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Michael E. Barsan
(Technical Editor)

INTRODUCTION

The NIOSH Pocket Guide to Chemical Hazards provides a concise source of general industrial hygiene information for workers, employers, and occupational health professionals. The Pocket Guide presents key information and data in abbreviated tabular form for 677 chemicals or substance groups commonly found in the work environment (e.g., manganese compounds, tellurium compounds, inorganic tin compounds, etc.). The industrial hygiene information found in the Pocket Guide assists users to recognize and control occupational chemical hazards. The chemicals or substances contained in this revision include all substances for which the National Institute for Occupational Safety and Health (NIOSH) has recommended exposure limits (RELs) and those with permissible exposure limits (PELs) as found in the Occupational Safety and Health Administration (OSHA) Occupational Safety and Health Standards (29 CFR 1910.1000 – 1052).

Background

In 1974, NIOSH (which is responsible for recommending health and safety standards) joined OSHA (whose jurisdictions include promulgation and enforcement activities) in developing a series of occupational health standards for substances with existing PELs. This joint effort was labeled the Standards Completion Program and involved the cooperative efforts of several contractors and personnel from various divisions within NIOSH and OSHA. The Standards Completion Program developed 380 substance-specific draft standards with supporting documentation that contained technical information and recommendations needed for the promulgation of new occupational health regulations. The Pocket Guide was developed to make the technical information in those draft standards more conveniently available to workers, employers, and occupational health professionals. The Pocket Guide is updated periodically to reflect new data regarding the toxicity of various substances and any changes in exposure standards or recommendations. (For the most current information and updates, consult the electronic version on the NIOSH Web site: http://www.cdc.gov/niosh/npg/npg.html.)

Data Collection and Application

The data collected for this revision were derived from a variety of sources, including NIOSH policy documents such as Criteria Documents and Current Intelligence Bulletins (CIBs), and recognized references in the fields of industrial hygiene, occupational medicine, toxicology, and analytical chemistry.

NIOSH RECOMMENDATIONS

Acting under the authority of the Occupational Safety and Health Act of 1970 (29 USC Chapter 15) and the Federal Mine Safety and Health Act of 1977 (30 USC Chapter 22), NIOSH develops and periodically revises recommended exposure limits (RELs) for hazardous substances or conditions in the workplace. NIOSH also recommends appropriate preventive measures to reduce or eliminate the adverse health and safety effects of these

hazards. To formulate these recommendations, NIOSH evaluates all known and available medical, biological, engineering, chemical, trade, and other information relevant to the hazard. These recommendations are then published and transmitted to OSHA and the Mine Safety and Health Administration (MSHA) for use in promulgating legal standards.

NIOSH recommendations are published in a variety of documents. Criteria documents recommend workplace exposure limits and appropriate preventive measures to reduce or eliminate adverse health effects and accidental injuries.

Current Intelligence Bulletins (CIBs) are issued to disseminate new scientific information about occupational hazards. A CIB may draw attention to a formerly unrecognized hazard, report new data on a known hazard, or present information on hazard control.

Alerts, Special Hazard Reviews, Occupational Hazard Assessments, and Technical Guidelines support and complement the criteria and standard development activities of the Institute. Their purpose is to assess the safety and health problems associated with a given agent or hazard (e.g., the potential for injury or for carcinogenic, mutagenic, or teratogenic effects) and to recommend appropriate control and surveillance methods. Although these documents are not intended to supplant these more comprehensive criteria documents, they

http://www.cdc.gov/niosh/docs/2005-100). The Documentation for Immediately Dangerous to Life or Health Concentrations (NTIS Publication Number PB-94-195047) further describes these criteria and provides information sources for both the original and revised IDLH values (http://www.cdc.gov/niosh/idlh/idlh-1.html). NIOSH currently is assessing the various uses of IDLHs, whether the criteria used to derive the IDLH values are valid, and if other information or criteria should be utilized.

The purpose for establishing an IDLH value in the Standards Completion Program was to determine the airborne concentration from which a worker could escape without injury or irreversible health effects from an IDLH exposure in the event of the failure of respiratory protection equipment. The IDLH was considered a maximum concentration above which only a highly reliable breathing apparatus providing maximum worker protection should be permitted. In determining IDLH values, NIOSH considered the ability of a worker to escape without loss of life or irreversible health effects along with certain transient effects, such as severe eye or respiratory irritation, disorientation, and incoordination, which could prevent escape. As a safety margin, IDLH values are based on effects that might occur as a consequence of a 30-minute exposure. However, the 30-minute period was NOT meant to imply that workers should stay in the work environment any longer than necessary; in fact, EVERY EFFORT SHOULD BE MADE TO EXIT IMMEDIATELY!

The NIOSH Respirator Selection Logic defines IDLH exposure conditions as "conditions that pose an immediate threat to life or health, or conditions that pose an immediate threat of severe exposure to contaminants, such as radioactive materials, which are likely to have adverse cumulative or delayed effects on health." The purpose of establishing an IDLH exposure concentration is to ensure that the worker can escape from a given contaminated environment in the event of failure of the respiratory protection equipment. The Respirator Selection Logic uses IDLH values as one of several respirator selection criteria. Under the Respirator Selection Logic, the most protective respirators (e.g., a self-contained breathing apparatus equipped with a full facepiece and operated in a pressure-demand or other positive-pressure mode) would be selected for firefighting, exposure to carcinogens, entry into oxygen-deficient atmospheres, in emergency situations, during entry into an atmosphere that contains a substance at a concentration greater than 2,000 times the NIOSH REL or OSHA PEL, and for entry into IDLH atmospheres. IDLH values are listed in the Pocket Guide for over 380 substances.

The notation "Ca" appears in the IDLH field for all substances that NIOSH considers potential occupational carcinogens. However, IDLH values that were originally determined in the Standards Completion Program or were subsequently revised are shown in brackets following the "Ca" designations. "10% LEL" indicates that the IDLH was based on 10% of the lower explosive limit for safety considerations even though the relevant toxicological data indicated that irreversible health effects or impairment of escape existed only at higher concentrations. "N.D." indicates that an IDLH value has not been determined for that substance. Appendix F (page 361) contains an explanation of the "Effective" IDLHs used for four chloronaphthalene compounds.

Conversion Factors

This section lists factors for the conversion of ppm (parts of vapor or gas per million parts of contaminated air by volume) to mg/m^3 (milligrams of vapor or gas per cubic meter of contaminated air) at 25°C and 1 atmosphere for chemicals with exposure limits expressed in ppm.

DOT ID and Guide Number

This section lists the U.S. Department of Transportation (DOT) Identification numbers and the corresponding Guide numbers. Their format is xxxx yyy. The Identification (ID) number (xxxx) indicates that the chemical is regulated by DOT. The Guide number (yyy) refers to actions to be taken to stabilize an emergency situation; this information can be found in the 2004 Emergency Response Guidebook (Office of Hazardous Materials Initiatives and Training [DHM-50], Research and Special Programs Administration, U.S. Department of Transportation, 400 7th Street, S.W., Washington, D.C. 20590-0001; for sale by the U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954). This information is also available on the CD-ROM and Web site versions of the Pocket Guide (http://www.cdc.gov/niosh/npg/npg.html). A page index for all DOT ID numbers listed is provided on page 379 to help the user locate a specific substance; please note however, that many DOT numbers are not unique for a specific substance.

Synonyms and Trade Names

This section contains an alphabetical list of common synonyms and trade names for each chemical. A page index for all chemical names, synonyms, and trade names listed in the Pocket Guide is included on page 383.

Exposure Limits

The NIOSH recommended exposure limits (RELs) are listed first in this section. For NIOSH RELs, "TWA" indicates a time-weighted average concentration for up to a 10-hour workday during a 40-hour workweek. A short-term exposure limit (STEL) is designated by "ST

UEL.....Upper explosive (flammable) limit in air, % by volume (at room temperature*)

LEL.....Lower explosive (flammable) limit in air, % by volume (at room temperature*)

MEC.....Minimum explosive concentration, g/m^3 (when available)

*If noted after a specific entry, these properties may be reported at other temperatures.

When available, the flammability/combustibility of a substance is listed at the bottom of the chemical and physical properties section. The following OSHA criteria (29 CFR 1910.106) were used to classify flammable or combustible liquids:

Class IA flammable liquid..... Fl.P below 73°F and BP below 100°F.
Class IB flammable liquid..... Fl.P below 73°F and BP at or above 100°F.
Class IC flammable liquid..... Fl.P at or above 73°F and below 100°F.
Class II combustible liquid..... Fl.P at or above 100°F and below 140°F.
Class IIIA combustible liquid..... Fl.P at or above 140°F and below 200°F.
Class IIIB combustible liquid..... Fl.P at or above 200°F.

Personal Protection and Sanitation

This section presents a summary of recommended practices for each substance. These recommendations supplement general work practices (e.g., no eating, drinking, or smoking where chemicals are used) and should be followed if additional controls are needed after using all feasible process, equipment, and task controls. Table 2 (page xviii) explains the codes used. Each category is described as follows:

SKIN..... Recommends the need for personal protective clothing.
EYES..... Recommends the need for eye protection.
WASH SKIN..... Recommends when workers should wash the spilled chemical from the body in addition to normal washing (e.g., before eating).
REMOVE.....Advises workers when to remove clothing that has accidentally become wet or significantly contaminated.
CHANGE.....Recommends whether routine changing of clothing is needed.
PROVIDE..... Recommends the need for eyewash fountains and/or quick drench facilities.

Recommendations for Respirator Selection

This section provides a condensed table of allowable respirators to be used for those substances for which IDLH values have been determined, or for which NIOSH has previously provided respirator recommendations (e.g., in criteria documents or Current Intelligence Bulletins) for certain chemicals. There are, however, 186 chemicals listed in

the Pocket Guide for which IDLH values have yet to be determined. Since the IDLH is a critical component for completing the Respirator Selection Logic for a given chemical, the Pocket Guide does not provide respiratory recommendations for those 186 chemicals without IDLH values. As new or revised IDLH values are developed for those and other chemicals, NIOSH will provide appropriate respirator recommendations. (Updated information on the Pocket Guide can be found on the NIOSH Web site (http://www.cdc.gov/niosh/npg/npg.html) and incorporated into subsequent editions of the Pocket Guide. [Appendix F (page 361) contains an explanation of the "Effective" IDLHs used for four chloronaphthalene compounds.]

In 1995, NIOSH developed a new set of regulations in 42 CFR 84 (also referred to as "Part 84") for testing and certifying non-powered, air-purifying, particulate-filter respirators. The new Part 84 respirators have passed a more demanding certification test than the old respirators (e.g., dust; dust and mist; dust, mist, and fume; spray paint; pesticide) certified under 30 CFR 11 (also referred to as "Part 11"). Recommendations for non-powered, air-purifying particulate respirators have been updated from previous editions of the Pocket Guide to incorporate Part 84 respirators; Part 11 terminology has been removed. See Table 4 (page xxv) for information concerning the selection of N-, R-, or P-series (Part 84) particulate respirators.

In January 1998, OSHA revised its respiratory protection standard (29 CFR 1910.134). Among the provisions in the revised standard is the requirement for an end-of-service-life indicator (ESLI) or a change schedule when air-purifying respirators with chemical cartridges or canisters are used for protection against gases and vapors [29 CFR 1910.134(d)(3)(iii)]. (Note: All respirator codes containing "*Ccr*" or "*Ov*" are covered by this requirement.) In the Pocket Guide, air-purifying respirators (without ESLIs) for protection against gases and vapors are recommended only for chemicals with adequate warning properties, but how these respirators may be selected regardless of the warning properties. Respirator recommendations in the Pocket Guide have not been revised in this edition to reflect the OSHA requirements for ESLIs or change schedules.

Appendix A (page 342) lists the NIOSH carcinogen policy. Respirator recommendations for carcinogens in the Pocket Guide have not been revised to reflect this policy; these recommendations will be revised in future editions.

The first line in the entry indicates whether the "NIOSH" or the "OSHA" exposure limit is used on which to base the respirator recommendations. The more protective limit between the NIOSH REL or the OSHA PEL is always used. "NIOSH/OSHA" indicates that the limits are equivalent.

Each subsequent line lists a maximum use concentration (MUC) followed by the classes of respirators that are acceptable for use up to the MUC. Codes for the various categories of respirators, and Assigned Protection Factors (APFs) for these respirators, are listed in Table 3 (page xx). Individual respirator classes are separated by diagonal lines ("/"). More protective respirators may be worn. The symbol "SCBA" is followed by the classes of respirators that are acceptable for emergency or planned entry into unknown concentrations or entry into IDLH conditions. "Escape" indicates that the respirators are to be used only

for escape purposes. For each MUC or condition, this entry lists only those respirators with the required APF and other use restrictions based on the NIOSH Respirator Selection Logic.

All respirators selected must be approved by NIOSH under the provisions of 42 CFR 84. The current listing of NIOSH/MSHA certified respirators can be found in the NIOSH Certified Equipment List, which is available on the NIOSH Web site (http://www.cdc.gov/niosh/npptl/topics/respirators/cel).

A complete respiratory protection program must be implemented and must fulfill all requirements of 29 CFR 1910.134. A respiratory protection program must include a written standard operating procedure covering required training, fit-testing, fit-checking, periodic environmental monitoring, maintenance, medical monitoring, inspection, cleaning, storage and periodic program evaluation. Selection of a specific respirator within a given class of recommended respirators depends on the particular situation; this choice should be made only by a knowledgeable person. REMEMBER: Air-purifying respirators will not protect users against oxygen-deficient atmospheres, and they are not to be used in IDLH conditions. The only respirators recommended for fire fighting are self-contained breathing apparatuses that have full facepieces and are operated in a pressure-demand or other positive-pressure mode. Additional information on the selection and use of respirators can be found in the NIOSH Respirator Selection Logic (DHHS [NIOSH] Publication No. 2005-100) and the NIOSH Guide to Industrial Respiratory Protection (DHHS [NIOSH] Publication No. 87-116), which are available on the Respirator Topic Page on the NIOSH Web site (http://www.cdc.gov/niosh/npptl/topics/respirators).

Incompatibilities and Reactivities

This section lists important hazardous incompatibilities or reactivities for each substance.

Exposure Routes, Symptoms, and Target Organs

The first row for each substance in this section lists the toxicologically important entry routes (ER) and whether contact with the skin or eyes is potentially hazardous. The second row lists the potential symptoms of exposure (SY) and whether NIOSH considers the substance a potential occupational carcinogen [carc]). The third row lists target organs (TO) affected by exposure to the substance (for carcinogens, the types of cancer are listed in brackets). Information in this section

Table 2 (Continued)
Personal Protection and Sanitation Codes

Code		Definition
Change:	Daily	Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premises.
	N.R.	No recommendation is made specifying the need for the worker to change clothing after the workshift.
Provide:	Eyewash	Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substances; this is irrespective of the recommendation involving the wearing of eye protection.
	Quick drench	Facilities for quickly drenching the body should be provided within the immediate work area for emergency use where there is a possibility of exposure. [Note: It is intended that these facilities provide a sufficient quantity or flow of water to quickly remove the substance from any body areas likely to be exposed. The actual determination of what constitutes an adequate quick drench facility depends on the specific circumstances. In certain instances, a deluge shower should be readily available, whereas in others, the availability of water from a sink or hose could be considered adequate.]
	Frostbite wash	Quick drench facilities and/or eyewash fountains should be provided within the immediate work area for emergency use where there is any possibility of exposure to liquids that are extremely cold or rapidly evaporating.
Other codes:	Liq	Liquid
	Molt	Molten
	Sol	Solid
	Soln	Solution containing the contaminant
	Vap	Vapor

Table 3
Symbols, Code Components, and Codes Used for Respirator Selection

Symbol	Description
¥	At concentrations above the NIOSH REL or, where there is no REL, at any detectable concentration
§	Emergency or planned entry into unknown concentrations or IDLH conditions
*	Substance reported to cause eye irritation or damage; may require eye protection
£	Substance causes eye irritation or damage; eye protection needed
¿	Only nonoxidizable sorbents allowed (not charcoal)
†	End of service life indicator (ESLI) required
APF	Assigned protection factor

Code Component	Description
95	Particulate respirator or filter that is 95% efficient. See Table 4 (page xxv) to select N95, R95, or P95.
99	Particulate respirator or filter that is 99% efficient. See Table 4 (page xxv) to select N99, R99, or P99.
100	Particulate respirator or filter that is 99.97% efficient. See Table 4 (page xxv) to select N100, R100, or P100.
Ccr	Chemical cartridge respirator
F	Full facepiece
GmF	Air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister
Papr	Powered, air-purifying respirator
Sa	Supplied-air respirator
Scba	Self-contained breathing apparatus
Ag	Acid gas cartridge or canister
Cf	Continuous flow mode
Hie	High-efficiency particulate filter
Ov	Organic vapor cartridge or canister
Pd,Pp	Pressure-demand or other positive-pressure mode
Qm	Quarter-mask respirator
S	Chemical cartridge or canister providing protection against the compound of concern
T	Tight-fitting facepiece
XQ	Except quarter-mask respirator

Table 3 (Continued)
Symbols, Code Components, and Codes
Used for Respirator Selection

Code	APF	Description
95F	10	Any air-purifying full-facepiece respirator equipped with an N95, R95, or P95 filter. The following filters may also be used: N99, R99, P99, N100, R100, P100. See Table 4 (page xxv) for information on selection of N, R, or P filters.
95XQ	10	Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100. See Table 4 (page xxv) for information on selection of N, R, or P filters.
100F	50	Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. See Table 4 (page xxv) for information on selection of N, R, or P filters.
100XQ	10	Any air-purifying respirator with an N100, R100, or P100 filter (including N100, R100, and P100 filtering facepieces) except quarter-mask respirators. See Table 4 (page xxv) for information on selection of N, R, or P filters.
CcrFAg100	50	Any chemical cartridge respirator with a full facepiece and acid gas cartridge(s) in combination with an N100, R100, or P100 filter. See Table 4 (page xxv) for information on selection of N, R, or P filters.
CcrFOv	50	Any air-purifying full-facepiece respirator equipped with organic vapor cartridge(s).
CcrFOv95	10	Any full-facepiece respirator with organic vapor cartridge(s) in combination with an N95, R95, or P95 filter. The following filters may also be used: N99, R99, P99, N100, R100, P100. See Table 4 (page xxv) for information on selection of N, R, or P filters.
CcrFOv100	50	Any air-purifying full-facepiece respirator equipped with organic vapor cartridge(s) in combination with an N100, R100, or P100 filter. See Table 4 (page xxv) for information on selection of N, R, or P filters.
CcrFS	50	Any air-purifying full-facepiece respirator equipped with cartridge(s) providing protection against the compound of concern.
CcrFS100	50	Any air-purifying full-facepiece respirator equipped with cartridge(s) providing protection against the compound of concern in combination with an N100, R100, or P100 filter. See Table 4 (page xxv) for information on selection of N, R, or P filters.
CcrOv	10	Any air-purifying half-mask respirator equipped with organic vapor cartridge(s).

Table 4
Selection of N-, R-, or P-Series Particulate Respirators

1. The selection of N-, R-, and P-series filters depends on the presence of oil particles as follows:

   - If no oil particles are present in the work environment, use a filter of any series (i.e., N-, R-, or P-series).
   - If oil particles (e.g., lubricants, cutting fluids, glycerine) are present, use an R- or P-series filter. Note: N-series filters cannot be used if oil particles are present.
   - If oil particles are present and the filter is to be used for more than one work shift, use only a P-series filter.

   Note: To help you remember the filter series, use the following guide:

   N for Not resistant to oil,
   R for Resistant to oil,
   P for oil Proof.

2. Selection of filter efficiency (i.e., 95%, 99%, or 99.97%) depends on how much filter leakage can be accepted. Higher filter efficiency means lower filter leakage.

3. The choice of facepiece depends on the level of protection needed – that is, the assigned protection factor (APF) needed. See Table 3 (page xx) for APFs of respirator classes, and see Recommendations for Respirator Selection (page xiv) for more information.

Table 5

Abbreviations for Exposure Routes, Symptoms, and Target Organs

Code	Definition	Code	Definition
abdom	Abdominal	dizz	Dizziness
abnor	Abnormal/Abnormalities	drow	Drowsiness
abs	Skin absorption	dysp	Dyspnea (breathing difficulty)
album	Albuminuria	emphy	Emphysema
anes	Anesthesia	eosin	Eosinophilia
anor	Anorexia	epilep	Epileptiform
anos	Anosmia (loss of the sense of smell)	epis	Epistaxis (nosebleed)
anxi	Anxiety	equi	Equilibrium
arrhy	Arrhythmias	eryt	Erythema (skin redness)
aspir	Aspiration	euph	Euphoria
asphy	Asphyxia	fail	Failure
BP	Blood pressure	fasc	Fasciculation
breath	Breath/breathing	FEV	Forced expiratory volume
bron	Bronchitis	fib	Fibrosis
BUN	Blood urea nitrogen	ftg	Fatigue
[carc]	Potential occupational carcinogen	func	Function
card	Cardiac	GI	Gastrointestinal
chol	Cholinesterase	halu	Hallucinations
cirr	Cirrhosis	head	Headache
CNS	Central nervous system	hema	Hematuria (blood in the urine)
conc	Concentration	hemato	Hematopoietic
con	Skin and/or eye contact	hemorr	Hemorrhage
conf	Confusion	hyperpig	Hyperpigmentation
conj	Conjunctivitis	hypox	Hypoxemia (reduced O_2 in the blood)
constip	Constipation	inco	Incoordination
convuls	Convulsions	incr	Increased
corn	Corneal	inebri	Inebriation
CVS	Cardiovascular system	inflamm	Inflammation
cyan	Cyanosis	ing	Ingestion
decr	Decreased	inh	Inhalation
depres	Depressed/Depression	inj	Injury
derm	Dermatitis	insom	Insomnia
diarr	Diarrhea	irreg	Irregular/Irregularities
dist	Disturbance	irrit	Irritation

Table 5 (Continued)
Abbreviations for Exposure Routes, Symptoms, and Target Organs

Code	Definition	Code	Definition
irrity	Irritability	prot	

Table 6 (Continued)
Codes for First Aid Data

Code	Definition
Breath:	
Resp support	If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.
Fresh air	If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. Other measures are usually unnecessary.
Fresh air; 100% O_2	If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. When breathing is difficult, properly trained personnel may assist the affected person by administering 100% oxygen. Keep the affected person warm and at rest. Get medical attention as soon as possible.
Swallow:	
Medical attention immed	If this chemical has been swallowed, get medical attention immediately.

CHEMICAL LISTING

Acetaldehyde

Formula:	CAS#:	RTECS#:	IDLH:
CH_3CHO	75-07-0	AB1925000	Ca [2000 ppm]

Conversion: 1 ppm = 1.80 mg/m^3

DOT: 1089 129

Synonyms/Trade Names: Acetic aldehyde, Ethanal, Ethyl aldehyde

Exposure Limits:
NIOSH REL: Ca
See Appendix A
See Appendix C (Aldehydes)
OSHA PEL†: TWA 200 ppm (360 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2018, 2538, 3507
OSHA 68

Physical Description: Colorless liquid or gas (above 69°F) with a pungent, fruity odor.

Chemical & Physical Properties:
MW: 44.1
BP: 69°F
Sol: Miscible
Fl.P: -36°F
IP: 10.22 eV
Sp.Gr: 0.79
VP: 740 mmHg
FRZ: -190°F
UEL: 60%
LEL: 4.0%
Class IA Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, acids, bases, alcohols, ammonia & amines, phenols, ketones, HCN, H_2S [Note: Prolonged contact with air may cause formation of peroxides that may explode and burst containers; easily undergoes polymerization.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, nose, throat; eye, skin burns; derm; conj; cough; CNS depres; delayed pulm edema; in animals: kidney, repro, terato effects; [carc]
TO: Eyes, skin, resp sys, kidneys, CNS, repro sys [in animals: nasal cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush prompt
Breath: Resp support
Swallow: Medical attention immed

Acetic acid

Formula:	CAS#:	RTECS#:	IDLH:
CH_3COOH	64-19-7	AF1225000	50 ppm

Conversion: 1 ppm = 2.46 mg/m^3

DOT: 2790 153 (10-80% acid); 2789 132 (>80% acid)

Synonyms/Trade Names: Acetic acid (aqueous), Ethanoic acid, Glacial acetic acid (pure compound), Methanecarboxylic acid [Note: Can be found in concentrations of 5-8% in vinegar.]

Exposure Limits:
NIOSH REL: TWA 10 ppm (25 mg/m^3)
ST 15 ppm (37 mg/m^3)
OSHA PEL: TWA 10 ppm (25 mg/m^3)

Physical Description: Colorless liquid or crystals with a sour, vinegar-like odor. [Note: Pure compound is a solid below 62°F. Often used in an aqueous solution.]

Acetone cyanohydrin

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3C(OH)CNCH_3$	75-86-5	OD9275000	N.D.

Conversion: 1 ppm = 3.48 mg/m^3

DOT: 1541 155 (stabilized)

Synonyms/Trade Names: Cyanohydrin-2-propanone, 2-Cyano-2-propanol, α-Hydroxyisobutyronitrile, 2-Hydroxy-2-methyl-propionitrile, 2-Methyllactonitrile

Exposure Limits:
NIOSH REL: C 1 ppm (4 mg/m^3) [15-minute]
OSHA PEL: none

Measurement Methods (see Table 1):
NIOSH 2506

Physical Description: Colorless liquid with a faint odor of bitter almond. [Note: Forms cyanide in the body.]

Chemical & Physical Properties:
MW: 85.1
BP: 203°F
Sol: Miscible
Fl.P: 165°F
IP: ?
Sp.Gr(77°F): 0.93
VP: 0.8 mmHg
FRZ: -4°F
UEL: 12.0%
LEL: 2.2%
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
10 ppm: Sa
25 ppm: Sa:Cf
50 ppm: ScbaF/SaF
250 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Sulfuric acid, caustics [Note: Slowly decomposes to acetone & HCN at room temperatures; rate is accelerated by an increase in pH, water content, or temperature.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; dizz, lass, head, conf, convuls; liver, kidney inj; pulm edema, asphy
TO: Eyes, skin, resp sys, CNS, CVS, liver, kidneys, GI tract

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Acetonitrile

Formula:	CAS#:	RTECS#:	IDLH:
CH_3CN	75-05-8	AL7700000	500 ppm

Conversion: 1 ppm = 1.68 mg/m^3

DOT: 1648 127

Synonyms/Trade Names: Cyanomethane, Ethyl nitrile, Methyl cyanide [Note: Forms cyanide in the body.]

Exposure Limits:
NIOSH REL: TWA 20 ppm (34 mg/m^3)
OSHA PEL†: TWA 40 ppm (70 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1606

Physical Description: Colorless liquid with an aromatic odor.

Chemical & Physical Properties:
MW: 41.1
BP: 179°F
Sol: Miscible
Fl.P(oc): 42°F
IP: 12.20 eV
Sp.Gr: 0.78
VP: 73 mmHg
FRZ: -49°F
UEL: 16.0%
LEL: 3.0%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes:

A

Acetylene tetrabromide

Formula:	CAS#:	RTECS#:	IDLH:
$CHBr_2CHBr_2$	79-27-6	KI8225000	8 ppm

Conversion: 1 ppm = 14.14 mg/m^3

DOT: 2504 159

Synonyms/Trade Names: Symmetrical tetrabromoethane, TBE, Tetrabromoacetylene, Tetrabromoethane, 1,1,2,2-Tetrabromoethane

Exposure Limits:
NIOSH REL: See Appendix D
OSHA PEL: TWA 1 ppm (14 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2003

Physical Description: Pale-yellow liquid with a pungent odor similar to camphor or iodoform. [Note: A solid below 32°F.]

Chemical & Physical Properties:
MW: 345.7
BP: 474°F (Decomposes)
Sol: 0.07%
Fl.P: NA
IP: ?
Sp.Gr: 2.97
VP: 0.02 mmHg
FRZ: 32°F
UEL: NA
LEL: NA
Noncombustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
OSHA
8 ppm: Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong caustics; hot iron; reducing metals such as aluminum, magnesium, and zinc

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, nose; anor, nau; head; abdom pain; jaun; leucyt; CNS depres
TO: Eyes, resp sys, liver, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush prompt
Breath: Resp support
Swallow: Medical attention immed

Acetylsalicylic acid

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3COOC_6H_4COOH$	50-78-2	VO0700000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: o-Acetoxybenzoic acid, 2-Acetoxybenzoic acid, Aspirin

Exposure Limits:
NIOSH REL: TWA 5 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 0500

Physical Description: Odorless, colorless to white, crystal-line powder. [aspirin] [Note: Develops the vinegar-like odor of acetic acid on contact with moisture.]

Chemical & Physical Properties:
MW: 180.2
BP: 284°F (Decomposes)
Sol(77°F): 0.3%
Fl.P: NA
IP: NA
Sp.Gr: 1.35
VP: 0 mmHg (approx)
MLT: 275°F
UEL: NA
LEL: NA
MEC: 40 g/m^3
Combustible Powder; explosion hazard if dispersed in air.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: N.R.
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Solutions of alkali hydroxides or carbonates, strong oxidizers, moisture
[Note: Slowly hydrolyzes in moist air to salicyclic & acetic acids.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, upper resp sys; incr blood clotting time; nau, vomit; liver, kidney inj
TO: Eyes, skin, resp sys, blood, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

Acrolein	Formula: CH_2=CHCHO	CAS#: 107-02-8	RTECS#: AS1050000	IDLH: 2 ppm
Conversion: 1 ppm = 2.29 mg/m^3	DOT: 1092 131P (inhibited)			
Synonyms/Trade Names: Acraldehyde, Acrylaldehyde, Acrylic aldehyde, Allyl aldehyde, Propenal, 2-Propenal				
Exposure Limits: NIOSH REL: TWA 0.1 ppm (0.25 mg/m^3) ST 0.3 ppm (0.8 mg/m^3) See Appendix C (Aldehydes) OSHA PEL†: TWA 0.1 ppm (0.25 mg/m^3)			Measurement Methods (see Table 1): NIOSH 2501 OSHA 52	
Physical Description: Colorless or yellow liquid with a piercing, disagreeable odor.				

Chemical & Physical Properties:

MW:

Adiponitrile

Formula:	CAS#:	RTECS#:	IDLH:
$NC(CH_2)_4CN$	111-69-3	AV2625000	N.D.

Conversion: 1 ppm = 4.43 mg/m^3

DOT: 2205 153

Synonyms/Trade Names: 1,4-Dicyanobutane, Hexanedinitrile, Tetramethylene cyanide

Exposure Limits:
NIOSH REL: TWA 4 ppm (18 mg/m^3) OSHA PEL: none

Physical Description: Water-white, practically odorless, oily liquid.
[Note: A solid below 34°F. Forms cyanide in the body.]

Measurement Methods (see Table 1):
NIOSH
Nitriles Criteria Document

Chemical & Physical Properties:
MW: 108.2
BP: 563°F
Sol: 4.5%
Fl.P(oc): 199°F
IP: ?
Sp.Gr: 0.97
VP: 0.002 mmHg
FRZ: 34°F
UEL: 5.0%
LEL: 1.7%
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH
40 ppm: Sa
100 ppm: Sa:Cf
200 ppm: ScbaF/SaF
250 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers (e.g., perchlorates, nitrates), strong acids (e.g., sulfuric acid)
[Note: Decomposes above 194°F, forming hydrogen cyanide.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; head, dizz, lass, conf, convuls; blurred vision; dysp; abdom pain, nau, vomit
TO: Eyes, skin, resp sys, CNS, CVS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Aldrin

Formula:	CAS#:	RTECS#:	IDLH:
$C_{12}H_8Cl_6$	309-00-2	IO2100000	Ca [25 mg/m^3]

Conversion:

DOT: 2761 151

Synonyms/Trade Names: HHDN, Octalene,
1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-endo-1,4-exo-5,8-dimethanonaphthalene

Exposure Limits:
NIOSH REL: Ca
TWA 0.25 mg/m^3 [skin]
See Appendix A
OSHA PEL: TWA 0.25 mg/m^3 [skin]

Measurement Methods (see Table 1):
NIOSH 5502

Physical Description: Colorless to dark-brown crystalline solid with a mild chemical odor. [Note: Formerly used as an insecticide.]

Personal Protection/Sanitation

Allyl glycidyl ether

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_{10}O_2$	106-92-3	RR0875000	50 ppm

Conversion: 1 ppm = 4.67 mg/m^3 DOT: 2219 129

Synonyms/Trade Names: AGE, 1-Allyloxy-2,3-epoxypropane, Glycidyl allyl ether, [(2-Propenyloxy)methyl] oxirane

Exposure Limits:
NIOSH REL: TWA 5 ppm (22 mg/m^3) [skin]
ST 10 ppm (44 mg/m^3)
OSHA PEL†: C 10 ppm (45 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2545

Physical Description: Colorless liquid with a pleasant odor.

Chemical & Physical Properties:
MW: 114.2
BP: 309°F
Sol: 14%
Fl.P: 135°F
IP: ?
Sp.Gr: 0.97
VP: 2 mmHg
FRZ: -148°F [forms glass]
UEL: ?
LEL: ?
Class II Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
NIOSH
50 ppm: CcrOv/PaprOv/GmFOv/Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, resp sys; derm; pulm edema; narco; possible hemato, repro effects
TO: Eyes, skin, resp sys, blood, repro sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush prompt
Breath: Resp support
Swallow: Medical attention immed

Allyl propyl disulfide

Formula:	CAS#:	RTECS#:	IDLH:
$H_2C{=}CHCH_2S_2CH_2CH_2CH_3$	2179-59-1	JO0350000	N.D.

Conversion: 1 ppm = 6.07 mg/m^3 DOT:

Synonyms/Trade Names: 4,5-Dithia-1-octene, Onion oil, 2-Propenyl propyl disulfide, Propyl allyl disulfide

Exposure Limits:
NIOSH REL: TWA 2 ppm (12 mg/m^3)
ST 3 ppm (18 mg/m^3)
OSHA PEL†: TWA 2 ppm (12 mg/m^3)

Physical Description:

Aluminum (pyro powders and welding fumes, as Al)	Formula:	CAS#:	RTECS#:	IDLH: N.D.
Conversion:	DOT: 1383 135 (powder, pyrophoric)			
Synonyms/Trade Names: Synonyms vary depending upon the specific aluminum compound.				
Exposure Limits: NIOSH REL: TWA 5 mg/m^3 OSHA PEL†: none			Measurement Methods (see Table 1): NIOSH 7300, 7301, 7303	
Physical Description: Appearance and odor vary depending upon the specific aluminum compound.				
Chemical & Physical Properties: Properties vary depending upon the specific aluminum compound.	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Varies				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit skin, resp sys; pulm fib TO: Skin, resp sys		First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed		

Aluminum (soluble salts and alkyls, as Al)	Formula:	CAS#:	RTECS#:	IDLH: N.D.
Conversion:	DOT: 3051 135 (Aluminum alkyls)			
Synonyms/Trade Names: Synonyms vary depending upon the specific aluminum compound.				
Exposure Limits: NIOSH REL: TWA 2 mg/m^3 OSHA PEL†: none			Measurement Methods (see Table 1): NIOSH 7013, 7300, 7301, 7303 OSHA ID121	
Physical Description: Appearance and odor vary depending upon the specific aluminum compound.				
Chemical & Physical Properties: Properties vary depending upon the specific aluminum compound.	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Varies				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit skin, resp sys; skin burns TO: Skin, resp sys		First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed		

4-Aminodiphenyl

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_5C_6H_4NH_2$	92-67-1	DU8925000	Ca [N.D.]

Conversion: DOT:

Synonyms/Trade Names: 4-Aminobiphenyl, p-Aminobiphenyl, p-Aminodiphenyl, 4-Phenylaniline

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL: [1910.1011] See Appendix B

Measurement Methods (see Table 1):
NIOSH P&CAM269 (II-4)
OSHA 93

Physical Description: Colorless crystals with a floral odor.
[Note: Turns purple on contact with air.]

Chemical & Physical Properties:
MW: 169.2
BP: 576°F
Sol: Slight
Fl.P: ?
IP: ?
Sp.Gr: 1.16
VP(227°F): 1 mmHg
MLT: 127°F
UEL: ?
LEL: ?
Combustible Solid, but must be preheated before ignition possible.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

See Appendix E (page 351)

Incompatibilities and Reactivities: Oxidized by air

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Head, dizz; drow, dysp; ataxia, lass; methemo; urinary burning; acute hemorrhagic cystitis; [carc]
TO: Bladder, skin [bladder cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

2-Aminopyridine

Formula:	CAS#:	RTECS#:	IDLH:
$NH_2C_5H_4N$	504-29-0	US1575000	5 ppm

Conversion: 1 ppm = 3.85 mg/m^3 DOT: 2671 153

Synonyms/Trade Names: α-Aminopyridine, α-Pyridylamine

Exposure Limits:
NIOSH REL: TWA 0.5 ppm (2 mg/m^3)
OSHA PEL: TWA 0.5 ppm (2 mg/m^3)

Measurement Methods (see Table 1):
NIOSH S158 (II-4)

Physical Description: White powder, leaflets, or crystals with a characteristic odor.

Chemical & Physical Properties:
MW: 94.1
BP: 411°F
Sol: >100%
Fl.P: 154°F
IP: 8.00 eV
Sp.Gr: ?
VP(77°F): 0.8 mmHg
MLT: 137°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
5 ppm: Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, nose, throat; head, dizz; excitement; nau; high BP; resp distress; lass; convuls; stupor
TO: CNS, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Amitrole

Formula:	CAS#:	RTECS#:	IDLH:
$C_2H_4N_4$	61-82-5	XZ3850000	Ca [N.D.]

Conversion:

DOT:

Synonyms/Trade Names: Aminotriazole; 3-Aminotriazole; 2-Amino-1,3,4-triazole; 3-Amino-1,2,4-triazole

Exposure Limits:
NIOSH REL: Ca
TWA 0.2 mg/m^3
See Appendix A

OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 0500
OSHA PV2006

Physical Description: Colorless to white, crystalline powder. [herbicide]
[Note: Odorless when pure.]

Chemical & Physical Properties:
MW: 84.1
BP: ?
Sol(77°F): 28%
Fl.P: NA
IP: ?
Sp.Gr: 1.14
VP: <0.000008 mmHg
MLT: 318°F
UEL: NA
LEL: NA
Noncombustible Solid, but may be dissolved in flammable liquids.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Light (decomposes), strong oxidizers
[Note: Corrosive to iron, aluminum & copper.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin; dysp, musc spasms, ataxia, anor, salv, incr body temperature; lass, skin dryness, depres (thyroid func suppression)
TO: Eyes, skin, thyroid [in animals: liver, thyroid & pituitary gland tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash immed
Breath: Resp support
Swallow: Medical attention immed

Ammonia

Formula:	CAS#:	RTECS#:	IDLH:
NH_3	7664-41-7	BO0875000	300 ppm

Conversion: 1 ppm = 0.70 mg/m^3

DOT: 1005 125 (anhydrous); 2672 154 (10-35% solution); 2073 125 (>35-50% solution); 1005 125 (>50% solution)

Synonyms/Trade Names: Anhydrous ammonia, Aqua ammonia, Aqueous ammonia
[Note: Often used in an aqueous solution.]

Exposure Limits:
NIOSH REL: TWA 25 ppm (18 mg/m^3)
ST 35 ppm (27 mg/m^3)

OSHA PEL†: TWA 50 ppm (35 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 3800, 6015, 6016
OSHA ID188

Physical Description: Colorless gas with a pungent, suffocating odor.
[Note: Shipped as a liquefied compressed gas. Easily liquefied under pressure.]

Chemical & Physical Properties:
MW: 17.0
BP: -28°F
Sol: 34%
Fl.P: NA (Gas)
IP: 10.18 eV
RGasD: 0.60
VP: 8.5 atm
FRZ: -108°F
UEL: 28%
LEL: 15%

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam (solution)
Remove: When wet or contam (solution)
Change: N.R.
Provide: Eyewash (>10%)
Quick drench (>10%)

Respirator Recommendations (see Tables 3 and 4):
NIOSH
250 ppm: CcrS*/Sa*
300 ppm: Sa:Cf*/PaprS*/CcrFS/GmFS/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

[Note: Although NH_3 does not meet the DOT definition of a Flammable Gas (for labeling purposes), it should be treated as one.]

Incompatibilities and Reactivities: Strong oxidizers, acids, halogens, salts of silver & zinc
[Note: Corrosive to copper & galvanized surfaces.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing (solution), Con (solution/liquid)
SY: Irrit eyes, nose, throat; dysp, wheez, chest pain; pulm edema; pink frothy sputum; skin burns, vesic; liquid: frostbite
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed (solution/liquid)
Skin: Water flush immed (solution/liquid)
Breath: Resp support
Swallow: Medical attention immed (solution)

Ammonium chloride fume

Formula:	CAS#:	RTECS#:	IDLH:
NH_4Cl	12125-02-9	BP4550000	N.D.

Conversion: DOT:

Synonyms/Trade Names: Ammonium chloride, Ammonium muriate fume, Sal ammoniac fume

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3
ST 20 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
OSHA ID188

Physical Description: Finely divided, odorless, white particulate dispersed in air.

Chemical & Physical Properties:
MW: 53.5
BP: Sublimes
Sol: 37%
Fl.P: NA
IP: NA
Sp.Gr: 1.53
VP(321°F): 1 mmHg
MLT: 662°F (Sublimes)
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Alkalis & their carbonates, lead & silver salts, strong oxidizers, ammonium nitrate, potassium chlorate, bromine trifluoride [Note: Corrodes most metals at high (i.e., fire) temperatures.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, resp sys; cough, dysp, pulm sens
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support

Ammonium sulfamate

Formula:	CAS#:	RTECS#:	IDLH:
$NH_4OSO_2NH_2$	7773-06-0	WO6125000	1500 mg/m^3

Conversion: DOT:

Synonyms/Trade Names: Ammate herbicide, Ammonium amidosulfonate, AMS, Monoammonium salt of sulfamic acid, Sulfamate

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL†: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH S348 (II-5)

Physical Description: Colorless to white crystalline, odorless solid. [herbicide]

Chemical & Physical Properties:
MW: 114.1
BP: 320°F (Decomposes)
Sol: 200%
Fl.P: NA
IP: ?
Sp.Gr: 1.77
VP: 0 mmHg (approx)
MLT: 268°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.

A

Aniline (and homologs)

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_5NH_2$	62-53-3	BW6650000	Ca [100 ppm]

Conversion: 1 ppm = 3.81 mg/m^3 DOT: 1547 153

Synonyms/Trade Names: Aminobenzene, Aniline oil, Benzenamine, Phenylamine

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL†: TWA 5 ppm (19 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 2002, 2017, 8317
OSHA PV2079

Physical Description: Colorless to brown, oily liquid with an aromatic amine-like odor. [Note: A solid below 21°F.]

Chemical & Physical Properties:
MW: 93.1
BP: 363°F
Sol: 4%
Fl.P: 158°F
IP: 7.70 eV
Sp.Gr: 1.02
VP: 0.6 mmHg
FRZ: 21°F
UEL: 11%
LEL: 1.3%
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong acids, toluene diisocyanate, alkalis

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Head, lass, dizz; cyan; ataxia; dysp on effort; tacar; irrit eyes; methemo; cirr; [carc]
TO: Blood, CVS, eyes, liver, kidneys, resp sys [bladder cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

o-Anisidine

Formula:	CAS#:	RTECS#:	IDLH:
$NH_2C_6H_4OCH_3$	90-04-0	BZ5410000	Ca [50 mg/m^3]

Conversion: DOT: 2431 153

Synonyms/Trade Names: ortho-Aminoanisole, 2-Anisidine, o-Methoxyaniline
[Note: o-Anisidine has been used as a basis for many dyes.]

Exposure Limits:
NIOSH REL: Ca
0.5 mg/m^3 [skin]
See Appendix A
OSHA PEL: TWA 0.5 mg/m^3 [skin]

Measurement Methods (see Table 1):
NIOSH 2514

Physical Description: Red or yellow, oily liquid with an amine-like odor. [Note: A solid below 41°F.]

