations.

### 3M™ Select Software®

- Helps you select the most appropriate respirator for the job.
- Just point and click to select the appropriate respirator.
- You'll know which respirator to use in a variety of different environments.
- Analyze combinations of over 600 different contaminants in varying concentrations.

### 3M™ Respirator Compliance Software

- Helps you develop and manage your respiratory protection program.
- Eliminates the guesswork. Helps you develop a complete respiratory protection program that complies with the latest regulations.

- Alerts you when fit testing, training sessions, exposure assessments and medical updates are due.
- Choose from General industry, Automotive aftermarket or Construction versions.

### 3M™ Hearing Compliance Software

- Helps you develop and manage your hearing conservation program.
- Helps you develop a customized program manual.
- Organizes record keeping.
- Provides extensive reporting capability.
- Integrates with 3M™ Respirator Compliance Software.

### PC System Requirements:

**Computer:** Minimum 486 IBM PC or fully compatible, CD-ROM drive required to install software on hard drive. VGA graphics or compatible adapter. 15 MB required on hard drive for each program.

**Operating System:** Windows® 3.1, Windows® 98, Windows NT™, or Windows® for Workgroups.

**Memory:** 16 MB RAM memory and a minimum of an additional 16 MB virtual memory.

### 3M™ Service Life Software

3M's Service Life Software helps calculate end of service life for 3M organic vapor respirator cartridges based on workplace conditions such as contaminant concentration, temperature, work rate and atmospheric pressure.

3M™ Service Life Software can be accessed at the 3M web site:

**[www.3M.com/occsafety](http://www.3M.com/occsafety)**.

*Sample these products through our on-line demonstration on the Internet.* Visit: [www.3M.com/ohesdemo](http://www.3M.com/ohesdemo)

## 3M™ Select Software®

3MSelect Software® helps you choose the proper respirator for different hazardous environments.

<b>3M Select Software®</b>	
<b>Features</b>	<b>Benefits</b>
Simple to use	Just point and click, then follow the prompts to select an appropriate respirator. Interactive user's manual is on-line.
Accurate	Knowing the contaminants and their concentrations, the program leads you to an appropriate respirator recommendation.
Explains the solution	Helps you understand the selection process.
Combines contaminant reference information from a variety of resources	Includes IDLH, exposure limit, odor threshold, molecular weight and more. No need to acquire and wrestle with a pile of documents. Saves time.
Uses health hazard data to calculate proper solutions when multiple contaminants are present	Analyzes combinations of over 600 different contaminants in varying concentrations.
Traceable audit reports	OSHA requires an audit trail. View or print the audit trail based on the contaminants and concentrations you've selected.

## 3M™ Respirator Compliance Software Helps Manage Respiratory Protection

3M Respirator Compliance Software helps you develop and manage your respiratory protection program.

<b>Compliance Software</b>	
<b>Features</b>	<b>Benefits</b>
Includes 42 CFR 84 approved products and incorporates changes to the OSHA 1910.134 Respiratory Protection Standard	Eliminates research and legwork. Helps you comply with the latest regulations.
Simple to use	Three main sections: Workplace Records, Standard Operating Procedures and Respiratory Protection Program requirements. The Windows® based program is menu-driven – just point and click. Interactive user's manual is on-line.
Helps you comply with OSHA or CSA regulations.	Helps you develop a customized written respiratory protection program that meets OSHA or CSA regulations.
Automates record-keeping	Alerts you when fit testing, training sessions, medical updates and exposure assessments are due.
Prepares you for an audit	Just push a button! Print selected audit materials, or an entire program for auditors, employees or administrators to review.
Customized versions available for different industries	Choose from General industry, Automotive aftermarket or Construction versions.
Integrates with 3M Hearing Compliance Software	Allows you to monitor both respiratory protection and hearing conservation programs from one package.
Works on a LAN	Your employees can work from various locations.

## 3M™ Hearing Compliance Software

3M Hearing Compliance Software helps you develop and manage your hearing conservation program.

<b>3M Hearing Compliance Software</b>	
<b>Features</b>	<b>Benefits</b>
Helps you develop a customized program manual	Helps ensure that your program complies with OSHA regulations.
Organizes record-keeping	Tracks audiogram dates, standard threshold shifts, personal and area exposure assessments and training records.
Provides extensive reporting capability	Alerts you when tasks are coming due. Allows you to view the status of records by locations, people or types of record. Prepares you for an audit.
Integrates with 3M Respirator Compliance Software	Allows you to monitor both respiratory protection and hearing conservation programs from one package.
Imports employee names	No need to type in employee names and numbers. Just load them in from existing programs.