Chemical & Physical Properties:
MW: 123.2
BP: 437°F
Sol(77°F): 1%
Fl.P(oc): 244°F
IP: 7.44 eV
Sp.Gr: 1.10
VP: <0.1 mmHg
FRZ: 41°F
UEL: ?
LEL: ?
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Head, dizz; cyan; RBC Heinz bodies; [carc]
TO: Blood, kidneys, liver, CVS, CNS [in animals: tumors of the
thyrre f2tt-1.zTO: ScbaF:Pd,Pp/SaF, CNS [9(ng,185.9c 0.0sT1 1 Tf 2ueMC /P <</MCID 120 >>BDC <</MC /P)1(imal4e)- :Pd,P si1

ANTU

Formula:	CAS#:	RTECS#:	IDLH:
$C_{10}H_7NHC(NH_2)S$	86-88-4	YT9275000	100 mg/m^3

Conversion: DOT: 1651 153

Synonyms/Trade Names: α-Naphthyl thiocarbamide, 1-Naphthyl thiourea, α-Naphthyl thiourea

Exposure Limits:
NIOSH REL: TWA 0.3 mg/m^3
OSHA PEL: TWA 0.3 mg/m^3

Measurement Methods (see Table 1):
NIOSH S276 (II-5)

Physical Description: White crystalline or gray, odorless powder. [rodenticide]

Chemical & Physical Properties:
MW: 202.3
BP: Decomposes
Sol: 0.06%
Fl.P: NA
IP: ?
Sp.Gr: ?
VP: Low
MLT: 388°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
3 mg/m^3: CcrOv95/Sa
7.5 mg/m^3: Sa:Cf/PaprOvHie
15 mg/m^3: CcrFOv100/GmFOv100/
PaprTOvHie/SaT:Cf/ScbaF/SaF
100 mg/m^3: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, silver nitrate

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing
SY: After ingestion of large doses: vomit, dysp, cyan, coarse pulm rales; liver damage
TO: Resp sys, blood, liver

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Arsenic (inorganic compounds, as As)

Formula:	CAS#:	RTECS#:	IDLH:
As (metal)	7440-38-2 (metal)	CG0525000 (metal)	Ca [5 mg/m^3 (as As)]

Conversion: DOT: 1558 152 (metal); 1562 152 (dust)

Synonyms/Trade Names: Arsenic metal: Arsenia
Other synonyms vary depending upon the specific As compound. [Note: OSHA considers "Inorganic Arsenic" to mean copper acetoarsenite & all inorganic compounds containing arsenic except ARSINE.]

Exposure Limits:
NIOSH REL: Ca
C 0.002 mg/m^3 [15-minute]
See Appendix A
OSHA PEL: [1910.1018] TWA 0.010 mg/m^3

Measurement Methods (see Table 1):
NIOSH 7300, 7301, 7303, 9102, 7900
OSHA ID105

Physical Description: Metal: Silver-gray or tin-white, brittle, odorless solid.

Chemical & Physical Properties:
MW: 74.9
BP: Sublimes
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 5.73 (metal)
VP: 0 mmHg (approx)
MLT: 1135°F (Sublimes)
UEL: NA
LEL: NA

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFAg100/ScbaE

See Appendix E (page 351)

Metal: Noncombustible Solid in bulk form, but a slight explosion hazard in the form of dust when exposed to flame.

Incompatibilities and Reactivities: Strong oxidizers, bromine azide
[Note: Hydrogen gas can react with inorganic arsenic to form the highly toxic gas arsine.]

Asbestos

Formula:	CAS#:	RTECS#:	IDLH:
Hydrated mineral silicates	1332-21-4	CI6475000	Ca [N.D.]

Conversion: DOT: 2212 171 (blue, brown); 2590 171 (white)

Synonyms/Trade Names: Actinolite, Actinolite asbestos, Amosite (cummingtonite-grunerite), Anthophyllite, Anthophyllite asbestos, Chrysotile, Crocidolite (Riebeckite), Tremolite, Tremolite asbestos

Exposure Limits:
NIOSH REL: Ca
See Appendix A
See Appendix C
OSHA PEL: [1910.1001] [1926.1101] See Appendix C

Measurement Methods (see Table 1):
NIOSH 7400, 7402
OSHA ID160, ID191

Physical Description: White or greenish (chrysotile), blue (crocidolite), or gray-green (amosite) fibrous, odorless solids.

Chemical & Physical Properties:
MW: Varies
BP: Decomposes
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: ?
VP: 0 mmHg (approx)
MLT: 1112°F (Decomposes)
UEL: NA
LEL: NA
Noncombustible Solids

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: N.R.
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

See Appendix E (page 351)

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Asbestosis (chronic exposure): dysp, interstitial fib, restricted pulm function, finger clubbing; irrit eyes; [carc]
TO: Resp sys, eyes [lung cancer]

First Aid (see Table 6):
Eye: Irr immed
Breath: Fresh air

Asphalt fumes

Formula:	CAS#:	RTECS#:	IDLH:
	8052-42-4	CI9900000	Ca [N.D.]

Conversion: DOT: 1999 130 (asphalt)

Synonyms/Trade Names: Asphalt: Asphaltum, Bitumen (European term), Petroleum asphalt, Petroleum bitumen, Road asphalt, Roofing asphalt

Exposure Limits:
NIOSH REL: Ca
C 5 mg/m^3 [15-minute]
See Appendix A
See Appendix C
OSHA PEL: none

Measurement Methods (see Table 1):
NIOSH 5042

Physical Description: Fumes generated during the production or application of asphalt (a dark-brown to black cement-like substance manufactured by the vacuum distillation of crude petroleum oil).

Chemical & Physical Properties:
Properties vary depending upon the specific asphalt formulation or mixture.

Asphalt: Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: N.R.
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: None reported [Note: Asphalt becomes molten at about 200°F.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Con
SY: Irrit eyes, resp sys; [carc]
TO: Eyes, resp sys [in animals: skin tumors]

First Aid (see Table 6):
Eye: Irr immed
Breath: Resp support

Atrazine	Formula: $C_8H_{14}ClN_5$	CAS#: 1912-24-9	RTECS#: XY5600000	IDLH: N.D.
Conversion:	DOT: 2763 151 (triazine pesticide)			

Synonyms/Trade Names: 2-Chloro-4-ethylamino-6-isopropylamino-s-triazine; 6-Chloro-N-ethyl-N'-(1-methylethyl)-1,3,5-triazine-2,4-diamine

Exposure Limits:
NIOSH REL: TWA 5 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 5602, 8315

Physical Description: Colorless or white, odorless, crystalline powder. [herbicide]

Chemical & Physical Properties:
MW: 215.7
BP: Decomposes
Sol: 0.003%
Fl.P: NA
IP: NA
Sp.Gr: 1.19
VP: 0.0000003 mmHg
MLT: 340°F
UEL: NA
LEL: NA
Noncombustible Solid, but may be mixed with flammable liquids.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
01 Tw 6.48 0 0>>BDC 0.749 0.678 0.68w 4.009 0 Td [4.009 0 Td [(E)-9(y8-9(contam

Barium sulfate	Formula: $BaSO_4$	CAS#: 7727-43-7	RTECS#: CR0600000	IDLH: N.D.
Conversion:	DOT: 1564 154 (barium compound, n.o.s.)			
Synonyms/Trade Names: Artificial barite, Barite, Barium salt of sulfuric acid, Barytes (natural)				

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL†: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500, 0600

Physical Description: White or yellowish, odorless powder.

Chemical & Physical Properties:
MW: 233.4
BP: 2912°F (Decomposes)
Sol(64°F): 0.0002%
Fl.P: NA
IP: NA
Sp.Gr: 4.25-4.5
VP: 0 mmHg (approx)
MLT: 2876°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: N.R.
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Phosphorus, aluminum
[Note: Aluminum in the presence of heat can cause an explosion.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, nose, upper resp sys; benign pneumoconiosis (baritosis)
TO: Eyes, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

Benomyl	Formula: $C_{14}H_{18}N_4O_3$	CAS#: 17804-35-2	RTECS#: DD6475000	IDLH: N.D.
Conversion:	DOT: 2757 151 (carbamate pesticide, solid)			
Synonyms/Trade Names: Methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate				

Exposure Limits:
NIOSH REL: See Appendix D
OSHA PEL†: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Benzidine

Formula:	CAS#:	RTECS#:	IDLH:
$NH_2C_6H_4C_6H_4NH_2$	92-87-5	DC9625000	Ca [N.D.]

Conversion: DOT: 1885 153

Synonyms/Trade Names: Benzidine-based dyes; 4,4'-Bianiline; 4,4'-Biphenyldiamine; 1,1'-Biphenyl-4,4'-diamine; 4,4'-Diaminobiphenyl; p-Diaminodiphenyl [Note: Benzidine has been used as a basis for many dyes.]

Exposure Limits:
NIOSH REL: Ca
See Appendix A
See Appendix C

OSHA PEL: [1910.1010]
See Appendix B
See Appendix C

Measurement Methods (see Table 1):
NIOSH 5509
OSHA 65

Physical Description: Grayish-yellow, reddish-gray, or white crystalline powder. [Note: Darkens on exposure to air and light.]

Chemical & Physical Properties:
MW: 184.3
BP: 752°F
Sol(54°F): 0.04%
Fl.P: ?
IP: ?
Sp.Gr: 1.25
VP: Low
MLT: 239°F
UEL: ?
LEL: ?
Combustible Solid, but difficult to burn.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

See Appendix E (page 351)

Incompatibilities and Reactivities: Red fuming nitric acid

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Hema; secondary anemia from hemolysis; acute cystitis; acute liver disorders; derm; painful, irreg urination; [carc]
TO: Bladder, skin, kidneys, liver, blood [liver, kidney & bladder cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Benzoyl peroxide

Formula:	CAS#:	RTECS#:	IDLH:
$(C_6H_5CO)_2O_2$	94-36-0	DM8575000	1500 mg/m^3

Conversion: DOT:

Synonyms/Trade Names: Benzoperoxide, Dibenzoyl peroxide

Exposure Limits:
NIOSH REL: TWA 5 mg/m^3
OSHA PEL: TWA 5 mg/m^3

Measurement Methods (see Table 1):
NIOSH 5009

Physical Description: Colorless to white crystals or a granular powder with a faint, benzaldehyde-like odor.

Chemical & Physical Properties:
MW: 242.2
BP: Decomposes explosively
Sol: <1%
Fl.P: 176°F
IP: ?
Sp.Gr: 1.33
VP: <1 mmHg
MLT: 217°F
UEL: ?
LEL: ?
Combustible Solid (easily ignited and burns very rapidly).

Personal Protection/Sanitation (see Table 2):
Skin:

Bismuth telluride, doped with Selenium sulfide (as Bi_2Te_3)	Formula:	CAS#:	RTECS#:	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: Doped bismuth sesquitelluride, Doped bismuth telluride, Doped bismuth tritelluride, Doped tellurobismuthite [Note: Doped with selenium sulfide. Commercial mix may contain 80% Bi_2Te_3, 20% stannous telluride, plus some tellurium.]

Exposure Limits:
NIOSH REL: TWA 5 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 0500
OSHA ID121

Physical Description: Gray, crystalline solid that has been enhanced (doped) with a small amount of selenium sulfide (SeS).
[Note: Doping alters the conductivity of a semiconductor.]

Chemical & Physical Properties:
Properties are unavailable but should be similar to Bismuth telluride, undoped.

Sp.Gr: ?

Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong oxidizers, moisture

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, upper resp sys; garlic breath; in animals: pulm lesions (nonfibrotic)
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Bismuth telluride, undoped	Formula: Bi_2Te_3	CAS#: 1304-82-1	RTECS#: EB3110000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: Bismuth sesquitelluride, Bismuth telluride, Bismuth tritelluride, Tellurobismuthite

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500, 0600
OSHA ID121

Physical Description: Gray, crystalline solid.

Chemical & Physical Properties:
MW: 800.8
BP: ?
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 7.7
VP: 0 mmHg (approx)
MLT: 1063°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong oxidizers (e.g., bromine, chlorine, or fluorine), moisture, nitric acid (decomposes)

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, upper resp sys; garlic breath
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Borates, tetra, sodium salts (Anhydrous)	Formula: $Na_2B_4O_7$	CAS#: 1330-43-4	RTECS#: ED4588000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: Anhydrous borax, Borax dehydrated, Disodium salt of boric acid, Disodium tetrabromate, Fused borax, Sodium borate (anhydrous), Sodium tetraborate

Exposure Limits:
NIOSH REL: TWA 1 mg/m^3
OSHA PEL†: none

Physical Description: White to gray, odorless powder. [herbicide]
[Note: Becomes opaque on exposure to air.]

Measurement Methods (see Table 1):
NIOSH 0500
OSHA ID125G

Chemical & Physical Properties:
MW: 201.2
BP: 2867°F (Decomposes)
Sol: 4%
Fl.P: NA
IP: NA
Sp.Gr: 2.37
VP: 0 mmHg (approx)
MLT: 1366°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: Daily
Remove: N.R.
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Moisture [Note: Forms partial hydrate in moist air.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, upper resp sys; derm; epis; cough, dysp
TO: Eyes, skin, resp sys

N

Boron tribromide	Formula: BBr_3	CAS#: 10294-33-4	RTECS#: ED7400000	IDLH: N.D.
Conversion: 1 ppm = 10.25 mg/m^3	DOT: 2692 157			
Synonyms/Trade Names: Boron bromide, Tribromoborane				

Exposure Limits: NIOSH REL: C 1 ppm (10 mg/m^3) OSHA PEL†: none	Measurement Methods (see Table 1): None available
Physical Description: Colorless, fuming liquid with a sharp, irritating odor.	

Chemical & Physical Properties:
MW: 250.5
BP:

B

Bromine pentafluoride

Formula:	CAS#:	RTECS#:	IDLH:
BrF_5	7789-30-2	EF9350000	N.D.

Conversion: 1 ppm = 7.15 mg/m^3

DOT: 1745 144

Synonyms/Trade Names: Bromine fluoride

Exposure Limits:
NIOSH REL: TWA 0.1 ppm (0.7 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless to pale-yellow, fuming liquid with a pungent odor. [Note: A colorless gas above 105°F. Shipped as a compressed gas.]

Chemical & Physical Properties:
MW: 174.9
BP: 105°F
Sol: Reacts violently
Fl.P: NA
IP: ?
Sp.Gr: 2.48
VP: 328 mmHg
FRZ: -77°F
UEL: NA
LEL: NA
Noncombustible Liquid, but a very powerful oxidizer.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Acids, halogens, arsenic, selenium, sulfur, glass, organic materials, water [Note: Reacts with all elements except inert gases, nitrogen & oxygen.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; corn nec; skin burns; cough, dysp, pulm edema; liver, kidney inj
TO: Eyes, skin, resp sys, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Bromoform

Formula:	CAS#:	RTECS#:	IDLH:
$CHBr_3$	75-25-2	PB5600000	850 ppm

[redacted]

B

2-Butanone

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3COCH_2CH_3$	78-93-3	EL6475000	3000 ppm

Conversion: 1 ppm = 2.95 mg/m^3 DOT: 1193 127

Synonyms/Trade Names: Ethyl methyl ketone, MEK, Methyl acetone, Methyl ethyl ketone

Exposure Limits:
NIOSH REL: TWA 200 ppm (590 mg/m^3)
ST 300 ppm (885 mg/m^3)
OSHA PEL†: TWA 200 ppm (590 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2500, 2555, 3800
OSHA 16, 84, 1004

Physical Description: Colorless liquid with a moderately sharp, fragrant, mint- or acetone-like odor.

Chemical & Physical Properties:
MW: 72.1
BP: 175°F
Sol: 28%
Fl.P: 16°F
IP: 9.54 eV
Sp.Gr: 0.81
VP: 78 mmHg
FRZ: -123°F
UEL(200°F): 11.4%
LEL(200°F): 1.4%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
3000 ppm: Sa:Cf£/PaprOv£/CcrFOv/GmFOv/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, amines, ammonia, inorganic acids, caustics, isocyanates, pyridines

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose; head; dizz; vomit; derm
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash immed
Breath: Fresh air
Swallow: Medical attention immed

2-Butoxyethanol

Formula:	CAS#:	RTECS#:	IDLH:
$C_4H_9OCH_2CH_2OH$	111-76-2	KJ8575000	700 ppm

Conversion: 1 ppm = 4.83 mg/m^3 DOT: 2369 152

Synonyms/Trade Names: Butyl Cellosolve®, Butyl oxitol, Dowanol® EB, EGBE, Ektasolve EB®, Ethylene glycol monobutyl ether, Jeffersol EB

Exposure Limits:
NIOSH REL: TWA 5 ppm (24 mg/m^3) [skin]
OSHA PEL†: TWA 50 ppm (240 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 1403
OSHA 83

Physical Description: Colorless liquid with a mild, ether-like odor.

Chemical & Physical Properties:
MW: 118.2
BP: 339°F
Sol: Miscible
Fl.P: 143°F
IP: 10.00 eV
Sp.Gr: 0.90
VP: 0.8 mmHg
FRZ: -107°F
UEL(275°F): 12.7%
LEL(200°F): 1.1%
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
50 ppm: CcrOv*/Sa*
125 ppm: Sa:Cf*/PaprOv*
250 ppm: CcrFOv/GmFOv/PaprTOv*/ScbaF/SaF
700 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba

B

sec-Butyl acetate	Formula: $CH_3COOCH(CH_3)CH_2CH_3$	CAS#: 105-46-4	RTECS#: AF7380000	IDLH: 1700 ppm [10%LEL]
Conversion: 1 ppm = 4.75 mg/m^3	DOT: 1123 129			
Synonyms/Trade Names: sec-Butyl ester of acetic acid, 1-Methylpropyl acetate				
Exposure Limits: NIOSH REL: TWA 200 ppm (950 mg/m^3) OSHA PEL: TWA 200 ppm (950 mg/m^3)				Measurement Methods (see Table 1): NIOSH 1450 OSHA 7
Physical Description: Colorless liquid with a pleasant, fruity odor.				

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 116.2 BP: 234°F Sol: 0.8% Fl.P: 62°F IP: 9.91 eV Sp.Gr: 0.86 VP: 10 mmHg FRZ: -100°F UEL: 9.8% LEL: 1.7% Class IB Flammable Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	NIOSH/OSHA 1700 ppm: Sa:Cf£/PaprOv£/CcrFOv/ GmFOv/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities:	Nitrates; strong oxidizers, alkalis & acids

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Ing, Con SY: Irrit eyes; head; drow; dryness upper resp sys, skin; narco TO: Eyes, skin, resp sys, CNS	Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed

tert-Butyl acetate	Formula: $CH_3COOC(CH_3)_3$	CAS#: 540-88-5	RTECS#: AF7400000	IDLH: 1500 ppm [10%LEL]
Conversion: 1 ppm = 4.75 mg/m^3	DOT: 1123 129			
Synonyms/Trade Names: tert-Butyl ester of acetic acid				
Exposure Limits: NIOSH REL: TWA 200 ppm (950 mg/m^3) OSHA PEL: TWA 200 ppm (950 mg/m^3)				Measurement Methods (see Table 1): NIOSH 1450 OSHA 7
Physical Description: Colorless liquid with a fruity odor.				

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 116.2 BP: 208°F Sol: Insoluble Fl.P: 72°F IP: ? Sp.Gr: 0.87 VP: ? FRZ: ? UEL: ? LEL: 1.5% Class IB Flammable Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	NIOSH/OSHA 1500 ppm: Sa:Cf£/PaprOv£/CcrFOv/ GmFOv/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities:	Nitrates; strong oxidizers, alkalis & acids

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Ing, Con SY: Itch, inflamm eyes; irrit upper resp tract; head; narco; derm TO: Resp sys, eyes, skin, CNS	Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed

Butyl acrylate	Formula: CH_2=CHCOOC_4H_9	CAS#: 141-32-2	RTECS#: UD3150000	IDLH: N.D.
Conversion: 1 ppm = 5.24 mg/m^3	DOT: 2348 130P			
Synonyms/Trade Names: n-Butyl acrylate, Butyl ester of acrylic acid, Butyl-2-propenoate				
Exposure Limits: NIOSH REL: TWA 10 ppm (55 mg/m^3) OSHA PEL†: none			Measurement Methods (see Table 1): OSHA PV2011	
Physical Description: Clear, colorless liquid with a strong, fruity odor. [Note: Highly reactive; may contain an inhibitor to prevent spontaneous polymerization.]				

Chemical & Physical Properties:
MW: 128.2
BP: 293°F
Sol: 0.1%
Fl.P: 103°F
IP: ?
Sp.Gr: 0.89
VP: 4 mmHg
FRZ: -83°F

n-Butylamine

Formula: $CH_3CH_2CH_2CH_2NH_2$ | CAS#: 109-73-9 | RTECS#: EO2975000 | IDLH: 300 ppm

Conversion: 1 ppm = 2.99 mg/m^3 | DOT: 1125 132

Synonyms/Trade Names: 1-Aminobutane, Butylamine

Exposure Limits:
NIOSH REL: C 5 ppm (15 mg/m^3) [skin]
OSHA PEL: C 5 ppm (15 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 2012

Physical Description: Colorless liquid with a fishy, ammonia-like odor.

Chemical & Physical Properties:
MW: 73.2
BP: 172°F
Sol: Miscible
Fl.P: 10°F
IP: 8.71 eV
Sp.Gr: 0.74
VP: 82 mmHg
FRZ: -58°F
UEL: 9.8%
LEL: 1.7%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
50 ppm: CcrS*/Sa*
125 ppm: Sa:Cf*/PaprS*
250 ppm: CcrFS/GmFS/PaprTS*/ScbaF/SaF
300 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong acids
[Note: May corrode some metals in presence of water.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat; head; skin flush, burns
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

tert-Butyl chromate

Formula: $[(CH_3)_3CO]_2CrO_2$ | CAS#:

n-Butyl mercaptan

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3CH_2CH_2CH_2SH$	109-79-5	EK6300000	500 ppm

Conversion: 1 ppm = 3.69 mg/m^3

DOT: 2347 130

Synonyms/Trade Names: Butanethiol, 1-Butanethiol, n-Butanethiol, 1-Mercaptobutane

Exposure Limits:
NIOSH REL: C 0.5 ppm (1.8 mg/m^3) [15-minute]
OSHA PEL†: TWA 10 ppm (35 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2525, 542

Physical Description: Colorless liquid with a strong, garlic-, cabbage-, or skunk-like odor.

Chemical & Physical Properties:
MW: 90.2
BP: 209°F
Sol: 0.06%
Fl.P: 35°F
IP: 9.15 eV
Sp.Gr: 0.83
VP: 35 mmHg
FRZ: -176°F
UEL: ?
LEL: ?
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
5 ppm: CcrOv/Sa
12.5 ppm: Sa:Cf/PaprOv
25 ppm: CcrFOv/GmFOv/PaprTOv/ScbaF/SaF
500 ppm: Sa:Pd,Pp*
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers (such as dry bleaches), acids

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin; musc weak, mal, sweat, nau, vomit, head, conf; in animals: narco, inco, lass; cyan, pulm irrit; liver, kidney damage
TO: Eyes, skin, resp sys, CNS, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

o-sec-Butylphenol

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3CH_2CH(CH_3)C_6H_4OH$	89-72-5	SJ8920000	N.D.

Conversion: 1 ppm = 6.14 mg/m^3

DOT:

Synonyms/Trade Names: 2-sec-Butylphenol; 2-(1-Methylpropyl)phenol

Exposure Limits:
NIOSH REL: TWA 5 ppm (30 mg/m^3) [skin]
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless liquid or solid (below 61°F).

Chemical & Physical Properties:
MW: 150.2
BP: 227°F
Sol: Insoluble
Fl.P: 225°F
IP: ?
Sp.Gr: 0.89
VP: Low
FRZ: 61°F
UEL: ?
LEL: ?
Class IIB Combustible Liquid
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con

Cadmium dust (as Cd)	Formula: Cd (metal)	CAS#: 7440-43-9 (metal)	RTECS#: EU9800000 (metal)	IDLH: Ca [9 mg/m^3 (as Cd)]
Conversion:	DOT: 2570 154 (cadmium compound)			

Synonyms/Trade Names: Cadmium metal: Cadmium
Other synonyms vary depending upon the specific cadmium compound.

Exposure Limits:
NIOSH REL*: Ca
See Appendix A
OSHA PEL*: [1910.1027] TWA 0.005 mg/m^3
[*Note: The REL and PEL apply to all Cadmium compounds (as Cd).]

Measurement Methods (see Table 1):
NIOSH 7048, 7300, 7301, 7303, 9102
OSHA ID121, ID125G, ID189, ID206

Physical Description: Metal: Silver-white, blue-tinged lustrous, odorless solid.

Chemical & Physical Properties:
MW: 112.4
BP: 1409°F
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 8.65 (metal)
VP: 0 mmHg (approx)
MLT: 610°F
UEL: NA
LEL: NA
Metal: Noncombustible Solid in bulk form, but will burn in powder form.

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: Daily
Remove: N.R.
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

See Appendix E (page 351)

Incompatibilities and Reactivities: Strong oxidizers; elemental sulfur, selenium & tellurium

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing
SY: Pulm edema, dysp, cough, chest tight, subs pain; head; chills, musc aches; nau, vomit, diarr; anos, emphy, prot, mild anemia; [carc]
TO: Resp sys, kidneys, prostate, blood [prostatic & lung cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

Cadmium fume (as Cd)	Formula: CdO/Cd	CAS#: 1306-19-0 (CdO)	RTECS#: EV1930000 (CdO)	IDLH: Ca [9 mg/m^3 (as Cd)]
Conversion:	DOT:			

Synonyms/Trade Names: CdO: Cadmium monoxide, Cadmium oxide fume Cd: Cadmium

Exposure Limits:
NIOSH REL*: Ca
See Appendix A
OSHA PEL*: [1910.1027] TWA 0.005 mg/m^3
[*Note: The REL and PEL apply to all Cadmium compounds (as Cd).]

Measurement Methods (see Table 1):
NIOSH 7048, 7300, 7301, 7303
OSHA ID121, ID125G, ID189, ID206

Physical Description: Odorless, yellow-brown, finely divided particulate dispersed in air. [Note: See listing for Cadmium dust for properties of Cd.]

Chemical & Physical Properties:
MW: 128.4
BP: Decomposes
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 8.15 (crystalline form)
6.95 (amorphous form)
VP: 0 mmHg (approx)
MLT: 2599°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: Daily
Remove: N.R.
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

See Appendix E (page 351)

Incompatibilities and Reactivities: Not applicable

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh
SY: Pulm edema, dysp, cough, chest tight, subs pain; head; chills, musc aches; nau, vomit, diarr; emphy, prot, anos, mild anemia; [carc]
TO: Resp sys, kidneys, blood [prostatic & lung cancer]

First Aid (see Table 6):
Breath: Resp support

C

Calcium oxide	Formula: CaO	CAS#: 1305-78-8	RTECS#: EW3100000	IDLH: 25 mg/m^3
Conversion:	DOT: 1910 157			

Synonyms/Trade Names: Burned lime, Burnt lime, Lime, Pebble lime, Quick lime, Unslaked lime

Exposure Limits:
NIOSH REL: TWA 2 mg/m^3
OSHA PEL: TWA 5 mg/m^3

Measurement Methods (see Table 1):
NIOSH 7020, 7303
OSHA ID121

Physical Description: White or gray, odorless lumps or granular powder.

Chemical & Physical Properties:
MW: 56.1
BP: 5162°F
Sol: Reacts
Fl.P: NA
IP: NA
Sp.Gr: 3.34
VP: 0 mmHg (approx)
MLT: 4662°F
UEL: NA
LEL: NA
Noncombustible Solid, but will support combustion by liberation of oxygen.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
10 mg/m^3: Qm
20 mg/m^3: 95XQ/Sa
25 mg/m^3: Sa:Cf/PaprHie/100F/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Water (liberates heat), fluorine, ethanol
[Note: Reacts with water to form calcium hydroxide.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, upper resp tract; ulcer, perf nasal septum; pneu; derm
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Calcium silicate	Formula: $CaSiO_3$	CAS#: 1344-95-2	RTECS#: VV9150000	IDLH: N.D.
Conversion:	DOT:			

C

Caprolactam

Formula:	CAS#:	RTECS#:	IDLH:
$C_2H_{11}NO$	105-60-2	CM3675000	N.D.

Conversion: 1 ppm = 4.63 mg/m^3

DOT:

Synonyms/Trade Names: Aminocaproic lactam, epsilon-Caprolactam, Hexahydro-2H-azepin-2-one, 2-Oxohexamethyleneimine

Exposure Limits:
NIOSH REL: Dust: TWA 1 mg/m^3
ST 3 mg/m^3
Vapor: TWA 0.22 ppm (1 mg/m^3)
ST 0.66 ppm (3 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
OSHA PV2012

Physical Description: White, crystalline solid or flakes with an unpleasant odor.
[Note: Significant vapor concentrations would be expected only at elevated temperatures.]

Chemical & Physical Properties:
MW: 113.2
BP: 515°F
Sol: 53%
Fl.P: 282°F
IP: ?
Sp.Gr: 1.01
VP: 0.00000008 mmHg
MLT: 156°F
UEL: 8.0%
LEL: 1.4%
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong oxidizers, (acetic acid + dinitrogen trioxide)

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit skin, eyes, resp sys; epis; derm, skin sens; asthma; irrity, conf, dizz, head; abdom cramps, diarr, nau, vomit; liver, kidney inj
TO: Eyes, skin, resp sys, CNS, CVS, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash immed
Breath: Resp support
Swallow: Medical attention immed

Captafol

Formula:	CAS#:	RTECS#:	IDLH:
$C_{10}H_9Cl_{14}NO_2S$	2425-06-1	GW4900000	Ca [N.D.]

Conversion:

DOT:

Synonyms/Trade Names: Captofol; Difolatan®; N-((1,1,2,2-Tetrachloroethyl)thio)-4-cyclohexene-1,2-dicarboximide

Exposure Limits:
NIOSH REL: Ca
TWA 0.1 mg/m^3 [skin]
See Appendix A
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 0500

Physical Description: White, crystalline solid with a slight, characteristic pungent odor. [fungicide]
[Note: Available commercially as a wettable powder or in liquid form.]

Chemical & Physical Properties:
MW: 349.1
BP: Decomposes
Sol: 0.0001%
Fl.P: NA
IP: NA
Sp.Gr: ?
VP: 0.000008 mmHg
MLT: 321°F (Decomposes)
UEL: NA
LEL: NA
Noncombustible Solid, but may be dissolved in flammable liquids.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Acids, acid vapors, strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; derm, skin sens; conj; bron, wheez; diarr, vomit; liver, kidney inj; high BP; in animals: terato effects; [carc]
TO: Eyes, skin, resp sys, CNS, liver, kidneys, CVS [in animals: tumors at many sites]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Captan	Formula: $C_9H_8Cl_3NO_2S$	CAS#: 133-06-2	RTECS#: GW5075000	IDLH: Ca [N.D.]
Conversion:	DOT:			

Synonyms/Trade Names: Captane; N-Trichloromethylmercapto-4-cyclohexene-1,2-dicarboximide

Exposure Limits:
NIOSH REL: Ca
TWA 5 mg/m^3
See Appendix A

OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 5601, 9202, 9205

Physical Description: Odorless, white, crystalline powder. [fungicide]
[Note: Commercial product is a yellow powder with a pungent odor.]

Chemical & Physical Properties:
MW: 300.6
BP: Decomposes
Sol(77°F): 0.0003%
Fl.P: ?
IP: NA
Sp.Gr: 1.74
VP: 0 mmHg (approx)
MLT: 352°F (Decomposes)
UEL: ?
LEL: ?
Combustible Solid; may be dissolved in flammable liquids.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong alkaline materials (e.g., hydrated lime) [Note: Corrosive to metals.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, upper resp sys; blurred vision; derm, skin

C

Carbofuran

Formula:	CAS#:	RTECS#:	IDLH:
$C_{12}H_{15}NO_3$	1563-66-2	FB9450000	N.D.

Conversion: DOT: 2757 151

Synonyms/Trade Names: 2,3-Dihydro-2,2-dimethyl-7-benzofuranyl methylcarbamate; Furacarb®; Furadan®

Exposure Limits:
NIOSH REL: TWA 0.1 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 5601

Physical Description: Odorless, white or grayish, crystalline solid. [insecticide]
[Note: May be dissolved in a liquid carrier.]

Chemical & Physical Properties:
MW: 221.3
BP: ?
Sol(77°F): 0.07%
Fl.P: NA
IP: NA
Sp.Gr: 1.18
VP(77°F): 0.000003 mmHg
MLT: 304°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Alkaline substances, acid, strong oxidizers (e.g., perchlorates, peroxides, chlorates, nitrates, permanganates)

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Miosis, blurred vision; sweat, salv, abdom cramps, diarr, head, nau, vomit; lass, musc twitch, inco, convuls
TO: CNS, PNS, blood chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Fresh air
Swallow: Medical attention immed

Carbon black

Formula:	CAS#:	RTECS#:	IDLH:
C	1333-86-4	FF5800000	1750 mg/m^3

Conversion: DOT:

Synonyms/Trade Names: Acetylene black, Channel black, Furnace black, Lamp black, Thermal black

Exposure Limits:
NIOSH REL: TWA 3.5 mg/m^3
Carbon black in presence of polycyclic aromatic hydrocarbons (PAHs):
Ca
TWA 0.1 mg PAHs/m^3
See Appendix A
See Appendix C
OSHA PEL: TWA 3.5 mg/m^3

Measurement Methods (see Table 1):
NIOSH 5000
OSHA ID196

Physical Description: Black, odorless solid.

Chemical & Physical Properties:
MW: 12.0
BP: Sublimes
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 1.8-2.1
VP: 0 mmHg (approx)
MLT: Sublimes
UEL: NA
LEL: NA
Combustible Solid that may contain flammable hydrocarbons.

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: Prevent eye contact
Wash skin: Daily
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
17.5 mg/m^3: Qm
35 mg/m^3: 95XQ/Sa
87.5 mg/m^3: Sa:Cf/PaprHie
175 mg/m^3: 100F/PaprTHie/ScbaF/SaF
1750 mg/m^3: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

In presence of polycyclic aromatic hydrocarbons:
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Strong oxidizers such as chlorates, bromates & nitrates

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Cough; irrit eyes; in presence of polycyclic aromatic hydrocarbons: [carc]
TO: Resp sys, eyes [lymphatic cancer (in presence of PAHs)]

First Aid (see Table 6):
Eye: Irr prompt
Breath: Fresh air

C

Carbon monoxide

Formula:	CAS#:	RTECS#:	IDLH:
CO	630-08-0	FG3500000	1200 ppm

Conversion: 1 ppm = 1.15 mg/m^3

DOT: 1016 119; 9202 168 (cryogenic liquid)

Synonyms/Trade Names: Carbon oxide, Flue gas, Monoxide

Exposure Limits:
NIOSH REL: TWA 35 ppm (40 mg/m^3)
C 200 ppm (229 mg/m^3)
OSHA PEL†: TWA 50 ppm (55 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 6604
OSHA ID209, ID210

Physical Description: Colorless, odorless gas.
[Note: Shipped as a nonliquefied or liquefied compressed gas.]

Chemical & Physical Properties:
MW: 28.0
BP: -313°F
Sol: 2%
Fl.P: NA (Gas)
IP: 14.01 eV
RGasD: 0.97
VP: >35 atm
MLT: -337°F
UEL: 74%
LEL: 12.5%
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Frostbite
Eyes: Frostbite
Wash skin: N.R.
Remove: When wet (flamm)
Change: N.R.
Provide: Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
NIOSH
350 ppm: Sa
875 ppm: Sa:Cf
1200 ppm: GmFS†/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS†/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, bromine trifluoride, chlorine trifluoride, lithium

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con (liquid)
SY: Head, tachypnea, nau, lass, dizz, conf, halu; cyan; depres S-T segment of electrocardiogram, angina, syncope
TO: CVS, lungs, blood, CNS

First Aid (see Table 6):
Eye: Frostbite
Skin: Frostbite
Breath: Resp support

Carbon tetrabromide

Formula:	CAS#:	RTECS#:	IDLH:
CBr_4	558-13-4	FG4725000	N.D.

Conversion: 1 ppm = 13.57 mg/m^3

DOT: 2516 151

Synonyms/Trade Names: Carbon bromide, Methane tetrabromide, Tetrabromomethane

Exposure Limits:
NIOSH REL: TWA 0.1 ppm (1.4 mg/m^3)
ST 0.3 ppm (4 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless to yellow-brown crystals with a slight odor.

Chemical & Physical Properties:
MW: 331.7
BP: 374°F
Sol: 0.02%
Fl.P: NA
IP: 10.31 eV
Sp.Gr: 3.42
VP(205°F): 40 mmHg
MLT: 194°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: Prevent eye contact
Wash skin: Daily
Remove: N.R.
Change: Daily
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong oxidizers, hexacyclohexyldilead, lithium

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; lac; lung, liver, kidney inj; in animals: corn damage
TO: Eyes, skin, resp sys, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Carbon tetrachloride

Formula:	CAS#:	RTECS#:	IDLH:
CCl_4	56-23-5	FG4900000	Ca [200 ppm]

Conversion: 1 ppm = 6.29 mg/m^3

DOT: 1846 151

Synonyms/Trade Names: Carbon chloride, Carbon tet, Freon® 10, Halon® 104, Tetrachloromethane

Exposure Limits:
NIOSH REL: Ca
ST 2 ppm (12.6 mg/m^3) [60-minute]
See Appendix A
OSHA PEL†: TWA 10 ppm
C 25 ppm
200 ppm (5-minute maximum peak in any 4 hours)

Measurement Methods (see Table 1):
NIOSH 1003
OSHA 7

Physical Description: Colorless liquid with a characteristic ether-like odor.

Chemical & Physical Properties:
MW: 153.8
BP: 170°F
Sol: 0.05%
Fl.P: NA
IP: 11.47 eV
Sp.Gr: 1.59
VP: 91 mmHg
FRZ: -9°F
UEL: NA
LEL: NA
Noncombustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Chemically-active metals such as sodium, potassium & magnesium; fluorine; aluminum [Note: Forms highly toxic phosgene gas when exposed to flames or welding arcs.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; CNS depres; nau, vomit; liver, kidney inj; drow, dizz, inco; [carc]
TO: CNS, eyes, lungs, liver, kidneys, skin [in animals: liver cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Carbonyl fluoride

Formula:	CAS#:	RTECS#:	IDLH:
COF_2	353-50-4	FG6125000	N.D.

Conversion: 1 ppm = 2.70 mg/m^3

DOT: 2417 125

Synonyms/Trade Names: Carbon difluoride oxide, Carbon fluoride oxide, Carbon oxyfluoride, Carbonyl difluoride, Fluoroformyl fluoride, Fluorophosgene

Exposure Limits:
NIOSH REL: TWA 2 ppm (5 mg/m^3)
ST 5 ppm (15 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless gas with a pungent and very irritating odor. [Note: Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 66.0
BP: -118°F
Sol: Reacts
Fl.P: NA
IP: 13.02 eV
RGasD: 2.29
VP: 55.4 atm
FRZ: -173°F
UEL: NA
LEL: NA
Nonflammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Frostbite
Eyes: Frostbite
Wash skin: N.R.
Remove: N.R.
Change: N.R.
Provide: Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Heat, moisture, hexafluoroisopropylideneamino-lithium
[Note: Reacts with water to form hydrogen fluoride & carbon dioxide.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, muc memb, resp sys; eye, skin burns; lac; cough, pulm edema, dysp; chronic exposure: GI pain, musc fib, skeletal fluorosis; liquid: frostbite
TO: Eyes, skin, resp sys, bone

First Aid (see Table 6):
Eye: Frostbite
Skin: Frostbite
Breath: Resp support

Cesium hydroxide

Formula:	CAS#:	RTECS#:	IDLH:
CsOH	21351-79-1	FK9800000	N.D.

Conversion: DOT: 2682 157; 2681 154 (solution)

Synonyms/Trade Names: Cesium hydrate, Cesium hydroxide dimer

Exposure Limits:
NIOSH REL: TWA 2 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless or yellowish, crystalline solid.
[Note: Hygroscopic (i.e., absorbs moisture from the air).]

Chemical & Physical Properties:
MW: 149.9
BP: ?
Sol(59°F): 395%
Fl.P: NA
IP: NA
Sp.Gr: 3.68
VP: 0 mmHg (approx)
MLT: 522°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Water, acids, CO_2, metals (e.g., Al, Pb, Sn, Zn), oxygen
[Note: CsOH is a strong base, causing the generation of considerable heat in contact with water or moisture.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, upper resp sys; eye, skin burns
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Chlordane

Formula:	CAS#:	RTECS#:	IDLH:
$C_{10}H_6Cl_8$	57-74-9	PB9800000	Ca [100 mg/m^3]

Conversion: DOT: 2996 151

Synonyms/Trade Names: Chlordan; Chlordano;
1,2,4,5,6,7,8,8-Octachloro-3a,4,7,7a-tetrahydro-4,7-methanoindane

Exposure Limits:
NIOSH REL: Ca
TWA 0.5 mg/m^3 [skin]
See Appendix A

Chlorine

Formula:	CAS#:	RTECS#:	IDLH:
Cl_2	7782-50-5	FO2100000	10 ppm

Conversion: 1 ppm = 2.90 mg/m^3

DOT: 1017 124

Synonyms/Trade Names: Molecular chlorine

Exposure Limits:
NIOSH REL: C 0.5 ppm (1.45 mg/m^3) [15-minute]
OSHA PEL†: C 1 ppm (3 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 6011
OSHA ID101, ID126SGX

Physical Description: Greenish-yellow gas with a pungent, irritating odor. [Note: Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 70.9
BP: -29°F
Sol: 0.7%
Fl.P: NA
IP: 11.48 eV
RGasD: 2.47
VP: 6.8 atm
FRZ: -150°F
UEL: NA
LEL: NA
Nonflammable Gas, but a strong oxidizer.

Personal Protection/Sanitation (see Table 2):
Skin: Frostbite
Eyes: Frostbite
Wash skin: N.R.
Remove: N.R.
Change: N.R.
Provide: Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
NIOSH
5 ppm: CcrS*/Sa*
10 ppm: Sa:Cf*/PaprS*/CcrFS/GmFS/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Reacts explosively or forms explosive compounds with many common substances such as acetylene, ether, turpentine, ammonia, fuel gas, hydrogen & finely divided metals.

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Burning of eyes, nose, mouth; lac, rhin; cough, choking, subs pain; nau, vomit; head, dizz; syncope; pulm edema; pneu; hypox; derm; liquid: frostbite
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Frostbite
Skin: Frostbite
Breath: Resp support

Chlorine dioxide

Formula:	CAS#:	RTECS#:	IDLH:
ClO_2	10049-04-4	FO3000000	5 ppm

Conversion: 1 ppm = 2.76 mg/m^3

DOT: 9191 143 (hydrate, frozen)

Synonyms/Trade Names: Chlorine oxide, Chlorine peroxide

Exposure Limits:
NIOSH REL: TWA 0.1 ppm (0.3 mg/m^3)
ST 0.3 ppm (0.9 mg/m^3)
OSHA PEL†: TWA 0.1 ppm (0.3 mg/m^3)

Measurement Methods (see Table 1):
OSHA ID126SGX, ID202

Physical Description: Yellow to red gas or a red-brown liquid (below 52°F) with an unpleasant odor similar to chlorine and nitric acid.

Chemical & Physical Properties:
MW: 67.5
BP: 52°F
Sol(77°F): 0.3%
Fl.P: NA (Gas) ? (Liquid)
IP: 10.36 eV
RGasD: 2.33
Sp.Gr: 1.6 (Liquid at 32°F)
VP: >1 atm
FRZ: -74°F
UEL: ?
LEL: ?
Flammable Gas, Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact (liquid)
Eyes: Prevent eye contact (liquid)

α-Chloroacetophenone	Formula: $C_6H_5COCH_2Cl$	CAS#: 532-27-4	RTECS#: AM6300000	IDLH: 15 mg/m^3
Conversion: 1 ppm = 6.32 mg/m^3	DOT: 1697 153			
Synonyms/Trade Names: 2-Chloroacetophenone, Chloromethyl phenyl ketone, Mace®, Phenacyl chloride, Phenyl chloromethyl ketone, Tear gas				
Exposure Limits: NIOSH REL: TWA 0.3 mg/m^3 (0.05 ppm) OSHA PEL: TWA 0.3 mg/m^3 (0.05 ppm)			Measurement Methods (see Table 1): NIOSH P&CAM291 (II-5)	
Physical Description: Colorless to gray crystalline solid with a sharp, irritating odor.				
Chemical & Physical Properties: MW: 154.6 BP: 472°F Sol: Insoluble Fl.P: 244°F IP: 9.44 eV Sp.Gr: 1.32 VP: 0.005 mmHg MLT: 134°F UEL: ? LEL: ? Combustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily Provide: Eyewash		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 3 mg/m^3: CcrOv95/Sa 7.5 mg/m^3: Sa:Cf£/PaprOvHie£ 15 mg/m^3: CcrFOv100/GmFS100/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS100/ScbaE	
Incompatibilities and Reactivities: Water, steam, strong oxidizers [Note: Slowly corrodes metals.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, resp sys; pulm edema TO: Eyes, skin, resp sys			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed	

Chloroacetyl chloride	Formula: $ClCH_2COCl$	CAS#: 79-04-9	RTECS#: AO6475000	IDLH: N.D.
Conversion: 1 ppm = 4.62 mg/m^3	DOT: 1752 156			
Synonyms/Trade Names: Chloroacetic acid chloride, Chloroacetic chloride, Monochloroacetyl chloride				
Exposure Limits: NIOSH REL: TWA 0.05 ppm (0.2 mg/m^3) OSHA PEL†: none			Measurement Methods (see Table 1): None available	
Physical Description: Colorless to yellowish liquid with a strong, pungent odor.				
Chemical & Physical Properties: MW: 112.9 BP: 223°F Sol: Decomposes Fl.P: NA IP: 10.30 eV Sp.Gr: 1.42 VP: 19 mmHg FRZ: -7°F UEL: NA LEL: NA Noncombustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Water, alcohols, bases, metals (corrosive), amines [Note: Decomposes in water to form chloroacetic acid & hydrogen chloride gas.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, resp sys; eye, skin burns; cough, wheez, dysp; lac TO: Eyes, skin, resp sys			First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed	

C

Chlorodiphenyl (42% chlorine)	Formula: $C_6H_4ClC_6H_3Cl_2$ (approx)	CAS#: 53469-21-9	RTECS#: TQ1356000	IDLH: Ca [5 mg/m^3]
Conversion:	DOT: 2315 171			

Synonyms/Trade Names: Aroclor® 1242, PCB, Polychlorinated biphenyl

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL*: Ca TWA 0.001 mg/m^3 See Appendix A [*Note: The REL also applies to other PCBs.] OSHA PEL: TWA 1 mg/m^3 [skin]	NIOSH 5503 OSHA PV2089

Physical Description: Colorless to light-colored, viscous liquid with a mild, hydrocarbon odor.

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 258 (approx) BP: 617-691°F Sol: Insoluble Fl.P: NA IP: ? Sp.Gr(77°F): 1.39 VP: 0.001 mmHg FRZ: -2°F UEL: NA LEL: NA	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily Provide: Eyewash Quick drench	NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE

Nonflammable Liquid, but exposure in a fire results in the formation of a black soot containing PCBs, polychlorinated dibenzofurans & chlorinated dibenzo-p-dioxins.

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Abs, Ing, Con SY: Irrit eyes; chloracne; liver damage; repro effects; [carc] TO: Skin, eyes, liver, repro sys [in animals: tumors of the pituitary gland & liver, leukemia]	Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

Chlorodiphenyl (54% chlorine)	Formula: $C_{12}H_7Cl_3$ (approx)	CAS#: 11097-69-1	RTECS#: TQ1360000	IDLH: Ca [5 mg/m^3]

ooDf.

C

Chloromethyl methyl ether	Formula: CH_3OCH_2Cl	CAS#: 107-30-2	RTECS#: KN6650000	IDLH: Ca [N.D.]
Conversion:	DOT: 1239 131			

Synonyms/Trade Names: Chlorodimethyl ether, Chloromethoxymethane, CMME, Dimethylchloroether, Methylchloromethyl ether

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: Ca See Appendix A OSHA PEL: [1910.1006] See Appendix B	NIOSH P&CAM220 (II-1) OSHA 10

Physical Description: Colorless liquid with an irritating odor.

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 80.5 BP: 138°F Sol: Reacts Fl.P(oc): 32°F IP: 10.25 eV Sp.Gr: 1.06 VP(70°F): 192 mmHg FRZ: -154°F UEL: ? LEL: ? Class IB Flammable Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet (flamm) Change: Daily Provide: Eyewash Quick drench	NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE See Appendix E (page 351)

Incompatibilities and Reactivities: Water [Note: Reacts with water to form hydrochloric acid & formaldehyde.]

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, muc memb; pulm edema, pulm congestion, pneu; skin burns, nec; cough, wheez, pulm congestion; blood stained-sputum; low-wgt; bronchial secretions; [carc] TO: Eyes, skin, resp sys [in animals: skin & lung cancer]	Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

d &bOn

C

β-Chloroprene	Formula: CH_2=CClCH=CH_2	CAS#: 126-99-8	RTECS#: EI9625000	IDLH: Ca [300 ppm]

Conversion: 1 ppm = 3.62 mg/m^3

DOT: 1991 131P (inhibited)

Synonyms/Trade Names: 2-Chloro-1,3-butadiene; Chlorobutadiene; Chloroprene

Exposure Limits:
NIOSH REL: Ca
C 1 ppm (3.6 mg/m^3) [15-minute]
See Appendix A
OSHA PEL†: TWA 25 ppm (90 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 1002
OSHA 112

Physical Description: Colorless liquid with a pungent, ether-like odor.

Chemical & Physical Properties:
MW: 88.5
BP: 139°F
Sol: Slight
Fl.P: -4°F
IP: 8.79 eV
Sp.Gr: 0.96
VP: 188 mmHg
FRZ: -153°F
UEL: 11.3%
LEL: 1.9%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Peroxides & other oxidizers
[Note: Polymerizes at room temperature unless inhibited with antioxidants.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; anxi, irrity; derm; alopecia; repro effects; [carc]
TO: Eyes, skin, resp sys, repro sys [lung & skin cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

o-Chlorostyrene	Formula: ClC_6H_4CH=CH_2	CAS#: 2039-87-4	RTECS#: WL4160000	IDLH: N.D.

Conversion: 1 ppm = 5.67 mg/m^3

DOT:

Synonyms/Trade Names: 2-Chlorostyrene, ortho-Chlorostyrene, 1-Chloro-2-ethenylbenzene

Exposure Limits:
NIOSH REL: TWA 50 ppm (285 mg/m^3)
ST 75 ppm (428 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless liquid.

Chemical & Physical Properties:
MW: 138.6
BP: 372°F
Sol: Insoluble
Fl.P: 138°F
IP: ?
Sp.Gr: 1.10
VP(77°F): 0.96 mmHg
FRZ: -82°F
UEL: ?
LEL: ?
Class II Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: In animals: irrit eyes, skin; hema, prot, acidosis; enlarged liver, jaun
TO: Eyes, skin, liver, kidneys, CNS, PNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

o-Chlorotoluene

Formula:	CAS#:	RTECS#:	IDLH:
$ClC_6H_4CH_3$	95-49-8	XS9000000	N.D.

Conversion: 1 ppm = 5.18 mg/m^3

DOT: 2238 129

Synonyms/Trade Names: 1-Chloro-2-methylbenzene, 2-Chloro-1-methylbenzene, 2-Chlorotoluene, o-Tolyl chloride

Exposure Limits:
NIOSH REL: TWA 50 ppm (250 mg/m^3)
ST 75 ppm (375 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless liquid with an aromatic odor.

Chemical & Physical Properties:
MW: 126.6
BP: 320°F
Sol(77°F): 0.009%
Fl.P: 96°F
IP: 8.83 eV
Sp.Gr: 1.08
VP(77°F): 4 mmHg
FRZ: -31°F
UEL: ?
LEL: ?
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Acids, alkalis, oxidizers, reducing materials, water

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, muc memb; derm; drow, inco, anes; cough; liver, kidney inj
TO: Eyes, skin, resp sys, CNS, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

2-Chloro-6-trichloromethyl pyridine

Formula:	CAS#:	RTECS#:	IDLH:
$ClC_5H_3NCCl_3$	1929-82-4	US7525000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: 2-Chloro-6-(trichloro-methyl)pyridine; Nitrapyrin; N-serve®; 2,2,2,6-Tetrachloro-2-picoline

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
ST 20 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
None available

Physical Description: Colorless or white, crystalline solid with a mild, sweet odor.

Chemical & Physical Properties:
MW: 230.9
BP: ?
Sol: Insoluble
Fl.P: ?
IP: ?
Sp.Gr: ?
VP(73°F): 0.003 mmHg
MLT: 145°F
UEL: ?
LEL: ?
Combustible Solid [Explosive]

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Aluminum, magnesium
[Note: Emits oxides of nitrogen and chloride ion when heated to decomposition.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: No adverse effects noted in ingestion studies with animals.
TO: Eyes, skin

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

C

Chlorpyrifos

Formula:	CAS#:	RTECS#:	IDLH:
$C_9H_{11}Cl_3NO_3PS$	2921-88-2	TF6300000	N.D.

Conversion: DOT: 2783 152

Synonyms/Trade Names: Chlorpyrifos-ethyl; O,O-Diethyl O-3,5,6-trichloro-2-pyridyl phosphorothioate; Dursban®

Exposure Limits:
NIOSH REL: TWA 0.2 mg/m^3
ST 0.6 mg/m^3 [skin]
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 5600 OSHA 62

Physical Description: Colorless to white, crystalline solid with a mild, mercaptan-like odor. [pesticide]
[Note: Commercial formulations may be combined with combustible liquids.]

Chemical & Physical Properties:
MW: 350.6
BP: 320°F (Decomposes)
Sol: 0.0002%
Fl.P: ?
IP: ?
Sp.Gr: 1.40 (Liquid at 110°F)
VP: 0.00002 mmHg
MLT: 108°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong acids, caustics, amines
[Note: Corrosive to copper & brass.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Wheez, lar spasms, salv; bluish lips, skin; miosis, blurred vision; nau, vomit, abdom cramps, diarr
TO: Resp sys, CNS, PNS, plasma chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Chromic acid and chromates

Formula:	CAS#:	RTECS#:	IDLH:
CrO_3 (acid)	1333-82-0 (CrO_3)	GB6650000 (CrO_3)	Ca [15 mg/m^3 {as Cr(VI)}]

Conversion: DOT: 1755 154 (acid solution); 1463 141 (acid, solid)

Synonyms/Trade Names: Chromic acid (CrO_3): Chromic anhydride, Chromic oxide, Chromium(VI) oxide (1:3), Chromium trioxide. Synonyms of chromates (i.e., chromium(VI) compounds) such as zinc chromate vary depending upon the specific compound.

Exposure Limits:
NIOSH REL (as Cr): Ca
TWA 0.001 mg/m^3
See Appendix A
See Appendix C
OSHA PEL (as CrO_3): TWA 0.005 mg/m^3 See Appendix C

Measurement Methods (see Table 1):
NIOSH 7600, 7604, 7605
OSHA ID103, ID215, W4001

Physical Description: CrO_3: Dark-red, odorless flakes or powder.
[Note: Often used in an aqueous solution (H_2CrO_4).]

Chemical & Physical Properties:
MW: 100.0
BP: 482°F (Decomposes)
Sol: 63%
Fl.P: NA
IP: NA
Sp.Gr: 2.70 (CrO_3)
VP: Very low
MLT: 387°F (Decomposes)
UEL: NA
LEL: NA
CrO_3: Noncombustible Solid, but will accelerate the burning of combustible materials.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Combustible, organic, or other readily oxidizable materials (paper, wood, sulfur, aluminum, plastics, etc.); corrosive to metals

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit resp sys; nasal septum perf; liver, kidney damage; leucyt, leupen, eosin; eye inj, conj; skin ulcer, sens derm; [carc]
TO: Blood, resp sys, liver, kidneys, eyes, skin [lung cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

Chromium(II) compounds (as Cr)	Formula:	CAS#:	RTECS#:	IDLH: 250 mg/m^3 [as Cr(II)]
Conversion:	DOT:			

Synonyms/Trade Names: Synonyms vary depending upon the specific Chromium(II) compound.
[Note: Chromium(II) compounds include soluble chromous salts.]

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: TWA 0.5 mg/m^3 See Appendix C OSHA PEL: TWA 0.5 mg/m^3 See Appendix C	NIOSH 7024, 7300, 7301, 7303, 9102 OSHA ID121, ID125G

Physical Description: Appearance and odor vary depending upon the specific compound.

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
Properties vary depending upon the specific compound.	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.	NIOSH/OSHA 2.5 mg/m^3: Qm* 5 mg/m^3: 95XQ*/Sa* 12.5 mg/m^3: Sa:Cf*/PaprHie* 25 mg/m^3: 100F/PaprTHie*/ScbaF/SaF 250 mg/m^3: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE

Incompatibilities and Reactivities:

Clopidol	Formula: $C_7H_7Cl_2NO$	CAS#: 2971-90-6	RTECS#: UU7711500	IDLH: N.D.
Conversion:	DOT:			
Synonyms/Trade Names: Coyden®; 3,5-Dichloro-2,6-dimethyl-4-pyridinol				

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
ST 20 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500, 0600

Physical Description: White to light-brown, crystalline solid.

Chemical & Physical Properties:
MW: 192.1
BP: ?
Sol: Insoluble
Fl.P: NA
IP: ?
Sp.Gr: ?
VP: ?
MLT: >608°F
UEL: NA
LEL: NA
Noncombustible Solid, but dust may explode in cloud form.

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, nose, throat; cough
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Fresh air

Coal dust	Formula:	CAS#:	RTECS#: GF8281000	IDLH: N.D.
Conversion:	DOT: 1361 133			
Synonyms/Trade Names: Anthracite coal dust, Bituminous coal dust, Lignite coal dust				

Exposure Limits:
NIOSH REL: TWA 1 mg/m^3 [measured according to MSHA method (CPSU)]
TWA 0.9 mg/m^3 [measured according to ISO/CEN/ACGIH criteria]
See Appendix C (Coal Dust and Coal Mine Dust)
OSHA PEL†: TWA 2.4 mg/m^3 [respirable, < 5% SiO_2]
TWA (10 mg/m^3)/(%SiO_2 + 2) [respirable, > 5% SiO_2]
See Appendix C (Mineral Dusts)
[Note: The Mine Safety and Health Administration (MSHA) PEL for respirable coal mine dust with < 5% silica is 2.0 mg/m^3, or (10 mg/m^3) / (% respirable quartz + 2) for coal dust with > 5% silica.]

Cobalt hydrocarbonyl (as Co)

Formula:	CAS#:	RTECS#:	IDLH:
$HCo(CO)_4$	16842-03-8	GG0900000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: Hydrocobalt tetracarbonyl, Tetracarbonylhydridocobalt, Tetracarbonylhydrocobalt

Exposure Limits:
NIOSH REL: TWA 0.1 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Gas with an offensive odor.

Chemical & Physical Properties:
MW: 172.0
BP: ?
Sol: 0.05%
Fl.P: NA (Gas)
IP: ?
RGasD: 5.93
VP: >1 atm
FRZ: -15°F
UEL: ?
LEL: ?
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Air
[Note: Unstable gas that decomposes rapidly in air at room temperature to cobalt carbonyl & hydrogen.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: In animals: irrit resp sys; dysp, cough, decr pulm func, pulm edema
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support

Cobalt metal dust and fume (as Co)

Formula:	CAS#:	RTECS#:	IDLH:
Co	7440-48-4	GF8750000	20 mg/m^3 (as Co)

Conversion:

DOT:

Synonyms/Trade Names: Cobalt metal dust, Cobalt metal fume

Exposure Limits:
NIOSH REL: TWA 0.05 mg/m^3
OSHA PEL†: TWA 0.1 mg/m^3

Measurement Methods (see Table 1):
NIOSH 7027, 7300, 7301, 7303, 9102
OSHA ID121, ID125G, ID213

Physical Description: Odorless, silver-gray to black solid.

Chemical & Physical Properties:
MW: 58.9
BP: 5612°F
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 8.92
VP: 0 mmHg (approx)
MLT: 2719°F
UEL: NA
LEL: NA
Noncombustible Solid in bulk form, but finely divided dust will burn at high temperatures.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: N.R.
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH
0.25 mg/m^3: Qm
0.5 mg/m^3: 95XQ*/Sa*
1.25 mg/m^3: Sa:Cf*/PaprHie*
2.5 mg/m^3: 100F/ScbaF/SaF
20 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, ammonium nitrate

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Cough, dysp, wheez, decr pulm func; low-wgt; derm; diffuse nodular fib; resp hypersensitivity, asthma
TO: Skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

Crag® herbicide	Formula: $C_6H_3Cl_2OCH_2CH_2OSO_3Na$	CAS#: 136-78-7	RTECS#: KK4900000	IDLH: 500 mg/m^3
Conversion:	DOT:			

Synonym 0.40 k BT 8.225-18(g.8 126.e03 0.749 0.LO 1.2 re f 34k48 36 re f 34.32 505.86Qa05.86Qa05.0.00 1 Tf -0.0002 Tc 0.0001

Cumene	Formula: $C_6H_5CH(CH_3)_2$	CAS#: 98-82-8	RTECS#: GR8575000	IDLH: 900 ppm [10%LEL]
Conversion: 1 ppm = 4.92 mg/m^3	DOT: 1918 130			
Synonyms/Trade Names: Cumol, Isopropyl benzene, 2-Phenyl propane				
Exposure Limits: NIOSH REL: TWA 50 ppm (245 mg/m^3) [skin] OSHA PEL: TWA 50 ppm (245 mg/m^3) [skin]				Measurement Methods (see Table 1): NIOSH 1501
Physical Description: Colorless liquid with a sharp, penetrating, aromatic odor.				
Chemical & Physical Properties: MW: 120.2 BP: 306°F Sol: Insoluble Fl.P: 96°F IP: 8.75 eV Sp.Gr: 0.86 VP: 8 mmHg FRZ: -141°F UEL: 6.5% LEL: 0.9% Class IC Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 500 ppm: CcrOv*/Sa* 900 ppm: Sa:Cf*/PaprOv*/CcrFOv/ GmFOv/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Oxidizers, nitric acid, sulfur acid [Note: Forms cumene hydroperoxide upon long exposure to air.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, muc memb; derm; head, narco, coma TO: Eyes, skin, resp sys, CNS			First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed	

Cyanamide	Formula: NH_2CN	CAS#: 420-04-2	RTECS#: GS5950000	IDLH: N.D.
Conversion:	DOT:			
Synonyms/Trade Names: Amidocyanogen, Carbimide, Carbodiimide, Cyanogen nitride, Hydrogen cyanamide [Note: Cyanamide is also a synonym for Calcium cyanamide.]				
Exposure Limits: NIOSH REL: TWA 2 mg/m^3 OSHA PEL†: none				Measurement Methods (see Table 1): NIOSH 0500
Physical Description: Crystalline solid.				
Chemical & Physical Properties: MW: 42.1 BP: 500°F (Decomposes) Sol(59°F): 78% Fl.P: 286°F IP: 10.65 eV Sp.Gr: 1.28 VP: ? MLT: 113°F UEL: ? LEL: ? Combustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily Provide: Eyewash Quick drench		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Above 104°F: Moisture, acids, or alkalis; 1,2-phenylene diamine salts [Note: Polymerization may occur on evaporation of aqueous solutions.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, resp sys; eye, skin burns; miosis, salv, lac, twitch; Antabuse-like effects TO: Eyes, skin, resp sys, CNS			First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed	

C

Cyanogen

Formula:	CAS#:	RTECS#:	IDLH:
NCCN	460-19-5	GT1925000	N.D.

Conversion: 1 ppm = 2.13 mg/m^3 | DOT: 1026 119

Synonyms/Trade Names: Carbon nitride, Dicyan, Dicyanogen, Ethanedinitrile, Oxalonitrile

Exposure Limits:
NIOSH REL: TWA 10 ppm (20 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
OSHA PV2104

Physical Description: Colorless gas with a pungent, almond-like odor.
[Note: Shipped as a liquefied compressed gas. Forms cyanide in the body.]

Chemical & Physical Properties:
MW: 52.0
BP: -6°F
Sol: 1%
Fl.P: NA (Gas)
IP: 13.57 eV
RGasD: 1.82
Sp.Gr: 0.95 (Liquid at -6°F)
VP(70°F): 5.1 atm
FRZ: -18°F
UEL: 32%
LEL: 6.6%
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Frostbite
Eyes: Prevent eye contact/Frostbite
Wash skin: N.R.
Remove: When wet (flamm)
Change: N.R.
Provide: Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Acids, water, strong oxidizers (e.g., dichlorine oxide, fluorine)
[Note: Slowly hydrolyzed in water to form hydrogen cyanide, oxalic acid, or ammonia.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, nose, upper resp sys; lac; cherry red lips, tachypnea, hypernea, bradycardia; head, convuls; dizz, loss of appetite, low-wgt; liquid: frostbite
TO: Eyes, resp sys, CNS, CVS

First Aid (see Table 6):
Eye: Frostbite
Skin: Frostbite
Breath: Resp support

Cyanogen chloride

Formula:	CAS#:	RTECS#:	IDLH:
ClCN	506-77-4	GT2275000	N.D.

Conversion: 1 ppm = 2.52 mg/m^3 | DOT: 1589 125 (inhibited)

Synonyms/Trade Names: Chlorcyan, Chlorine cyanide, Chlorocyanide, Chlorocyanogen

Exposure Limits:
NIOSH REL: C 0.3 ppm (0.6 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless gas or liquid (below 55°F) with an irritating odor.
[Note: Shipped as a liquefied gas. A solid below 20°F. Forms cyanide in the body.]

Chemical & Physical Properties:
MW: 61.5
BP: 55°F
Sol: 7%
Fl.P: NA
IP: 12.49 eV
RGasD: 2.16
Sp.Gr: 1.22 (Liquid at 32°F)
VP: 1010 mmHg
FRZ: 20°F
UEL: NA
LEL: NA
Nonflammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact (liquid)
Eyes: Prevent eye contact (liquid)
Wash skin: When contam (liquid)
Remove: When wet or contam (liquid)
Change: N.R.
Provide: Eyewash (liquid)
Quick drench (liquid)

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Water, acids, alkalis, ammonia, alcohols
[Note: Can react very slowly with water to form hydrogen cyanide. May be stabilized to prevent polymerization.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs (liquid), Ing (liquid), Con (liquid)
SY: Irrit eyes, upper resp sys; cough, delayed pulm edema; lass, head, dizz, conf, nau, vomit; irreg heartbeat; irrit skin (liquid)
TO: Eyes, skin, resp sys, CNS, CVS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash immed (liquid)
Breath: Resp support
Swallow: Medical attention immed (liquid)

Cyclohexane	Formula: C_6H_{12}	CAS#: 110-82-7	RTECS#: GU6300000	IDLH: 1300 ppm [10%LEL]
Conversion: 1 ppm = 3.44 mg/m^3	DOT: 1145 128			
Synonyms/Trade Names: Benzene hexahydride, Hexahydrobenzene, Hexamethylene, Hexanaphthene				
Exposure Limits: NIOSH REL: TWA 300 ppm (1050 mg/m^3) OSHA PEL: TWA 300 ppm (1050 mg/m^3)				Measurement Methods (see Table 1): NIOSH 1500 OSHA 7
Physical Description: Colorless liquid with a sweet, chloroform-like odor. [Note: A solid below 44°F.]				

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 84.2 BP: 177°F Sol: Insoluble Fl.P: 0°F IP: 9.88 eV Sp.Gr: 0.78 VP: 78 mmHg FRZ: 44°F UEL: 8% LEL: 1.3% Class IB Flammable Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	NIOSH/OSHA 1300 ppm: Sa:Cf£/PaprOv£/CcrFOv/ GmFOv/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, resp sys; drow; derm; narco, coma TO: Eyes, skin, resp sys, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed

Cyclohexanethiol	Formula: $C_6H_{11}SH$	CAS#: 1569-69-3	RTECS#: GV7525000	IDLH: N.D.
Conversion: 1 ppm = 4.75 mg/m^3	DOT: 3054 129			
Synonyms/Trade Names: Cyclohexylmercaptan, Cyclohexylthiol				
Exposure Limits: NIOSH REL: C 0.5 ppm (2.4 mg/m^3) [15-minute] OSHA PEL: none				Measurement Methods (see Table 1): None available
Physical Description: Colorless liquid with a strong, offensive odor.				

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 116.2 BP: 316°F Sol: Insoluble Fl.P: 110°F IP: ? Sp.Gr: 0.98 VP: 10 mmHg FRZ: -181°F UEL: ? LEL: ? Class II Combustible Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench	NIOSH 5 ppm: CcrOv/Sa 12.5 ppm: Sa:Cf/PaprOv 25 ppm: CcrFOv/GmFOv/PaprTOv/ ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, reducing agents, strong acids, alkali metals	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, resp sys; head, dizz, lass, nau, vomit, convuls; cough, wheez, laryngitis, dysp TO: Eyes, skin, resp sys, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Soap flush immed Breath: Resp support Swallow: Medical attention immed

C

Cyclohexanol

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_{11}OH$	108-93-0	GV7875000	400 ppm

Conversion: 1 ppm = 4.10 mg/m^3

DOT: 1993 128 (combustible liquid, n.o.s.)

Synonyms/Trade Names: Anol, Cyclohexyl alcohol, Hexahydrophenol, Hexalin, Hydralin, Hydroxycyclohexane

Exposure Limits:
NIOSH REL: TWA 50 ppm (200 mg/m^3) [skin]
OSHA PEL†: TWA 50 ppm (200 mg/m^3)

Physical Description: Sticky solid or colorless to light-yellow liquid (above 77°F) with a camphor-like odor.

Measurement Methods (see Table 1):
NIOSH 1402, 1405
OSHA 7

Chemical & Physical Properties:
MW: 100.2
BP: 322°F
Sol: 4%
Fl.P: 154°F
IP: 10.00 eV
Sp.Gr: 0.96
VP: 1 mmHg
MLT: 77°F
UEL: ?
LEL: ?
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
400 ppm: CcrOv*/PaprOv*/GmFOv/Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers (such as hydrogen peroxide & nitric acid)

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat; narco
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash prompt
Breath: Resp support
Swallow: Medical attention immed

Cyclohexanone

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_{10}O$	108-94-1	GW1050000	700 ppm

Conversion: 1 ppm = 4.02 mg/m^3

DOT: 1915 127

Synonyms/Trade Names: Anone, Cyclohexyl ketone, Pimelic ketone

Exposure Limits:
NIOSH REL: TWA 25 ppm (100 mg/m^3) [skin]
OSHA PEL†: TWA 50 ppm (200 mg/m^3)

Physical Description: Water-white to pale-yellow liquid with a peppermint- or acetone-like odor.

Measurement Methods (see Table 1):
NIOSH 1300, 2555
OSHA 1

Chemical & Physical Properties:
MW: 98.2
BP: 312°F
Sol: 15%
Fl.P: 146°F
IP: 9.14 eV
Sp.Gr: 0.95
VP: 5 mmHg
FRZ: -49°F
UEL: 9.4%
LEL(212°F): 1.1%
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
625 ppm: Sa:Cf£/PaprOv£
700 ppm: CcrFOv/GmFOv/PaprTOv£/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, nitric acid

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, muc memb; head; narco, coma; derm; in animals: liver, kidney damage
TO: Eyes, skin, resp sys, CNS, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush prompt
Breath: Resp support
Swallow: Medical attention immed

Cyclohexene	Formula: C_6H_{10}	CAS#: 110-83-8	RTECS#: GW2500000	IDLH: 2000 ppm
Conversion: 1 ppm = 3.36 mg/m^3	DOT: 2256 130			
Synonyms/Trade Names: Benzene tetrahydride, Tetrahydrobenzene				
Exposure Limits: NIOSH REL: TWA 300 ppm (1015 mg/m^3) OSHA PEL: TWA 300 ppm (1015 mg/m^3)			Measurement Methods (see Table 1): NIOSH 1500 OSHA 7	
Physical Description: Colorless liquid with a sweet odor.				
Chemical & Physical Properties: MW: 82.2 BP: 181°F Sol: Insoluble Fl.P: 11°F IP: 8.95 eV Sp.Gr: 0.81 VP: 67 mmHg FRZ: -154°F UEL: ? LEL: ? Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 2000 ppm: Sa:Cf£/PaprOv£/CcrFOv/ GmFOv/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers [Note: Forms explosive peroxides with oxygen upon storage.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, resp sys; drow TO: Eyes, skin, resp sys, CNS			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed	

Cyclohexylamine	Formula: $C_6H_{11}NH_2$	CAS#: 108-91-8	RTECS#: GX0700000	IDLH: N.D.
Conversion: 1 ppm = 4.06 mg/m^3	DOT: 2357 132			
Synonyms/Trade Names: Aminocyclohexane, Aminohexahydrobenzene, Hexahydroaniline, Hexahydrobenzenamine				
Exposure Limits: NIOSH REL: TWA 10 ppm (40 mg/m^3) OSHA PEL†: none			Measurement Methods (see Table 1): NIOSH 2010 OSHA PV2016	
Physical Description: Colorless or yellow liquid with a strong, fishy, amine-like odor.				
Chemical & Physical Properties: MW: 99.2 BP: 274°F Sol: Miscible Fl.P: 88°F IP: 8.37 eV Sp.Gr: 0.87 VP: 11 mmHg FRZ: 0°F UEL: 9.4% LEL: 1.5% Class IC Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R. Provide: Eyewash Quick drench		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Oxidizers, organic compounds, acid anhydrides, acid chlorides, acids, lead [Note: Corrosive to copper, aluminum, zinc & galvanized steel.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, muc memb, resp sys; eye, skin burns; skin sens; cough, pulm edema; drow, dizz; diarr, nau, vomit TO: Eyes, skin, resp sys, CNS			First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed	

C

Cyclonite	Formula: $C_3H_6N_6O_6$	CAS#: 121-82-4	RTECS#: XY9450000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: Cyclotrimethylenetrinitramine; Hexahydro-1,3,5-trinitro-s-triazine; RDX; Trimethylenetrinitramine; 1,3,5-Trinitro-1,3,5-triazacyclohexane

Exposure Limits:
NIOSH REL: TWA 1.5 mg/m^3
ST 3 mg/m^3 [skin]
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 0500

Physical Description: White, crystalline powder. [Note: A powerful high explosive.]

Chemical & Physical Properties:
MW: 222.2
BP: ?
Sol: Insoluble
Fl.P: Explodes
IP: ?
Sp.Gr: 1.82
VP(230°F): 0.0004 mmHg
MLT: 401°F
UEL: ?
LEL: ?
Combustible Solid [EXPLOSIVE!]

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong oxidizers, combustible materials, heat
[Note: Detonates on contact with mercury fulminate.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; head, irrity, lass, tremor, nau, dizz, vomit, insom, convuls
TO: Eyes, skin, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

Cyclopentadiene	Formula: C_5H_6	CAS#: 542-92-7	RTECS#: GY1000000	IDLH: 750 ppm
Conversion: 1 ppm = 2.70 mg/m^3	DOT:			

Synonyms/Trade Names: 1,3-Cyclopentadiene

Exposure Limits:
NIOSH REL: TWA 75 ppm (200 mg/m^3)
OSHA PEL: TWA 75 ppm (200 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2523

Physical Description: Colorless liquid with an irritating, terpene-like odor.

Chemical & Physical Properties:
MW: 66.1
BP: 107°F
Sol: Insoluble
Fl.P(oc): 77°F
IP: 8.56 eV
Sp.Gr: 0.80
VP: 400 mmHg
FRZ: -121°F
UEL: ?
LEL: ?
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
750 ppm: CcrOv/GmFOv/PaprOv/Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, fuming nitric acid, sulfuric acid
[Note: Polymerizes to dicyclopentadiene upon standing.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, nose
TO: Eyes, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Cyclopentane	Formula: C_5H_{10}	CAS#: 287-92-3	RTECS#: GY2390000	IDLH: N.D.
Conversion: 1 ppm = 2.87 mg/m^3	DOT: 1146 128			
Synonyms/Trade Names: Pentamethylene				

Exposure Limits: NIOSH REL: TWA 600 ppm (1720 mg/m^3) OSHA PEL†: none	Measurement Methods (see Table 1): None available
Physical Description: Colorless liquid with a mild, sweet odor.	

Chemical & Physical Properties: MW: 70.2 BP: 121°F Sol: Insoluble Fl.P: -35°F IP: 10.52 eV Sp.Gr: 0.75 VP(88°F): 400 mmHg FRZ: -137°F UEL: 8.7% LEL: 1.1% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet (flamm) Change: N.R.	Respirator Recommendations (see Tables 3 and 4): Not available.

Incompatibilities and Reactivities: Strong oxidizers (e.g., chlorine, bromine, fluorine)	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose, throat; dizz, euph, inco, nau, vomit, stupor; dry, cracking skin TO: Eyes, skin, resp sys, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash Breath: Resp support Swallow: Medical attention immed

Cyhexatin	Formula: $(C_6H_{11})_3SnOH$	CAS#: 13121-70-5	RTECS#: WH8750000	IDLH: 80 mg/m^3 [25 mg/m^3 (as Sn)]
Conversion:	DOT:			
Synonyms/Trade Names: TCHH, Tricyclohexylhydroxystannane, Tricyclohexylhydroxytin, Tricyclohexylstannium hydroxide, Tricyclohexyltin hydroxide				

Exposure Limits: NIOSH REL: TWA 5 mg/m^3 OSHA PEL†: TWA 0.32 mg/m^3 [0.1 mg/m^3 (as Sn)]	Measurement Methods (see Table 1): NIOSH 5504
Physical Description: Colorless to white, nearly odorless, crystalline powder. [insecticide]	

Chemical & Physical Properties: MW: 385.2 BP: 442°F (Decomposes) Sol: Insoluble Fl.P: NA IP: NA Sp.Gr: ? VP: 0 mmHg (approx) MLT: 383°F UEL: NA LEL: NA	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: N.R. Wash skin: When contam Remove: When wet or contam Change: Daily	Respirator Recommendations (see Tables 3 and 4): OSHA 3.2 mg/m^3: CcrOv95/Sa 8 mg/m^3: Sa:Cf/PaprOvHie 16 mg/m^3: CcrFOv100/GmFOv100/ PaprTOvHie/SaT:Cf/ScbaF/SaF 80 mg/m^3: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, ultraviolet light	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, resp sys; head, dizz; sore throat, cough; abdom pain, vomit; skin burns, pruritus; in animals: liver, kidney damage TO: Eyes, skin, resp sys, liver, kidneys	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

D

2,4-D

Formula:	CAS#:	RTECS#:	IDLH:
$Cl_2C_6H_3OCH_2COOH$	94-75-7	AG6825000	100 mg/m^3

Conversion: DOT: 2765 152

Synonyms/Trade Names: Dichlorophenoxyacetic acid; 2,4-Dichlorophenoxyacetic acid

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3
OSHA PEL: TWA 10 mg/m^3

Measurement Methods (see Table 1):
NIOSH 5001

Physical Description: White to yellow, crystalline, odorless powder. [herbicide]

Chemical & Physical Properties:
MW: 221.0
BP: Decomposes
Sol: 0.05%
Fl.P: NA
IP: ?
Sp.Gr: 1.57
VP(320°F): 0.4 mmHg
MLT: 280°F
UEL: NA
LEL: NA
Noncombustible Solid, but may be dissolved in flammable liquids.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
100 mg/m^3: CcrOv95/GmFOv100/PaprOvHie/Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Lass, stupor, hyporeflexia, musc twitch; convuls; derm; in animals: liver, kidney inj
TO: Skin, CNS, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

DDT

Formula:	CAS#:	RTECS#:	IDLH:
$(C_6H_4Cl)_2CHCCl_3$	50-29-3	KJ3325000	Ca [500 mg/m^3]

Conversion: DOT: 2761 151

Synonyms/Trade Names: p,p'-DDT; Dichlorodiphenyltrichloroethane; 1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane

Exposure Limits:
NIOSH REL: Ca
TWA 0.5 mg/m^3
See Appendix A
OSHA PEL: TWA 1 mg/m^3 [skin]

Measurement Methods (see Table 1):
NIOSH S274 (II-3)

Physical Description: Colorless crystals or off-white powder with a slight, aromatic odor. [pesticide]

Chemical & Physical Properties:
MW: 354.5
BP: 230°F (Decomposes)
Sol: Insoluble
Fl.P: 162-171°F
IP: ?
Sp.Gr: 0.99
VP: 0.0000002 mmHg
MLT: 227°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, alkalis

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; pares tongue, lips, face; tremor; anxi, dizz, conf, mal, head, lass; convuls; paresis hands; vomit; [carc]
TO: Eyes, skin, CNS, kidneys, liver, PNS [in animals: liver, lung & lymphatic tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Decaborane

Formula:	CAS#:	RTECS#:	IDLH:
$B_{10}H_{14}$	17702-41-9	HD1400000	15 mg/m^3

Conversion: 1 ppm = 5.00 mg/m^3 DOT: 1868 134

Synonyms/Trade Names: Decaboron tetradecahydride

Exposure Limits:
NIOSH REL: TWA 0.3 mg/m^3 (0.05 ppm) [skin]
ST 0.9 mg/m^3 (0.15 ppm)
OSHA PEL†: TWA 0.3 mg/m^3 (0.05 ppm) [skin]

Measurement Methods (see Table 1):
None available

Physical Description: Colorless to white crystalline solid with an intense, bitter, chocolate-like odor.

Chemical & Physical Properties:
MW: 122.2
BP: 415°F
Sol: Slight
Fl.P: 176°F
IP: 9.88 eV
Sp.Gr: 0.94
VP: 0.2 mmHg
MLT: 211°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
3 mg/m^3: Sa
7.5 mg/m^3: Sa:Cf
15 mg/m^3: SaT:Cf/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Oxidizers, water, halogenated compounds (especially carbon tetrachloride)
[Note: May ignite SPONTANEOUSLY on exposure to air. Decomposes slowly in hot water.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Dizz, head, nau, drow; inco, local musc spasm, tremor, convuls; lass; in animals: dysp; lass; liver, kidney damage
TO: CNS, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

1-Decanethiol

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3(CH_2)_9SH$	143-10-2		N.D.

Conversion: 1 ppm = 7.13 mg/m^3 DOT: 1228 131

Synonyms/Trade Names: Decylmercaptan, n-Decylmercaptan, 1-Mercaptodecane

Exposure Limits:
NIOSH REL: C 0.5 ppm (3.6 mg/m^3) [15-minute]
OSHA PEL: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless liquid with a strong odor.

Chemical & Physical Properties:
MW: 174.4
BP: 465°F
Sol: Insoluble
Fl.P: 209°F
IP: ?
Sp.Gr: 0.84
VP: ?
FRZ: -15°F
UEL: ?
LEL: ?
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
5 ppm: CcrOv/Sa
12.5 ppm: Sa:Cf/PaprOv
25 ppm: CcrFOv/GmFOv/PaprTOv/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, strong acids & bases, alkali metals, nitric acid

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; conf, dizz, head, drow, nau, vomit, lass, convuls
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

D

Demeton	Formula: $(C_2H_5O)_2PSOC_2H_4SC_2H_5$	CAS#: 8065-48-3	RTECS#: TF3150000	IDLH: 10 mg/m^3
Conversion:	DOT:			

Synonyms/Trade Names: O-O-Diethyl-O(and S)-2-(ethylthio)ethyl phosphorothioate mixture, Systox®

Exposure Limits:
NIOSH REL: TWA 0.1 mg/m^3 [skin]
OSHA PEL: TWA 0.1 mg/m^3 [skin]

Measurement Methods (see Table 1):
NIOSH 5514

Physical Description: Amber, oily liquid with a sulfur-like odor. [insecticide]

Chemical & Physical Properties:
MW: 258.3
BP: Decomposes
Sol: 0.01%
Fl.P: 113°F
IP: ?
Sp.Gr: 1.12
VP: 0.0003 mmHg
FRZ: <-13°F
UEL: ?
LEL: ?
Class II Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1 mg/m^3: Sa
2.5 mg/m^3: Sa:Cf
5 mg/m^3: SaT:Cf/ScbaF/SaF
10 mg/m^3: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, alkalis, water

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; miosis, ache eyes, rhin, head; chest tight, wheez, lar spasm, salv, cyan; anor, nau, vomit, abdom cramps, diarr; local sweat; musc fasc, lass, para; dizz, conf, ataxia; convuls, coma; low BP; card irreg
TO: Eyes, skin, resp sys, CVS, CNS, blood chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Diacetone alcohol	Formula: $CH_3COCH_2C(CH_3)_2OH$	CAS#: 123-42-2	RTECS#: SA9100000	IDLH: 1800 ppm [10%LEL]
Conversion: 1 ppm = 4.75 mg/m^3	DOT: 1148 129			

Synonyms/Trade Names: Diacetone, 4-Hydroxy-4-methyl-2-pentanone, 2-Methyl-2-pentanol-4-one

Exposure Limits:
NIOSH REL: TWA 50 ppm (240 mg/m^3)
OSHA PEL: TWA 50 ppm (240 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1402, 1405
OSHA 7

Physical Description: Colorless liquid with a faint, minty odor.

Chemical & Physical Properties:
MW: 116.2
BP: 334°F
Sol: Miscible
Fl.P: 125°F
IP: ?
Sp.Gr: 0.94
VP: 1 mmHg
FRZ: -47°F
UEL: 6.9%
LEL: 1.8%
Class II Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1250 ppm: Sa:Cf£/PaprOv£
1800 ppm: CcrFOv/GmFOv/PaprTOv£/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong alkalis

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; corn damage; in animals: narco, liver damage
TO: Eyes, skin, resp sys, CNS, liver

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush prompt
Breath: Resp support
Swallow: Medical attention immed

2,4-Diaminoanisole (and its salts)	Formula: $(NH_2)_2C_6H_3OCH_3$	CAS#: 615-05-4	RTECS#: BZ8580500	IDLH: Ca [N.D.]
Conversion:	DOT:			

Synonyms/Trade Names: 1,3-Diamino-4-methoxybenzene; 4-Methoxy-1,3-benzene-diamine; 4-Methoxy-m-phenylene-diamine (Synonyms of salts vary depending upon the specific compound.)

Exposure Limits:
NIOSH REL: Ca
Minimize occupational exposure (especially skin exposures)
See Appendix A
OSHA PEL: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless solid (needles).
[Note: The primary use (including its salts such as 2,4-diaminoanisole sulfate) is a component of hair & fur dye formulations.]

Chemical & Physical Properties:
MW: 138.2
BP: ?
Sol: ?
Fl.P: ?
IP: ?
Sp.Gr: ?
VP: ?
MLT: 153°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: In animals: irrit skin; thyroid, liver changes; terato effects; [carc]
TO: Skin, thyroid, liver, repro sys [in animals: thyroid, liver, skin & lymphatic sys tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

o-Dianisidine	Formula: $(NH_2C_6H_3OCH_3)_2$	CAS#: 119-90-4	RTECS#: DD0875000	IDLH: Ca [N.D.]
Conversion:	DOT:			

Synonyms/Trade Names: Dianisidine; 3,3'-Dianisidine; 3,3'-Dimethoxybenzidine

Exposure Limits:
NIOSH REL: Ca
See Appendix A
See Appendix C
OSHA PEL: See Appendix C

Measurement Methods (see Table 1):
NIOSH 5013
OSHA 71

Physical Description: Colorless crystals that turn a violet color on standing.
[Note: Used as a basis for many dyes.]

Chemical & Physical Properties:
MW: 244.3
BP: ?
Sol: Insoluble
Fl.P: 403°F
IP: ?
Sp.Gr: ?
VP: ?
MLT: 279°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit skin; in animals: kidney, liver damage; thyroid, spleen changes; [carc]
TO: Skin, kidneys, liver, thyroid, liver [in animals: bladder, liver, stomach & mammary gland tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

D

Diazinon®

Formula:	CAS#:	RTECS#:	IDLH:
$C_{12}H_{21}N_2O_3PS$	333-41-5	TF3325000	N.D.

Conversion: DOT: 2783 152

Synonyms/Trade Names: Basudin®; Diazide®; O,O-Diethyl-O-2-isopropyl-4-methyl-6-pyrimidinyl-phosphorothioate; Spectracide®

Exposure Limits:
NIOSH REL: TWA 0.1 mg/m^3 [skin]
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 5600
OSHA 62

Physical Description: Colorless liquid with a faint ester-like odor. [insecticide] [Note: Technical grade is pale to dark brown.]

Chemical & Physical Properties:
MW: 304.4
BP: Decomposes
Sol: 0.004%
Fl.P: 180°F
IP: ?
Sp.Gr: 1.12
VP: 0.0001 mmHg
FRZ: ?
UEL: ?
LEL: ?
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong acids & alkalis, copper-containing compounds [Note: Hydrolyzes slowly in water & dilute acid.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes; miosis, blurred vision; dizz, conf, lass, convuls; dysp; salv, abdom cramps, nau, vomit
TO: Eyes, resp sys, CNS, CVS, blood chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Diazomethane

Formula:	CAS#:	RTECS#:	IDLH:
CH_2N_2	334-88-3	PA7000000	2 ppm

Conversion: 1 ppm = 1.72 mg/m^3 DOT:

Synonyms/Trade Names: Azimethylene, Azomethylene, Diazirine

Exposure Limits:
NIOSH REL: TWA 0.2 ppm (0.4 mg/m^3)
OSHA PEL: TWA 0.2 ppm (0.4 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2515

Physical Description: Yellow gas with a musty odor. [Note: Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 42.1
BP: -9°F
Sol: Reacts
Fl.P: NA (Gas)
IP: 9.00 eV
RGasD: 1.45
VP: >1 atm
FRZ: -229°F
UEL: ?
LEL: ?
Flammable Gas [EXPLOSIVE!]

Personal Protection/Sanitation (see Table 2):
Skin: Frostbite
Eyes: Frostbite
Wash skin: N.R.
Remove: When wet (flamm)
Change: N.R.
Provide: Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
2 ppm: Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Alkali metals, water, drying agents such as calcium arsenate [Note: May explode violently on heating, exposure to sunlight, or contact with rough edges such as ground glass.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con (liquid)
SY: Irrit eyes; cough, short breath; head, lass; flush skin, fever; chest pain, pulm edema, pneu; asthma; liquid: frostbite
TO: Eyes, resp sys

First Aid (see Table 6):
Eye: Frostbite
Skin: Frostbite
Breath: Resp support

Diborane

Formula:	CAS#:	RTECS#:	IDLH:
B_2H_6	19287-45-7	HQ9275000	15 ppm

Conversion: 1 ppm = 1.13 mg/m^3 DOT: 1911 119

Synonyms/Trade Names: Boroethane, Boron hydride, Diboron hexahydride

Exposure Limits:
NIOSH REL: TWA 0.1 ppm (0.1 mg/m^3)
OSHA PEL: TWA 0.1 ppm (0.1 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 6006

Physical Description: Colorless gas with a repulsive, sweet odor.
[Note: Usually shipped in pressurized cylinders diluted with hydrogen, argon, nitrogen, or helium.]