## 3M™ Respiratory Protection Training Courses

3M offers two unique training courses that provide information for effectively operating a respiratory protection program. The courses are unique among those offered by respirator manufacturers in that they are based on the technical and regulatory aspects of a sound respirator program, rather than specific products. In fact, a large equipment display from a number of respirator manufacturers is used to supplement the classroom and workshop presentations.

**Respiratory Protection** is a comprehensive 4½ day course intended for anyone who manages all or part of a respiratory protection program. All respirator types and each element of a respirator program are thoroughly discussed. Workshop sessions are used extensively to reinforce the course material.

**Current Topics in Respiratory Protection** is a 2 day course designed to provide the latest in technical and regulatory information to experienced program managers.

The 2002/2003 schedule of course dates and locations is listed to the right. For more information or to enroll, please do one of the following:

- Phone 1-800-659-0151, ext. 275
- Visit our Web site at [www.3M.com/occsafety/html/fschedule.html](http://www.3M.com/occsafety/html/fschedule.html) and follow the prompts.
- Dial the 3M Fax On Demand system at 1-800-646-1655, request document #2023

### **Respiratory Protection – 2002 Schedule/Locations**

January 28 - February 1 . . . . .	San Diego, CA
February 25 - March 1 . . . . .	Houston, TX
April 8-12 . . . . .	Phoenix, AZ
July 15-19 . . . . .	Minneapolis, MN
September 9-13 . . . . .	Seattle, WA
October 7-11 . . . . .	Denver, CO

### **Respiratory Protection – 2003 Schedule/Locations**

January 20-24. . . . .	Phoenix, AZ
February 24-28. . . . .	San Diego, CA
March 31 - April 4 . . . . .	New Orleans, LA
July 14-18 . . . . .	Minneapolis, MN
September 8-12 . . . . .	Portland, OR
October 20-24 . . . . .	Charleston, SC

### **Current Topics in Respiratory Protection – 2002 Schedule/Location**

July 22-23 . . . . .	Minneapolis, MN
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Use this card to request a copy of the next 3M Respirator Selection Guide.

3M reserves the right to limit the number of updates issued.

## 3M Respirator Selection Guide

*Please complete fully and return to request a Respirator Selection Guide update.*

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Company size - Number of Employees

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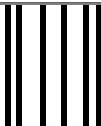
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The 3M™ Health & Safety Software Library helps manage respiratory protection and hearing conservation programs. See the back pages for details, call 1-800-896-4223, or visit [www.3M.com/occsafety/html/software.html](http://www.3M.com/occsafety/html/software.html)

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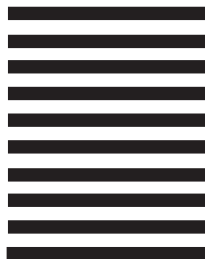
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# Respirator Codes & Descriptions

For use with the Chemical Compound Guide (beginning on page 15)