Chemical & Physical Properties:
MW: 27.7
BP: -135°F
Sol: Reacts
Fl.P: NA (Gas)
IP: 11.38 eV
RGasD: 0.97
VP(62°F): 39.5 atm
FRZ: -265°F
UEL: 88%
LEL: 0.8%
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1 ppm: Sa
2.5 ppm: Sa:Cf
5 ppm: SaT:Cf/ScbaF/SaF
15 ppm: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Water, halogenated compounds, aluminum, lithium, oxidized surfaces, acids
[Note: Will ignite spontaneously in moist air at room temperature. Reacts with water to form hydrogen & boric acid.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh
SY: Chest tight, precordial pain, short breath, nonproductive cough, nau; head, dizz, chills, fever, lass, tremor, musc fasc; in animals: liver, kidney damage; pulm edema; hemorr
TO: Resp sys, CNS, liver, kidneys

First Aid (see Table 6):
Breath: Resp support

1,2-Dibromo-3-chloropropane

Formula:	CAS#:	RTECS#:	IDLH:
$CH_2BrCHBrCH_2Cl$	96-12-8	TX8750000	Ca [N.D.]

Conversion: 1 ppm = 9.67 mg/m^3 DOT: 2872 159

Synonyms/Trade Names: 1-Chloro-2,3-dibromopropane; DBCP; Dibromochloropropane

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL: [1910.1044] TWA 0.001 ppm

Measurement Methods (see Table 1):
None available

Physical Description: Dense yellow or amber liquid with a pungent odor at high concentrations. [pesticide]
[Note: A solid below 43°F.]

Chemical & Physical Properties:
MW: 236.4
BP: 384°F
Sol: 0.1%
Fl.P(oc): 170°F
IP: ?
Sp.Gr: 2.05
VP: 0.8 mmHg
FRZ: 43°F
UEL: ?
LEL: ?
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

See Appendix E (page 351)

Incompatibilities and Reactivities: Chemically-active metals such as aluminum, magnesium & tin alloys [Note: Corrosive to metals.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat; drow; nau, vomit; pulm edema; liver, kidney inj; sterility; [carc]
TO: Eyes, skin, resp sys, CNS, liver, kidneys, spleen, repro sys, digestive sys [in animals: cancer of the nasal cavity, tongue, pharynx, lungs, stomach, adrenal & mammary glands]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

D

2-N-Dibutylaminoethanol	Formula: $(C_4H_9)_2NCH_2CH_2OH$	CAS#: 102-81-8	RTECS#: KK3850000	IDLH: N.D.
Conversion: 1 ppm = 7.09 mg/m^3	DOT: 2873 153			

Synonyms/Trade Names: Dibutylaminoethanol; 2-Dibutylaminoethanol; 2-Di-N-butylaminoethanol; 2-Di-N-butylaminoethyl alcohol; N,N-Dibutylethanolamine

Exposure Limits:
NIOSH REL: TWA 2 ppm (14 mg/m^3) [skin]
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 2007

Physical Description: Colorless liquid with a faint, amine-like odor.

Chemical & Physical Properties:
MW: 173.3
BP: 446°F
Sol: 0.4%
Fl.P: 195°F
IP: ?
Sp.Gr: 0.86
VP: 0.1 mmHg
FRZ: ?
UEL: ?
LEL: ?
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: In animals: irrit eyes, skin, nose; derm; skin, corn nec; low-wgt
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

2,6-Di-tert-butyl-p-cresol	Formula: $[C(CH_3)_3]_2CH_3C_6H_2OH$	CAS#: 128-37-0	RTECS#: GO7875000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: BHT; Butylated hydroxytoluene; Dibutylated hydroxytoluene; 4-Methyl-2,6-di-tert-butyl phenol

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH P&CAM226 (II-1)
OSHA PV2108

Physical Description: White to pale-yellow, crystalline solid with a slight, phenolic odor. [food preservative]

Chemical & Physical Properties:
MW: 220.4
BP: 509°F
Sol: 0.00004%
Fl.P: 261°F
IP: ?
Sp.Gr: 1.05
VP: 0.01 mmHg
MLT: 158°F
UEL: ?
LEL: ?
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin; in animals: decr growth rate, incr liver weight
TO: Eyes, skin

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Fresh air
Swallow: Medical attention immed

Dibutyl phosphate

Formula:	CAS#:	RTECS#:	IDLH:
$(C_4H_9O)_2(OH)PO$	107-66-4	TB9605000	30 ppm

Conversion: 1 ppm = 8.60 mg/m^3

DOT:

Synonyms/Trade Names: Dibutyl acid o-phosphate, Di-n-butyl hydrogen phosphate, Dibutyl phosphoric acid

Exposure Limits:
NIOSH REL: TWA 1 ppm (5 mg/m^3)
ST 2 ppm (10 mg/m^3)
OSHA PEL†: TWA 1 ppm (5 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 5017

Physical Description: Pale-amber, odorless liquid.

Chemical & Physical Properties:
MW: 210.2
BP: 212°F (Decomposes)
Sol: Insoluble
Fl.P: ?
IP: ?
Sp.Gr: 1.06
VP: 1 mmHg (approx)
FRZ: ?
UEL: ?
LEL: ?
Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
10 ppm: Sa
25 ppm: Sa:Cf
30 ppm: SaT:Cf/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; head
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Dibutyl phthalate

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_4(COOC_4H_9)_2$	84-74-2	TI0875000	4000 mg/m^3

Conversion: 1 ppm = 11.57 mg/m^3

DOT:

Synonyms/Trade Names: DBP; Dibutyl-1,2-benzene-dicarboxylate; Di-n-butyl phthalate

Exposure Limits:
NIOSH REL: TWA 5 mg/m^3
OSHA PEL: TWA 5 mg/m^3

Measurement Methods (see Table 1):
NIOSH 5020
OSHA 104

Physical Description: Colorless to faint-yellow, oily liquid with a slight, aromatic odor.

Chemical & Physical Properties:
MW: 278.3
BP: 644°F
Sol(77°F): 0.001%
Fl.P: 315°F
IP: ?
Sp.Gr: 1.05
VP: 0.00007 mmHg
FRZ: -31°F
UEL: ?
LEL(456°F): 0.5%
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: Prevent eye contact
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
50 mg/m^3: 95F
125 mg/m^3: Sa:Cf£/PaprHie£
250 mg/m^3: 100F/ScbaF/SaF
4000 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Nitrates; strong oxidizers, alkalis & acids; liquid chlorine

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, upper resp sys, stomach
TO: Eyes, resp sys, GI tract

First Aid (see Table 6):
Eye: Irr immed
Skin: Wash regularly
Breath: Resp support
Swallow: Medical attention immed

Dichloroacetylene

Formula:	CAS#:	RTECS#:	IDLH:
C_2Cl_2	7572-29-4	AP1080000	Ca [N.D.]

Conversion: 1 ppm = 3.88 mg/m^3 DOT:

Synonyms/Trade Names: DCA, Dichloroethyne
[Note: DCA is a possible decomposition product of trichloroethylene or trichloroethane.]

Exposure Limits:
NIOSH REL: Ca
C 0.1 ppm (0.4 mg/m^3)
See Appendix A
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Volatile oil with a disagreeable, sweetish odor.
[Note: A gas above 90°F. DCA is not produced commercially.]

Chemical & Physical Properties:
MW: 94.9
BP: 90°F (Explodes)
Sol: ?
Fl.P: ?
IP: ?
Sp.Gr: 1.26
VP: ?
FRZ: -58 to -87°F
UEL: ?
LEL: ?
Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, heat, shock

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Head, loss of appetite, nau, vomit, intense jaw pain, cranial nerve palsy; in animals: kidney, liver, brain inj; low-wgt; [carc]
TO: CNS [in animals: kidney tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

o-Dichlorobenzene

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_4Cl_2$	95-50-1	CZ4500000	200 ppm

Conversion: 1 ppm = 6.01 mg/m^3 DOT: 1591 152

Synonyms/Trade Names: o-DCB; 1,2-Dichlorobenzene; ortho-Dichlorobenzene; o-Dichlorobenzol

Exposure Limits:
NIOSH REL: C 50 ppm (300 mg/m^3)
OSHA PEL: C 50 ppm (300 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1003
OSHA 7

Physical Description: Colorless to pale-yellow liquid with a pleasant, aromatic odor.
[herbicide]

Chemical & Physical Properties:
MW: 147.0
BP: 357°F
Sol: 0.01%
Fl.P: 151°F
IP: 9.06 eV
Sp.Gr: 1.30
VP: 1 mmHg
FRZ: 1°F
UEL: 9.2%
LEL: 2.2%
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
200 ppm: CcrFOv/PaprOv£/
ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, aluminum, chlorides, acids, acid fumes

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, nose; liver, kidney damage; skin blisters
TO: Eyes, skin, resp sys, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

p-Dichlorobenzene	Formula: $C_6H_4Cl_2$	CAS#: 106-46-7	RTECS#: CZ4550000	IDLH: Ca [150 ppm]
Conversion: 1 ppm = 6.01 mg/m^3	DOT:			
Synonyms/Trade Names: p-DCB; 1,4-Dichlorobenzene; para-Dichlorobenzene; Dichlorocide				
Exposure Limits: NIOSH REL: Ca See Appendix A OSHA PEL†: TWA 75 ppm (450 mg/m^3)				Measurement Methods (see Table 1): NIOSH 1003 OSHA 7
Physical Description: Colorless or white crystalline solid with a mothball-like odor. [insecticide]				
Chemical & Physical Properties: MW: 147.0 BP: 345°F Sol: 0.008% Fl.P: 150°F IP: 8.98 eV Sp.Gr: 1.25 VP: 1.3 mmHg MLT: 128°F UEL: ? LEL: 2.5% Combustible Solid, but may take some effort to ignite.	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily Provide: Eyewash Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers (such as chlorine or permanganate)				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Eye irrit, swell periorb; profuse rhinitis; head, anor, nau, vomit; low-wgt, jaun, cirr; in animals: liver, kidney inj; [carc] TO: Liver, resp sys, eyes, kidneys, skin [in animals: liver & kidney cancer]			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash Breath: Resp support Swallow: Medical attention immed	

3,3'-Dichlorobenzidine (and its salts)	Formula: $NH_2ClC_6H_3C_6H_3ClNH_2$	CAS#: 91-94-1	RTECS#: DD0525000	IDLH: Ca [N.D.]
Conversion:	DOT:			
Synonyms/Trade Names: 4,4'-Diamino-3,3'-dichlorobiphenyl; Dichlorobenzidine base; o,o'-Dichlorobenzidine; 3,3'-Dichlorobiphenyl-4,4'-diamine; 3,3'-Dichloro-4,4'-biphenyldiamine; 3,3'-Dichloro-4,4'-diaminobiphenyl				
Exposure Limits: NIOSH REL: Ca See Appendix A OSHA PEL: [1910.1007] See Appendix B				Measurement Methods (see Table 1): NIOSH 5509 OSHA 65
Physical Description: Gray to purple, crystalline solid.				
Chemical & Physical Properties: MW: 253.1 BP: 788°F Sol(59°F): 0.07% Fl.P: ? IP: ? Sp.Gr: ? VP: ? MLT: 271°F UEL: ? LEL: ?	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily Provide: Eyewash Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE See Appendix E (page 351)	
Incompatibilities and Reactivities: None reported				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Skin sens, derm; head, dizz; caustic burns; frequent urination, dysuria; hema; GI upset; upper resp infection; [carc] TO: Bladder, liver, lung, skin, GI tract [in animals: liver & bladder cancer]			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed	

Dichlorodifluoromethane	Formula: CCl_2F_2	CAS#: 75-71-8	RTECS#: PA8200000	IDLH: 15,000 ppm
Conversion: 1 ppm = 4.95 mg/m^3	DOT: 1028 126			

Synonyms/Trade Names: Difluorodichloromethane, Fluorocarbon 12, Freon® 12, Genetron® 12, Halon® 122, Propellant 12, Refrigerant 12

Exposure Limits:
NIOSH REL: TWA 1000 ppm (4950 mg/m^3)
OSHA PEL: TWA 1000 ppm (4950 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1018

Physical Description: Colorless gas with an ether-like odor at extremely high concentrations. [Note: Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 120.9
BP: -22°F
Sol(77°F): 0.03%
Fl.P: NA
IP: 11.75 eV
RGasD: 4.2
VP: 5.7 atm
FRZ: -252°F
UEL: NA
LEL: NA
Nonflammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Frostbite
Eyes: Frostbite
Wash skin: N.R.
Remove: N.R.
Change: N.R.
Provide: Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
10,000 ppm: Sa
15,000 ppm: Sa:Cf/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Chemically-active metals such as sodium, potassium, calcium, powdered aluminum, zinc & magnesium

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con (liquid)
SY: Dizz, tremor, asphy, uncon, card arrhy, card arrest; liquid: frostbite
TO: CVS, PNS

First Aid (see Table 6):
Eye: Frostbite
Skin: Frostbite
Breath: Resp support

1,3-Dichloro-5,5-dimethylhydantoin	Formula: $C_5H_6Cl_2N_2O_2$	CAS#: 118-52-5	RTECS#: MU0700000	IDLH: 5 mg/m^3
Conversion:	DOT:			

Synonyms/Trade Names: Dactin, DDH, Halane

Exposure Limits:
NIOSH REL: TWA 0.2 mg/m^3
ST 0.4 mg/m^3
OSHA PEL†: TWA 0.2 mg/m^3

Measurement Methods (see Table 1):
None available

Physical Description: White powder with a chlorine-like odor.

Chemical & Physical Properties:
MW: 197.0
BP: ?
Sol: 0.2%
Fl.P: 346°F
IP: ?
Sp.Gr: 1.5
VP: ?
MLT: 270°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
2 mg/m^3: Sa
5 mg/m^3: Sa:Cf/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS100/ScbaE

Incompatibilities and Reactivities: Water, strong acids, easily oxidized materials such as ammonia salts & sulfides

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, muc memb, resp sys
TO: Eyes, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

1,1-Dichloroethane	Formula: $CHCl_2CH_3$	CAS#: 75-34-3	RTECS#: KI0175000	IDLH: 3000 ppm
Conversion: 1 ppm = 4.05 mg/m^3	DOT: 2362 130			
Synonyms/Trade Names: Asymmetrical dichloroethane; Ethylidene chloride; 1,1-Ethylidene dichloride				

Exposure Limits: NIOSH REL: TWA 100 ppm (400 mg/m^3) See Appendix C (Chloroethanes) OSHA PEL: TWA 100 ppm (400 mg/m^3) Physical Description: Colorless, oily liquid with a chloroform-like odor.	Measurement Methods (see Table 1): NIOSH 1003 OSHA 7

Chemical & Physical Properties: MW: 99.0 BP: 135°F Sol: 0.6% Fl.P: 2°F IP: 11.06 eV Sp.Gr: 1.18 VP: 182 mmHg FRZ: -143°F UEL: 11.4% LEL: 5.4% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 1000 ppm: Sa 2500 ppm: Sa:Cf 3000 ppm: ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong caustics	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit skin; CNS depres; liver, kidney, lung damage TO: Skin, liver, kidneys, lungs, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Soap flush prompt Breath: Resp support Swallow: Medical attention immed

1,2-Dichloroethylene	Formula: ClCH=CHCl	CAS#: 540-59-0	RTECS#: KV9360000	IDLH: 1000 ppm
Conversion: 1 ppm = 3.97 mg/m^3	DOT: 1150 130P			
Synonyms/Trade Names: Acetylene dichloride, cis-Acetylene dichloride, trans-Acetylene dichloride, sym-Dichloroethylene				

Exposure Limits: NIOSH REL: TWA 200 ppm (790 mg/m^3) OSHA PEL: TWA 200 ppm (790 mg/m^3) Physical Description: Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor.	Measurement Methods (see Table 1): NIOSH 1003 OSHA 7

Chemical & Physical Properties: MW: 97.0 BP: 118-140°F Sol: 0.4% Fl.P: 36-39°F IP: 9.65 eV Sp.Gr(77°F): 1.27 VP: 180-265 mmHg FRZ: -57 to -115°F UEL: 12.8% LEL: 5.6% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 1000 ppm: Sa:Cf£/PaprOv£/CcrFOv/ GmFOv/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong alkalis, potassium hydroxide, copper [Note: Usually contains inhibitors to prevent polymerization.]	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, resp sys; CNS depres TO: Eyes, resp sys, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed

D

Dichloroethyl ether

Formula: $(ClCH_2CH_2)_2O$ | CAS#: 111-44-4 | RTECS#: KN0875000 | IDLH: Ca [100 ppm]

Conversion: 1 ppm = 5.85 mg/m^3 | DOT: 1916 152

Synonyms/Trade Names: bis(2-Chloroethyl)ether; 2,2'-Dichlorodiethyl ether, 2,2'-Dichloroethyl ether

Exposure Limits:
NIOSH REL: Ca
TWA 5 ppm (30 mg/m^3)
ST 10 ppm (60 mg/m^3) [skin]
See Appendix A
OSHA PEL†: TWA 15 ppm (90 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 1004
OSHA 7

Physical Description: Colorless liquid with a chlorinated solvent-like odor.

Chemical & Physical Properties:
MW: 143.0
BP: 352°F
Sol: 1%
Fl.P: 131°F
IP: ?
Sp.Gr: 1.22
VP: 0.7 mmHg
FRZ: -58°F
UEL: ?
LEL: 2.7%
Class II Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers
[Note: Decomposes in presence of moisture to form hydrochloric acid.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit nose, throat, resp sys; lac; cough; nau, vomit; in animals: pulm edema; liver damage; [carc]
TO: Eyes, resp sys, liver [in animals: liver tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

Dichloromonofluoromethane

Formula: $CHCl_2F$ | CAS#: 75-43-4 | RTECS#: PA8400000 | IDLH: 5000 ppm

Conversion: 1 ppm = 4.21 mg/m^3 | DOT: 1029 126

Synonyms/Trade Names: Dichlorofluoromethane, Fluorodichloromethane, Freon® 21, Genetron® 21, Halon® 112, Refrigerant 21

Exposure Limits:
NIOSH REL: TWA 10 ppm (40 mg/m^3)
OSHA PEL†: TWA 1000 ppm (4200 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2516

Physical Description: Colorless gas with a slight, ether-like odor.
[Note: A liquid below 48°F. Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 102.9
BP: 48°F
Sol(86°F): 0.7%
Fl.P: NA
IP: 12.39 eV
RGasD: 3.57
VP(70°F): 1.6 atm
FRZ: -211°F
UEL: NA
LEL: NA
Nonflammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Frostbite
Eyes: Frostbite
Wash skin: N.R.
Remove: N.R.
Change: N.R.
Provide: Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
NIOSH
100 ppm: Sa
250 ppm: Sa:Cf
500 ppm: ScbaF/SaF
5000 ppm: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Chemically-active metals such as sodium, potassium, calcium, powdered aluminum, zinc & magnesium; acid; acid fumes

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con (liquid)
SY: Asphy, card arrhy, card arrest; liquid: frostbite
TO: Resp sys, CVS

First Aid (see Table 6):
Eye: Frostbite
Skin: Frostbite
Breath: Resp support

1,1-Dichloro-1-nitroethane	Formula: $CH_3CCl_2NO_2$	CAS#: 594-72-9	RTECS#: KI0500000	IDLH: 25 ppm
Conversion: 1 ppm = 5.89 mg/m^3	DOT: 2650 153			
Synonyms/Trade Names: Dichloronitroethane				

Exposure Limits:
NIOSH REL: TWA 2 ppm (10 mg/m^3)
OSHA PEL†: C 10 ppm (60 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1601
OSHA 7

Physical Description: Colorless liquid with an unpleasant odor. [fumigant]

Chemical & Physical Properties:
MW: 143.9
BP: 255°F
Sol: 0.3%
Fl.P: 136°F
IP: ?
Sp.Gr: 1.43
VP: 15 mmHg
FRZ: ?
UEL: ?
LEL: ?
Class II Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
20 ppm: Sa
25 ppm: Sa:Cf/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers [Note: Corrosive to iron in presence of moisture.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: In animals: irrit eyes, skin; liver, heart, kidney damage; pulm edema, hemorr
TO: Eyes, skin, resp sys, liver, kidneys, CVS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

1,3-Dichloropropene	Formula: $ClHC{=}CHCH_2Cl$	CAS#: 542-75-6	RTECS#: UC8310000	IDLH: Ca [N.D.]
Conversion: 1 ppm = 4.54 mg/m^3	DOT: 2047 129			
Synonyms/Trade Names: 3-Chloroallyl chloride; DCP; 1,3-Dichloro-1-propene; 1,3-Dichloropropylene; Telone®				

Exposure Limits:
NIOSH REL: Ca
TWA 1 ppm (5 mg/m^3) [skin]
See Appendix A
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless to straw-colored liquid with a sharp, sweet, irritating, chloroform-like odor. [insecticide] [Note: Exists as mixture of cis- & trans-isomers.]

Chemical & Physical Properties:
MW: 111.0
BP: 226°F
Sol: 0.2%
Fl.P: 77°F
IP: ?
Sp.Gr: 1.21
VP: 28 mmHg
FRZ: -119°F
UEL: 14.5%
LEL: 5.3%
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Aluminum, magnesium, halogens, oxidizers [Note: Epichlorohydrin may be added as a stabilizer.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; eye, skin burns; lac; head, dizz; in animals; liver, kidney damage; [carc]
TO: Eyes, skin, resp sys, CNS, liver, kidneys [in animals: cancer of the bladder, liver, lung & forestomach]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

2,2-Dichloropropionic acid	Formula: CH_3CCl_2COOH	CAS#: 75-99-0	RTECS#: UF0690000	IDLH: N.D.
Conversion: 1 ppm = 5.85 mg/m^3	DOT:			
Synonyms/Trade Names: Dalapon; 2,2-Dichloropropanoic acid; α,α-Dichloropropionic acid				
Exposure Limits: NIOSH REL: TWA 1 ppm (6 mg/m^3) OSHA PEL†: none			Measurement Methods (see Table 1): OSHA PV2017	
Physical Description: Colorless liquid with an acrid odor. [herbicide] [Note: A white to tan powder below 46°F. The sodium salt, a white powder, is often used.]				

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 143.0 BP: 374°F Sol: 50% Fl.P: NA IP: ? Sp.Gr: 1.40 VP: ? FRZ: 46°F UEL: NA LEL: NA Noncombustible Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench	Not available.

Incompatibilities and Reactivities: Metals [Note: Very corrosive to aluminum & copper alloys. Reacts slowly in water to form hydrochloric & pyruvic acids.]	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, upper resp sys; skin burns; lass, loss of appetite, diarr, vomit, slowing of pulse; CNS depres TO: Eyes, skin, resp sys, GI tract, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Water wash immed Breath: Resp support Swallow: Medical attention immed

Dichlorotetrafluoroethane	Formula: $CClF_2CClF_2$	CAS#: 76-14-2	RTECS#: KI1101000	IDLH: 15,000 ppm
Conversion: 1 ppm = 6.99 mg/m^3	DOT: 1958 126			
Synonyms/Trade Names: 1,2-Dichlorotetrafluoroethane; Freon® 114; Genetron® 114; Halon® 242; Refrigerant 114				
Exposure Limits: NIOSH REL: TWA 1000 ppm (7000 mg/m^3) OSHA PEL: TWA 1000 ppm (7000 mg/m^3)			Measurement Methods (see Table 1): NIOSH 1018	
Physical Description: Colorless gas with a faint, ether-like odor at high concentrations. [Note: A liquid below 38°F. Shipped as a liquefied compressed gas.]				

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 170.9 BP: 38°F Sol: 0.01% Fl.P: NA IP: 12.20 eV RGasD: 5.93 VP(70°F): 1.9 atm FRZ: -137°F UEL: NA LEL: NA Nonflammable Gas	Skin: Frostbite Eyes: Frostbite Wash skin: N.R. Remove: N.R. Change: N.R. Provide: Frostbite wash	NIOSH/OSHA 10,000 ppm: Sa 15,000 ppm: Sa:Cf/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Chemically-active metals such as sodium, potassium, calcium, powdered aluminum, zinc & magnesium; acids; acid fumes	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Con (liquid) SY: Irrit resp sys; asphy; card arrhy, card arrest; liquid: frostbite TO: Resp sys, CVS	First Aid (see Table 6): Eye: Frostbite Skin: Frostbite Breath: Resp support

Dichlorvos	Formula: $(CH_3O)_2P(O)OCH=CCl_2$	CAS#: 62-73-7	RTECS#: TC0350000	IDLH: 100 mg/m^3
Conversion: 1 ppm = 9.04 mg/m^3	DOT: 2783 152			
Synonyms/Trade Names: DDVP; 2,2-Dichlorovinyl dimethyl phosphate				
Exposure Limits: NIOSH REL: TWA 1 mg/m^3 [skin] OSHA PEL: TWA 1 mg/m^3 [skin]				Measurement Methods (see Table 1): NIOSH P&CAM295 (II-5) OSHA 62
Physical Description: Colorless to amber liquid with a mild, chemical odor. [Note: Insecticide that may be absorbed on a dry carrier.]				

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 221.0 BP: Decomposes Sol: 0.5% Fl.P: >175°F IP: ? Sp.Gr(77°F): 1.42 VP: 0.01 mmHg FRZ: ? UEL: ? LEL: ? Class III Combustible Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.	NIOSH/OSHA 10 mg/m^3: Sa 25 mg/m^3: Sa:Cf 50 mg/m^3: SaT:Cf/ScbaF/SaF 100 mg/m^3: Sa:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong acids, strong alkalis [Note: Corrosive to iron & mild steel.]	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin; miosis, ache eyes; rhin; head; chest tight, wheez, lar spasm, salv; cyan; anor, nau, vomit, diarr; sweat; musc fasc, para, dizz, ataxia; convuls; low BP, card irreg TO: Eyes, skin, resp sys, CVS, CNS, blood chol	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

Dicrotophos	Formula: $C_8H_{16}NO_5P$	CAS#: 141-66-2	RTECS#: TC3850000	IDLH: N.D.
Conversion: 1 ppm = 9.70 mg/m^3	DOT:			
Synonyms/Trade Names: Bidrin®, Carbicron®, 2-Dimethyl-cis-2-dimethylcarbamoyl-1-methylvinylphosphate				
Exposure Limits: NIOSH REL: TWA 0.25 mg/m^3 [skin] OSHA PEL†: none				Measurement Methods (see Table 1): NIOSH 5600
Physical Description: Yellow-brown liquid with a mild, ester odor. [insecticide]				

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 237.2 BP: 752°F Sol: Miscible Fl.P: >200°F IP: ? Sp.Gr(59°F): 1.22 VP: 0.0001 mmHg FRZ: ? UEL: ? LEL: ? Class IIIB Combustible Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily Provide: Quick drench	Not available.

Incompatibilities and Reactivities: Metals [Note: Corrosive to cast iron, mild steel, brass & stainless steel.]	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Head, nau, dizz, anxi, restless, musc twitch, lass, tremor, inco, vomit, abdom cramps, diarr; salv, sweat, lac, rhinitis; anor, mal TO: CNS, blood chol	First Aid (see Table 6): Eye: Irr immed Skin: Water wash immed Breath: Resp support Swallow: Medical attention immed

Dicyclopentadiene

Formula:	CAS#:	RTECS#:	IDLH:
$C_{10}H_{12}$	77-73-6	PC1050000	N.D.

Conversion: 1 ppm = 5.41 mg/m^3 DOT: 2048 130

Synonyms/Trade Names: Bicyclopentadiene; DCPD; 1,3-Dicyclopentadiene dimer; 3a,4,7,7a-Tetrahydro-4,7-methanoindene [Note: Exists in two stereoisomeric forms.]

Exposure Limits:
NIOSH REL: TWA 5 ppm (30 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
OSHA PV2098

Physical Description: Colorless, crystalline solid with a disagreeable, camphor-like odor. [Note: A liquid above 90°F.]

Chemical & Physical Properties:
MW: 132.2
BP: 342°F
Sol: 0.02%
Fl.P(oc): 90°F
IP: ?
Sp.Gr: 0.98 (Liquid at 95°F)
VP: 1.4 mmHg
FRZ: 90°F
UEL: 6.3%
LEL: 0.8%
Class IC Flammable Liquid
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Oxidizers
[Note: Depolymerizes at boiling point and forms two molecules of cyclopentadiene. Must be inhibited and maintained under an inert atmosphere to prevent polymerization.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; inco, head; sneez, cough; skin blisters; in animals: kidney, lung damage
TO: Eyes, skin, resp sys, CNS, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

Dicyclopentadienyl iron

Formula:	CAS#:	RTECS#:	IDLH:
$(C_5H_5)_2Fe$	102-54-5	LK0700000	N.D.

Conversion: DOT:

Synonyms/Trade Names: bis(Cyclopentadienyl)iron, Ferrocene, Iron dicyclopentadienyl

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL†: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
OSHA ID125G

Physical Description: Orange, crystalline solid with a camphor-like odor.

Chemical & Physical Properties:
MW: 186.1
BP: 480°F
Sol: Insoluble
Fl.P: ?
IP: 6.88 eV
Sp.Gr: ?
VP: ?
MLT: 343°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Ammonium perchlorate, tetranitromethane, mercury(II) nitrate

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Possible irrit eyes, skin, resp sys; in animals: liver, RBC, testicular changes
TO: Eyes, skin, resp sys, liver, blood, repro sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

Dieldrin	Formula: $C_{12}H_8Cl_6O$	CAS#: 60-57-1	RTECS#: IO1750000	IDLH: Ca [50 mg/m^3]
Conversion:	DOT: 2761 151			

Synonyms/Trade Names: HEOD;
1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo,exo-5,8-dimethanonaphthalene

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: Ca TWA 0.25 mg/m^3 [skin] See Appendix A OSHA PEL: TWA 0.25 mg/m^3 [skin]	NIOSH S283 (II-3)

Physical Description: Colorless to light-tan crystals with a mild, chemical odor. [insecticide]

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 380.9 BP: Decomposes Sol: 0.02% Fl.P: NA IP: ? Sp.Gr: 1.75 VP(77°F): 8 x 10^{-7} mmHg MLT: 349°F UEL: NA LEL: NA Noncombustible Solid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily Provide: Eyewash Quick drench	NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, active metals such as sodium, strong acids, phenols

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Abs, Ing, Con SY: Head, dizz; nau, vomit, mal, sweat; myoclonic limb jerks; clonic, tonic convuls; coma; [carc]; in animals: liver, kidney damage TO: CNS, liver, kidneys, skin [in animals: lung, liver, thyroid & adrenal gland tumors]	Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

Diesel exhaust	Formula:	CAS#:	RTECS#: HZ1755000	IDLH: Ca [N.D.]
Conversion:	DOT:			

Synonyms/Trade Names: Synonyms vary depending upon the specific diesel exhaust component.

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: Ca See Appendix A OSHA PEL: none	NIOSH 2560, 5040
Physical Description: Appearance and odor vary depending upon the specific diesel exhaust component.	

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
Properties vary depending upon the specific component diesel exhaust component.	Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.	NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Varies

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Con SY: Eye irrit, pulm func changes; [carc] TO: Eyes, resp sys [in animals: lung tumors]	Breath: Resp support

D

Diethanolamine

Formula:	CAS#:	RTECS#:	IDLH:
$(HOCH_2CH_2)_2NH$	111-42-2	KL2975000	N.D.

Conversion: 1 ppm = 4.30 mg/m^3

DOT:

Synonyms/Trade Names: DEA; Di(2-hydroxyethyl)amine; 2,2'-Dihydroxydiethyamine; Diolamine; bis(2-Hydroxyethyl)amine; 2,2'-Iminodiethanol

Exposure Limits:
NIOSH REL: TWA 3 ppm (15 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 3509
OSHA PV2018

Physical Description: Colorless crystals or a syrupy, white liquid (above 82°F) with a mild, ammonia-like odor.

Chemical & Physical Properties:
MW: 105.2
BP: 516°F (Decomposes)
Sol: 95%
Fl.P: 279°F
IP: ?
Sp.Gr: 1.10
VP: <0.01 mmHg
MLT: 82°F
UEL: 9.8%
LEL: 1.6%
Class IIIB Combustible Liquid
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Oxidizers, strong acids, acid anhydrides, halides
[Note: Reacts with CO_2 in the air. Hygroscopic (i.e., absorbs moisture from the air). Corrosive to copper, zinc, and galvanized iron.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; eye burns, corn nec; skin burns; lac, cough, sneez
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Diethylamine

Formula:	CAS#:	RTECS#:	IDLH:
$(C_2H_5)_2NH$	109-89-7	HZ8750000	200 ppm

Conversion: 1 ppm = 2.99 mg/m^3

DOT: 1154 132

Synonyms/Trade Names: Diethamine; N,N-Diethylamine; N-Ethylethanamine

Exposure Limits:
NIOSH REL: TWA 10 ppm (30 mg/m^3)
ST 25 ppm (75 mg/m^3)
OSHA PEL†: TWA 25 ppm (75 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2010
OSHA 41

Physical Description: Colorless liquid with a fishy, ammonia-like odor.

Chemical & Physical Properties:
MW: 73.1
BP: 132°F
Sol: Miscible
Fl.P: -15°F
IP: 8.01 eV
Sp.Gr: 0.71
VP: 192 mmHg
FRZ: -58°F
UEL: 10.1%
LEL: 1.8%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash (>0.5%)
Quick drench (liquid)

Respirator Recommendations (see Tables 3 and 4):
NIOSH
200 ppm: Sa:Cf£/PaprS£/CcrFS/GmFS/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong acids, cellulose nitrate

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; in animals; myocardial degeneration
TO: Eyes, skin, resp sys, CVS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

2-Diethylaminoethanol	Formula: $(C_2H_5)_2NCH_2CH_2OH$	CAS#: 100-37-8	RTECS#: KK5075000	IDLH: 100 ppm
Conversion: 1 ppm = 4.79 mg/m^3	DOT: 2686 132			

Synonyms/Trade Names: Diethylaminoethanol; 2-Diethylaminoethyl alcohol; N,N-Diethylethanolamine; Diethyl-(2-hydroxyethyl)amine; 2-Hydroxytriethylamine

Exposure Limits:
NIOSH REL: TWA 10 ppm (50 mg/m^3) [skin]
OSHA PEL: TWA 10 ppm (50 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 2007

Physical Description: Colorless liquid with a nauseating, ammonia-like odor.

Chemical & Physical Properties:
MW: 117.2
BP: 325°F
Sol: Miscible
Fl.P: 126°F
IP: ?
Sp.Gr: 0.89
VP: 1 mmHg
FRZ: -94°F
UEL: 11.7%
LEL: 6.7%
Class II Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash (>5%)
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
100 ppm: CcrOv*/GmFOv/PaprOv*/ Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong acids

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; nau, vomit
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Diethylenetriamine	Formula: $(NH_2CH_2CH_2)_2NH$	CAS#: 111-40-0	RTECS#: IE1225000	IDLH: N.D.
Conversion: 1 ppm = 4.22 mg/m^3	DOT: 2079 154			

Synonyms/Trade Names: N-(2-Aminoethyl)-1,2-ethanediamine; bis(2-Aminoethyl)amine; DETA; 2,2'-Diaminodiethylamine

Exposure Limits:
NIOSH REL: TWA 1 ppm (4 mg/m^3) [skin]
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 2540
OSHA 60

Physical Description: Colorless to yellow liquid with a strong, ammonia-like odor. [Note: Hygroscopic (i.e., absorbs moisture from the air).]

Chemical & Physical Properties:
MW: 103.2
BP: 405°F
Sol: Miscible
Fl.P: 208°F
IP: ?
Sp.Gr: 0.96
VP: 0.4 mmHg
FRZ: -38°F
UEL: 6.7%
LEL: 2%
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Oxidizers, strong acids, cellulose nitrate
[Note: May form explosive complexes with silver, cobalt, or chromium compounds. Corrosive to aluminum, copper, brass & zinc.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, muc memb, upper resp sys; derm, skin sens; eye, skin nec; cough, dysp, pulm sens
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

D

Diethyl ketone

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3CH_2COCH_2CH_3$	96-22-0	SA8050000	N.D.

Conversion: 1 ppm = 3.53 mg/m^3

DOT: 1156 127

Synonyms/Trade Names: DEK, Dimethylacetone, Ethyl ketone, Metacetone, 3-Pentanone, Propione

Exposure Limits:
NIOSH REL: TWA 200 ppm (705 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless liquid with an acetone-like odor.

Chemical & Physical Properties:
MW: 86.2
BP: 215°F
Sol: 5%
Fl.P(oc): 55°F
IP: 9.32 eV
Sp.Gr: 0.81
VP(77°F): 35 mmHg
FRZ: -44°F
UEL: 6.4%
LEL: 1.6%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: Prevent eye contact
Wash skin: Daily
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong oxidizers, alkalis, mineral acids, (hydrogen peroxide + nitric acid)

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, muc memb, resp sys; cough, sneez
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

Diethyl phthalate

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_4(COOC_2H_5)_2$	84-66-2	TI1050000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: DEP, Diethyl ester of phthalic acid, Ethyl phthalate

Exposure Limits:
NIOSH REL: TWA 5 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
OSHA 104

Physical Description: Colorless to water-white, oily liquid with a very slight, aromatic odor. [pesticide]

Chemical & Physical Properties:
MW: 222.3
BP: 563°F
Sol(77°F): 0.1%
Fl.P(oc): 322°F
IP: ?
Sp.Gr: 1.12
VP(77°F): 0.002 mmHg
FRZ: -41°F
UEL: ?
LEL(368°F): 0.7%
Class IIIB Combustible Liquid; however, ignition is difficult.

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong oxidizers, strong acids, nitric acid, permanganates, water

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; head, dizz, nau; lac; possible polyneur, vestibular dysfunc; pain, numb, lass, spasms in arms & legs; in animals: possible repro effects
TO: Eyes, skin, resp sys, CNS, PNS, repro sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Wash regularly
Breath: Resp support
Swallow: Medical attention immed

Difluorodibromomethane

Formula:	CAS#:	RTECS#:	IDLH:
CBr_2F_2	75-61-6	PA7525000	2000 ppm

Conversion: 1 ppm = 8.58 mg/m^3

DOT: 1941 171

Synonyms/Trade Names: Dibromodifluoromethane, Freon® 12B2, Halon® 1202

Exposure Limits:
NIOSH REL: TWA 100 ppm (860 mg/m^3)
OSHA PEL: TWA 100 ppm (860 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1012
OSHA 7

Physical Description: Colorless, heavy liquid or gas (above 76°F) with a characteristic odor.

Chemical & Physical Properties:
MW: 209.8
BP: 76°F
Sol: Insoluble
Fl.P: NA
IP: 11.07 eV
Sp.Gr(59°F): 2.29
VP: 620 mmHg
FRZ: -231°F
UEL: NA
LEL: NA
Noncombustible Liquid
Nonflammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: N.R.
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1000 ppm: Sa
2000 ppm: Sa:Cf/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Chemically-active metals such as sodium, potassium, calcium, powdered aluminum, zinc & magnesium

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: In animals: irrit resp sys; CNS symptoms; liver damage
TO: Resp sys, CNS, liver

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Diglycidyl ether

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_{10}O_3$	2238-07-5	KN2350000	Ca [10 ppm]

Conversion: 1 ppm = 5.33 mg/m^3

DOT:

Synonyms/Trade Names: Diallyl ether dioxide; DGE; Di(2,3-epoxypropyl) ether; 2-Epoxypropyl ether; bis(2,3-Epoxypropyl) ether

Exposure Limits:
NIOSH REL: Ca
TWA 0.1 ppm (0.5 mg/m^3)
See Appendix A
OSHA PEL†: C 0.5 ppm (2.8 mg/m^3)

Measurement Methods (see Table 1):
None available

Physical Description: Colorless liquid with a strong, irritating odor.

Chemical & Physical Properties:
MW: 130.2
BP: 500°F
Sol: ?
Fl.P: 147°F
IP: ?
Sp.Gr: 1.12
VP(77°F): 0.09 mmHg
FRZ: ?
UEL: ?
LEL: ?
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; skin burns; in animals: hemato sys, lung, liver, kidney damage; repro effects; [carc]
TO: Eyes, skin, resp sys, repro sys [in animals: skin tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

D

Diisobutyl ketone

Formula:	CAS#:	RTECS#:	IDLH:
$[(CH_3)_2CHCH_2]_2CO$	108-83-8	MJ5775000	500 ppm

Conversion: 1 ppm = 5.82 mg/m^3 DOT: 1157 128

Synonyms/Trade Names: DIBK; sym-Diisopropyl acetone; 2,6-Dimethyl-4-heptanone; Isovalerone; Valerone

Exposure Limits:
NIOSH REL: TWA 25 ppm (150 mg/m^3)
OSHA PEL†: TWA 50 ppm (290 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1300, 2555
OSHA 7

Physical Description: Colorless liquid with a mild, sweet odor.

Chemical & Physical Properties:
MW: 142.3
BP: 334°F
Sol: 0.05%
Fl.P: 120°F
IP: 9.04 eV
Sp.Gr: 0.81
VP: 2 mmHg
FRZ: -43°F
UEL(200°F): 7.1%
LEL(200°F): 0.8%
Class II Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: N.R.
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
500 ppm: Sa:Cf£/PaprOv£/CcrFOv/ GmFOv/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; head, dizz; derm; liver, kidney damage
TO: Eyes, skin, resp sys, CNS, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Diisopropylamine

Formula:	CAS#:	RTECS#:	IDLH:
$[(CH_3)_2CH]_2NH$	108-18-9	IM4025000	200 ppm

Conversion: 1 ppm = 4.14 mg/m^3 DOT: 1158 132

Synonyms/Trade Names: DIPA, N-(1-Methylethyl)-2-propanamine

Exposure Limits:
NIOSH REL: TWA 5 ppm (20 mg/m^3) [skin]
OSHA PEL: TWA 5 ppm (20 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH S141 (II-4)

Physical Description: Colorless liquid with an ammonia- or fish-like odor.

Chemical & Physical Properties:
MW: 101.2
BP: 183°F
Sol: Miscible
Fl.P: 20°F
IP: 7.73 eV
Sp.Gr: 0.72
VP: 70 mmHg
FRZ: -141°F
UEL: 7.1%
LEL: 1.1%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact (>5%)
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash (>5%)

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
125 ppm: Sa:Cf£/PaprOv£
200 ppm: CcrFOv/GmFOv/PaprTOv£/ ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong acids

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; nau, vomit; head; vis dist
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash immed
Breath: Resp support
Swallow: Medical attention immed

Dimethyl acetamide	Formula: $CH_3CON(CH_3)_2$	CAS#: 127-19-5	RTECS#: AB7700000	IDLH: 300 ppm
Conversion: 1 ppm = 3.56 mg/m^3	DOT:			
Synonyms/Trade Names: N,N-Dimethyl acetamide; DMAC				
Exposure Limits: NIOSH REL: TWA 10 ppm (35 mg/m^3) [skin] OSHA PEL: TWA 10 ppm (35 mg/m^3) [skin]			Measurement Methods (see Table 1): NIOSH 2004	
Physical Description: Colorless liquid with a weak, ammonia- or fish-like odor.				
Chemical & Physical Properties: MW: 87.1 BP: 329°F Sol: Miscible Fl.P(oc): 158°F IP: 8.81 eV Sp.Gr: 0.94 VP: 2 mmHg FRZ: -4°F UEL(320°F): 11.5% LEL(212°F): 1.8% Class IIIA Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 100 ppm: Sa 250 ppm: Sa:Cf 300 ppm: ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Carbon tetrachloride, other halogenated compounds when in contact with iron, oxidizers				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit skin; jaun, liver damage; depres, drow, halu, delusions TO: Skin, liver, CNS			First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed	

Dimethylamine	Formula: $(CH_3)_2NH$	CAS#: 124-40-3	RTECS#: IP8750000	IDLH: 500 ppm
Conversion: 1 ppm = 1.85 mg/m^3	DOT: 1032 118 (anhydrous); 1160 132 (solution)			
Synonyms/Trade Names: Dimethylamine (anhydrous), N-Methylmethanamine				
Exposure Limits: NIOSH REL: TWA 10 ppm (18 mg/m^3) OSHA PEL: TWA 10 ppm (18 mg/m^3)			Measurement Methods (see Table 1): NIOSH 2010 OSHA 34	
Physical Description: Colorless gas with an ammonia- or fish-like odor. [Note: A liquid below 44°F. Shipped as a liquefied compressed gas.]				
Chemical & Physical Properties: MW: 45.1 BP: 44°F Sol(140°F): 24% Fl.P: NA (Gas) 20°F (Liquid) IP: 8.24 eV RGasD: 1.56 Sp.Gr: 0.67 (Liquid at 44°F) VP: 1.7 atm FRZ: -134°F UEL: 14.4% LEL: 2.8% Flammable Gas	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact (liquid) Frostbite Eyes: Prevent eye contact (liquid) Frostbite Wash skin: When contam (liquid) Remove: When wet (flamm) Change: N.R. Provide: Eyewash (liquid) Quick drench (liquid) Frostbite wash		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 250 ppm: Sa:Cf£ 500 ppm: ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers, chlorine, mercury, acraldehyde, fluorides, maleic anhydride, aluminum, brass, copper, zinc				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Con (liquid) SY: Irrit nose, throat; sneez, cough, dysp; pulm edema; conj; derm; liquid: frostbite TO: Eyes, skin, resp sys			First Aid (see Table 6): Eye: Irr immed (liquid)/Frostbite Skin: Water flush immed (liquid)/Frostbite Breath: Resp support	

D

4-Dimethylaminoazobenzene	Formula: $C_6H_5NNC_6H_4N(CH_3)_2$	CAS#: 60-11-7	RTECS#: BX7350000	IDLH: Ca [N.D.]
Conversion:	DOT:			

Synonyms/Trade Names: Butter yellow; DAB; p-Dimethylaminoazobenzene; N,N-Dimethyl-4-aminoazobenzene; Methyl yellow

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL: [1910.1015] See Appendix B

Measurement Methods (see Table 1):
NIOSH P&CAM284 (II-4)

Physical Description: Yellow, leaf-shaped crystals.

Chemical & Physical Properties:
MW: 225.3
BP: Sublimes
Sol: 0.001%
Fl.P: ?
IP: ?
Sp.Gr: ?
VP: 0.0000003 mmHg (est.)
MLT: 237°F
UEL: ?
LEL: ?

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

See Appendix E (page 351)

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Enlarged liver; liver, kidney dist; contact derm; cough, wheez, dysp; bloody sputum; bronchial secretions; frequent urination, hema, dysuria; [carc]
TO: Skin, resp sys, liver, kidneys, bladder [in animals: liver & bladder tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

bis(2-(Dimethylamino)ethyl)ether	Formula: $C_8H_{20}N_2O$	CAS#: 3033-62-3	RTECS#: KR9460000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: NIAX® A99; NIAX® Catalyst A1; 2,2'-Oxybis(N,N-dimethyl ethylamine)
[Note: A component (5%) of NIAX® Catalyst ESN, along with dimethylaminopropionitrile (95%).]

Exposure Limits:
NIOSH REL: See Appendix C (NIAX® Catalyst ESN)
OSHA PEL: See Appendix C (NIAX® Catalyst ESN)

Measurement Methods (see Table 1):
None available

Physical Description: Liquid.

Chemical & Physical Properties:
MW: 160.3
BP: 372°F
Sol: ?
Fl.P: ?
IP: ?
Sp.Gr: ?
VP: ?
FRZ: ?
UEL: ?
LEL: ?

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Possible urinary dist, neurological disorders; in animals: irrit eyes, skin
TO: Eyes, skin, urinary tract, PNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Dimethylaminopropionitrile	Formula: $(CH_3)_2NCH_2CH_2CN$	CAS#: 1738-25-6	RTECS#: UG1575000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: 3-(Dimethylamino)propionitrile; N,N-Dimethylamino-3-propionitrile
[Note: A component (95%) of NIAX® Catalyst ESN, along with bis(2-(dimethylamino)ethyl) ether (5%).]

Exposure Limits:
NIOSH REL: See Appendix C (NIAX® Catalyst ESN)
OSHA PEL: See Appendix C (NIAX® Catalyst ESN)

Measurement Methods (see Table 1):
None available

Physical Description: Colorless liquid.

Chemical & Physical Properties:
MW: 98.2
BP: 342°F
Sol: Miscible
Fl.P: 147°F
IP: ?
Sp.Gr(86°F): 0.86
VP(135°F): 10 mmHg
FRZ: -48°F
UEL: ?
LEL: ?
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers
[Note: Emits toxic oxides of nitrogen and cyanide fumes when heated to decomposition.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; urinary dist; neurological disorders; pins & needles in hands & feet; musc weak, lass, nau, vomit; decr nerve conduction in lower legs
TO: Eyes, skin, CNS, urinary tract

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

N,N-Dimethylaniline	Formula: $C_6H_5N(CH_3)_2$	CAS#: 121-69-7	RTECS#: BX4725000	IDLH: 100 ppm
Conversion: 1 ppm = 4.96 mg/m^3	DOT: 2253 153			

Synonyms/Trade Names: N,N-Dimethylbenzeneamine; N,N-Dimethylphenylamine
[Note: Also known as Dimethylaniline which is a correct synonym for Xylidine.]

Exposure Limits:
NIOSH REL: TWA 5 ppm (25 mg/m^3)
ST 10 ppm (50 mg/m^3) [skin]
OSHA PEL†: TWA 5 ppm (25 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 2002
OSHA PV2064

Physical Description: Pale yellow, oily liquid with an amine-like odor. [Note: A solid below 36°F.]

Chemical & Physical Properties:
MW: 121.2
BP: 378°F
Sol: 2%
Fl.P: 142°F
IP: 7.14 eV
Sp.Gr: 0.96
VP: 1 mmHg
FRZ: 36°F
UEL: ?
LEL: ?
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
50 ppm: Sa
100 ppm: Sa:Cf/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong acids, benzoyl peroxide

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Anoxia symptoms: cyan, lass, dizz, ataxia; methemo
TO: Blood, kidneys, liver, CVS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

D

Dimethyl carbamoyl chloride	Formula: $(CH_3)_2NCOCl$	CAS#: 79-44-7	RTECS#: FD4200000	IDLH: Ca [N.D.]
Conversion:	DOT: 2262 156			

Synonyms/Trade Names: Chloroformic acid dimethylamide; Dimethylcarbamic chloride; N,N-Dimethylcarbamoyl chloride; DMCC

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL: none

Measurement Methods (see Table 1):
None available

Physical Description: Clear, colorless liquid.

Chemical & Physical Properties:
MW: 107.6
BP: 329°F
Sol: Reacts
Fl.P: 155°F
IP: ?
Sp.Gr: 1.17
VP: ?
FRZ: -27°F
UEL: ?
LEL: ?
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Acids, water
[Note: Rapidly hydrolyzes in water to dimethylamine, carbon dioxide, and hydrogen chloride.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat, resp sys; eye, skin burns; cough, wheez, larnygitis, dysp; head, nau, vomit; liver inj; [carc]
TO: Eyes, skin, resp sys, liver [in animals: nasal cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Dimethyl-1,2-dibromo-2,2-dichlorethyl phosphate	Formula: $(CH_3O)_2P(O)OCHBrCBrCl_2$	CAS#: 300-76-5	RTECS#: TB9450000	IDLH: 200 mg/m^3
Conversion:	DOT:			

Synonyms/Trade Names: Dibrom®; 1,2-Dibromo-2,2-dichloroethyl dimethyl phosphate; Naled

Exposure Limits:
NIOSH REL: TWA 3 mg/m^3 [skin]
OSHA PEL†: TWA 3 mg/m^3

Measurement Methods (see Table 1):
None available

Physical Description: Colorless to white solid or straw-colored liquid (above 80°F) with a slightly pungent odor. [insecticide]

Chemical & Physical Properties:
MW: 380.8
BP: Decomposes
Sol: Insoluble
Fl.P: NA
IP: ?
Sp.Gr(77°F): 1.96
VP: 0.0002 mmHg
MLT: 80°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
30 mg/m^3: 95XQ/Sa
75 mg/m^3: Sa:Cf/PaprHie
150 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF
200 mg/m^3: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, acids, sunlight, water
[Note: Corrosive to metals. Hydrolyzed in presence of water.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; miosis, lac; head; chest tight, wheez, lar spasm; salv; cyan; anor, nau, vomit, abdom cramp, diarr; lass, twitch, para; dizz, ataxia, convuls; low BP; card irreg
TO: Eyes, skin, resp sys, CNS, CVS, blood chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Dimethylformamide

Formula:	CAS#:	RTECS#:	IDLH:
$HCON(CH_3)_2$	68-12-2	LQ2100000	500 ppm

Conversion: 1 ppm = 2.99 mg/m^3

DOT: 2265 129

Synonyms/Trade Names: Dimethyl formamide; N,N-Dimethylformamide; DMF

Exposure Limits:
NIOSH REL: TWA 10 ppm (30 mg/m^3) [skin]
OSHA PEL: TWA 10 ppm (30 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 2004
OSHA 66

Physical Description: Colorless to pale-yellow liquid with a faint, amine-like odor.

Chemical & Physical Properties:
MW: 73.1
BP: 307°F
Sol: Miscible
Fl.P: 136°F
IP: 9.12 eV
Sp.Gr: 0.95
VP: 3 mmHg
FRZ: -78°F
UEL: 15.2%
LEL(212°F): 2.2%
Class II Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
100 ppm: Sa*
250 ppm: Sa:Cf*
500 ppm: SaT:Cf*/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Carbon tetrachloride; other halogenated compounds when in contact with iron; strong oxidizers; alkyl aluminums; inorganic nitrates

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; nau, vomit, colic; liver damage, enlarged liver; high BP; face flush; derm; in animals: kidney, heart damage
TO: Eyes, skin, resp sys, liver, kidneys, CVS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush prompt
Breath: Resp support
Swallow: Medical attention immed

1,1-Dimethylhydrazine

Formula:	CAS#:	RTECS#:	IDLH:
$(CH_3)_2NNH_2$	57-14-7	MV2450000	Ca [15 ppm]

Conversion: 1 ppm = 2.46 mg/m^3

DOT: 1163 131

Synonyms/Trade Names: Dimazine, DMH, UDMH, Unsymmetrical dimethylhydrazine

Exposure Limits:
NIOSH REL: Ca
C 0.06 ppm (0.15 mg/m^3) [2-hr]
See Appendix A
OSHA PEL: TWA 0.5 ppm (1 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 3515

Physical Description: Colorless liquid with an ammonia- or fish-like odor.

Chemical & Physical Properties:
MW: 60.1
BP: 147°F
Sol: Miscible
Fl.P: 5°F
IP: 8.05 eV
Sp.Gr: 0.79
VP: 103 mmHg
FRZ: -72°F
UEL: 95%
LEL: 2%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Oxidizers, halogens, metallic mercury, fuming nitric acid, hydrogen peroxide [Note: May ignite SPONTANEOUSLY in contact with oxidizers.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; choking, chest pain, dysp; drow; nau; anoxia; convuls; liver inj; [carc]
TO: CNS, liver, GI tract, blood, resp sys, eyes, skin [in animals: tumors of the lungs, liver, blood vessels & intestines]

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

D

Dimethylphthalate	Formula: $C_6H_4(COOCH_3)_2$	CAS#: 131-11-3	RTECS#: TI1575000	IDLH: 2000 mg/m^3
Conversion:	DOT:			
Synonyms/Trade Names: Dimethyl ester of 1,2-benzenedicarboxylic acid; DMP				

Exposure Limits: NIOSH REL: TWA 5 mg/m^3 OSHA PEL: TWA 5 mg/m^3	Measurement Methods (see Table 1): OSHA 104
Physical Description: Colorless, oily liquid with a slight, aromatic odor. [Note: A solid below 42°F.]	

Chemical & Physical Properties: MW: 194.2 BP: 543°F Sol: 0.4% Fl.P: 295°F IP: 9.64 eV Sp.Gr: 1.19 VP: 0.01 mmHg FRZ: 42°F UEL: ? LEL(358°F): 0.9% Class IIIB Combustible Liquid; however, ignition is difficult.	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: Prevent eye contact Wash skin: N.R. Remove: N.R. Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 50 mg/m^3: 95F 125 mg/m^3: Sa:Cf£/PaprHie£ 250 mg/m^3: 100F/ScbaF/SaF 2000 mg/m^3: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE

Incompatibilities and Reactivities: Nitrates; strong oxidizers, alkalis & acids	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, upper resp sys; stomach pain TO: Eyes, resp sys, GI tract	First Aid (see Table 6): Eye: Irr prompt Skin: Wash regularly Breath: Resp support Swallow: Medical attention immed

Dimethyl sulfate	Formula: $(CH_3)_2SO_4$	CAS#: 77-78-1	RTECS#: WS8225000	IDLH: Ca [7 ppm]
Conversion: 1 ppm = 5.16 mg/m^3	DOT: 1595 156			
Synonyms/Trade Names: Dimethyl ester of sulfuric acid, Dimethylsulfate, Methyl sulfate				

Exposure Limits: NIOSH REL: Ca TWA 0.1 ppm (0.5 mg/m^3) [skin] See Appendix A OSHA PEL†: TWA 1 ppm (5 mg/m^3) [skin]	Measurement Methods (see Table 1): NIOSH 2524
Physical Description: Colorless, oily liquid with a faint, onion-like odor.	

Chemical & Physical Properties: MW: 126.1 BP: 370°F (Decomposes) Sol(64°F): 3% Fl.P: 182°F IP: ? Sp.Gr: 1.33 VP: 0.1 mmHg FRZ: -25°F UEL: ? LEL: ? Class IIIA Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench	Respirator Recommendations (see Tables 3 and 4): NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, ammonia solutions [Note: Decomposes in water to sulfuric acid; corrosive to metals.]	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, nose; head; dizz; conj; photo; periorb edema; dysphonia, aphonia, dysphagia, productive cough; chest pain; dysp, cyan; vomit, diarr; dysuria; analgesia; fever; prot, hema; eye, skin burns; delirium; [carc] TO: Eyes, skin, resp sys, liver, kidneys, CNS [in animals: nasal & lung cancer]	First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed

Dinitolmide	Formula: $(NO_2)_2C_6H_2(CH_3)CONH_2$	CAS#: 148-01-6	RTECS#: XS4200000	IDLH: N.D.
Conversion:	DOT:			
Synonyms/Trade Names: 3,5-Dinitro-o-toluamide; 2-Methyl-3,5-dinitrobenzamide; Zoalene				
Exposure Limits: NIOSH REL: TWA 5 mg/m^3 OSHA PEL†: none			Measurement Methods (see Table 1): NIOSH 0500	
Physical Description: Yellowish, crystalline solid.				
Chemical & Physical Properties: MW: 225.2 BP: ? Sol: Slight Fl.P: NA IP: ? Sp.Gr: ? VP: ? MLT: 351°F UEL: NA LEL: NA Noncombustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: None reported				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Contact eczema; in animals: methemo, liver changes TO: Skin, liver, blood	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed			

m-Dinitrobenzene	Formula: $C_6H_4(NO_2)_2$	CAS#: 99-65-0	RTECS#: CZ7350000	IDLH: 50 mg/m^3
Conversion:	DOT: 1597 152			
Synonyms/Trade Names: meta-Dinitrobenzene; 1,3-Dinitrobenzene				
Exposure Limits: NIOSH REL: TWA 1 mg/m^3 [skin] OSHA PEL: TWA 1 mg/m^3 [skin]			Measurement Methods (see Table 1): NIOSH S214 (II-4)	
Physical Description: Pale-white or yellow solid.				
Chemical & Physical Properties: MW: 168.1 BP: 572°F Sol: 0.02% Fl.P: 302°F IP: 10.43 eV Sp.Gr: 1.58 VP: ? MLT: 192°F UEL: ? LEL: ? Combustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily Provide: Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 5 mg/m^3: Qm 10 mg/m^3: 95XQ/Sa 25 mg/m^3: Sa:Cf/PaprHie 50 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers, caustics, metals such as tin & zinc [Note: Prolonged exposure to fire and heat may result in an explosion due to SPONTANEOUS decomposition.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Anoxia, cyan; vis dist, central scotomas; bad taste, burning mouth, dry throat, thirst; yellowing hair, eyes, skin; anemia; liver damage TO: Eyes, skin, blood, liver, CVS, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed			

D

o-Dinitrobenzene	Formula: $C_6H_4(NO_2)_2$	CAS#: 528-29-0	RTECS#: CZ7450000	IDLH: 50 mg/m^3
Conversion:	DOT: 1597 152			
Synonyms/Trade Names: ortho-Dinitrobenzene; 1,2-Dinitrobenzene				
Exposure Limits: NIOSH REL: TWA 1 mg/m^3 [skin] OSHA PEL: TWA 1 mg/m^3 [skin]			Measurement Methods (see Table 1): NIOSH S214 (II-4)	
Physical Description: Pale-white or yellow solid.				
Chemical & Physical Properties: MW: 168.1 BP: 606°F Sol: 0.05% Fl.P: 302°F IP: 10.71 eV Sp.Gr: 1.57 VP: ? MLT: 244°F UEL: ? LEL: ? Combustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily Provide: Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 5 mg/m^3: Qm 10 mg/m^3: 95XQ/Sa 25 mg/m^3: Sa:Cf/PaprHie 50 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers, caustics, metals such as tin & zinc [Note: Prolonged exposure to fire and heat may result in an explosion due to SPONTANEOUS decomposition.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Anoxia, cyan; vis dist, central scotomas; bad taste, burning mouth, dry throat, thirst; yellowing hair, eyes, skin; anemia; liver damage TO: Eyes, skin, blood, liver, CVS, CNS			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed	

p-Dinitrobenzene	Formula: $C_6H_4(NO_2)_2$	CAS#: 100-25-4	RTECS#: CZ7525000	IDLH: 50 mg/m^3
Conversion:	DOT: 1597 152			
Synonyms/Trade Names: para-Dinitrobenzene; 1,4-Dinitrobenzene				
Exposure Limits: NIOSH REL: TWA 1 mg/m^3 [skin] OSHA PEL: TWA 1 mg/m^3 [skin]			Measurement Methods (see Table 1): NIOSH S214 (II-4)	
Physical Description: Pale-white or yellow solid.				
Chemical & Physical Properties: MW: 168.1 BP: 570°F Sol: 0.01% Fl.P: ? IP: 10.50 eV Sp.Gr: 1.63 VP: ? MLT: 343°F UEL: ? LEL: ? Combustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily Provide: Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 5 mg/m^3: Qm 10 mg/m^3: 95XQ/Sa 25 mg/m^3: Sa:Cf/PaprHie 50 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers, caustics, metals such as tin & zinc [Note: Prolonged exposure to fire and heat may result in an explosion due to SPONTANEOUS decomposition.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Anoxia, cyan; vis dist, central scotomas; bad taste, burning mouth, dry throat, thirst; yellowing hair, eyes, skin; anemia; liver damage TO: Eyes, skin, blood, liver, CVS, CNS			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed	

Dinitro-o-cresol	Formula: $CH_3C_6H_2OH(NO_2)_2$	CAS#: 534-52-1	RTECS#: GO9625000	IDLH: 5 mg/m^3
Conversion:	DOT: 1598 153			
Synonyms/Trade Names: 4,6-Dinitro-o-cresol; 3,5-Dinitro-2-hydroxytoluene; 4,6-Dinitro-2-methyl phenol; DNC; DNOC				
Exposure Limits: NIOSH REL: TWA 0.2 mg/m^3 [skin] OSHA PEL: TWA 0.2 mg/m^3 [skin]			Measurement Methods (see Table 1): NIOSH S166 (II-5)	
Physical Description: Yellow, odorless solid. [insecticide]				
Chemical & Physical Properties: MW: 198.1 BP: 594°F Sol: 0.01% Fl.P: NA IP: ? Sp.Gr: 1.1 (estimated) VP: 0.00005 mmHg MLT: 190°F UEL: NA LEL: NA MEC: 30 g/m^3 Noncombustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 2 mg/m^3: 95F 5 mg/m^3: 100F/Sa:Cf£/PaprHie£/ ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Sense of well being; head, fever, lass, profuse sweat, excess thirst, tacar, hyperpnea, cough, short breath, coma TO: CVS, endocrine sys		First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed		

Dinitrotoluene	Formula: $CH_3C_6H_3(NO_2)_2$	CAS#: 25321-14-6	RTECS#: XT1300000	IDLH: Ca [50 mg/m^3]
Conversion:	DOT: 1600 152 (molten); 2038 152 (solid)			
Synonyms/Trade Names: Dinitrotoluol, DNT, Methyldinitrobenzene [Note: Various isomers of DNT exist.]				
Exposure Limits: NIOSH REL: Ca TWA 1.5 mg/m^3 [skin] See Appendix A OSHA PEL: TWA 1.5 mg/m^3 [skin]			Measurement Methods (see Table 1): OSHA 44	
Physical Description: Orange-yellow crystalline solid with a characteristic odor. [Note: Often shipped molten.]				
Chemical & Physical Properties: MW: 182.2 BP: 572°F Sol: Insoluble Fl.P: 404°F IP: ? Sp.Gr: 1.32 VP: 1 mmHg MLT: 158°F UEL: ? LEL: ? Combustible Solid, but difficult to ignite.	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily Provide: Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers, caustics, metals such as tin & zinc [Note: Commercial grades will decompose at 482°F, with self-sustaining decomposition at 536°F.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Anoxia, cyan; anemia, jaun; repro effects; [carc] TO: Blood, liver, CVS, repro sys [in animals: liver, skin & kidney tumors]		First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed		

Di-sec octyl phthalate	Formula: $C_{24}H_{38}O_4$	CAS#: 117-81-7	RTECS#: TI0350000	IDLH: Ca [5000 mg/m^3]
Conversion:	DOT:			

Synonyms/Trade Names: DEHP, Di(2-ethylhexyl)phthalate, DOP, bis-(2-Ethylhexyl)phthalate, Octyl phthalate

Exposure Limits:
NIOSH REL: Ca
TWA 5 mg/m^3
ST 10 mg/m^3
See Appendix A
OSHA PEL†: TWA 5 mg/m^3

Measurement Methods (see Table 1):
NIOSH 5020

Physical Description: Colorless, oily liquid with a slight odor.

Chemical & Physical Properties:
MW: 390.5
BP: 727°F
Sol(75°F): 0.00003%
Fl.P(oc): 420°F
IP: ?
Sp.Gr: 0.99
VP: <0.01 mmHg
FRZ: -58°F
UEL: ?
LEL(474°F): 0.3%
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Nitrates; strong oxidizers, acids & alkalis

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, muc memb; in animals: liver damage; terato effects; [carc]
TO: Eyes, resp sys, CNS, liver, repro sys, GI tract [in animals: liver tumors]

First Aid (see Table 6):
Eye: Irr immed
Breath: Resp support
Swallow: Medical attention immed

Dioxane	Formula: $C_4H_8O_2$	CAS#: 123-91-1	RTECS#: JG8225000	IDLH: Ca [500 ppm]
Conversion: 1 ppm = 3.60 mg/m^3	DOT: 1165 127			

Synonyms/Trade Names: Diethylene dioxide; Diethylene ether; Dioxan; p-Dioxane; 1,4-Dioxane

Exposure Limits:
NIOSH REL: Ca
C 1 ppm (3.6 mg/m^3) [30-minute]
See Appendix A
OSHA PEL†: TWA 100 ppm (360 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 1602
OSHA 7

Physical Description: Colorless liquid or solid (below 53°F) with a mild, ether-like odor.

Chemical & Physical Properties:
MW: 88.1
BP: 214°F
Sol: Miscible
Fl.P: 55°F
IP: 9.13 eV
Sp.Gr: 1.03
VP: 29 mmHg
FRZ: 53°F
UEL: 22%
LEL: 2.0%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, decaborane, triethynyl aluminum

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat; drow, head; nau, vomit; liver damage; kidney failure; [carc]
TO: Eyes, skin, resp sys, liver, kidneys [in animals: lung, liver & nasal cavity tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash prompt
Breath: Resp support
Swallow: Medical attention immed

Dioxathion

Formula:	CAS#:	RTECS#:	IDLH:
$C_4H_6O_2[SPS(OC_2H_5)_2]_2$	78-34-2	TE3350000	N.D.

Conversion: DOT:

Synonyms/Trade Names: Delnav®; p-Dioxane-2,3-diyl ethyl phosphorodithioate; Dioxane phosphate; 2,3-p-Dioxanethiol-S,S-bis(O,O-diethyl phosphoro-dithioate); Navadel®

Exposure Limits:
NIOSH REL: TWA 0.2 mg/m^3 [skin]
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Viscous, brown, tan, or dark-amber liquid. [insecticide] [Note: Technical product is a mixture of cis- & trans-isomers.]

Chemical & Physical Properties:
MW: 456.6
BP: ?
Sol: Insoluble
Fl.P: NA
IP: ?
Sp.Gr(79°F): 1.26
VP: ?
FRZ: -4°F
UEL: NA
LEL: NA
Noncombustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Alkalis, iron or tin surfaces, heat

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; head, dizz, lass; rhin, chest tight; miosis; nau, vomit, abdom cramps, diarr, salv; musc fasc; conf, drow
TO: Eyes, skin, resp sys, CNS, CVS, blood chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

Diphenyl

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_5C_6H_5$	92-52-4	DU8050000	100 mg/m^3

Conversion: 1 ppm = 6.31 mg/m^3 DOT:

Synonyms/Trade Names: Biphenyl, Phenyl benzene

Exposure Limits:
NIOSH REL: TWA 1 mg/m^3 (0.2 ppm)
OSHA PEL: TWA 1 mg/m^3 (0.2 ppm)

Measurement Methods (see Table 1):
NIOSH 2530
OSHA PV2022

Physical Description: Colorless to pale-yellow solid with a pleasant, characteristic odor. [fungicide]

Chemical & Physical Properties:
MW: 154.2
BP: 489°F
Sol: Insoluble
Fl.P: 235°F
IP: 7.95 eV
Sp.Gr: 1.04
VP: 0.005 mmHg
MLT: 156°F
UEL(311°F): 5.8%
LEL(232°F): 0.6%
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash (molt)
Quick drench (molt)

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
10 mg/m^3: CcrOv95/Sa
25 mg/m^3: Sa:Cf*/PaprOvHie*
50 mg/m^3: CcrFOv100/GmFOv100/ PaprTOvHie*/ScbaF/SaF
100 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, throat; head, nau, lass, numb limbs; liver damage
TO: Eyes, resp sys, liver, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Diphenylamine

Formula:	CAS#:	RTECS#:	IDLH:
$(C_6H_5)_2NH$	122-39-4	JJ7800000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: Anilinobenzene, DPA, Phenylaniline, N-Phenylaniline, N-Phenylbenzenamine
[Note: The carcinogen 4-Aminodiphenyl may be present as an impurity in the commercial product.]

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
OSHA 22, 78

Physical Description: Colorless, tan, amber, or brown crystalline solid with a pleasant, floral odor. [fungicide]

Chemical & Physical Properties:
MW: 169.2
BP: 576°F
Sol: 0.03%
Fl.P: 307°F
IP: 7.40 eV
Sp.Gr: 1.16
VP(227°F): 1 mmHg
MLT: 127°F
UEL: ?
LEL: ?
Combustible Solid; explosive if a cloud of dust is exposed to a source of ignition.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Oxidizers, hexachloromelamine, trichloromelamine

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, muc memb; eczema; tacar, hypertension; cough, sneez; methemo; incr BP, heart rate; prot, hema, bladder inj; in animals: terato effects
TO: Eyes, skin, resp sys, CVS, blood, bladder, repro sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Dipropylene glycol methyl ether

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3OC_3H_6OC_3H_6OH$	34590-94-8	JM1575000	600 ppm

Conversion: 1 ppm = 6.06 mg/m^3

DOT:

Synonyms/Trade Names: Dipropylene glycol monomethyl ether, Dowanol® 50B

Exposure Limits:
NIOSH REL: TWA 100 ppm (600 mg/m^3)
ST 150 ppm (900 mg/m^3) [skin]
OSHA PEL†: TWA 100 ppm (600 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 2554, S69 (II-2)

Physical Description: Colorless liquid with a mild, ether-like odor.

Chemical & Physical Properties:
MW: 148.2
BP: 408°F
Sol: Miscible
Fl.P: 180°F
IP: ?
Sp.Gr: 0.95
VP: 0.5 mmHg
FRZ: -112°F
UEL: 3.0%
LEL(392°F): 1.1%
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
600 ppm: Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, nose, throat; lass, dizz, head
TO: Eyes, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash prompt
Breath: Resp support
Swallow: Medical attention immed

Dipropyl ketone

Formula:	CAS#:	RTECS#:	IDLH:
$(CH_3CH_2CH_2)_2CO$	123-19-3	MJ5600000	N.D.

Conversion: 1 ppm = 4.67 mg/m^3

DOT: 2710 128

Synonyms/Trade Names: Butyrone, DPK, 4-Heptanone, Heptan-4-one, Propyl ketone

Exposure Limits:
NIOSH REL: TWA 50 ppm (235 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
OSHA 7

Physical Description: Colorless liquid with a pleasant odor.

Chemical & Physical Properties:
MW: 114.2
BP: 291°F
Sol: Insoluble
Fl.P: 120°F
IP: 9.10 eV
Sp.Gr: 0.82
VP: 5 mmHg
FRZ: -27°F
UEL: ?
LEL: ?
Class II Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin; CNS depres, dizz, drow, decr breath; in animals: liver inj; narco
TO: Eyes, skin, CNS, liver

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

Diquat (Diquat dibromide)

Formula:	CAS#:	RTECS#:	IDLH:
$C_{12}H_{12}N_2Br_2$	85-00-7	JM5690000	N.D.

Conversion:

DOT: 2781 151 (solid); 2782 131 (liquid)

Synonyms/Trade Names: Diquat dibromide; 1,1'-Ethylene-2,2'-bipyridyllium dibromide
[Note: Diquat is a cation ($C_{12}H_{12}N_2^{++}$; 1,1'-Ethylene-2,2-bipyridyllium ion). Various diquat salts are commercially available.]

Exposure Limits:
NIOSH REL: TWA 0.5 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Dibromide salt: Yellow crystals. [herbicide]
[Note: Commercial product may be found in a liquid concentrate or a solution.]

Chemical & Physical Properties:
MW: 344.1
BP: Decomposes
Sol: 70%
Fl.P: ?
IP: ?
Sp.Gr: 1.22-1.27
VP: <0.00001 mmHg
MLT: 635°F
UEL: ?
LEL: ?
Combustible Solid, but does not readily ignite and burns with difficulty.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Alkalis, UV light, basic solutions
[Note: Concentrated diquat solutions corrode aluminum.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, muc memb, resp sys; rhin, epis; skin burns; nau, vomit, diarr, mal; kidney, liver inj; cough, chest pain, dysp, pulm edema; tremor, convuls; delayed healing of wounds
TO: Eyes, skin, resp sys, kidneys, liver, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

D

Disulfiram

Formula:	CAS#:	RTECS#:	IDLH:
$[(C_2H_5)_2NCS]_2S_2$	97-77-8	JO1225000	N.D.

Conversion: DOT:

Synonyms/Trade Names: Antabuse®, bis(Diethylthiocarbamoyl) disulfide, Ro-Sulfiram®, TETD, Tetraethylthiuram disulfide

Exposure Limits:
NIOSH REL: TWA 2 mg/m^3
[Precautions should be taken to avoid concurrent exposure to ethylene dibromide.]
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: White, yellowish, or light-gray powder with a slight odor. [fungicide]

Chemical & Physical Properties:
MW: 296.6
BP: ?
Sol: 0.02%
Fl.P: NA
IP: ?
Sp.Gr: 1.30
VP: ?
MLT: 158°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; sens derm; lass, tremor, restless, head, dizz; metallic taste; peri neur; liver damage
TO: Eyes, skin, resp sys, CNS, PNS, liver

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Disulfoton

Formula:	CAS#:	RTECS#:	IDLH:
$C_8H_{19}O_2PS_3$	298-04-4	TD9275000	N.D.

Conversion: DOT: 2783 152

Synonyms/Trade Names: O,O-Diethyl S-2-(ethylthio)-ethyl phosphorodithioate; Di-Syston®; Thiodemeton

Exposure Limits:
NIOSH REL: TWA 0.1 mg/m^3 [skin]
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 5600

Physical Description: Oily, colorless to yellow liquid with a characteristic, sulfur odor. [insecticide] [Note: Technical product is a brown liquid.]

Chemical & Physical Properties:
MW: 274.4
BP: ?
Sol(73°F): 0.003%
Fl.P: >180°F
IP: ?
Sp.Gr: 1.14
VP: 0.0002 mmHg
FRZ: >-13°F
UEL: ?
LEL: ?
Combustible Liquid, but will not ignite easily.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Alkalis

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; nau, vomit, abdom cramps, diarr, salv; head, dizz, lass; rhin, chest tight; blurred vision, miosis; card irreg; musc fasc; dysp; eye, skin burns
TO: Eyes, skin, resp sys, CNS, CVS, blood chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

Diuron

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_3Cl_2NHCON(CH_3)_2$	330-54-1	YS8925000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: 3-(3,4-Dichlorophenyl)-1,1-dimethylurea; Direx®; Karmex®

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 5601
OSHA PV2097

Physical Description: White, odorless, crystalline solid. [herbicide]

Chemical & Physical Properties:
MW: 233.1
BP: 356°F (Decomposes)
Sol: 0.004%
Fl.P: NA
IP:?
Sp.Gr: ?
VP: 0.000000002 mmHg
MLT: 316°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: N.R.
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong acids

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; in animals: anemia, methemo
TO: Eyes, skin, resp sys, blood

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Divinyl benzene

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_4(HC=CH_2)_2$	1321-74-0 (mixed isomers)	CZ9370000	N.D.

Conversion: 1 ppm = 5.33 mg/m^3

DOT: 2049 130

Synonyms/Trade Names: Diethyl benzene, DVB, Vinylstyrene
[Note: Commercial product contains all 3 isomers, but m-isomer predominates. Usually contains an inhibitor to prevent polymerization.]

Exposure Limits:
NIOSH REL: TWA 10 ppm (50 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
OSHA 89

Physical Description: Pale, straw-colored liquid.

Chemical & Physical Properties:
MW: 130.2
BP: 392°F
Sol: 0.005%
Fl.P(oc): 169°F
IP: ?
Sp.Gr: 0.93
VP: 0.7 mmHg
FRZ: -88°F
UEL: 6.2%
LEL: 1.1%
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; skin burns; in animals: CNS depres
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

1-Dodecanethiol	Formula: $CH_3(CH_2)_{11}SH$	CAS#: 112-55-0	RTECS#: JR3155000	IDLH: N.D.
Conversion: 1 ppm = 8.28 mg/m^3	DOT: 1228 131			

Synonyms/Trade Names: Dodecyl mercaptan, 1-Dodecyl mercaptan, n-Dodecyl mercaptan, Lauryl mercaptan, n-Lauryl mercaptan, 1-Mercaptododecane

Exposure Limits:
NIOSH REL: C 0.5 ppm (4.1 mg/m^3) [15-minute]
OSHA PEL: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless, water-white, or pale-yellow, oily liquid with a mild, skunk-like odor. [Note: A solid below 15°F.]

Chemical & Physical Properties:
MW: 202.4
BP: 441-478°F
Sol: Insoluble
Fl.P(oc): 190°F
IP: ?
Sp.Gr: 0.85
VP(77°F): 3 mmHg
FRZ: 15°F
UEL: ?
LEL: ?
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
NIOSH
5 ppm: CcrOv/Sa
12.5 ppm: Sa:Cf/PaprOv
25 ppm: CcrFOv/GmFOv/PaprTOv/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers & acids, strong bases, reducing agents, alkali metals, water, steam

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; cough; dizz, dysp, lass, conf, cyan; abdom pain, nau; skin sens
TO: Eyes, skin, resp sys, CNS, blood

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Emery	Formula: Al_2O_3	CAS#: 1302-74-5 (corundum)	RTECS#: GN2310000 (corundum)	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: Aluminum oxide, Aluminum trioxide, Corundum, Impure corundum, Natural aluminum oxide [Note: Emery is an impure variety of Al_2O_3 which may contain small impurities of iron, magnesium & silica Corundum is natural Al_2O_3.]

Exposure Limits:
NIOSH REL: See Appendix D
OSHA PEL†: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500, 0600

Physical Description: Odorless, white, crystalline powder.

Chemical & Physical Properties:
See α-Alumina for physical & chemical properties.

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities:

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Breath: Fresh air
Swallow: Medical attention immed

Endosulfan

Formula:	CAS#:	RTECS#:	IDLH:
$C_9H_6Cl_6O_3S$	115-29-7	RB9275000	N.D.

Conversion: DOT: 2761 151

Synonyms/Trade Names: Benzoepin; Endosulphan; 6,7,8,9,10-Hexachloro-1,5,5a,6,9,9a-hexachloro-6,9-methano-2,4,3-benzo-dioxathiepin-3-oxide; Thiodan®

Exposure Limits:
NIOSH REL: TWA 0.1 mg/m^3 [skin] OSHA PEL†: none

Measurement Methods (see Table 1):
OSHA PV2023

Physical Description: Brown crystals with a slight, sulfur dioxide odor. [insecticide] [Note: Technical product is a tan, waxy, isomer mixture.]

Chemical & Physical Properties:
MW: 406.9
BP: Decomposes
Sol: 0.00001%
Fl.P: NA
IP: ?
Sp.Gr: 1.74
VP(77°F): 0.00001 mmHg
MLT: 223°F
UEL: NA
LEL: NA Noncombustible Solid, but may be dissolved in flammable liquids.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Alkalis, acids, water
[Note: Corrosive to iron. Hydrolyzes slowly on contact with water or decomposes in presence of alkalis and acids to form sulfur dioxide.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit skin; nau, conf, agitation, flushing, dry mouth, tremor, convuls, head; in animals: kidney, liver inj; decr testis weight
TO: Skin, CNS, liver, kidneys, repro sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

Endrin

Formula:	CAS#:	RTECS#:	IDLH:
$C_{12}H_8Cl_6O$	72-20-8	IO1575000	2 mg/m^3

Conversion: DOT: 2761 151

Synonyms/Trade Names: Hexadrin®, 1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo,endo-5,8-dimethanonaphthalene

Exposure Limits:
NIOSH REL: TWA 0.1 mg/m^3 [skin]
OSHA PEL: TWA 0.1 mg/m^3 [skin]

Measurement Methods (see Table 1):
NIOSH 5519

Physical Description: Colorless to tan, crystalline solid with a mild, chemical odor. [insecticide]

Chemical & Physical Properties:
MW: 380.9
BP: Decomposes
Sol: Insoluble
Fl.P: NA
IP: ?
Sp.Gr: 1.70
VP: Low
MLT: 392°F (Decomposes)
UEL: NA
LEL: NA Noncombustible Solid, but may be dissolved in flammable liquids.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1 mg/m^3: CcrOv95/Sa
2 mg/m^3: Sa:Cf/PaprOvHie/ CcrFOv100/GmFOv100/ ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong acids, parathion
[Note: May emit hydrogen chloride & phosgene when heated or burned.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Epilep convuls; stupor, head, dizz; abdom discomfort, nau, vomit; insom; aggressiveness, conf; drow, lass; anor; in animals: liver damage
TO: CNS, liver

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

E

Enflurane

Formula:	CAS#:	RTECS#:	IDLH:
CHF_2OCF_2CHClF	13838-16-9	KN6800000	N.D.

Conversion: 1 ppm = 7.55 mg/m^3

DOT:

Synonyms/Trade Names: 2-Chloro-1-(difluoromethoxy)-1,1,2-trifluoroethane; 2-Chloro-1,1,2-trifluoroethyl difluoromethyl ether; Ethrane®

Exposure Limits:
NIOSH REL*: C 2 ppm (15.1 mg/m^3) [60-minute]
[*Note: REL for exposure to waste anesthetic gas.]
OSHA PEL: none

Measurement Methods (see Table 1):
OSHA 29, 103

Physical Description: Clear, colorless liquid with a mild, sweet odor. [inhalation anesthetic]

Chemical & Physical Properties:
MW: 184.5
BP: 134°F
Sol: Low
Fl.P: NA
IP: ?
Sp.Gr(77°F): 1.52
VP: 175 mmHg
FRZ: ?
UEL: NA
LEL: NA
Noncombustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: Prevent eye contact
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes; CNS depres, analgesia, anes, convuls, resp depres
TO: Eyes, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

Epichlorohydrin

Formula:	CAS#:	RTECS#:	IDLH:
C_3H_5OCl	106-89-8	TX4900000	Ca [75 ppm]

Conversion: 1 ppm = 3.78 mg/m^3

DOT: 2023 131P

Synonyms/Trade Names: 1-Chloro-2,3-epoxypropane; 2-Chloropropylene oxide; γ-Chloropropylene oxide

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL†: TWA 5 ppm (19 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 1010
OSHA 7

Physical Description: Colorless liquid with a slightly irritating, chloroform-like odor.

Chemical & Physical Properties:
MW: 92.5
BP: 242°F
Sol: 7%
Fl.P: 93°F
IP: 10.60 eV
Sp.Gr: 1.18
VP: 13 mmHg
FRZ: -54°F
UEL: 21.0%
LEL: 3.8%
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOvAg/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong acids, certain salts, caustics, zinc, aluminum, water
[Note: May polymerize in presence of strong acids and bases, particularly when hot.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin with deep pain; nau, vomit; abdom pain; resp distress, cough; cyan; repro effects; [carc]
TO: Eyes, skin, resp sys, kidneys, liver, repro sys [in animals: nasal cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

EPN

Formula: $C_{14}H_{14}O_4NSP$ | CAS#: 2104-64-5 | RTECS#: TB1925000 | IDLH: 5 mg/m^3

Conversion: | DOT:

Synonyms/Trade Names: Ethyl p-nitrophenyl benzenethionophosphonate, O-Ethyl O-(4-nitrophenyl) phenylphosphonothioate

Exposure Limits:
NIOSH REL: TWA 0.5 mg/m^3 [skin]
OSHA PEL: TWA 0.5 mg/m^3 [skin]

Measurement Methods (see Table 1):
NIOSH 5012

Physical Description: Yellow solid with an aromatic odor. [pesticide]
[Note: A brown liquid above 97°F.]

Chemical & Physical Properties:
MW: 323.3
BP: ?
Sol: Insoluble
Fl.P: NA
IP: ?
Sp.Gr(77°F): 1.27
VP(212°F): 0.0003 mmHg
MLT: 97°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
5 mg/m^3: Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; miosis, lac; rhin; head; chest tight, wheez, lar spasm; salv; cyan; anor, nau, abdom cramps, diarr; para, convuls; low BP, card irreg
TO: Eyes, skin, resp sys, CVS, CNS, blood chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Ethanolamine

Formula: $NH_2CH_2CH_2OH$ | CAS#: 141-43-5 | RTECS#: KJ5775000 | IDLH: 30 ppm

Conversion: 1 ppm = 2.50 mg/m^3 | DOT: 2491 153

Synonyms/Trade Names: 2-Aminoethanol, β-Aminoethyl alcohol, Ethylolamine, 2-Hydroxyethylamine, Monoethanolamine

Exposure Limits:
NIOSH REL: TWA 3 ppm (8 mg/m^3)
ST 6 ppm (15 mg/m^3)
OSHA PEL†: TWA 3 ppm (6 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2007

Physical Description: Colorless, viscous liquid or solid (below 51°F) with an unpleasant, ammonia-like odor.

Chemical & Physical Properties:
MW: 61.1
BP: 339°F
Sol: Miscible
Fl.P: 186°F
IP: 8.96 eV
Sp.Gr: 1.02
VP: 0.4 mmHg
FRZ: 51°F
UEL: 23.5%
LEL(284°F): 3.0%
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
30 ppm: CcrS*/GmFS/PaprS*/Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong acids, iron
[Note: May attack copper, brass, and rubber.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; drow
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush prompt
Breath: Resp support
Swallow: Medical attention immed

E

Ethion

Formula:	CAS#:	RTECS#:	IDLH:
$[(C_2H_5O)_2P(S)S]_2CH_2$	563-12-2	TE4550000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: O,O,O',O'-Tetraethyl S,S'-methylene di(phosphorodithioate)

Exposure Limits:
NIOSH REL: 0.4 mg/m^3 [skin]
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 5600

Physical Description: Colorless to amber-colored, odorless liquid. [insecticide]
[Note: A solid below 10°F. The technical product has a very disagreeable odor.]

Chemical & Physical Properties:
MW: 384.5
BP: >302°F (Decomposes)
Sol: 0.0001%
Fl.P: 349°F
IP: ?
Sp.Gr: 1.22
VP: 0.0000015 mmHg
FRZ: 10°F
UEL: ?
LEL: ?
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Acids, alkalis

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; nau, vomit, abdom cramps, diarr, salv; head, dizz, lass; rhin, chest tight; blurred vision, miosis; card irreg; musc fasc; dysp
TO: Eyes, skin, resp sys, CNS, CVS, blood chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

2-Ethoxyethanol

Formula:	CAS#:	RTECS#:	IDLH:
$C_2H_5OCH_2CH_2OH$	110-80-5	KK8050000	500 ppm

Conversion: 1 ppm = 3.69 mg/m^3

DOT: 1171 127

Synonyms/Trade Names: Cellosolve®, EGEE, Ethylene glycol monoethyl ether

Exposure Limits:
NIOSH REL: TWA 0.5 ppm (1.8 mg/m^3) [skin]
OSHA PEL: TWA 200 ppm (740 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 1403
OSHA 53, 79

Physical Description: Colorless liquid with a sweet, pleasant, ether-like odor.