Respirator Code	Description
N95	Half Facepiece N95 Particulate Filter
(F)N95	Full Facepiece with N95 Particulate Filter
P95	Half Facepiece P95 Particulate Filter
(F)P95	Full Facepiece with P95 Particulate Filter
P100	Half Facepiece P100 Particulate Filter
(F)P100	Full Facepiece with P100 Particulate Filter
OV	Half Facepiece Organic Vapor
OV/N95	Half Facepiece Organic Vapor & N95 Particulate Filter
OV/P95	Half Facepiece Organic Vapor & P95 Particulate Filter
OV/P100	Half Facepiece Organic Vapor & P100 Particulate Filter
(F)OV	Full Facepiece with Organic Vapor
(F)OV/N95	Full Facepiece with Organic Vapor & N95 Particulate Filter
(F)OV/P95	Full Facepiece with Organic Vapor & P95 Particulate Filter
(F)OV/P100	Full Facepiece with Organic Vapor & P100 Particulate Filter
AG	Half Facepiece Acid Gas
AG/N95	Half Facepiece Acid Gas & N95 Particulate Filter
AG/P95	Half Facepiece Acid Gas & P95 Particulate Filter
AG/P100	Half Facepiece Acid Gas & P100 Particulate Filter
(F)AG	Full Facepiece with Acid Gas
(F)AG/N95	Full Facepiece with Acid Gas & N95 Particulate Filter
(F)AG/P95	Full Facepiece with Acid Gas & P95 Particulate Filter
(F)AG/P100	Full Facepiece with Acid Gas & P100 Particulate Filter
OV/AG	Half Facepiece Organic Vapor/Acid Gas
OV/AG/N95	Half Facepiece Organic Vapor/Acid Gas & N95 Particulate Filter
OV/AG/P95	Half Facepiece Organic Vapor/Acid Gas & P95 Particulate Filter
OV/AG/P100	Half Facepiece Organic Vapor/Acid Gas & P100 Particulate Filter
(F)OV/AG	Full Facepiece with Organic Vapor/Acid Gas
(F)OV/AG/N95	Full Facepiece with Organic Vapor/Acid Gas & N95 Particulate Filter
(F)OV/AG/P95	Full Facepiece with Organic Vapor/Acid Gas & P95 Particulate Filter
(F)OV/AG/P100	Full Facepiece with Organic Vapor/Acid Gas & P100 Particulate Filter
AM	Half Facepiece Ammonia/Methylamine
AM/N95	Half Facepiece Ammonia/Methylamine & N95 Particulate Filter
AM/P95	Half Facepiece Ammonia/Methylamine & P95 Particulate Filter
AM/P100	Half Facepiece Ammonia/Methylamine & P100 Particulate Filter

Respirator Code	Description
FORM	Half Facepiece Formaldehyde
FORM/N95	Half Facepiece Formaldehyde & N95 Particulate Filter
FORM/P95	Half Facepiece Formaldehyde & P95 Particulate Filter
FORM/P100	Half Facepiece Formaldehyde & P100 Particulate Filter
(F)FORM	Full Facepiece with Formaldehyde
(F)FORM/N95	Full Facepiece with Formaldehyde & N95 Particulate Filter
(F)FORM/P95	Full Facepiece with Formaldehyde & P95 Particulate Filter
(F)FORM/P100	Full Facepiece with Formaldehyde & P100 Particulate Filter
HF	Half Facepiece Hydrogen Fluoride
HF/P95	Half Facepiece Hydrogen Fluoride & P95 Particulate Filter
(F)HF	Full Facepiece with Hydrogen Fluoride
(F)HF/P95	Full Facepiece with Hydrogen Fluoride & P95 Particulate Filter
HG	Half Facepiece Mercury Vapor or Chlorine Gas
HG/N95	Half Facepiece Mercury Vapor or Chlorine Gas & N95 Particulate Filter
HG/P95	Half Facepiece Mercury Vapor or Chlorine Gas & P95 Particulate Filter
HG/P100	Half Facepiece Mercury Vapor or Chlorine Gas & P100 Particulate Filter
(F)HG	Full Facepiece Mercury Vapor or Chlorine Gas
(F)HG/N95	Full Facepiece Mercury Vapor or Chlorine Gas & N95 Particulate Filter
(F)HG/P95	Full Facepiece Mercury Vapor or Chlorine Gas & P95 Particulate Filter
(F)HG/P100	Full Facepiece Mercury Vapor or Chlorine Gas & P100 Particulate Filter
MG	Half Facepiece Multi-Gas/Vapor
MG/N95	Half Facepiece Multi-Gas/Vapor & N95 Particulate Filter
MG/P95	Half Facepiece Multi-Gas/Vapor & P95 Particulate Filter
MG/P100	Half Facepiece Multi-Gas/Vapor & P100 Particulate Filter
(F)MG	Full Facepiece with Multi-Gas/Vapor
(F)MG/N95	Full Facepiece with Multi-Gas/Vapor & N95 Particulate Filter
(F)MG/P95	Full Facepiece with Multi-Gas/Vapor & P95 Particulate Filter
(F)MG/P100	Full Facepiece with Multi-Gas/Vapor & P100 Particulate Filter
OZ	Ozone
(F)OZ	Full Facepiece with Ozone
SA	Supplied Air Respirator with Half Facepiece
SA(F)	Supplied Air Respirator with Full Facepiece, Hood or Helmet
SCBA	Self-Contained Breathing Apparatus

Data for this guide compiled  
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Always refer to latest TLV Guide and OSHA standards  
for possible changes and rulings.

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# 3M

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