Chemical & Physical Properties:
MW: 90.1
BP: 275°F
Sol: Miscible
Fl.P: 110°F
IP: ?
Sp.Gr: 0.93
VP: 4 mmHg
FRZ: -130°F
UEL(200°F): 15.6%
LEL(200°F): 1.7%
Class II Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
5 ppm: Sa*
12.5 ppm: Sa:Cf*
25 ppm: ScbaF/SaF
500 ppm: Sa:Pd,Pp*
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: In animals: irrit eyes, resp sys; blood changes; liver, kidney, lung damage; repro, terato effects
TO: Eyes, resp sys, blood, kidneys, liver, repro sys, hemato sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush prompt
Breath: Resp support
Swallow: Medical attention immed

2-Ethoxyethyl acetate	Formula: $CH_3COOCH_2CH_2OC_2H_5$	CAS#: 111-15-9	RTECS#: KK8225000	IDLH: 500 ppm
Conversion: 1 ppm = 5.41 mg/m^3	DOT: 1172 129			
Synonyms/Trade Names: Cellosolve® acetate, EGEEA, Ethylene glycol monoethyl ether acetate, Glycol monoethyl ether acetate				
Exposure Limits: NIOSH REL: TWA 0.5 ppm (2.7 mg/m^3) [skin] OSHA PEL: TWA 100 ppm (540 mg/m^3) [skin]			Measurement Methods (see Table 1): NIOSH 1450 OSHA 53	
Physical Description: Colorless liquid with a mild odor.				
Chemical & Physical Properties: MW: 132.2 BP: 313°F Sol: 23% Fl.P: 124°F IP: ? Sp.Gr: 0.98 VP: 2 mmHg FRZ: -79°F UEL: ? LEL: 1.7% Class II Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH 5 ppm: CcrOv*/Sa* 12.5 ppm: Sa:Cf*/PaprOv* 25 ppm: CcrFOv/GmFOv/PaprTOv*/ ScbaF/SaF 500 ppm: Sa:Pd,Pp* §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE		
Incompatibilities and Reactivities: Nitrates; strong oxidizers, alkalis & acids				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, nose; vomit; kidney damage; para; in animals: repro, terato effects TO: Eyes, resp sys, GI tract, repro sys, hemato sys	First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed			

Ethyl acetate	Formula: $CH_3COOC_2H_5$	CAS#: 141-78-6	RTECS#: AH5425000	IDLH: 2000 ppm [10%LEL]
Conversion: 1 ppm = 3.60 mg/m^3	DOT: 1173 129			
Synonyms/Trade Names: Acetic ester, Acetic ether, Ethyl ester of acetic acid, Ethyl ethanoate				
Exposure Limits: NIOSH REL: TWA 400 ppm (1400 mg/m^3) OSHA PEL: TWA 400 ppm (1400 mg/m^3)			Measurement Methods (see Table 1): NIOSH 1457 OSHA 7	
Physical Description: Colorless liquid with an ether-like, fruity odor.				
Chemical & Physical Properties: MW: 88.1 BP: 171°F Sol(77°F): 10% Fl.P: 24°F IP: 10.01 eV Sp.Gr: 0.90 VP: 73 mmHg FRZ: -117°F UEL: 11.5% LEL: 2.0% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 2000 ppm: Sa:Cf£/PaprOv£/CcrFOv/ GmFOv/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE		
Incompatibilities and Reactivities: Nitrates; strong oxidizers, alkalis & acids				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose, throat; narco; derm TO: Eyes, skin, resp sys	First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed			

Ethyl acrylate	Formula: $CH_2=CHCOOC_2H_5$	CAS#: 140-88-5	RTECS#: AT0700000	IDLH: Ca [300 ppm]
Conversion: 1 ppm = 4.09 mg/m^3	DOT: 1917 129P (inhibited)			
Synonyms/Trade Names: Ethyl acrylate (inhibited), Ethyl ester of acrylic acid, Ethyl propenoate				

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL†: TWA 25 ppm (100 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 1450
OSHA 92

Physical Description: Colorless liquid with an acrid odor.

Chemical & Physical Properties:
MW: 100.1
BP: 211°F
Sol: 2%
Fl.P: 48°F
IP: 10.30 eV
Sp.Gr: 0.92
VP: 29 mmHg
FRZ: -96°F
UEL: 14%
LEL: 1.4%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, peroxides, polymerizers, strong alkalis, moisture, chlorosulfonic acid [Note: Polymerizes readily unless an inhibitor such as hydroquinone is added.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; [carc]
TO: Eyes, skin, resp sys [in animals: tumors of the forestomach]

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Ethyl alcohol	Formula: CH_3CH_2OH	CAS#: 64-17-5	RTECS#: KQ6300000	IDLH: 3300 ppm [10%LEL]
Conversion: 1 ppm = 1.89 mg/m^3	DOT: 1170 127			
Synonyms/Trade Names: Alcohol, Cologne spirit, Ethanol, EtOH, Grain alcohol				

Exposure Limits:
NIOSH REL: TWA 1000 ppm (1900 mg/m^3)
OSHA PEL: TWA 1000 ppm (1900 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1400
OSHA 100

Physical Description: Clear, colorless liquid with a weak, ethereal, vinous odor.

Chemical & Physical Properties:
MW: 46.1
BP: 173°F
Sol: Miscible
Fl.P: 55°F
IP: 10.47 eV
Sp.Gr: 0.79
VP: 44 mmHg
FRZ: -173°F
UEL: 19%
LEL: 3.3%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
3300 ppm: Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: ScbaE

Incompatibilities and Reactivities: Strong oxidizers, potassium dioxide, bromine pentafluoride, acetyl bromide, acetyl chloride, platinum, sodium

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose; head, drow, lass, narco; cough; liver damage; anemia; repro, terato effects
TO: Eyes, skin, resp sys, CNS, liver, blood, repro sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush prompt
Breath: Fresh air
Swallow: Medical attention immed

Ethylamine

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3CH_2NH_2$	75-04-7	KH2100000	600 ppm

Conversion: 1 ppm = 1.85 mg/m^3

DOT: 1036 118

Synonyms/Trade Names: Aminoethane, Ethylamine (anhydrous), Monoethylamine

Exposure Limits:
NIOSH REL: TWA 10 ppm (18 mg/m^3)
OSHA PEL: TWA 10 ppm (18 mg/m^3)

Measurement Methods (see Table 1):
NIOSH S144 (II-3)
OSHA 36

Physical Description: Colorless gas or water-white liquid (below 62°F) with an ammonia-like odor. [Note: Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 45.1
BP: 62°F
Sol: Miscible
Fl.P: 1°F
IP: 8.86 eV
RGasD: 1.61
Sp.Gr: 0.69 (Liquid)
VP: 874 mmHg
FRZ: -114°F
UEL: 14.0%
LEL: 3.5%
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact (liquid)
Eyes: Prevent eye contact (liquid)
Wash skin: When contam (liquid)
Remove: When wet or contam (liquid)
Change: N.R.
Provide: Eyewash (liquid)
Quick drench (liquid)

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
250 ppm: Sa:Cf£/PaprS£
500 ppm: CcrFS/GmFS/ScbaF/SaF
600 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Strong acids; strong oxidizers; copper, tin & zinc in presence of moisture; cellulose nitrate; chlorine; hypochlorites

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs (liquid), Ing (liquid), Con (liquid)
SY: Irrit eyes, skin, resp sys; skin burns, derm
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed (liquid)
Skin: Water flush immed (liquid)
Breath: Resp support
Swallow: Medical attention immed (liquid)

Ethyl benzene

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3CH_2C_6H_5$	100-41-4	DA0700000	800 ppm [10%LEL]

Conversion: 1 ppm = 4.34 mg/m^3

DOT: 1175 130

Synonyms/Trade Names: Ethylbenzol, Phenylethane

Exposure Limits:
NIOSH REL: TWA 100 ppm (435 mg/m^3)
ST 125 ppm (545 mg/m^3)
OSHA PEL†: TWA 100 ppm (435 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1501
OSHA 7, 1002

Physical Description: Colorless liquid with an aromatic odor.

Chemical & Physical Properties:
MW: 106.2
BP: 277°F
Sol: 0.01%
Fl.P: 55°F
IP: 8.76 eV
Sp.Gr: 0.87
VP: 7 mmHg
FRZ: -139°F
UEL: 6.7%
LEL: 0.8%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
800 ppm: CcrOv*/GmFOv/PaprOv*/Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, muc memb; head; derm; narco, coma
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush prompt
Breath: Resp support
Swallow: Medical attention immed

E

Ethyl bromide	Formula: CH_3CH_2Br	CAS#: 74-96-4	RTECS#: KH6475000	IDLH: 2000 ppm
Conversion: 1 ppm = 4.46 mg/m^3	DOT: 1891 131			
Synonyms/Trade Names: Bromoethane, Monobromoethane				

Exposure Limits: NIOSH REL: See Appendix D OSHA PEL†: TWA 200 ppm (890 mg/m^3)	Measurement Methods (see Table 1): NIOSH 1011 OSHA 7
Physical Description: Colorless to yellow liquid with an ether-like odor. [Note: A gas above 101°F.]	

Chemical & Physical Properties: MW: 109.0 BP: 101°F Sol: 0.9% Fl.P: <4°F IP: 10.29 eV Sp.Gr: 1.46 VP: 375 mmHg FRZ: -182°F UEL: 8.0% LEL: 6.8% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	Respirator Recommendations (see Tables 3 and 4): OSHA 2000 ppm: Sa/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Chemically-active metals such as sodium, potassium, calcium, powdered aluminum, zinc & magnesium	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, resp sys; CNS depres; pulm edema; liver, kidney disease; card arrhy, card arrest TO: Eyes, skin, resp sys, liver, kidneys, CVS, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Soap flush prompt Breath: Resp support Swallow: Medical attention immed

Ethyl butyl ketone	Formula: $CH_3CH_2CO[CH_2]_3CH_3$	CAS#: 106-35-4	RTECS#: MJ5250000	IDLH: 1000 ppm
Conversion: 1 ppm = 4.67 mg/m^3	DOT: 1224 127			
Synonyms/Trade Names: Butyl ethyl ketone, 3-Heptanone				

Exposure Limits: NIOSH REL: TWA 50 ppm (230 mg/m^3) OSHA PEL: TWA 50 ppm (230 mg/m^3)	Measurement Methods (see Table 1): NIOSH 1301, 2553 OSHA 7
Physical Description: Colorless liquid with a powerful, fruity odor.	

Chemical & Physical Properties: MW: 114.2 BP: 298°F Sol: 1% Fl.P(oc): 115°F IP: 9.02 eV Sp.Gr: 0.82 VP: 4 mmHg FRZ: -38°F UEL: ? LEL: ? Class II Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 500 ppm: CcrOv*/Sa* 1000 ppm: Sa:Cf*/PaprOv*/CcrFOv/ GmFOv/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, acetaldehyde, perchloric acid	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, muc memb; head, narco, coma; derm TO: Eyes, skin, resp sys, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Water flush Breath: Resp support Swallow: Medical attention immed

Ethyl chloride	Formula: CH_3CH_2Cl	CAS#: 75-00-3	RTECS#: KH7525000	IDLH: 3800 ppm [10%LEL]
Conversion: 1 ppm = 2.64 mg/m^3	DOT: 1037 115			
Synonyms/Trade Names: Chloroethane, Hydrochloric ether, Monochloroethane, Muriatic ether				
Exposure Limits: NIOSH REL: Handle with caution in the workplace. See Appendix C (Chloroethanes) OSHA PEL: TWA 1000 ppm (2600 mg/m^3)			Measurement Methods (see Table 1): NIOSH 2519	
Physical Description: Colorless gas or liquid (below 54°F) with a pungent, ether-like odor. [Note: Shipped as a liquefied compressed gas.]				
Chemical & Physical Properties: MW: 64.5 BP: 54°F Sol: 0.6% Fl.P: NA (Gas) -58°F (Liquid) IP: 10.97 eV RGasD: 2.23 Sp.Gr: 0.92 (Liquid at 32°F) VP: 1000 mmHg FRZ: -218°F UEL: 15.4% LEL: 3.8% Flammable Gas	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact (liquid) Eyes: Prevent eye contact (liquid) Wash skin: N.R. Remove: When wet (flamm) Change: N.R.		Respirator Recommendations (see Tables 3 and 4): OSHA 3800 ppm: Sa*/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Chemically-active metals such as sodium, potassium, calcium, powdered aluminum, zinc & magnesium; oxidizers; water or steam [Note: Reacts with water to form hydrochloric acid.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs (liquid), Ing (liquid), Con SY: Inco, inebri; abdom cramps; card arrhy, card arrest; liver, kidney damage TO: Liver, kidneys, resp sys, CVS, CNS			First Aid (see Table 6): Eye: Irr immed (liquid) Skin: Water flush prompt (liquid) Breath: Resp support Swallow: Medical attention immed (liquid)	

Ethylene chlorohydrin	Formula: CH_2ClCH_2OH	CAS#: 107-07-3	RTECS#: KK0875000	IDLH: 7 ppm
Conversion: 1 ppm = 3.29 mg/m^3	DOT: 1135 131			
Synonyms/Trade Names: 2-Chloroethanol, 2-Chloroethyl alcohol, Ethylene chlorhydrin				
Exposure Limits: NIOSH REL: C 1 ppm (3 mg/m^3) [skin] OSHA PEL†: TWA 5 ppm (16 mg/m^3) [skin]			Measurement Methods (see Table 1): NIOSH 2513 OSHA 7	
Physical Description: Colorless liquid with a faint, ether-like odor.				
Chemical & Physical Properties: MW: 80.5 BP: 262°F Sol: Miscible Fl.P: 140°F IP: 10.90 eV Sp.Gr: 1.20 VP: 5 mmHg FRZ: -90°F UEL: 15.9% LEL: 4.9% Class IIIA Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH 7 ppm: Sa*/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers, strong caustics, water or steam				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit muc memb; nau, vomit; dizz, inco; numb; vis dist; head; thirst; delirium; low BP; collapse, shock, coma; liver, kidney damage TO: Resp sys, liver, kidneys, CNS, CVS, eyes			First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed	

E

Ethylenediamine

Formula:	CAS#:	RTECS#:	IDLH:
$NH_2CH_2CH_2NH_2$	107-15-3	KH8575000	1000 ppm

Conversion: 1 ppm = 2.46 mg/m^3 DOT: 1604 132

Synonyms/Trade Names: 1,2-Diaminoethane; 1,2-Ethanediamine; Ethylenediamine (anhydrous)

Exposure Limits:
NIOSH REL: TWA 10 ppm (25 mg/m^3)
OSHA PEL: TWA 10 ppm (25 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2540
OSHA 60

Physical Description: Colorless, viscous liquid with an ammonia-like odor. [fungicide] [Note: A solid below 47°F.]

Chemical & Physical Properties:
MW: 60.1
BP: 241°F
Sol: Miscible
Fl.P: 93°F
IP: 8.60 eV
Sp.Gr: 0.91
VP: 11 mmHg
FRZ: 47°F
UEL(212°F): 12%
LEL(212°F): 2.5%
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash (>5%)
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
250 ppm: Sa:Cf£/PaprS£
500 ppm: CcrFS/GmFS/PaprTS£/ ScbaF/SaF
1000 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Strong acids & oxidizers, carbon tetrachloride & other chlorinated organic compounds, carbon disulfide [Note: Corrosive to metals.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit nose, resp sys; sens derm; asthma; liver, kidney damage
TO: Skin, resp sys, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Ethylene dibromide

Formula:	CAS#:	RTECS#:	IDLH:
$BrCH_2CH_2Br$	106-93-4	KH9275000	Ca [100 ppm]

Conversion: 1 ppm = 7.69 mg/m^3 DOT: 1605 154

Synonyms/Trade Names: 1,2-Dibromoethane; Ethylene bromide; Glycol dibromide

Exposure Limits:
NIOSH REL: Ca
TWA 0.045 ppm
C 0.13 ppm [15-minute]
See Appendix A
OSHA PEL: TWA 20 ppm
C 30 ppm
50 ppm [5-minute maximum peak]

Measurement Methods (see Table 1):
NIOSH 1008
OSHA 2

Physical Description: Colorless liquid or solid (below 50°F) with a sweet odor. [fumigant]

Chemical & Physical Properties:
MW: 187.9
BP: 268°F
Sol: 0.4%
Fl.P: NA
IP: 9.45 eV
Sp.Gr: 2.17
VP: 12 mmHg
FRZ: 50°F
UEL: NA
LEL: NA
Noncombustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Chemically-active metals such as sodium, potassium, calcium, hot aluminum & magnesium; liquid ammonia; strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; derm with vesic; liver, heart, spleen, kidney damage; repro effects; [carc]
TO: Eyes, skin, resp sys, liver, kidneys, repro sys [in animals: skin & lung tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Ethylene dichloride

Formula:	CAS#:	RTECS#:	IDLH:
$ClCH_2CH_2Cl$	107-06-2	KI0525000	Ca [50 ppm]

Conversion: 1 ppm = 4.05 mg/m^3

DOT: 1184 131

Synonyms/Trade Names: 1,2-Dichloroethane; Ethylene chloride; Glycol dichloride

Exposure Limits:
NIOSH REL: Ca
TWA 1 ppm (4 mg/m^3)
ST 2 ppm (8 mg/m^3)
See Appendix A,
See Appendix C (Chloroethanes)
OSHA PEL†: TWA 50 ppm
C 100 ppm
200 ppm [5-minute maximum peak in any 3 hours]

Measurement Methods (see Table 1):
NIOSH 1003
OSHA 3

Physical Description: Colorless liquid with a pleasant, chloroform-like odor. [Note: Decomposes slowly, becomes acidic & darkens in color.]

Chemical & Physical Properties:
MW: 99.0
BP: 182°F
Sol: 0.9%
Fl.P: 56°F
IP: 11.05 eV
Sp.Gr: 1.24
VP: 64 mmHg
FRZ: -32°F
UEL: 16%
LEL: 6.2%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers & caustics; chemically-active metals such as magnesium or aluminum powder, sodium & potassium; liquid ammonia [Note: Decomposes to vinyl chloride & HCl above 1112°F.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Abs, Con
SY: Irrit eyes, corn opac; CNS depres; nau, vomit; derm; liver, kidney, CVS damage; [carc]
TO: Eyes, skin, kidneys, liver, CNS, CVS [in animals: forestomach, mammary gland & circulatory sys cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Ethylene glycol

Formula:	CAS#:	RTECS#:	IDLH:
$HOCH_2CH_2OH$	107-21-1	KW2975000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: 1,2-Dihydroxyethane; 1,2-Ethanediol; Glycol; Glycol alcohol; Monoethylene glycol

Exposure Limits:
NIOSH REL: See Appendix D
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 5523
OSHA PV2024

Physical Description: Clear, colorless, syrupy, odorless liquid. [antifreeze] [Note: A solid below 9°F.]

Chemical & Physical Properties:
MW: 62.1
BP: 388°F
Sol: Miscible
Fl.P: 232°F
IP: ?
Sp.Gr: 1.11
VP: 0.06 mmHg
FRZ: 9°F
UEL: 15.3%
LEL: 3.2%
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong oxidizers, chromium trioxide, potassium permanganate, sodium peroxide
[Note: Hygroscopic (i.e., absorbs moisture from the air).]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; nau, vomit, abdom pain, lass; dizz, stupor, convuls, CNS depres; skin sens
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash immed
Breath: Resp support
Swallow: Medical attention immed

E

Ethylene glycol dinitrate

Formula: $O_2NOCH_2CH_2ONO_2$ | CAS#: 628-96-6 | RTECS#: KW5600000 | IDLH: 75 mg/m^3

Conversion: 1 ppm = 6.22 mg/m^3 | DOT:

Synonyms/Trade Names: EGDN; 1,2-Ethanediol dinitrate; Ethylene dinitrate; Ethylene nitrate; Glycol dinitrate; Nitroglycol

Exposure Limits:
NIOSH REL: ST 0.1 mg/m^3 [skin]
OSHA PEL†: C 0.2 ppm (1 mg/m^3) [skin]

Physical Description: Colorless to yellow, oily, odorless liquid. [Note: An explosive ingredient (60-80%) in dynamite along with nitroglycerine (40-20%).]

Measurement Methods (see Table 1):
NIOSH 2507
OSHA 43

Chemical & Physical Properties:
MW: 152.1
BP: 387°F
Sol: Insoluble
Fl.P: 419°F
IP: ?
Sp.Gr: 1.49
VP: 0.05 mmHg
FRZ: -8°F
UEL: ?
LEL: ?
Explosive Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: Daily
Provide: Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
1 mg/m^3: Sa*
2.5 mg/m^3: Sa:Cf*
5 mg/m^3: SaT:Cf*/ScbaF/SaF
75 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Acids, alkalis

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Throb head; dizz; nau, vomit, abdom pain; hypotension, flush, palp, angina; methemo; delirium, CNS depres; irrit skin; in animals: anemia; liver, kidney damage
TO: Skin, CVS, blood, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Ethyleneimine

Formula: C_2H_5N | CAS#: 151-56-4 | RTECS#: KX5075000 | IDLH: Ca [100 ppm]

Conversion: 1 ppm = 1.76 mg/m^3 | DOT: 1185 131P (inhibited)

Synonyms/Trade Names: Aminoethylene, Azirane, Aziridine, Dimethyleneimine, Dimethylenimine, Ethylenimine, Ethylimine

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL: [1910.1012] See Appendix B

Physical Description: Colorless liquid with an ammonia-like odor. [Note: Usually contains inhibitors to prevent polymerization.]

Measurement Methods (see Table 1):
NIOSH 3514

Chemical & Physical Properties:
MW: 43.1
BP: 133°F
Sol: Miscible
Fl.P: 12°F
IP: 9.20 eV
Sp.Gr: 0.83
VP: 160 mmHg
FRZ: -97°F
UEL: 54.8%
LEL: 3.3%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

See Appendix E (page 351)

Incompatibilities and Reactivities: Polymerizes explosively in presence of acids [Note: Explosive silver derivatives may be formed with silver alloys (e.g., silver solder).]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat; nau, vomit; head, dizz; pulm edema; liver, kidney damage; eye burns; skin sens; [carc]
TO: Eyes, skin, resp sys, liver, kidneys [in animals: lung & liver tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Ethylene oxide

Formula:	CAS#:	RTECS#:	IDLH:
C_2H_4O	75-21-8	KX2450000	Ca [800 ppm]

Conversion: 1 ppm = 1.80 mg/m^3

DOT: 1040 119P

Synonyms/Trade Names: Dimethylene oxide; 1,2-Epoxy ethane; Oxirane

Exposure Limits:
NIOSH REL: Ca
TWA <0.1 ppm (0.18 mg/m^3)
C 5 ppm (9 mg/m^3) [10-min/day]
See Appendix A
OSHA PEL: [1910.1047] TWA 1 ppm
5 ppm [15-minute Excursion]

Measurement Methods (see Table 1):
NIOSH 1614, 3800
OSHA 30, 49, 50

Physical Description: Colorless gas or liquid (below 51°F) with an ether-like odor.

Chemical & Physical Properties:
MW: 44.1
BP: 51°F
Sol: Miscible
Fl.P: NA (Gas)
-20°F (Liquid)
IP: 10.56 eV
RGasD: 1.49
Sp.Gr: 0.82 (Liquid at 50°F)
VP: 1.46 atm
FRZ: -171°F
UEL: 100%
LEL: 3.0%
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact (liquid)
Eyes: Prevent eye contact (liquid)
Wash skin: When contam (liquid)
Remove: When wet (flamm)
Change: N.R.
Provide: Quick drench (liquid)

Respirator Recommendations (see Tables 3 and 4):
NIOSH
5 ppm: GmFS†/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS†/ScbaE

See Appendix E (page 351)

Incompatibilities and Reactivities: Strong acids, alkalis & oxidizers; chlorides of iron, aluminum & tin; oxides of iron & aluminum; water

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, (liquid), Con
SY: Irrit eyes, skin, nose, throat; peculiar taste; head; nau, vomit, diarr; dysp, cyan, pulm edema; drow, lass, inco; EKG abnor; eye, skin burns (liq or high vap conc); liquid: frostbite; repro effects; [carc]; in animals: convuls; liver, kidney damage
TO: Eyes, skin, resp sys, liver, CNS, blood, kidneys, repro sys [peritoneal cancer, leukemia]

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed (liquid)

Ethylene thiourea

Formula:	CAS#:	RTECS#:	IDLH:
$C_3H_6N_2S$	96-45-7	NI9625000	Ca [N.D.]

Conversion:

DOT:

Synonyms/Trade Names: 1,3-Ethylene-2-thiourea; N,N-Ethylenethiourea; ETU; 2-Imidazolidine-2-thione

Exposure Limits:
NIOSH REL: Ca
Use encapsulated form.
See Appendix A
OSHA PEL: none

Measurement Methods (see Table 1):
NIOSH 5011
OSHA 95

Physical Description: White to pale-green, crystalline solid with a faint, amine odor. [Note: Used as an accelerator in the curing of polychloroprene & other elastomers.]

Chemical & Physical Properties:
MW: 102.2
BP: 446-595°F
Sol(86°F): 2%
Fl.P: 486°F
IP: 8.15 eV
Sp.Gr: ?
VP: 16 mmHg
MLT: 392°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Acrolein

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes; in animals: thickening of the skin; goiter; terato effects; [carc]
TO: Eyes, skin, thyroid, repro sys [in animals: liver, thyroid & lymphatic sys tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

E

Ethyl ether

Formula:	CAS#:	RTECS#:	IDLH:
$C_2H_5OC_2H_5$	60-29-7	KI5775000	1900 ppm [10%LEL]

Conversion: 1 ppm = 3.03 mg/m^3

DOT: 1155 127

Synonyms/Trade Names: Diethyl ether, Diethyl oxide, Ethyl oxide, Ether, Solvent ether

Exposure Limits:
NIOSH REL: See Appendix D
OSHA PEL†: TWA 400 ppm (1200 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1610
OSHA 7

Physical Description: Colorless liquid with a pungent, sweetish odor.
[Note: A gas above 94°F.]

Chemical & Physical Properties:
MW: 74.1
BP: 94°F
Sol: 8%
Fl.P: -49°F
IP: 9.53 eV
Sp.Gr: 0.71
VP: 440 mmHg
FRZ: -177°F
UEL: 36.0%
LEL: 1.9%
Class IA Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: N.R.
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
OSHA
1900 ppm: CcrOv*/GmFOv/PaprOv*/
Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, halogens, sulfur, sulfur compounds
[Note: Tends to form explosive peroxides under influence of air and light.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, upper resp sys; dizz, drow, head, excited, narco; nau, vomit
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash prompt
Breath: Resp support
Swallow: Medical attention immed

Ethyl formate

Formula:	CAS#:	RTECS#:	IDLH:
CH_3CH_2OCHO	109-94-4	LQ8400000	1500 ppm

Conversion: 1 ppm = 3.03 mg/m^3

DOT: 1190 129

Synonyms/Trade Names: Ethyl ester of formic acid, Ethyl methanoate

Exposure Limits:
NIOSH REL: TWA 100 ppm (300 mg/m^3)
OSHA PEL: TWA 100 ppm (300 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1452
OSHA 7

Physical Description: Colorless liquid with a fruity odor.

Chemical & Physical Properties:
MW: 74.1
BP: 130°F
Sol(64°F): 9%
Fl.P: -4°F
IP: 10.61 eV
Sp.Gr: 0.92
VP: 200 mmHg
FRZ: -113°F
UEL: 16.0%
LEL: 2.8%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1500 ppm: Sa:Cf£/PaprOv£/CcrFOv/
GmFOv/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Nitrates; strong oxidizers, alkalis & acids
[Note: Decomposes slowly in water to form ethyl alcohol and formic acid.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, upper resp sys; in animals: narco
TO: Eyes, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Ethylidene norbornene

Formula:	CAS#:	RTECS#:	IDLH:
C_9H_{12}	16219-75-3	RB9450000	N.D.

Conversion: 1 ppm = 4.92 mg/m^3 DOT:

Synonyms/Trade Names: ENB, 5-Ethylidenebicyclo(2.2.1)hept-2-ene, 5-Ethylidene-2-norbornene
[Note: Due to its reactivity, ENB may be stabilized with tert-butyl catechol.]

Exposure Limits:
NIOSH REL: C 5 ppm (25 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless to white liquid with a turpentine-like odor.

Chemical & Physical Properties:
MW: 120.2
BP: 298°F
Sol: ?
Fl.P(oc): 101°F
IP: ?
Sp.Gr: 0.90
VP: 4 mmHg
FRZ: -112°F
UEL: ?
LEL: ?
Class II Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Oxygen
[Note: ENB should be stored in a nitrogen atmosphere since it reacts with oxygen.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat; head; cough, dysp; nau, vomit; olfactory, taste changes; chemical pneu (aspir liquid); in animals: liver, kidney, urogenital inj; bone marrow effects
TO: Eyes, skin, resp sys, CNS, liver, kidneys, urogenital system, bone marrow

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Ethyl mercaptan

Formula:	CAS#:	RTECS#:	IDLH:
CH_3CH_2SH	75-08-1	KI9625000	500 ppm

Conversion: 1 ppm = 2.54 mg/m^3 DOT: 2363 129

Synonyms/Trade Names: Ethanethiol, Ethyl sulfhydrate, Mercaptoethane

Exposure Limits:
NIOSH REL: C 0.5 ppm (1.3 mg/m^3) [15-minute]
OSHA PEL†: C 10 ppm (25 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2542

Physical Description: Colorless liquid with a strong, skunk-like odor.
[Note: A gas above 95°F.]

Chemical & Physical Properties:
MW: 62.1
BP: 95°F
Sol: 0.7%
Fl.P: -55°F
IP: 9.29 eV
Sp.Gr: 0.84
VP: 442 mmHg
FRZ: -228°F
UEL: 18.0%
LEL: 2.8%
Class IA Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
5 ppm: CcrOv/Sa
12.5 ppm: Sa:Cf/PaprOv
25 ppm: CcrFOv/GmFOv/SaT:Cf/PaprTOv/ScbaF/SaF
500 ppm: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers [Note: Reacts violently with calcium hypochlorite.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit muc memb; head, nau; in animals: inco, lass; liver, kidney damage; cyan; narco
TO: Eyes, resp sys, liver, kidneys, blood

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

E

N-Ethylmorpholine

Formula:	CAS#:	RTECS#:	IDLH:
$C_4H_8ONCH_2CH_3$	100-74-3	QE4025000	100 ppm

Conversion: 1 ppm = 4.71 mg/m^3

DOT:

Synonyms/Trade Names: 4-Ethylmorpholine

Exposure Limits:
NIOSH REL: TWA 5 ppm (23 mg/m^3) [skin]
OSHA PEL†: TWA 20 ppm (94 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH S146 (II-3)

Physical Description: Colorless liquid with an ammonia-like odor.

Chemical & Physical Properties:
MW: 115.2
BP: 281°F
Sol: Miscible
Fl.P(oc): 90°F
IP: ?
Sp.Gr: 0.90
VP: 6 mmHg
FRZ: -81°F
UEL: ?
LEL: ?
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash (>15%)
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
50 ppm: CcrOv*/Sa*
100 ppm: Sa:Cf*/PaprOv*/CcrFOv/GmFOv/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong acids, strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, nose, throat; vis dist: corn edema, blue-gray vision, colored haloes
TO: Eyes, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush prompt
Breath: Resp support
Swallow: Medical attention immed

Ethyl silicate

Formula:	CAS#:	RTECS#:	IDLH:
$(C_2H_5)_4SiO_4$	78-10-4	VV9450000	700 ppm

Conversion: 1 ppm = 8.52 mg/m^3

DOT: 1292 129

Synonyms/Trade Names: Ethyl orthosilicate, Ethyl silicate (condensed), Tetraethoxysilane, Tetraethyl orthosilicate, Tetraethyl silicate

Exposure Limits:
NIOSH REL: TWA 10 ppm (85 mg/m^3)
OSHA PEL†: TWA 100 ppm (850 mg/m^3)

Measurement Methods (see Table 1):
NIOSH S264 (II-3)

Physical Description: Colorless liquid with a sharp, alcohol-like odor.

Chemical & Physical Properties:
MW: 208.3
BP: 336°F
Sol: Reacts
Fl.P: 99°F
IP: 9.77 eV
Sp.Gr: 0.93
VP: 1 mmHg
FRZ: -117°F
UEL: ?
LEL: ?
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
100 ppm: Sa*
250 ppm: Sa:Cf*
500 ppm: ScbaF/SaF
700 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, water
[Note: Reacts with water to form a silicone adhesive (a milky-white mass).]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, nose; in animals: lac; dysp, pulm edema; tremor, narco; liver, kidney damage; anemia
TO: Eyes, resp sys, liver, kidneys, blood, skin

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Fenamiphos	Formula: $C_{13}H_{22}NO_3PS$	CAS#: 22224-92-6	RTECS#: TB3675000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: Ethyl 3-methyl-4-(methylthio)phenyl-(1-methylethyl)phosphoramidate, Nemacur®, Phenamiphos

Exposure Limits: NIOSH REL: TWA 0.1 mg/m^3 [skin] OSHA PEL†: none	Measurement Methods (see Table 1): NIOSH 5600
Physical Description: Off-white to tan, waxy solid. [insecticide] [Note: Found commercially as a granular ingredient (5-15%) or in an emulsifiable concentrate (400 g/l).]	

Chemical & Physical Properties: MW: 303.4 BP: ? Sol: 0.03% Fl.P: ? IP: ? Sp.Gr: 1.14 VP: 0.00005 mmHg MLT: 121°F UEL: ? LEL: ?	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily Provide: Quick drench	Respirator Recommendations (see Tables 3 and 4): Not available.

Incompatibilities and Reactivities: None reported [Note: May hydrolyze under alkaline conditions.]

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Nau, vomit, abdom cramps, diarr, salv; head, dizz, lass; rhin, chest tight; blurred vision, miosis; card irreg; musc fasc; dysp TO: Resp sys, CNS, CVS, blood chol	First Aid (see Table 6): Eye: Irr immed Skin: Soap flush immed Breath: Resp support Swallow: Medical attention immed

Fensulfothion	Formula: $C_{11}H_{17}O_4PS_2$	CAS#: 115-90-2	RTECS#: TF3850000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: Dasanit®; O,O-Diethyl O-(p-methylsulfinyl)phenyl)phosphorothioate; Terracur P®

Exposure Limits: NIOSH REL: TWA 0.1 mg/m^3 OSHA PEL†: none	Measurement Methods (see Table 1): None available
Physical Description: Brown liquid or yellow oil. [pesticide]	

Chemical & Physical Properties: MW: 308.4 BP: ? Sol(77°F): 0.2% Fl.P: ? IP: ? Sp.Gr: 1.20 VP: ? FRZ: ? UEL: ? LEL: ? Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench	Respirator Recommendations (see Tables 3 and 4): Not available.

Incompatibilities and Reactivities: Alkalis

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit skin; nau, vomit, abdom cramps, diarr, salv; head, dizz, lass; rhin, chest tight; blurred vision, miosis; card irreg; musc fasc; dys TO: Skin, resp sys, CNS, CVS, blood chol	First Aid (see Table 6): Eye: Irr immed Skin: Soap flush immed Breath: Resp support Swallow: Medical attention immed

F

Fenthion

Formula:	CAS#:	RTECS#:	IDLH:
$C_{10}H_{15}O_3PS$	55-38-9	TF9625000	N.D.

Conversion: DOT:

Synonyms/Trade Names: Baytex; Entex; O,O-Dimethyl O-3-methyl-4-methylthiophenyl phosphorothioate

Exposure Limits:
NIOSH REL: See Appendix D
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless to brown liquid with a slight, garlic-like odor. [insecticide]

Chemical & Physical Properties:
MW: 278.3
BP: ?
Sol: 0.006%
Fl.P: NA
IP: ?
Sp.Gr: 1.25
VP: 0.0003 mmHg
FRZ: 43°F
UEL: NA
LEL: NA
Noncombustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Nau, vomit, abdom cramps, diarr, salv; head, dizz, lass; rhin, chest tight; blurred vision, miosis; card irregularities; musc fasc; dysp
TO: Resp sys, CNS, CVS, plasma chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

Ferbam

Formula:	CAS#:	RTECS#:	IDLH:
$[(CH_3)_2NCS_2]_3Fe$	14484-64-1	NO8750000	800 mg/m^3

Conversion: DOT:

Synonyms/Trade Names: tris(Dimethyldithiocarbamato)iron, Ferric dimethyl dithiocarbamate

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3
OSHA PEL†: TWA 15 mg/m^3

Measurement Methods (see Table 1):
NIOSH 0500

Physical Description: Dark brown to black, odorless solid. [fungicide]

Chemical & Physical Properties:
MW: 416.5
BP: Decomposes
Sol: 0.01%
Fl.P: ?
IP: 7.72 eV
Sp.Gr: ?
VP: 0 mmHg (approx)
MLT: >356°F (Decomposes)
UEL: ?
LEL: ?
MEC: 55 g/m^3
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH
50 mg/m^3: Qm
100 mg/m^3: 95XQ*/Sa*
250 mg/m^3: Sa:Cf*/PaprHie*
500 mg/m^3: 100F/SaT:Cf*/PaprTHie*/ScbaF/SaF
800 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, moisture

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, resp tract; derm; GI dist
TO: Eyes, skin, resp sys, GI tract

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Ferrovanadium dust

Formula:	CAS#:	RTECS#:	IDLH:
FeV	12604-58-9	LK2900000	500 mg/m^3

Conversion: DOT:

Synonyms/Trade Names: Ferrovanadium

Exposure Limits:
NIOSH REL*: TWA 1 mg/m^3
ST 3 mg/m^3
[*Note: The REL also applies to Vanadium metal and Vanadium carbide.]
OSHA PEL†: TWA 1 mg/m^3

Measurement Methods (see Table 1):
OSHA ID121, ID125G

Physical Description: Dark, odorless particulate dispersed in air.
[Note: Ferrovanadium metal is an alloy usually containing 50-80% vanadium.]

Chemical & Physical Properties:
MW: 106.8
BP: ?
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: ?
VP: 0 mmHg (approx)
MLT: 2696-2768°F
UEL: NA
LEL: NA
MEC: 1.3 g/m^3
Metal: Noncombustible Solid, but dust may be an explosion hazard.

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
5 mg/m^3: Qm*
10 mg/m^3: 95XQ*/Sa*
25 mg/m^3: Sa:Cf*/PaprHie*
50 mg/m^3: 100F/SaT:Cf*/PaprTHie*/ScbaF/SaF
500 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, resp sys; in animals: bron, pneu
TO: Eyes, resp sys

First Aid (see Table 6):
Eye: Irr immed
Breath: Resp support

Fibrous glass dust

Formula:	CAS#:	RTECS#:	IDLH:
		LK3651000	N.D.

Conversion: DOT:

Synonyms/Trade Names: Fiber glas®, Fiberglass, Glass fibers, Glass wool
[Note: Usually produced from borosilicate & low alkali silicate glasses.]

Exposure Limits:
NIOSH REL: TWA 3 fibers/cm^3 (fibers ≤ 3.5 µm in diameter & ≥ 10 µm in length)
TWA 5 mg/m^3 (total)
OSHA PEL: TWA 15 mg/m3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 7400

Physical Description: Typically, glass filaments >3 µm in diameter or glass "wool" with diameters down to 0.05 µm & >1 µm in length.

Chemical & Physical Properties:
MW: NA
BP: NA
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 2.5
VP: 0 mmHg (approx)
MLT: ?
UEL: NA
LEL: NA
Noncombustible Fibers

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: N.R.
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH
5X REL: Qm
10X REL: 95XQ/Sa
25X REL: Sa:Cf/PaprHie
50X REL: 100F/PaprTHie/ScbaF/SaF
1000X REL: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, nose, throat; dysp
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Breath: Fresh air

F

Fluorine

Formula:	CAS#:	RTECS#:	IDLH:
F_2	7782-41-4	LM6475000	25 ppm

Conversion: 1 ppm = 1.55 mg/m^3

DOT: 1045 124; 9192 167 (cryogenic liquid)

Synonyms/Trade Names: Fluorine-19

Exposure Limits:
NIOSH REL: TWA 0.1 ppm (0.2 mg/m^3)
OSHA PEL: TWA 0.1 ppm (0.2 mg/m^3)

Measurement Methods (see Table 1):
None available

Physical Description: Pale-yellow to greenish gas with a pungent, irritating odor.

Chemical & Physical Properties:
MW: 38.0
BP: -307°F
Sol: Reacts
Fl.P: NA
IP: 15.70 eV
RGasD: 1.31
VP: >1 atm
FRZ: -363°F
UEL: NA
LEL: NA
Nonflammable Gas, but an extremely strong oxidizer.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact (liquid)
Eyes: Prevent eye contact (liquid)
Wash skin: When contam (liquid)
Remove: When wet or contam (liquid)
Change: N.R.
Provide: Eyewash (liquid)
Quick drench (liquid)

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1 ppm: Sa*
2.5 ppm: Sa:Cf*
5 ppm: ScbaF/SaF
25 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS¿/ScbaE

Incompatibilities and Reactivities: Water, nitric acid, oxidizers, organic compounds
[Note: Reacts violently with all combustible materials, except the metal containers in which it is shipped. Reacts with H_2O to form hydrofluoric acid.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, nose, resp sys; lar spasm, wheez; pulm edema; eye, skin burns; in animals: liver, kidney damage
TO: Eyes, skin, resp sys, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support

Fluorotrichloromethane

Formula:	CAS#:	RTECS#:	IDLH:
CCl_3F	75-69-4	PB6125000	2000 ppm

Conversion: 1 ppm = 5.62 mg/m^3

DOT:

Synonyms/Trade Names: Freon® 11, Monofluorotrichloromethane, Refrigerant 11, Trichlorofluoromethane, Trichloromonofluoromethane

Exposure Limits:
NIOSH REL: C 1000 ppm (5600 mg/m^3)
OSHA PEL†: TWA 1000 ppm (5600 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1006

Physical Description: Colorless to water-white, nearly odorless liquid or gas (above 75°F).

Chemical & Physical Properties:
MW: 137.4
BP: 75°F
Sol(75°F): 0.1%
Fl.P: NA
IP: 11.77 eV
RGasD: 4.74
Sp.Gr: 1.47 (Liquid at 75°F)
VP: 690 mmHg
FRZ: -168°F
UEL: NA
LEL: NA
Noncombustible Liquid
Nonflammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: N.R.
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
2000 ppm: Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Chemically-active metals such as sodium, potassium, calcium, powdered aluminum, zinc, magnesium & lithium shavings; granular barium

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Inco, tremor; derm; card arrhy, card arrest; asphy; liquid: frostbite
TO: Skin, resp sys, CVS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Fluoroxene

Formula:	CAS#:	RTECS#:	IDLH:
$CF_3CH_2OCH=CH_2$	406-90-6	KO4250000	N.D.

Conversion: 1 ppm = 5.16 mg/m^3

DOT:

Synonyms/Trade Names: 2,2,2-Trifluoroethoxyethene; 2,2,2-Trifluoroethyl vinyl ether

Exposure Limits:
NIOSH REL*: C 2 ppm (10.3 mg/m^3) [60-minute]
[*Note: REL for exposure to waste anesthetic gas.]
OSHA PEL: none

Measurement Methods (see Table 1):
None available

Physical Description: Liquid. [inhalation anesthetic] [Note: A gas above 109°F.]

Chemical & Physical Properties:
MW: 126.1
BP: 109°F
Sol: ?
Fl.P: ?
IP: ?
Sp.Gr: 1.14
VP: 286 mmHg
FRZ: ?
UEL: ?
LEL: ?
Combustible Liquid
[Potentially EXPLOSIVE!]

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: Prevent eye contact
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes; CNS depres, analgesia, anes, convuls, resp depres
TO: Eyes, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

Fonofos

Formula:	CAS#:	RTECS#:	IDLH:
$C_{10}H_{15}OPS_2$	944-22-9	TA5950000	N.D.

Conversion: 1 ppm = 10.07 mg/m^3

DOT:

Synonyms/Trade Names: Dyfonate®, Dyphonate, O-Ethyl-S-phenyl ethylphosphorothioate, Fonophos

Exposure Limits:
NIOSH REL: TWA 0.1 mg/m^3 [skin]
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 5600
OSHA PV2027

Physical Description: Light-yellow liquid with an aromatic odor. [insecticide]

Chemical & Physical Properties:
MW: 246.3
BP: ?
Sol: 0.001%
Fl.P: >201°F
IP: ?
Sp.Gr: 1.15
VP(77°F): 0.0002 mmHg
FRZ: ?
UEL: ?
LEL: ?
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Nau, vomit, abdom cramps, diarr, salv; head, dizz, lass; rhin, chest tight; blurred vision, miosis; card irreg; musc fasc; dysp
TO: Resp sys, CNS, CVS, blood chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

F

Formaldehyde

Formula: HCHO | CAS#: 50-00-0 | RTECS#: LP8925000 | IDLH: Ca [20 ppm]

Conversion: 1 ppm = 1.23 mg/m^3 | DOT:

Synonyms/Trade Names: Methanal, Methyl aldehyde, Methylene oxide

Exposure Limits:
NIOSH REL: Ca
TWA 0.016 ppm
C 0.1 ppm [15-minute]
See Appendix A
OSHA PEL: [1910.1048] TWA 0.75 ppm
ST 2 ppm

Measurement Methods (see Table 1):
NIOSH 2016, 2541, 3500, 3800
OSHA ID205, 52

Physical Description: Nearly colorless gas with a pungent, suffocating odor. [Note: Often used in an aqueous solution (see specific listing for Formalin).]

Chemical & Physical Properties:
MW: 30.0
BP: -6°F
Sol: Miscible
Fl.P: NA (Gas)
IP: 10.88 eV
RGasD: 1.04
VP: >1 atm
FRZ: -134°F
UEL: 73%
LEL: 7.0%
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: Prevent eye contact
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

See Appendix E (page 351)

Incompatibilities and Reactivities: Strong oxidizers, alkalis & acids; phenols; urea [Note: Pure formaldehyde has a tendency to polymerize. Reacts with HCl to form bis-Chloromethyl ether.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, nose, throat, resp sys; lac; cough; wheez; [carc]
TO: Eyes, resp sys [nasal cancer]

First Aid (see Table 6):
Eye: Irr immed
Breath: Resp support

Formalin (as formaldehyde)

Formula: | CAS#: | RTECS#: | IDLH: Ca [20 ppm]

Conversion: | DOT: 1198 132; 2209 132

Synonyms/Trade Names: Formaldehyde solution
[Note: Formalin is an aqueous solution that is 37% formaldehyde by weight; inhibited solutions usually contain 6-12% methyl alcohol. Also see specific listings for Formaldehyde and Methyl alcohol.]

Exposure Limits:
NIOSH REL: Ca
TWA 0.016 ppm
C 0.1 ppm [15-minute]
See Appendix A
OSHA PEL: [1910.1048] TWA 0.75 ppm
ST 2 ppm

Measurement Methods (see Table 1):
NIOSH 2016, 2541, 3500, 3800
OSHA ID205, 52

Physical Description: Colorless liquid with a pungent odor.

Chemical & Physical Properties:
MW: Varies
BP: 214°F
Sol: Miscible
Fl.P: 185°F
IP: ?
Sp.Gr(77°F): 1.08
VP: 1 mmHg
FRZ: ?
UEL: 73%
LEL: 7%
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

See Appendix E (page 351)

Incompatibilities and Reactivities: Strong oxidizers, alkalis & acids; phenols; urea; oxides; isocyanates; caustics; anhydrides

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, nose, throat, resp sys; lac; cough; wheez, derm; [carc]
TO: Eyes, skin, resp sys [nasal cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush prompt
Breath: Resp support
Swallow: Medical attention immed

Formamide	Formula: $HCONH_2$	CAS#: 75-12-7	RTECS#: LQ0525000	IDLH: N.D.
Conversion: 1 ppm = 1.85 mg/m^3	DOT:			
Synonyms/Trade Names: Carbamaldehyde, Methanamide				

Exposure Limits:
NIOSH REL: TWA 10 ppm (15 mg/m^3) [skin]
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless, oily liquid. [Note: A solid below 37°F.]

Chemical & Physical Properties:
MW: 45.1
BP: 411°F (Decomposes)
Sol: Miscible
Fl.P(oc): 310°F
IP: 10.20 eV
Sp.Gr: 1.13
VP(86°F): 0.1 mmHg
FRZ: 37°F
UEL: ?
LEL: ?
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: Prevent eye contact
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Oxidizers, iodine, pyridine, sulfur trioxide, copper, brass, lead
[Note: Hygroscopic (i.e., absorbs moisture from the air).]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, muc memb; drow, lass; nau; acidosis; skin eruptions; in animals: repro effects
TO: Eyes, skin, resp sys, CNS, repro sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash
Breath: Resp support
Swallow: Medical attention immed

Formic acid	Formula: HCOOH	CAS#: 64-18-6	RTECS#: LQ4900000	IDLH: 30 ppm
Conversion: 1 ppm = 1.88 mg/m^3	DOT: 1779 153			
Synonyms/Trade Names: Formic acid (85-95% in aqueous solution); Hydrogen carboxylic acid; Methanoic acid				

Exposure Limits:
NIOSH REL: TWA 5 ppm (9 mg/m^3)
OSHA PEL: TWA 5 ppm (9 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2011
OSHA ID186SG

Physical Description: Colorless liquid with a pungent, penetrating odor.
[Note: Often used in an aqueous solution.]

Chemical & Physical Properties:
MW: 46.0
BP: 224°F (90% solution)
Sol: Miscible
Fl.P(oc): 122°F (90% solution)
IP: 11.05 eV
Sp.Gr: 1.22 (90% solution)
VP: 35 mmHg
FRZ: 20°F (90% solution)
UEL: 57% (90% solution)
LEL: 18% (90% solution)
Class II Combustible Liquid (90% solution)

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
30 ppm: Sa*/ScbaF
§: ScbaF:Pd,Pp/
SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong caustics, concentrated sulfuric acid
[Note: Corrosive to metals.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes; skin, throat; skin burns, derm; lac; rhin; cough, dysp; nau
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Furfural	Formula: $C_5H_4O_2$	CAS#: 98-01-1	RTECS#: LT7000000	IDLH: 100 ppm
Conversion: 1 ppm = 3.93 mg/m^3	DOT: 1199 132P			
Synonyms/Trade Names: Fural, 2-Furancarboxaldehyde, Furfuraldehyde, 2-Furfuraldehyde				
Exposure Limits: NIOSH REL: See Appendix D OSHA PEL†: TWA 5 ppm (20 mg/m^3) [skin]			Measurement Methods (see Table 1): NIOSH 2529 OSHA 72	
Physical Description: Colorless to amber liquid with an almond-like odor. [Note: Darkens in light and air.]				
Chemical & Physical Properties: MW: 96.1 BP: 323°F Sol: 8% Fl.P: 140°F IP: 9.21 eV Sp.Gr: 1.16 VP: 2 mmHg FRZ: -34°F UEL: 19.3% LEL: 2.1% Class IIIA Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.		Respirator Recommendations (see Tables 3 and 4): OSHA 50 ppm: CcrOv*/Sa* 100 ppm: Sa:Cf*/CcrFOv/PaprOv*/ GmFOv/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Strong acids, oxidizers, strong alkalis [Note: May polymerize on contact with strong acids or strong alkalis.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, upper resp sys; head; derm TO: Eyes, skin, resp sys			First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed	

Furfuryl alcohol	Formula: $C_5H_6O_2$	CAS#: 98-00-0	RTECS#: LU9100000	IDLH: 75 ppm
Conversion: 1 ppm = 4.01 mg/m^3	DOT: 2874 153			
Synonyms/Trade Names: 2-Furylmethanol, 2-Hydroxymethylfuran				
Exposure Limits: NIOSH REL: TWA 10 ppm (40 mg/m^3) [skin] ST 15 ppm (60 mg/m^3) OSHA PEL†: TWA 50 ppm (200 mg/m^3)			Measurement Methods (see Table 1): NIOSH 2505	
Physical Description: Colorless to amber liquid with a faint, burning odor. [Note: Darkens on exposure to light.]				
Chemical & Physical Properties: MW: 98.1 BP: 338°F Sol: Miscible Fl.P: 149°F IP: ? Sp.Gr: 1.13 VP(77°F): 0.6 mmHg FRZ: 6°F UEL: 16.3% LEL: 1.8% Class IIIA Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH 75 ppm: CcrOv*/GmFOv/PaprOv*/ Sa*/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers & acids [Note: Contact with organic acids may lead to polymerization.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, muc memb; dizz; nau, diarr; diuresis; resp, body temperature depres; vomit; derm TO: Eyes, skin, resp sys, CNS			First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed	

Gasoline

Formula:	CAS#:	RTECS#:	IDLH:
	8006-61-9	LX3300000	Ca [N.D.]

Conversion: 1 ppm = 4.5 mg/m^3 (approx)

DOT: 1203 128

Synonyms/Trade Names: Motor fuel, Motor spirits, Natural gasoline, Petrol
[Note: A complex mixture of volatile hydrocarbons (paraffins, cycloparaffins & aromatics).]

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL†: none

Measurement Methods (see Table 1):
OSHA PV2028

Physical Description: Clear liquid with a characteristic odor.

Chemical & Physical Properties:
MW: 110 (approx)
BP: 102°F
Sol: Insoluble
Fl.P: -45°F
IP: ?
Sp.Gr(60°F): 0.72-0.76
VP: 38-300 mmHg
FRZ: ?
UEL: 7.6%
LEL: 1.4%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers such as peroxides, nitric acid & perchlorates

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, muc memb; derm; head, lass, blurred vision, dizz, slurred speech, conf, convuls; chemical pneu (aspir liquid); possible liver, kidney damage; [carc]
TO: Eyes, skin, resp sys, CNS, liver, kidneys [in animals: liver & kidney cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

Germanium tetrahydride

Formula:	CAS#:	RTECS#:	IDLH:
GeH_4	7782-65-2	LY4900000	N.D.

Conversion: 1 ppm = 3.13 mg/m^3

DOT: 2192 119

Synonyms/Trade Names: Germane, Germanium hydride, Germanomethane, Monogermane
[Note: Used chiefly for the production of high purity germanium for use in semiconductors.]

Exposure Limits:
NIOSH REL: TWA 0.2 ppm (0.6 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless gas with a pungent odor.
[Note: Shipped as a compressed gas.]

Chemical & Physical Properties:
MW: 76.6
BP: -127°F
Sol: Insoluble
Fl.P: NA (Gas)
IP: 11.34 eV
RGasD: 2.65
VP: >1 atm
FRZ: -267°F
UEL: ?
LEL: ?
Flammable Gas (may ignite SPONTANEOUSLY in air).

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Bromine

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh
SY: Mal, head, dizz, fainting; dysp; nau, vomit; kidney inj; hemolytic effects
TO: CNS, kidneys, blood

First Aid (see Table 6):
Breath: Resp support

Glutaraldehyde

Formula:	CAS#:	RTECS#:	IDLH:
$OCH(CH_2)_3CHO$	111-30-8	MA2450000	N.D.

Conversion: 1 ppm = 4.09 mg/m^3

DOT:

Synonyms/Trade Names: Glutaric dialdehyde; 1,5-Pentanedial

Exposure Limits:
NIOSH REL: C 0.2 ppm (0.8 mg/m^3)
See Appendix C (Aldehydes)
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 2532
OSHA 64

Physical Description: Colorless liquid with a pungent odor.

Chemical & Physical Properties:
MW: 100.1
BP: 212°F
Sol: Miscible
Fl.P: NA
IP: ?
Sp.Gr: 1.10
VP: 17 mmHg
FRZ: 7°F
UEL: NA
LEL: NA
Noncombustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong oxidizers, strong bases [Note: Alkaline solutions of glutaraldehyde (i.e., activated glutaraldehyde) react with alcohol, ketones, amines, hydrazines & proteins.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; derm, sens skin; cough, asthma; nau, vomit
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Glycerin (mist)

Formula:	CAS#:	RTECS#:	IDLH:
$HOCH_2CH(OH)CH_2OH$	56-81-5	MA8050000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: Glycerin (anhydrous); Glycerol; Glycyl alcohol; 1,2,3-Propanetriol; Trihydroxypropane

Exposure Limits:
NIOSH REL: See Appendix D
OSHA PEL†: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500, 0600

Physical Description: Clear, colorless, odorless, syrupy liquid or solid (below 64°F).
[Note: The solid form melts above 64°F but the liquid form freezes at a much lower temperature.]

Chemical & Physical Properties:
MW: 92.1
BP: 554°F (Decomposes)
Sol: Miscible
Fl.P: 320°F
IP: ?
Sp.Gr: 1.26
VP(122°F): 0.003 mmHg
MLT: 64°F
UEL: ?
LEL: ?
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong oxidizers (e.g., chromium trioxide, potassium chlorate, potassium permanganate) [Note: Hygroscopic (i.e., absorbs moisture from the air).]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, resp sys; head, nau, vomit; kidney inj
TO: Eyes, skin, resp sys, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash
Breath: Fresh air

Glycidol

Formula:	CAS#:	RTECS#:	IDLH:
$C_3H_6O_2$	556-52-5	UB4375000	150 ppm

Conversion: 1 ppm = 3.03 mg/m^3 DOT:

Synonyms/Trade Names: 2,3-Epoxy-1-propanol; Epoxypropyl alcohol; Glycide; Hydroxymethyl ethylene oxide; 2-Hydroxymethyl oxiran; 3-Hydroxypropylene oxide

Exposure Limits:
NIOSH REL: TWA 25 ppm (75 mg/m^3)
OSHA PEL†: TWA 50 ppm (150 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1608
OSHA 7

Physical Description: Colorless liquid.

Chemical & Physical Properties:
MW: 74.1
BP: 320°F (Decomposes)
Sol: Miscible
Fl.P: 162°F
IP: ?
Sp.Gr: 1.12
VP(77°F): 0.9 mmHg
FRZ: -49°F
UEL: ?
LEL: ?
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
150 ppm: Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, nitrates

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; narco
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash prompt
Breath: Resp support
Swallow: Medical attention immed

Glycolonitrile

Formula:	CAS#:	RTECS#:	IDLH:
$HOCH_2CN$	107-16-4	AM0350000	N.D.

Conversion: 1 ppm = 2.34 mg/m^3 DOT:

Synonyms/Trade Names: Cyanomethanol, Formaldehyde cyanohydrin, Glycolic nitrile, Glyconitrile, Hydroxyacetonitrile

Exposure Limits:
NIOSH REL: C 2 ppm (5 mg/m^3) [15-minute]
OSHA PEL: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless, odorless, oily liquid.
[Note: Forms cyanide in the body.]

Chemical & Physical Properties:
MW: 57.1
BP: 361°F (Decomposes)
Sol: Soluble
Fl.P: ?
IP: ?
Sp.Gr(66°F): 1.10
VP(145°F): 1 mmHg
FRZ: <-98°F
UEL: ?
LEL: ?
Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
20 ppm: Sa
50 ppm: Sa:Cf
100 ppm: ScbaF/SaF
250 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Traces of alkalis (promote violent polymerization)

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; head, dizz, lass, conf, convuls; dysp; abdom pain, nau, vomit
TO: Eyes, skin, resp sys, CNS, CVS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash immed
Breath: Resp support
Swallow: Medical attention immed

Grain dust (oat, wheat, barley)	Formula:	CAS#:	RTECS#:	IDLH:
			MD7900000	N.D.
Conversion:	DOT:			

Synonyms/Trade Names: None
[Note: Grain dust consists of 60-75% organic materials (cereal grains) & 25-40% inorganic materials (soil), and includes fertilizers, pesticides & microorganisms.]

Exposure Limits:
NIOSH REL: TWA 4 mg/m^3
OSHA PEL: TWA 10 mg/m^3

Measurement Methods (see Table 1):
NIOSH 0500

Physical Description: Mixture of grain and all the other substances associated with its cultivation & harvesting.

Chemical & Physical Properties:
Properties depend upon the specific component of the grain dust.

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, upper resp sys; cough, dysp, wheez, asthma, bron, chronic obstructive pulm disease; conj, derm, rhinitis, grain fever
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Breath: Fresh air

Graphite (natural)	Formula:	CAS#:	RTECS#:	IDLH:
	C	7782-42-5	MD9659600	1250 mg/m^3
Conversion:	DOT:			

Synonyms/Trade Names: Black lead, Mineral carbon, Plumbago, Silver graphite, Stove black
[Note: Also see specific listing for Graphite (synthetic).]

Exposure Limits:
NIOSH REL: TWA 2.5 mg/m^3 (resp)
OSHA PEL†: TWA 15 mppcf

Measurement Methods (see Table 1):
NIOSH 0500, 0600

Physical Description: Steel gray to black, greasy feeling, odorless solid.

Chemical & Physical Properties:
MW: 12.0
BP: Sublimes
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 2.0-2.25
VP: 0 mmHg (approx)
MLT: 6602°F (Sublimes)
UEL: NA
LEL: NA
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
12.5 mg/m^3: Qm
25 mg/m^3: 95XQ/Sa
62.5 mg/m^3: PaprHie/Sa:Cf
125 mg/m^3: 100F/PaprTHie/SaT:Cf/ScbaF/SaF
1250 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Very strong oxidizers such as fluorine, chlorine trifluoride & potassium peroxide

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Cough, dysp, black sputum, decr pulm func, lung fib
TO: Resp sys, CVS

First Aid (see Table 6):
Eye: Irr immed
Breath: Fresh air

Graphite (synthetic)	Formula: C	CAS#: 7440-44-0 (synthetic)	RTECS#: FF5250100 (synthetic)	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: Acheson graphite, Artificial graphite
[Note: Also see specific listing for Graphite (natural).]

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: See Appendix D OSHA PEL†: TWA 15 mg/m^3 (total) TWA 5 mg/m^3 (resp)	NIOSH 0500, 0600

Physical Description: Steel gray to black, greasy feeling, odorless solid.

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 12.0 BP: Sublimes Sol: Insoluble Fl.P: NA IP: NA Sp.Gr: 1.5-1.8 VP: 0 mmHg (approx) MLT: 6602°F (Sublimes) UEL: NA LEL: NA Combustible Solid	Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.	Not available.

Incompatibilities and Reactivities: Very strong oxidizers such as fluorine, chlorine trifluoride & potassium peroxide

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Con SY: Cough, dysp, black sputum, decr pulm func, lung fib TO: Resp sys, CVS	Eye: Irr immed Breath: Fresh air

Gypsum	Formula: $CaSO_4 \times 2H_2O$	CAS#: 13397-24-5	RTECS#: MG2360000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: Calcium(II) sulfate dihydrate, Gypsum stone, Hydrated calcium sulfate, Mineral white
[Note: Gypsum is the dihydrate form of calcium sulfate; Plaster of Paris is the hemihydrate form.]

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: TWA 10 mg/m^3 (total) TWA 5 mg/m^3 (resp) OSHA PEL: TWA 15 mg/m^3 (total) TWA 5 mg/m^3 (resp)	NIOSH 0500, 0600

Physical Description: White or nearly white, odorless, crystalline solid.

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 172.2 BP: ? Sol(77°F): 0.2% Fl.P: NA IP: NA Sp.Gr: 2.32 VP: 0 mmHg (approx) MLT: 262-325°F (Loses H_2O) UEL: NA LEL: NA Noncombustible Solid	Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.	Not available.

Incompatibilities and Reactivities: Aluminum (at high temperatures), diazomethane

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Con SY: Irrit eyes, skin, muc memb, upper resp sys; cough, sneez, rhin TO: Eyes, skin, resp sys	Eye: Irr immed Breath: Fresh air

Hafnium

Formula:	CAS#:	RTECS#:	IDLH:
Hf	7440-58-6	MG4600000	50 mg/m^3 (as Hf)

Conversion: DOT: 1326 170 (powder, wet); 2545 135 (powder, dry)

Synonyms/Trade Names: Celtium, Elemental hafnium, Hafnium metal

Exposure Limits:
NIOSH REL*: TWA 0.5 mg/m^3
OSHA PEL*: TWA 0.5 mg/m^3
[*Note: The REL and PEL also apply to other hafnium compounds (as Hf).]

Measurement Methods (see Table 1):
NIOSH S194 (II-5)
OSHA ID121

Physical Description: Highly lustrous, ductile, grayish solid.

Chemical & Physical Properties:
MW: 178.5
BP: 8316°F
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 13.31
VP: 0 mmHg (approx)
MLT: 4041°F
UEL: NA
LEL: NA
Explosive in powder form (either dry or with <25% water); finely divided powder can be ignited by static electricity or even SPONTANEOUSLY.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
2.5 mg/m^3: Qm
5 mg/m^3: 95XQ/Sa
12.5 mg/m^3: Sa:Cf*/PaprHie*
25 mg/m^3: 100F/SaT:Cf*/PaprTHie*/ScbaF/SaF
50 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, chlorine

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: In animals: irrit eyes, skin, muc memb; liver damage
TO: Eyes, skin, muc memb, liver

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Halothane

Formula:	CAS#:	RTECS#:	IDLH:
$CF_3CHBrCl$	151-67-7	KH6550000	N.D.

Conversion: 1 ppm = 8.07 mg/m^3 DOT:

Synonyms/Trade Names: 1-Bromo-1-chloro-2,2,2-trifluoroethane; 2-Bromo-2-chloro-1,1,1-trifluoroethane; 1,1,1-Trifluoro-2-bromo-2-chloroethane; 2,2,2-Trifluoro-1-bromo-1-chloroethane

Exposure Limits:
NIOSH REL*: C 2 ppm (16.2 mg/m^3) [60-minute]
[*Note: REL for exposure to waste anesthetic gas.]
OSHA PEL: none

Measurement Methods (see Table 1):
OSHA 29

Physical Description: Clear, colorless liquid with a sweetish, pleasant odor. [inhalation anesthetic]

Chemical & Physical Properties:
MW: 197.4
BP: 122°F
Sol: 0.3%
Fl.P: NA
IP: ?
Sp.Gr: 1.87
VP: 243 mmHg
FRZ: -180°F
UEL: NA
LEL: NA
Noncombustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: May attack rubber & some plastics; sensitive to light.
[Note: Light causes decomposition. May be stabilized with 0.01% thymol.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; conf, drow, dizz, nau, analgesia, anes; card arrhy; liver, kidney damage; decr audio-visual performance; in animals: repro effects
TO: Eyes, skin, resp sys, CVS, CNS, liver, kidneys, repro sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Heptachlor

Formula: $C_{10}H_5Cl_7$ | CAS#: 76-44-8 | RTECS#: PC0700000 | IDLH: Ca [35 mg/m^3]

Conversion: | DOT: 2761 151 (organochlorine pesticide, solid)

Synonyms/Trade Names: 1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene

Exposure Limits:
NIOSH REL: Ca
TWA 0.5 mg/m^3 [skin]
See Appendix A
OSHA PEL: TWA 0.5 mg/m^3 [skin]

Measurement Methods (see Table 1):
NIOSH S287 (II-5)
OSHA PV2029

Physical Description: White to light-tan crystals with a camphor-like odor. [insecticide]

Chemical & Physical Properties:
MW: 373.4
BP: 293°F (Decomposes)
Sol: 0.0006%
Fl.P: NA
IP: ?
Sp.Gr: 1.66
VP(77°F): 0.0003 mmHg
MLT: 203°F
UEL: NA
LEL: NA
Noncombustible Solid, but may be dissolved in flammable liquids.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Iron, rust

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: In animals: tremor, convuls; liver damage; [carc]
TO: CNS,liver [in animals: liver cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

n-Heptane

Formula: $CH_3[CH_2]_5CH_3$ | CAS#: 142-82-5 | RTECS#: MI7700000 | IDLH: 750 ppm

Conversion: 1 ppm = 4.10 mg/m^3 | DOT: 1206 128

Synonyms/Trade Names: Heptane, normal-Heptane

Exposure Limits:
NIOSH REL: TWA 85 ppm (350 mg/m^3)
C 440 ppm (1800 mg/m^3) [15-minute]
OSHA PEL†: TWA 500 ppm (2000 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1500
OSHA 7

Physical Description: Colorless liquid with a gasoline-like odor.

Chemical & Physical Properties:
MW: 100.2
BP: 209°F
Sol: 0.0003%
Fl.P: 25°F
IP: 9.90 eV
Sp.Gr: 0.68
VP(72°F): 40 mmHg
FRZ: -131°F
UEL: 6.7%
LEL: 1.05%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
750 ppm: CcrOv/GmFOv/PaprOv/Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Dizz, stupor, inco; loss of appetite, nau; derm; chemical pneu (aspir liquid); uncon
TO: Skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

1-Heptanethiol

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3[CH_2]_6SH$	1639-09-4	MJ1400000	N.D.

Conversion: 1 ppm = 5.41 mg/m^3 | DOT: 1228 131

Synonyms/Trade Names: Heptyl mercaptan, n-Heptyl mercaptan

Exposure Limits:
NIOSH REL: C 0.5 ppm (2.7 mg/m^3) [15-minute]
OSHA PEL: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless liquid with a strong odor.

Chemical & Physical Properties:
MW: 132.3
BP: 351°F
Sol: Insoluble
Fl.P: 115°F
IP: ?
Sp.Gr: 0.84
VP: ?
FRZ: -46°F
UEL: ?
LEL: ?
Class II Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
5 ppm: CcrOv/Sa
12.5 ppm: Sa:Cf/PaprOv
25 ppm: CcrFOv/GmFOv/PaprTOv/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, reducing agents, strong acids & bases, alkali metals

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; lass, cyan, incr respiration, nau, drow, head, vomit
TO: Eyes, skin, resp sys, CNS, blood

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

Hexachlorobutadiene

Formula:	CAS#:	RTECS#:	IDLH:
$Cl_2C{=}CClCCl{=}CCl_2$	87-68-3	EJ07000	Ca [N.D.]

Conversion: 1 ppm = 10.66 mg/m^3 | DOT: 2279 151

Synonyms/Trade Names: HCBD; Hexachloro-1,3-butadiene; 1,3-Hexachlorobutadiene; Perchlorobutadiene

Exposure Limits:
NIOSH REL: Ca
TWA 0.02 ppm (0.24 mg/m^3) [skin]
See Appendix A
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 2543

Physical Description: Clear, colorless liquid with a mild, turpentine-like odor.

Chemical & Physical Properties:
MW: 260.7
BP: 419°F
Sol: Insoluble
Fl.P: ?
IP: ?
Sp.Gr: 1.55
VP: 0.2 mmHg
FRZ: -6°F
UEL: ?
LEL: ?
Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: In animals: irrit eyes, skin, resp sys; kidney damage; [carc]
TO: Eyes, skin, resp sys, kidneys [in animals: kidney tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Hexachlorocyclopentadiene	Formula: C_5Cl_6	CAS#: 77-47-4	RTECS#: GY1225000	IDLH: N.D.
Conversion: 1 ppm = 11.16 mg/m^3	DOT: 2646 151			
Synonyms/Trade Names: HCCPD; Hexachloro-1,3-cyclopentadiene; 1,2,3,4,5,5-Hexachloro-1,3-cyclopentadiene; Perchlorocyclopentadiene				
Exposure Limits: NIOSH REL: TWA 0.01 ppm (0.1 mg/m^3) OSHA PEL†: none			Measurement Methods (see Table 1): NIOSH 2518	
Physical Description: Pale-yellow to amber-colored liquid with a pungent, unpleasant odor. [Note: A solid below 16°F.]				
Chemical & Physical Properties: MW: 272.8 BP: 462°F Sol(77°F): 0.0002% (Reacts) Fl.P: NA IP: ? Sp.Gr: 1.71 VP(77°F): 0.08 mmHg FRZ: 16°F UEL: NA LEL: NA Noncombustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Water, light [Note: Reacts slowly with water to form hydrochloric acid; will corrode iron & most metals in presence of moisture. Explosive hydrogen gas may collect in enclosed spaces in the presence of moisture.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, resp sys; eye, skin burns; lac; sneez, cough, dysp, salv, pulm edema; nau, vomit, diarr; in animals: liver, kidney inj TO: Eyes, skin, resp sys, liver, kidneys			First Aid (see Table 6): Eye: Irr immed Skin: Soap flush immed Breath: Resp support Swallow: Medical attention immed	

Hexachloroethane	Formula: Cl_3CCCl_3	CAS#: 67-72-1	RTECS#: KI4025000	IDLH: Ca [300 ppm]
Conversion: 1 ppm = 9.68 mg/m^3	DOT:			
Synonyms/Trade Names: Carbon hexachloride, Ethane hexachloride, Perchloroethane				
Exposure Limits: NIOSH REL: Ca TWA 1 ppm (10 mg/m^3) [skin] See Appendix A See Appendix C (Chloroethanes) OSHA PEL: TWA 1 ppm (10 mg/m^3) [skin]			Measurement Methods (see Table 1): NIOSH 1003 OSHA 7	
Physical Description: Colorless crystals with a camphor-like odor.				
Chemical & Physical Properties: MW: 236.7 BP: Sublimes Sol(72°F): 0.005% Fl.P: NA IP: 11.22 eV Sp.Gr: 2.09 VP: 0.2 mmHg MLT: 368°F (Sublimes) UEL: NA LEL: NA Noncombustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily Provide: Eyewash Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
	Incompatibilities and Reactivities: Alkalis; metals such as zinc, cadmium, aluminum, hot iron & mercury			
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, muc memb; in animals: kidney damage; [carc] TO: Eyes, skin, resp sys, kidneys [in animals: liver cancer]			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed	

Hexachloronaphthalene	Formula: $C_{10}H_2Cl_6$	CAS#: 1335-87-1	RTECS#: QJ7350000	IDLH: 2 mg/m^3
Conversion:	DOT:			
Synonyms/Trade Names: Halowax® 1014				

Exposure Limits:
NIOSH REL: TWA 0.2 mg/m^3 [skin]
OSHA PEL: TWA 0.2 mg/m^3 [skin]

Measurement Methods (see Table 1):
NIOSH S100 (II-2)

Physical Description: White to light-yellow solid with an aromatic odor.

Chemical & Physical Properties:
MW: 334.9
BP: 650-730°F
Sol: Insoluble
Fl.P: NA
IP: ?
Sp.Gr: 1.78
VP: <1 mmHg
MLT: 279°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
2 mg/m^3: Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Acne-form derm, nau, conf, jaun, coma
TO: Skin, liver

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

1-Hexadecanethiol	Formula: $CH_3[CH_2]_{15}SH$	CAS#: 2917-26-2	RTECS#:	IDLH: N.D.
Conversion: 1 ppm = 10.59 mg/m^3	DOT: 1228 131 (liquid)			
Synonyms/Trade Names: Cetyl mercaptan, Hexadecanethiol-1, n-Hexadecanethiol, Hexadecyl mercaptan				

Exposure Limits:
NIOSH REL: C 0.5 ppm (5.3 mg/m^3) [15-minute]
OSHA PEL: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless liquid or solid (below 64-68°F) with a strong odor.

Chemical & Physical Properties:
MW: 258.5
BP: ?
Sol: Insoluble
Fl.P: 215°F
IP: ?
Sp.Gr: 0.85
VP: 0.1 mmHg
FRZ: 64-68°F
UEL: ?
LEL: ?
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH
5 ppm: CcrOv/Sa
12.5 ppm: Sa:Cf/PaprOv
25 ppm: CcrFOv/GmFOv/PaprTOv/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, strong acids & bases, alkali metals, reducing agents

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; head, dizz, lass, cyan, nau, convuls
TO: Eyes, skin, resp sys, CNS, blood

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Hexafluoroacetone	Formula: $(CF_3)_2CO$	CAS#: 684-16-2	RTECS#: UC2450000	IDLH: N.D.
Conversion: 1 ppm = 6.79 mg/m^3	DOT: 2420 125			
Synonyms/Trade Names: Hexafluoro-2-propanone; 1,1,1,3,3,3-Hexafluoro-2-propanone; HFA; Perfluoroacetone				
Exposure Limits: NIOSH REL: TWA 0.1 ppm (0.7 mg/m^3) [skin] OSHA PEL†: none				Measurement Methods (see Table 1): None available
Physical Description: Colorless gas with a musty odor. [Note: Shipped as a liquefied compressed gas.]				
Chemical & Physical Properties: MW: 166.0 BP: -18°F Sol: Reacts Fl.P: NA IP: 11.81 eV RGasD: 5.76 VP: 5.8 atm FRZ: -188°F UEL: NA LEL: NA Nonflammable Gas, but highly reactive with water & other substances, releasing heat.	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact/Frostbite Eyes: Prevent eye contact/Frostbite Wash skin: N.R. Remove: N.R. Change: N.R. Provide: Frostbite wash		Respirator Recommendations (see Tables 3 and 4): Not available.	
	Incompatibilities and Reactivities: Water, acids [Note: Hygroscopic (i.e., absorbs moisture from the air); reacts with moisture to form a highly acidic sesquihydrate.]			
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Con SY: Irrit eyes, skin, muc memb, resp sys; pulm edema; liquid: frostbite; in animals: terato, repro effects; kidney inj TO: Eyes, skin, resp sys, kidneys, repro sys		First Aid (see Table 6): Eye: Frostbite Skin: Frostbite Breath: Resp support		

Hexamethylene diisocyanate	Formula: $OCN[CH_2]_6NCO$	CAS#: 822-06-0	RTECS#: MO1740000	IDLH: N.D.
Conversion: 1 ppm = 6.88 mg/m^3	DOT: 2281 156			
Synonyms/Trade Names: 1,6-Diisocyanatohexane; HDI; Hexamethylene-1,6-diisocyanate; 1,6-Hexamethylene diisocyanate; HMDI				
Exposure Limits: NIOSH REL: TWA 0.005 ppm (0.035 mg/m^3) C 0.020 ppm (0.140 mg/m^3) [10-minute] OSHA PEL: none				Measurement Methods (see Table 1): NIOSH 5521, 5522, 5525 OSHA 42
Physical Description: Clear, colorless to slightly yellow liquid with a sharp, pungent odor.				
Chemical & Physical Properties: MW: 168.2 BP: 415°F Sol: Low (Reacts) Fl.P: 284°F IP:? Sp.Gr(77°F): 1.04 VP(77°F): 0.05 mmHg FRZ: -89°F UEL: ? LEL: ? Class IIIB Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH 0.05 ppm: Sa* 0.125 ppm: Sa:Cf* 0.25 ppm: ScbaF/SaF 1 ppm: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Water, alcohols, strong bases, amines, carboxylic acids, organotin catalysts [Note: Reacts slowly with water to form carbon dioxide. Avoid heating above 392°F (polymerizes).]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, resp sys; cough, dysp, bron, wheez, pulm edema, asthma; corn damage, skin blisters TO: Eyes, skin, resp sys		First Aid (see Table 6): Eye: Irr immed Skin: Soap flush immed Breath: Resp support Swallow: Medical attention immed		

Hexamethyl phosphoramide	Formula: $[(CH_3)_2N]_3PO$	CAS#: 680-31-9	RTECS#: TD0875000	IDLH: Ca [N.D.]
Conversion:	DOT:			

Synonyms/Trade Names: Hexamethylphosphoric triamide, Hexamethylphosphorotriamide, HMPA, Tris(dimethylamino)phosphine oxide

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL: none

Measurement Methods (see Table 1):
None available

Physical Description: Clear, colorless liquid with an aromatic or mild, amine-like odor. [Note: A solid below 43°F.]

Chemical & Physical Properties:
MW: 179.2
BP: 451°F
Sol: Miscible
Fl.P: 220°F
IP: ?
Sp.Gr: 1.03
VP: 0.03 mmHg
FRZ: 43°F
UEL: ?
LEL: ?
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, strong acids, chemically-active metals (e.g., potassium, sodium, magnesium, zinc)

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; dysp; abdom pain; [carc]
TO: Eyes, skin, resp sys, CNS, GI tract [in animals: cancer of the nasal cavity]

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

n-Hexane	Formula: $CH_3[CH_2]_4CH_3$	CAS#: 110-54-3	RTECS#: MN9275000	IDLH: 1100 ppm [10%LEL]
Conversion: 1 ppm = 3.53 mg/m^3	DOT: 1208 128			

Synonyms/Trade Names: Hexane, Hexyl hydride, normal-Hexane

Exposure Limits:
NIOSH REL: TWA 50 ppm (180 mg/m^3)
OSHA PEL†: TWA 500 ppm (1800 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1500, 3800
OSHA 7

Physical Description: Colorless liquid with a gasoline-like odor.

Chemical & Physical Properties:
MW: 86.2
BP: 156°F
Sol: 0.002%
Fl.P: -7°F
IP: 10.18 eV
Sp.Gr: 0.66
VP: 124 mmHg
FRZ: -219°F
UEL: 7.5%
LEL: 1.1%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
500 ppm: Sa*
1100 ppm: Sa:Cf*/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, nose; nau, head; peri neur: numb extremities, musc weak; derm; dizz; chemical pneu (aspir liquid)
TO: Eyes, skin, resp sys, CNS, PNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Hexane isomers (excluding n-Hexane)	Formula: C_6H_{14}	CAS#:	RTECS#:	IDLH: N.D.
Conversion: 1 ppm = 3.53 mg/m^3	DOT: 1208 128			

Synonyms/Trade Names: Diethylmethylmethane; Diisopropyl; 2,2-Dimethylbutane; 2,3-Dimethylbutane; Isohexane; 2-Methylpentane; 3-Methylpentane [Note: Also see specific listing for n-Hexane.]

Exposure Limits:
NIOSH REL: TWA 100 ppm (350 mg/m^3)
C 510 ppm (1800 mg/m^3) [15-minute]
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Clear liquids with mild, gasoline-like odors.
[Note: Includes all the isomers of hexane except n-hexane.]

Chemical & Physical Properties:
MW: 86.2
BP: 122-145°F
Sol: Insoluble
Fl.P: -54 to 19°F
IP: ?
Sp.Gr: 0.65-0.66
VP: ?
FRZ: -245 to -148°F
UEL: ?
LEL: ?
Class IB Flammable Liquids

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
1000 ppm: Sa*
2500 ppm: Sa:Cf*
5000 ppm: SaT:Cf*/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; head, dizz; nau; chemical pneu (aspir liquid); derm
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

n-Hexanethiol	Formula: $CH_3[CH_2]_5SH$	CAS#: 111-31-9	RTECS#: MO4550000	IDLH: N.D.
Conversion: 1 ppm = 4.83 mg/m^3	DOT: 1228 131			

Synonyms/Trade Names: 1-Hexanethiol, Hexyl mercaptan, n-Hexyl mercaptan, n-Hexylthiol

Exposure Limits:
NIOSH REL: C 0.5 ppm (2.7 mg/m^3) [15-minute]
OSHA PEL: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless liquid with an unpleasant odor.

Chemical & Physical Properties:
MW: 118.2
BP: 304°F
Sol: Insoluble
Fl.P: 68°F
IP: ?
Sp.Gr: 0.84
VP: ?
FRZ: -113°F
UEL: ?
LEL: ?
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
5 ppm: CcrOv/Sa
12.5 ppm: Sa:Cf/PaprOv
25 ppm: CcrFOv/GmFOv/PaprTOv/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, reducing agents, strong acids & bases, alkali metals

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; lass, cyan, incr respiration, nau, drow, head, vomit
TO: Eyes, skin, resp sys, CNS, blood

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

2-Hexanone	Formula: $CH_3CO[CH_2]_3CH_3$	CAS#: 591-78-6	RTECS#: MP1400000	IDLH: 1600 ppm
Conversion: 1 ppm = 4.10 mg/m^3	DOT:			
Synonyms/Trade Names: Butyl methyl ketone, MBK, Methyl butyl ketone, Methyl n-butyl ketone				
Exposure Limits: NIOSH REL: TWA 1 ppm (4 mg/m^3) OSHA PEL†: TWA 100 ppm (410 mg/m^3)			Measurement Methods (see Table 1): NIOSH 1300, 2555 OSHA PV2031	
Physical Description: Colorless liquid with an acetone-like odor.				

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 100.2 BP: 262°F Sol: 2% Fl.P: 77°F IP: 9.34 eV Sp.Gr: 0.81 VP: 11 mmHg FRZ: -71°F UEL: 8% LEL: ? Class IC Flammable Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	NIOSH 10 ppm: Sa 25 ppm: Sa:Cf 50 ppm: SaT:Cf/ScbaF/SaF 1600 ppm: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, nose; peri neur: lass, pares; derm; head, drow TO: Eyes, skin, resp sys, CNS, PNS	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

Hexone	Formula: $CH_3COCH_2CH(CH_3)_2$	CAS#: 108-10-1	RTECS#: SA9275000	IDLH: 500 ppm
Conversion: 1 ppm = 4.10 mg/m^3	DOT: 1245 127			
Synonyms/Trade Names: Isobutyl methyl ketone, Methyl isobutyl ketone, 4-Methyl 2-pentanone, MIBK				
Exposure Limits: NIOSH REL: TWA 50 ppm (205 mg/m^3) ST 75 ppm (300 mg/m^3) OSHA PEL†: TWA 100 ppm (410 mg/m^3)			Measurement Methods (see Table 1): NIOSH 1300, 2555 OSHA 1004	
Physical Description: Colorless liquid with a pleasant odor.				

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 100.2 BP: 242°F Sol: 2% Fl.P: 64°F IP: 9.30 eV Sp.Gr: 0.80 VP: 16 mmHg FRZ: -120°F UEL(200°F): 8.0% LEL(200°F): 1.2% Class IB Flammable Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	NIOSH 500 ppm: CcrOv*/GmFOv/PaprTOv*/ Sa*/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, potassium tert-butoxide	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, muc memb; head, narco, coma; derm; in animals: liver, kidney damage TO: Eyes, skin, resp sys, CNS, liver, kidneys	First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed

sec-Hexyl acetate	Formula: $C_8H_{16}O_2$	CAS#: 108-84-9	RTECS#: SA7525000	IDLH: 500 ppm
Conversion: 1 ppm = 5.90 mg/m^3	DOT: 1233 130			
Synonyms/Trade Names: 1,3-Dimethylbutyl acetate; Methylisoamyl acetate				
Exposure Limits: NIOSH REL: TWA 50 ppm (300 mg/m^3) OSHA PEL: TWA 50 ppm (300 mg/m^3)			Measurement Methods (see Table 1): NIOSH 1450 OSHA 7	
Physical Description: Colorless liquid with a mild, pleasant, fruity odor.				
Chemical & Physical Properties: MW: 144.2 BP: 297°F Sol: 0.08% Fl.P: 113°F IP: ? Sp.Gr: 0.86 VP: 3 mmHg FRZ: -83°F UEL: ? LEL: ? Class II Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 500 ppm: CcrOv*/GmFOv/PaprOv*/ Sa*/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Nitrates; strong oxidizers, alkalis & acids				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose, throat; head; in animals: narco TO: Eyes, skin, resp sys, CNS		First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed		

Hexylene glycol	Formula: $(CH_3)_2COHCH_2CHOHCH_3$	CAS#: 107-41-5	RTECS#: SA0810000	IDLH: N.D.
Conversion: 1 ppm = 4.83 mg/m^3	DOT:			
Synonyms/Trade Names: 2,4-Dihydroxy-2-methylpentane; 2-Methyl-2,4-pentanediol; 4-Methyl-2,4-pentanediol; 2-Methylpentane-2,4-diol				
Exposure Limits: NIOSH REL: C 25 ppm (125 mg/m^3) OSHA PEL†: none			Measurement Methods (see Table 1): OSHA PV2101	
Physical Description: Colorless liquid with a mild, sweetish odor.				
Chemical & Physical Properties: MW: 118.2 BP: 388°F Sol: Miscible Fl.P: 209°F IP: ? Sp.Gr: 0.92 VP: 0.05 mmHg FRZ: -58°F (Sets to glass) UEL(est): 7.4% LEL(calc): 1.3% Class IIIB Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Strong oxidizers, strong acids [Note: Hygroscopic (i.e., absorbs moisture from the air).]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, resp sys; head, dizz, nau, inco, CNS depres; derm, skin sens TO: Eyes, skin, resp sys, CNS		First Aid (see Table 6): Eye: Irr immed Skin: Water wash immed Breath: Resp support Swallow: Medical attention immed		

Hydrazine

Formula:	CAS#:	RTECS#:	IDLH:
H_2NNH_2	302-01-2	MU7175000	Ca [50 ppm]

Conversion: 1 ppm = 1.31 mg/m^3

DOT: 2029 132 (anhydrous); 3293 152 (≤ 37% solution); 2030 153 (37-64% solution); 2029 132 (>64% solution)

Synonyms/Trade Names: Diamine, Hydrazine (anhydrous), Hydrazine base

Exposure Limits:
NIOSH REL: Ca
C 0.03 ppm (0.04 mg/m^3) [2-hour]
See Appendix A
OSHA PEL†: TWA 1 ppm (1.3 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 3503
OSHA 20, 108

Physical Description: Colorless, fuming, oily liquid with an ammonia-like odor. [Note: A solid below 36°F.]

Chemical & Physical Properties:
MW: 32.1
BP: 236°F
Sol: Miscible
Fl.P: 99°F
IP: 8.93 eV
Sp.Gr: 1.01
VP: 10 mmHg
FRZ: 36°F
UEL: 98%
LEL: 2.9%
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: ScbaE

Incompatibilities and Reactivities: Oxidizers, hydrogen peroxide, nitric acid, metallic oxides, acids
[Note: Can ignite SPONTANEOUSLY on contact with oxidizers or porous materials such as earth, wood & cloth.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat; temporary blindness; dizz, nau; derm; eye, skin burns; in animals: bron, pulm edema; liver, kidney damage; convuls; [carc]
TO: Eyes, skin, resp sys, CNS, liver, kidneys [in animals: tumors of the lungs, liver, blood vessels & intestine]

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Hydrogenated terphenyls

Formula:	CAS#:	RTECS#:	IDLH:
$(C_6H_n)_3$	61788-32-7	WZ6535000	N.D.

Conversion: 1 ppm = 12.19 mg/m^3 (40% hydrogenated)

DOT:

Synonyms/Trade Names: Hydrogenated diphenylbenzenes, Hydrogenated phenylbiphenyls, Hydrogenated triphenyls [Note: Complex mixture of terphenyl isomers that are partially hydrogenated.]

Exposure Limits:
NIOSH REL: TWA 0.5 ppm (5 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Clear, oily, pale-yellow liquids with a faint odor. [plasticizer/heat-transfer media]

Chemical & Physical Properties:
MW: 298 (40% hydrogenated)
BP: 644°F (40% hydrogenated)
Sol: Insoluble
Fl.P: 315°F (40% hydrogenated)
IP: ?
Sp.Gr(77°F): 1.003-1.009 (40% hydrogenated)
VP: ?
FRZ: ?
UEL: ?
LEL: ?
Class IIIB Combustible Liquids

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported [Note: When heated, irritating vapors will be released.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; liver, kidney, hemato damage
TO: Eyes, skin, resp sys, liver, kidneys, hemato sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Hydrogen bromide

Formula:	CAS#:	RTECS#:	IDLH:
HBr	10035-10-6	MW3850000	30 ppm

Conversion: 1 ppm = 3.31 mg/m^3

DOT: 1048 125 (anhydrous); 1788 154 (solution)

Synonyms/Trade Names: Anhydrous hydrogen bromide; Aqueous hydrogen bromide (i.e., Hydrobromic acid)

Exposure Limits:
NIOSH REL: C 3 ppm (10 mg/m^3)
OSHA PEL†: TWA 3 ppm (10 mg/m^3)

Physical Description: Colorless gas with a sharp, irritating odor.
[Note: Shipped as a liquefied compressed gas. Often used in an aqueous solution.]

Measurement Methods (see Table 1):
NIOSH 7903
OSHA ID165SG

Chemical & Physical Properties:
MW: 80.9
BP: -88°F
Sol: 49%
Fl.P: NA
IP: 11.62 eV
RGasD: 2.81
VP: 20 atm
FRZ: -124°F
UEL: NA
LEL: NA
Nonflammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact (solution)/Frostbite
Eyes: Prevent eye contact (solution)/Frostbite
Wash skin: When contam (solution)
Remove: When wet or contam (solution)
Change: N.R.
Provide: Eyewash (liquid)
Quick drench (solution)
Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
30 ppm: Sa:Cf£/PaprAg£/GmFAg/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFAg/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong caustics, moisture, copper, brass, zinc
[Note: Hydrobromic acid is highly corrosive to most metals.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing (solution), Con
SY: Irrit eyes, skin, nose, throat; solution: eye, skin burns; liquid: frostbite
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed (solution)/Frostbite
Skin: Water flush immed (solution)/Frostbite
Breath: Resp support
Swallow: Medical attention immed (solution)

Hydrogen chloride

Formula:	CAS#:	RTECS#:	IDLH:
HCl	7647-01-0	MW4025000	50 ppm

Conversion: 1 ppm = 1.49 mg/m^3

DOT: 1050 125 (anhydrous); 1789 157 (solution)

Synonyms/Trade Names: Anhydrous hydrogen chloride;
Aqueous hydrogen chloride (i.e., Hydrochloric acid, Muriatic acid) [Note: Often used in an aqueous solution.]

Exposure Limits:
NIOSH REL: C 5 ppm (7 mg/m^3)
OSHA PEL: C 5 ppm (7 mg/m^3)

Physical Description: Colorless to slightly yellow gas with a pungent, irritating odor.
[Note: Shipped as a liquefied compressed gas.]

Measurement Methods (see Table 1):
NIOSH 7903
OSHA ID174SG

Chemical & Physical Properties:
MW: 36.5
BP: -121°F
Sol(86°F): 67%
Fl.P: NA
IP: 12.74 eV
RGasD: 1.27
VP: 40.5 atm
FRZ: -174°F
UEL: NA
LEL: NA
Nonflammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact (solution)/Frostbite
Eyes: Prevent eye contact/Frostbite
Wash skin: When contam (solution)
Remove: When wet or contam (solution)
Change: N.R.
Provide: Eyewash (solution)
Quick drench (solution)
Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
50 ppm: CcrS*/GmFS/PaprS*/Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFAg/ScbaE

Incompatibilities and Reactivities: Hydroxides, amines, alkalis, copper, brass, zinc
[Note: Hydrochloric acid is highly corrosive to most metals.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing (solution), Con
SY: Irrit nose, throat, larynx; cough, choking; derm; solution: eye, skin burns; liquid: frostbite; in animals: lar spasm; pulm edema
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed (solution)/Frostbite
Skin: Water flush immed (solution)/Frostbite
Breath: Resp support
Swallow: Medical attention immed (solution)

Hydrogen cyanide

Formula:	CAS#:	RTECS#:	IDLH:
HCN	74-90-8	MW6825000	50 ppm

Conversion: 1 ppm = 1.10 mg/m^3

DOT: 1051 117 (>20% solution); 1051 117 (anhydrous); 1613 154 (20% solution)

Synonyms/Trade Names: Formonitrile, Hydrocyanic acid, Prussic acid

Exposure Limits:
NIOSH REL: ST 4.7 ppm (5 mg/m^3) [skin]
OSHA PEL†: TWA 10 ppm (11 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 6010, 6017

Physical Description: Colorless or pale-blue liquid or gas (above 78°F) with a bitter, almond-like odor. [Note: Often used as a 96% solution in water.]

Chemical & Physical Properties:
MW: 27.0
BP: 78°F (96%)
Sol: Miscible
Fl.P: 0°F (96%)
IP: 13.60 eV
Sp.Gr: 0.69
VP: 630 mmHg
FRZ: 7°F (96%)
UEL: 40.0%
LEL: 5.6%
Class IA Flammable Liquid
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
47 ppm: Sa
50 ppm: Sa:Cf/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Amines, oxidizers, acids, sodium hydroxide, calcium hydroxide, sodium carbonate, caustics, ammonia [Note: Can polymerize at 122-140°F.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Asphy; lass, head, conf; nau, vomit; incr rate and depth of respiration or respiration slow and gasping; thyroid, blood changes
TO: CNS, CVS, thyroid, blood

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Hydrogen fluoride

Formula:	CAS#:	RTECS#:	IDLH:
HF	7664-39-3	MW7875000	30 ppm

Conversion: 1 ppm = 0.82 mg/m^3

DOT: 1052 125 (anhydrous); 1790 157 (solution)

Synonyms/Trade Names: Anhydrous hydrogen fluoride; Aqueous hydrogen fluoride (i.e., Hydrofluoric acid); HF-A

Exposure Limits:
NIOSH REL: TWA 3 ppm (2.5 mg/m^3)
C 6 ppm (5 mg/m^3) [15-minute]
OSHA PEL†: TWA 3 ppm

Measurement Methods (see Table 1):
NIOSH 3800, 7902, 7903, 7906
OSHA ID110

Physical Description: Colorless gas or fuming liquid (below 67°F) with a strong, irritating odor. [Note: Shipped in cylinders.]

Chemical & Physical Properties:
MW: 20.0
BP: 67°F
Sol: Miscible
Fl.P: NA
IP: 15.98 eV
RGasD: 0.69
Sp.Gr: 1.00 (Liquid at 67°F)
VP: 783 mmHg
FRZ: -118°F
UEL: NA
LEL: NA
Nonflammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact (liquid)
Eyes: Prevent eye contact (liquid)
Wash skin: When contam (liquid)
Remove: When wet or contam (liquid)
Change: N.R.
Provide: Eyewash (liquid)
Quick drench (liquid)

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
30 ppm: CcrS*/PaprS*/GmFS/Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Metals, water or steam [Note: Corrosive to metals. Will attack glass and concrete.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs (liquid), Ing (solution), Con
SY: Irrit eyes, skin, nose, throat; pulm edema; eye, skin burns; rhinitis; bron; bone changes
TO: Eyes, skin, resp sys, bones

First Aid (see Table 6):
Eye: Irr immed (solution/liquid)
Skin: Water flush immed (solution/liquid)
Breath: Resp support
Swallow: Medical attention immed (solution)

Hydrogen peroxide	Formula: H_2O_2	CAS#: 7722-84-1	RTECS#: MX0900000	IDLH: 75 ppm
Conversion: 1 ppm = 1.39 mg/m^3	DOT: 2984 140 (8-20% solution); 2014 140 (20-60% solution); 2015 143 (>60% solution)			
Synonyms/Trade Names: High-strength hydrogen peroxide, Hydrogen dioxide, Hydrogen peroxide (aqueous), Hydroperoxide, Peroxide				
Exposure Limits: NIOSH REL: TWA 1 ppm (1.4 mg/m^3) OSHA PEL: TWA 1 ppm (1.4 mg/m^3)				Measurement Methods (see Table 1): OSHA ID126SG
Physical Description: Colorless liquid with a slightly sharp odor. [Note: The pure compound is a crystalline solid below 12°F. Often used in an aqueous solution.]				
Chemical & Physical Properties: MW: 34.0 BP: 286°F Sol: Miscible Fl.P: NA IP: 10.54 eV Sp.Gr: 1.39 VP(86°F): 5 mmHg FRZ: 12°F UEL: NA LEL: NA Noncombustible Liquid, but a powerful oxidizer.	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 10 ppm: Sa* 25 ppm: Sa:Cf* 50 ppm: ScbaF/SaF 75 ppm: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS/ScbaE	
Incompatibilities and Reactivities: Oxidizable materials, iron, copper, brass, bronze, chromium, zinc, lead, silver, manganese [Note: Contact with combustible material may result in SPONTANEOUS combustion.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, nose, throat; corn ulcer; eryt, vesic skin; bleaching hair TO: Eyes, skin, resp sys			First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed	

Hydrogen selenide	Formula: H_2Se	CAS#: 7783-07-5	RTECS#: MX1050000	IDLH: 1 ppm
Conversion: 1 ppm = 3.31 mg/m^3	DOT: 2202 117 (anhydrous)			
Synonyms/Trade Names: Selenium dihydride, Selenium hydride				
Exposure Limits: NIOSH REL: TWA 0.05 ppm (0.2 mg/m^3) OSHA PEL: TWA 0.05 ppm (0.2 mg/m^3)				Measurement Methods (see Table 1): None available
Physical Description: Colorless gas with an odor resembling decayed horseradish. [Note: Shipped as a liquefied compressed gas.]				
Chemical & Physical Properties: MW: 81.0 BP: -42°F Sol(73°F): 0.9% Fl.P: NA (Gas) IP: 9.88 eV RGasD: 2.80 VP(70°F): 9.5 atm FRZ: -87°F UEL: ? LEL: ? Flammable Gas	Personal Protection/Sanitation (see Table 2): Skin: Frostbite Eyes: Frostbite Wash skin: N.R. Remove: When wet (flamm) Change: N.R. Provide: Frostbite wash		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 0.5 ppm: Sa 1 ppm: Sa:Cf*/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS¿/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers, acids, water, halogenated hydrocarbons				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Con SY: Irrit eyes, nose, throat; nau, vomit, diarr; metallic taste, garlic breath; dizz, lass; liquid: frostbite; in animals: pneu; liver damage TO: Eyes, resp sys, liver			First Aid (see Table 6): Eye: Frostbite Skin: Frostbite Breath: Resp support	

Hydrogen sulfide

Formula:	CAS#:	RTECS#:	IDLH:
H_2S	7783-06-4	MX1225000	100 ppm

Conversion: 1 ppm = 1.40 mg/m^3

DOT: 1053 117

Synonyms/Trade Names: Hydrosulfuric acid, Sewer gas, Sulfuretted hydrogen

Exposure Limits:
NIOSH REL: C 10 ppm (15 mg/m^3) [10-minute]
OSHA PEL†: C 20 ppm
50 ppm [10-minute maximum peak]

Measurement Methods (see Table 1):
NIOSH 6013
OSHA ID141

Physical Description: Colorless gas with a strong odor of rotten eggs.
[Note: Sense of smell becomes rapidly fatigued & can NOT be relied upon to warn of the continuous presence of H_2S. Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 34.1
BP: -77°F
Sol: 0.4%
Fl.P: NA (Gas)
IP: 10.46 eV
RGasD: 1.19
VP: 17.6 atm
FRZ: -122°F
UEL: 44.0%
LEL: 4.0%
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Frostbite
Eyes: Frostbite
Wash skin: N.R.
Remove: When wet (flamm)
Change: N.R.
Provide: Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
NIOSH
100 ppm: PaprS/GmFS/Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong nitric acid, metals

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, resp sys; apnea, coma, convuls; conj, eye pain, lac, photo, corn vesic; dizz, head, lass, irrity, insom; GI dist; liquid: frostbite
TO: Eyes, resp sys, CNS

First Aid (see Table 6):
Eye: Frostbite
Skin: Frostbite
Breath: Resp support

Hydroquinone

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_4(OH)_2$	123-31-9	MX3500000	50 mg/m^3

Conversion:

DOT: 2662 153

Synonyms/Trade Names: p-Benzenediol; 1,4-Benzenediol; Dihydroxybenzene; 1,4-Dihydroxybenzene; Quinol

Exposure Limits:
NIOSH REL: C 2 mg/m^3 [15-minute]
OSHA PEL: TWA 2 mg/m^3

Measurement Methods (see Table 1):
NIOSH 5004
OSHA PV2094

Physical Description: Light-tan, light-gray, or colorless crystals.

Chemical & Physical Properties:
MW: 110.1
BP: 545°F
Sol: 7%
Fl.P: 329°F (Molten)
IP: 7.95 eV
Sp.Gr: 1.33
VP: 0.00001 mmHg
MLT: 338°F
UEL: ?
LEL: ?
Combustible Solid; dust cloud may explode if ignited in an enclosed area.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash (>7%)

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
50 mg/m^3: PaprHie£/100F/SaT:Cf£/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, alkalis

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes; conj; kera; CNS excitement; colored urine, nau, dizz, suffocation, rapid breath; musc twitch, delirium; collapse; skin irrit, sens, derm
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush
Breath: Resp support
Swallow: Medical attention immed

2-Hydroxypropyl acrylate	Formula: CH_2=CHCOOCH$_2$CHOHCH$_3$	CAS#: 999-61-1	RTECS#: AT1925000	IDLH: N.D.
Conversion: 1 ppm = 5.33 mg/m^3	DOT:			
Synonyms/Trade Names: HPA, β-Hydroxypropyl acrylate, Propylene glycol monoacrylate				
Exposure Limits: NIOSH REL: TWA 0.5 ppm (3 mg/m^3) [skin] OSHA PEL†: none				Measurement Methods (see Table 1): None available
Physical Description: Clear to light-yellow liquid with a sweetish, solvent odor.				
Chemical & Physical Properties: MW: 130.2 BP: 376°F Sol: ? Fl.P: 149°F IP: ? Sp.Gr: 1.05 VP: ? FRZ: ? UEL: ? LEL: 1.8% Class IIIA Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Water [Note: Can become unstable at high temperatures & pressures or may react with water with some release of energy, but not violently.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, resp sys; eye, skin burns; cough, dysp TO: Eyes, skin, resp sys	First Aid (see Table 6): Eye: Irr immed Skin: Soap flush immed Breath: Resp support Swallow: Medical attention immed			

Indene	Formula: C_9H_8	CAS#: 95-13-6	RTECS#: NK8225000	IDLH: N.D.
Conversion: 1 ppm = 4.75 mg/m^3	DOT:			
Synonyms/Trade Names: Indonaphthene				
Exposure Limits: NIOSH REL: TWA 10 ppm (45 mg/m^3) OSHA PEL†: none				Measurement Methods (see Table 1): None available
Physical Description: Colorless liquid. [Note: A solid below 29°F.]				
Chemical & Physical Properties: MW: 116.2 BP: 359°F Sol: Insoluble Fl.P: 173°F IP: 8.81 eV Sp.Gr: 0.997 VP: ? FRZ: 29°F UEL: ? LEL: ? Class IIIA Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet or contam Change: N.R.		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: None reported [Note: Polymerizes & oxidizes on standing. It has exploded during nitration with (H_2SO_4 + HNO_3).]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: In animals: irrit eyes, skin, muc memb; derm, skin sens; chemical pneu (aspir liquid); liver, kidney, spleen inj TO: Eyes, skin, resp sys, liver, kidneys, spleen	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash Breath: Resp support Swallow: Medical attention immed			

Indium

Formula:	CAS#:	RTECS#:	IDLH:
In	7440-74-6	NL1050000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: Indium metal

Exposure Limits:
NIOSH REL*: TWA 0.1 mg/m^3
[*Note: The REL also applies to other indium compounds (as In).]
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 7303, P&CAM173 (II-5)
OSHA ID121

Physical Description: Ductile, shiny, silver-white metal that is softer than lead.

Chemical & Physical Properties:
MW: 114.8
BP: 3767°F
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 7.31
VP: 0 mmHg (approx)
MLT: 314°F
UEL: NA
LEL: NA
Noncombustible Solid in bulk form, but may ignite in powdered or dust form.

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: (Dinitrogen tetraoxide + acetonitrile), mercury(II) bromide (at 662°F), sulfur (mixtures ignite when heated) [Note: oxidizes readily at higher temperatures.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; possible liver, kidney, heart, blood effects; pulm edema
TO: Eyes, skin, resp sys, liver, kidneys, heart, blood

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

Iodine

Formula:	CAS#:	RTECS#:	IDLH:
I_2	7553-56-2	NN1575000	2 ppm

Conversion: 1 ppm = 10.38 mg/m^3

DOT:

Synonyms/Trade Names: Iodine crystals, Molecular iodine

Exposure Limits:
NIOSH REL: C 0.1 ppm (1 mg/m^3)
OSHA PEL: C 0.1 ppm (1 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 6005
OSHA ID212

Physical Description: Violet solid with a sharp, characteristic odor.

Chemical & Physical Properties:
MW: 253.8
BP: 365°F
Sol: 0.01%
Fl.P: NA
IP: 9.31 eV
Sp.Gr: 4.93
VP(77°F): 0.3 mmHg
MLT: 236°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash (>7%)
Quick drench (>7%)

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1 ppm: Sa*
2 ppm: Sa:Cf*/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFAg100/ScbaE

Incompatibilities and Reactivities: Ammonia, acetylene, acetaldehyde, powdered aluminum, active metals, liquid chlorine

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose; lac; head; chest tight; skin burns, rash; cutaneous hypersensitivity
TO: Eyes, skin, resp sys, CNS, CVS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Iodoform	Formula: CHI_3	CAS#: 75-47-8	RTECS#: PB7000000	IDLH: N.D.
Conversion: 1 ppm = 16.10 mg/m^3	DOT:			
Synonyms/Trade Names: Triiodomethane				
Exposure Limits: NIOSH REL: TWA 0.6 ppm (10 mg/m^3) OSHA PEL†: none			Measurement Methods (see Table 1): None available	
Physical Description: Yellow to greenish-yellow powder or crystalline solid with a pungent, disagreeable odor. [antiseptic for external use]				
Chemical & Physical Properties: MW: 393.7 BP: 410°F (Decomposes) Sol: 0.01% Fl.P: NA IP: ? Sp.Gr: 4.01 VP: ? MLT: 246°F UEL: NA LEL: NA Noncombustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Strong oxidizers, lithium, metallic salts (e.g., mercuric oxide, silver nitrate), strong bases, calomel, tannin				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin; lass, dizz, nau, inco, CNS depres; dysp; liver, kidney, heart damage; vis dist TO: Eyes, skin, resp sys, liver, kidneys, heart	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed			

Iron oxide dust and fume (as Fe)	Formula: Fe_2O_3	CAS#: 1309-37-1	RTECS#: NO7400000 NO7525000 (fume)	IDLH: 2500 mg/m^3 (as Fe)
Conversion:	DOT: 1376 135 (spent)			
Synonyms/Trade Names: Ferric oxide, Iron(III) oxide				
Exposure Limits: NIOSH REL: TWA 5 mg/m^3 OSHA PEL: TWA 10 mg/m^3			Measurement Methods (see Table 1): NIOSH 7300, 7301, 7303, 9102 OSHA ID121, ID125G	
Physical Description: Reddish-brown solid. [Note: Exposure to fume may occur during the arc-welding of iron.]				
Chemical & Physical Properties: MW: 159.7 BP: ? Sol: Insoluble Fl.P: NA IP: NA Sp.Gr: 5.24 VP: 0 mmHg (approx) MLT: 2664°F UEL: NA LEL: NA Noncombustible Solid	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH 50 mg/m^3: 95XQ/Sa 125 mg/m^3: Sa:Cf/PaprHie 250 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF 2500 mg/m^3: Sa:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE	
Incompatibilities and Reactivities: Calcium hypochlorite				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh SY: Benign pneumoconiosis with X-ray shadows indistinguishable from fibrotic pneumoconiosis (siderosis) TO: Resp sys	First Aid (see Table 6): Breath: Resp support			

Iron pentacarbonyl (as Fe)	Formula: $Fe(CO)_5$	CAS#: 13463-40-6	RTECS#: NO4900000	IDLH: N.D.
Conversion: 1 ppm = 2.28 mg/m^3 (as Fe)	DOT: 1994 131			
Synonyms/Trade Names: Iron carbonyl, Pentacarbonyl iron				
Exposure Limits: NIOSH REL: TWA 0.1 ppm (0.23 mg/m^3) ST 0.2 ppm (0.45 mg/m^3) OSHA PEL†: none			Measurement Methods (see Table 1): None available	
Physical Description: Colorless to yellow to dark-red, oily liquid.				
Chemical & Physical Properties: MW: 195.9 BP(749 mmHg): 217°F Sol: Insoluble Fl.P: 5°F IP: ? Sp.Gr: 1.46-1.52 VP(87°F): 40 mmHg FRZ: -6°F UEL: ? LEL: ? Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R. Provide: Quick drench		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Oxidizers, nitrogen oxide, (zinc + cobalt halides) [Note: Pyrophoric (i.e., ignites spontaneously in air). Decomposed by light or air, releasing carbon monoxide.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, muc memb, resp sys; head, dizz, nau, vomit; fever, cyan, cough, dysp; liver, kidney, lung inj; degenerative changes in CNS TO: Eyes, resp sys, CNS, liver, kidneys			First Aid (see Table 6): Eye: Irr immed Skin: Soap flush immed Breath: Resp support Swallow: Medical attention immed	

Iron salts (soluble, as Fe)	Formula:	CAS#:	RTECS#:	IDLH: N.D.
Conversion:	DOT:			
Synonyms/Trade Names: $FeSO_4$: Ferrous sulfate, Iron(II) sulfate; $FeCl_2$: Ferrous chloride, Iron(II) chloride; $Fe(NO_3)_3$: Ferric nitrate, Iron(III) nitrate; $Fe(SO_4)_3$: Ferric sulfate, Iron(III) sulfate; $FeCl_3$: Ferric chloride, Iron (III) chloride				
Exposure Limits: NIOSH REL: TWA 1 mg/m^3 OSHA PEL†: none			Measurement Methods (see Table 1): NIOSH 7300, 7301, 7303, 9102 OSHA ID121, ID125G	
Physical Description: Appearance and odor vary depending upon the specific soluble iron salt.				
Chemical & Physical Properties: Properties vary depending upon the specific soluble iron salt. Noncombustible Solids	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: N.R. Change: Daily		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Varies				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, muc memb; abdom pain, diarr, vomit; possible liver damage TO: Eyes, skin, resp sys, liver, GI tract			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash Breath: Resp support Swallow: Medical attention immed	

Isoamyl acetate	Formula: $CH_3COOCH_2CH_2CH(CH_3)_2$	CAS#: 123-92-2	RTECS#: NS9800000	IDLH: 1000 ppm
Conversion: 1 ppm = 5.33 mg/m^3	DOT: 1104 129			
Synonyms/Trade Names: Banana oil, Isopentyl acetate, 3-Methyl-1-butanol acetate, 3-Methylbutyl ester of acetic acid, 3-Methylbutyl ethanoate				
Exposure Limits: NIOSH REL: TWA 100 ppm (525 mg/m^3) OSHA PEL: TWA 100 ppm (525 mg/m^3) Physical Description: Colorless liquid with a banana-like odor.			Measurement Methods (see Table 1): NIOSH 1450 OSHA 7	
Chemical & Physical Properties: MW: 130.2 BP: 288°F Sol: 0.3% Fl.P: 77°F IP: ? Sp.Gr: 0.87 VP: 4 mmHg FRZ: -109°F UEL: 7.5% LEL(212°F): 1.0% Class IC Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 1000 ppm: CcrOv/PaprOv/GmFOv/ Sa/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Nitrates; strong oxidizers, alkalis & acids				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose, throat; derm; in animals: narco TO: Eyes, skin, resp sys, CNS		First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed		

Isoamyl alcohol (primary)	Formula: $(CH_3)_2CHCH_2CH_2OH$	CAS#: 123-51-3	RTECS#: EL5425000	IDLH: 500 ppm
Conversion: 1 ppm = 3.61 mg/m^3	DOT: 1105 129			
Synonyms/Trade Names: Fermentation amyl alcohol, Fusel oil, Isobutyl carbinol, Isopentyl alcohol, 3-Methyl-1-butanol, Primary isoamyl alcohol				
Exposure Limits: NIOSH REL: TWA 100 ppm (360 mg/m^3) ST 125 ppm (450 mg/m^3) OSHA PEL†: TWA 100 ppm (360 mg/m^3) Physical Description: Colorless liquid with a disagreeable odor.			Measurement Methods (see Table 1): NIOSH 1402, 1405	
Chemical & Physical Properties: MW: 88.2 BP: 270°F Sol(57°F): 2% Fl.P: 109°F IP: ? Sp.Gr(57°F): 0.81 VP: 28 mmHg FRZ: -179°F UEL(212°F): 9.0% LEL: 1.2% Class II Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 500 ppm: Sa:Cf£/CcrFOv/GmFOv/ PaprOv£/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose, throat; head, dizz; cough, dysp, nau, vomit, diarr; skin cracking; in animals: narco TO: Eyes, skin, resp sys, CNS		First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed		

Isoamyl alcohol (secondary)	Formula: $(CH_3)_2CHCH(OH)CH_3$	CAS#: 6032-29-7	RTECS#: SA4900000	IDLH: 500 ppm
Conversion: 1 ppm = 3.61 mg/m^3	DOT: 1105 129			
Synonyms/Trade Names: 3-Methyl-2-butanol, Secondary isoamyl alcohol				
Exposure Limits: NIOSH REL: TWA 100 ppm (360 mg/m^3) ST 125 ppm (450 mg/m^3) OSHA PEL†: TWA 100 ppm (360 mg/m^3)			Measurement Methods (see Table 1): NIOSH 1402	
Physical Description: Colorless liquid with a disagreeable odor.				
Chemical & Physical Properties: MW: 88.2 BP: 234°F Sol: ? Fl.P(oc): 95°F IP: ? Sp.Gr: 0.82 VP: 1 mmHg FRZ: ? UEL: ? LEL: ? Class IC Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 500 ppm: Sa:Cf£/CcrFOv/GmFOv/ PaprOv£/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose, throat; head, dizz; cough, dysp, nau, vomit, diarr; skin cracking; in animals: narco TO: Eyes, skin, resp sys, CNS		First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed		

Isobutane	Formula: $CH_3CH(CH_3)_2$	CAS#: 75-28-5	RTECS#: TZ4300000	IDLH: N.D.
Conversion: 1 ppm = 2.38 mg/m^3	DOT: 1075 115; 1969 115			
Synonyms/Trade Names: 2-Methylpropane [Note: Also see specific listing for n-Butane.]				
Exposure Limits: NIOSH REL: TWA 800 ppm (1900 mg/m^3) OSHA PEL†: none			Measurement Methods (see Table 1): None available	
Physical Description: Colorless gas with a gasoline-like or natural gas odor. [Note: Shipped as a liquefied compressed gas. A liquid below 11°F.]				
Chemical & Physical Properties: MW: 58.1 BP: 11°F Sol: Slight Fl.P: NA (Gas) IP: 10.74 eV RGasD: 2.06 VP(70°F): 3.1 atm FRZ: -255°F UEL: 8.4% LEL: 1.6% Flammable Gas	Personal Protection/Sanitation (see Table 2): Skin: Frostbite Eyes: Frostbite Wash skin: N.R. Remove: When wet (flamm) Change: N.R. Provide: Frostbite wash		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Strong oxidizers (e.g., nitrates & perchlorates), chlorine, fluorine, (nickel carbonyl + oxygen)				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Con (liquid) SY: Drow, narco, asphy; liquid: frostbite TO: CNS		First Aid (see Table 6): Eye: Frostbite Skin: Frostbite Breath: Resp support		

Isobutyl acetate	Formula: $CH_3COOCH_2CH(CH_3)_2$	CAS#: 110-19-0	RTECS#: AI4025000	IDLH: 1300 ppm [10%LEL]
Conversion: 1 ppm = 4.75 mg/m^3	DOT: 1213 129			
Synonyms/Trade Names: Isobutyl ester of acetic acid, 2-Methylpropyl acetate, 2-Methylpropyl ester of acetic acid, β-Methylpropyl ethanoate				
Exposure Limits: NIOSH REL: TWA 150 ppm (700 mg/m^3) OSHA PEL: TWA 150 ppm (700 mg/m^3) Physical Description: Colorless liquid with a fruity, floral odor.				Measurement Methods (see Table 1): NIOSH 1450 OSHA 7
Chemical & Physical Properties: MW: 116.2 BP: 243°F Sol(77°F): 0.6% Fl.P: 64°F IP: 9.97 eV Sp.Gr: 0.87 VP: 13 mmHg FRZ: -145°F UEL: 10.5% LEL: 1.3% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 1300 ppm: Sa:Cf£/CcrFOv/GmFOv/ PaprOv£/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE		
Incompatibilities and Reactivities: Nitrates; strong oxidizers, alkalis & acids				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, upper resp sys; head, drow, anes; in animals: narco TO: Eyes, skin, resp sys, CNS			First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed	

Isobutyl alcohol	Formula: $(CH_3)_2CHCH_2OH$	CAS#: 78-83-1	RTECS#: NP9625000	IDLH: 1600 ppm
Conversion: 1 ppm = 3.03 mg/m^3	DOT: 1212 129			
Synonyms/Trade Names: IBA, Isobutanol, Isopropylcarbinol, 2-Methyl-1-propanol				
Exposure Limits: NIOSH REL: TWA 50 ppm (150 mg/m^3) OSHA PEL†: TWA 100 ppm (300 mg/m^3) Physical Description: Colorless, oily liquid with a sweet, musty odor.				Measurement Methods (see Table 1): NIOSH 1401, 1405 OSHA 7
Chemical & Physical Properties: MW: 74.1 BP: 227°F Sol: 10% Fl.P: 82°F IP: 10.12 eV Sp.Gr: 0.80 VP: 9 mmHg FRZ: -162°F UEL(202°F): 10.6% LEL(123°F): 1.7% Class IC Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH 500 ppm: CcrOv*/Sa* 1250 ppm: Sa:Cf*/PaprOv* 1600 ppm: CcrFOv/GmFOv/PaprTOv*/ ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE		
Incompatibilities and Reactivities: Strong oxidizers				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, throat; head, drow; skin cracking; in animals: narco TO: Eyes, skin, resp sys, CNS			First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed	

Isobutyronitrile

Formula:	CAS#:	RTECS#:	IDLH:
$(CH_3)_2CHCN$	78-82-0	TZ4900000	N.D.

Conversion: 1 ppm = 2.83 mg/m^3 DOT: 2284 131

Synonyms/Trade Names: Isopropyl cyanide, 2-Methylpropanenitrile, 2-Methylpropionitrile

Exposure Limits:
NIOSH REL: TWA 8 ppm (22 mg/m^3)
OSHA PEL: none

Measurement Methods (see Table 1):
NIOSH 1606 (adapt)

Physical Description: Colorless liquid with an almond-like odor.
[Note: Forms cyanide in the body.]

Chemical & Physical Properties:
MW: 69.1
BP: 219°F
Sol: Slight
Fl.P: 47°F
IP: ?
Sp.Gr: 0.76
VP(130°F): 100 mmHg
FRZ: -97°F
UEL: ?
LEL: ?
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
80 ppm: CcrOv/Sa
200 ppm: Sa:Cf/PaprOv
400 ppm: CcrFOv/GmFOv/PaprTOv/ScbaF/SaF
1000 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, reducing agents, strong acids & bases

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat; head, dizz, lass, conf, convuls; dysp; abdom pain, nau, vomit
TO: Eyes, skin, resp sys, CNS, CVS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

Isooctyl alcohol

Formula:	CAS#:	RTECS#:	IDLH:
$C_7H_{15}CH_2OH$	26952-21-6	NS7700000	N.D.

Conversion: 1 ppm = 5.33 mg/m^3 DOT:

Synonyms/Trade Names: Isooctanol, Oxooctyl alcohol [Note: A mixture of closely related isomeric, primary alcohols with branched chains such as 2-Ethylhexanol, $CH_3(CH_2)_3CH(CH_2CH_3)CH_2OH$.]

Exposure Limits:
NIOSH REL: TWA 50 ppm (270 mg/m^3) [skin]
OSHA PEL†: none

Measurement Methods (see Table 1):
OSHA PV2033

Physical Description: Clear, colorless liquid.

Chemical & Physical Properties:
MW: 130.3
BP: 367°F
Sol: Insoluble
Fl.P(oc): 180°F
IP: ?
Sp.Gr: 0.83
VP: 0.4 mmHg
FRZ: <-105°F
UEL(est.): 5.7%
LEL(calc.): 0.9%
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: N.R.
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat; eye, skin burns
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Isophorone	Formula: $C_9H_{14}O$	CAS#: 78-59-1	RTECS#: GW7700000	IDLH: 200 ppm
Conversion: 1 ppm = 5.65 mg/m^3	DOT: 1993 128 (combustible liquid, n.o.s.)			
Synonyms/Trade Names: Isoacetophorone; 3,5,5-Trimethyl-2-cyclohexenone; 3,5,5-Trimethyl-2-cyclo-hexen-1-one				
Exposure Limits: NIOSH REL: TWA 4 ppm (23 mg/m^3) OSHA PEL†: TWA 25 ppm (140 mg/m^3)				Measurement Methods (see Table 1): NIOSH 2508, 2556 OSHA 7
Physical Description: Colorless to white liquid with a peppermint-like odor.				
Chemical & Physical Properties: MW: 138.2 BP: 419°F Sol: 1% Fl.P: 184°F IP: 9.07 eV Sp.Gr: 0.92 VP: 0.3 mmHg FRZ: 17°F UEL: 3.8% LEL: 0.8% Class IIIA Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash		Respirator Recommendations (see Tables 3 and 4): NIOSH 40 ppm: CcrOv*/Sa* 100 ppm: Sa:Cf*/PaprOv* 200 ppm: CcrFOv/GmFOv/PaprTOv*/ SaT:Cf*/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Oxidizers, strong alkalis, amines				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, nose, throat; head, nau, dizz, lass, mal, narco; derm; in animals: kidney, liver damage TO: Eyes, skin, resp sys, CNS, liver, kidneys		First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed		

Isophorone diisocyanate	Formula: $C_{12}H_{18}N_2O_2$	CAS#: 4098-71-9	RTECS#: NQ9370000	IDLH: N.D.
Conversion: 1 ppm = 9.09 mg/m^3	DOT: 2290 156			
Synonyms/Trade Names: IPDI; 3-Isocyanatomethyl-3,5,5-trimethylcyclohexyl-isocyanate; Isophorone diamine diisocyanate				
Exposure Limits: NIOSH REL: TWA 0.005 ppm (0.045 mg/m^3) [skin] ST 0.02 ppm (0.180 mg/m^3) OSHA PEL†: none				Measurement Methods (see Table 1): NIOSH 5525 OSHA PV2034
Physical Description: Colorless to slightly yellow liquid with a pungent odor.				
Chemical & Physical Properties: MW: 222.3 BP: ? Sol: Decomposes Fl.P: 311°F IP: ? Sp.Gr: 1.06 VP: 0.0003 mmHg FRZ: -76°F UEL: ? LEL: ? Class IIIB Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily Provide: Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH 0.05 ppm: Sa* 0.125 ppm: Sa:Cf* 0.25 ppm: ScbaF/SaF 1 ppm: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Water, alcohols, phenols, amines, mercaptans, amides, urethanes, ureas [Note: Reacts with water to form carbon dioxide.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, resp sys; chest tight, dysp, cough, sore throat; bron, wheez, pulm edema; possible resp sens, asthma TO: Eyes, skin, resp sys		First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed		

2-Isopropoxyethanol	Formula: $(CH_3)_2CHOCH_2CH_2OH$	CAS#: 109-59-1	RTECS#: KL5075000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: Ethylene glycol isopropyl ether, β-Hydroxyethyl isopropyl ether, Isopropyl Cellosolve®, Isopropyl glycol

Exposure Limits: NIOSH REL: See Appendix D OSHA PEL†: none Physical Description: Colorless liquid with a mild, ethereal odor.	Measurement Methods (see Table 1): None available

Chemical & Physical Properties: MW: 104.2 BP: 283°F Sol: Miscible Fl.P(oc): 92°F IP: ? Sp.Gr: 0.90 VP: 3 mmHg FRZ: ? UEL: ? LEL: ? Class IC Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	Respirator Recommendations (see Tables 3 and 4): Not available.

Incompatibilities and Reactivities: Oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: In animals: irrit eyes, skin; hema, anemia, pulm edema TO: Eyes, skin, resp sys, blood	First Aid (see Table 6): Eye: Irr immed Skin: Water wash immed Breath: Resp support Swallow: Medical attention immed

Isopropyl acetate	Formula: $CH_3COOCH(CH_3)_2$	CAS#: 108-21-4	RTECS#: AI4930000	IDLH: 1800 ppm
Conversion: 1 ppm = 4.18 mg/m^3	DOT: 1220 129			

Synonyms/Trade Names: Isopropyl ester of acetic acid, 1-Methylethyl ester of acetic acid, 2-Propyl acetate

Exposure Limits: NIOSH REL: See Appendix D OSHA PEL†: TWA 250 ppm (950 mg/m^3) Physical Description: Colorless liquid with a fruity odor.	Measurement Methods (see Table 1): NIOSH 1454, 1460 OSHA 7

Chemical & Physical Properties: MW: 102.2 BP: 194°F Sol: 3% Fl.P: 36°F IP: 9.95 eV Sp.Gr: 0.87 VP: 42 mmHg FRZ: -92°F UEL: 8% LEL(100°F): 1.8% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	Respirator Recommendations (see Tables 3 and 4): OSHA 1800 ppm: Sa:Cf£/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Nitrates; strong oxidizers, alkalis & acids

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose; derm; in animals: narco TO: Eyes, skin, resp sys, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed

Isopropyl alcohol	Formula: $(CH_3)_2CHOH$	CAS#: 67-63-0	RTECS#: NT8050000	IDLH: 2000 ppm [10%LEL]
Conversion: 1 ppm = 2.46 mg/m^3	DOT: 1219 129			
Synonyms/Trade Names: Dimethyl carbinol, IPA, Isopropanol, 2-Propanol, sec-Propyl alcohol, Rubbing alcohol				
Exposure Limits: NIOSH REL: TWA 400 ppm (980 mg/m^3) ST 500 ppm (1225 mg/m^3) OSHA PEL†: TWA 400 ppm (980 mg/m^3)				Measurement Methods (see Table 1): NIOSH 1400 OSHA 109
Physical Description: Colorless liquid with the odor of rubbing alcohol.				
Chemical & Physical Properties: MW: 60.1 BP: 181°F Sol: Miscible Fl.P: 53°F IP: 10.10 eV Sp.Gr: 0.79 VP: 33 mmHg FRZ: -127°F UEL(200°F): 12.7% LEL: 2.0% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 2000 ppm: Sa:Cf£/CcrFOv/GmFOv/ PaprOv£/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers, acetaldehyde, chlorine, ethylene oxide, acids, isocyanates				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, nose, throat; drow, dizz, head; dry cracking skin; in animals: narco TO: Eyes, skin, resp sys			First Aid (see Table 6): Eye: Irr immed Skin: Water flush Breath: Resp support Swallow: Medical attention immed	

Isopropylamine	Formula: $(CH_3)_2CHNH_2$	CAS#: 75-31-0	RTECS#: NT8400000	IDLH: 750 ppm
Conversion: 1 ppm = 2.42 mg/m^3	DOT: 1221 132			
Synonyms/Trade Names: 2-Aminopropane, Monoisopropylamine, 2-Propylamine, sec-Propylamine				
Exposure Limits: NIOSH REL: See Appendix D OSHA PEL†: TWA 5 ppm (12 mg/m^3)				Measurement Methods (see Table 1): NIOSH S147 (II-3)
Physical Description: Colorless liquid with an ammonia-like odor. [Note: A gas above 91°F.]				
Chemical & Physical Properties: MW: 59.1 BP: 91°F Sol: Miscible Fl.P(oc): -35°F IP: 8.72 eV Sp.Gr: 0.69 VP: 460 mmHg FRZ: -150°F UEL: ? LEL: ? Class IA Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R. Provide: Eyewash Quick drench		Respirator Recommendations (see Tables 3 and 4): OSHA 125 ppm: Sa:Cf£/PaprS£ 250 ppm: CcrFS/GmFS/PaprTS£/ ScbaF/SaF 750 ppm: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS/ScbaE	
Incompatibilities and Reactivities: Strong acids, strong oxidizers, aldehydes, ketones, epoxides				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, nose, throat; pulm edema; vis dist; eye, skin burns; derm TO: Eyes, skin, resp sys			First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed	

N-Isopropylaniline	Formula: $C_6H_5NHCH(CH_3)_2$	CAS#: 768-52-5	RTECS#: BY4190000	IDLH: N.D.
Conversion: 1 ppm = 5.53 mg/m^3	DOT:			
Synonyms/Trade Names: N-IPA, Isopropylaniline, N-(1-Methylethyl)-benzenamine, N-Phenylisopropylamine				
Exposure Limits: NIOSH REL: TWA 2 ppm (10 mg/m^3) [skin] OSHA PEL†: none			Measurement Methods (see Table 1): OSHA 78	
Physical Description: Clear, yellowish liquid with a sweet, aromatic odor.				
Chemical & Physical Properties: MW: 135.2 BP: 397°F Sol: ? Fl.P(oc): 190°F IP: ? Sp.Gr(60°F): 0.93 VP(77°F): 0.03 mmHg FRZ: -58°F UEL: ? LEL: ? Class IIIB Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Quick drench		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: None reported				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin; head, lass, dizz; cyan; ataxia; dysp on effort; tacar; methemo TO: Eyes, skin, resp sys, blood, CVS, liver, kidneys	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed			

Isopropyl ether	Formula: $(CH_3)_2CHOCH(CH_3)_2$	CAS#: 108-20-3	RTECS#: TZ5425000	IDLH: 1400 ppm [10%LEL]
Conversion: 1 ppm = 4.18 mg/m^3	DOT: 1159 127			
Synonyms/Trade Names: Diisopropyl ether, Diisopropyl oxide, 2-Isopropoxy propane				
Exposure Limits: NIOSH REL: TWA 500 ppm (2100 mg/m^3) OSHA PEL: TWA 500 ppm (2100 mg/m^3)			Measurement Methods (see Table 1): NIOSH 1618 OSHA 7	
Physical Description: Colorless liquid with a sharp, sweet, ether-like odor.				
Chemical & Physical Properties: MW: 102.2 BP: 154°F Sol: 0.2% Fl.P: -18°F IP: 9.20 eV Sp.Gr: 0.73 VP: 119 mmHg FRZ: -76°F UEL: 7.9% LEL: 1.4% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 1400 ppm: CcrOv*/PaprOv*/GmFOv/Sa*/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers, acids [Note: Unstable peroxides may form on long contact with air.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose; resp discomfort; derm; in animals: drow, dizz, uncon, narco TO: Eyes, skin, resp sys, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed			

Isopropyl glycidyl ether	Formula: $C_6H_{12}O_2$	CAS#: 4016-14-2	RTECS#: TZ3500000	IDLH: 400 ppm
Conversion: 1 ppm = 4.75 mg/m^3	DOT:			
Synonyms/Trade Names: 1,2-Epoxy-3-isopropoxypropane; IGE; Isopropoxymethyl oxirane				

Exposure Limits: NIOSH REL: C 50 ppm (240 mg/m^3) [15-minute] OSHA PEL†: TWA 50 ppm (240 mg/m^3) Physical Description: Colorless liquid.	Measurement Methods (see Table 1): NIOSH 1620 OSHA 7

Chemical & Physical Properties: MW: 116.2 BP: 279°F Sol: 19% Fl.P: 92°F IP: ? Sp.Gr: 0.92 VP(77°F): 9 mmHg FRZ: ? UEL: ? LEL: ? Class IC Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 400 ppm: Sa:Cf£/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong caustics [Note: May form explosive peroxides upon exposure to air or light.]	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, upper resp sys; skin sens; possible hemato, repro effects TO: Eyes, skin, resp sys, blood, repro sys	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

Kaolin	Formula:	CAS#: 1332-58-7	RTECS#: GF1670500	IDLH: N.D.
Conversion:	DOT:			
Synonyms/Trade Names: China clay, Clay, Hydrated aluminum silicate, Hydrite, Porcelain clay [Note: Main constituent of Kaolin is Kaolinite ($Al_2Si_2O_5(OH)_4$).]				

Exposure Limits: NIOSH REL: TWA 10 mg/m^3 (total) TWA 5 mg/m^3 (resp) OSHA PEL†: TWA 15 mg/m^3 (total) TWA 5 mg/m^3 (resp) Physical Description: White to yellowish or grayish powder. [Note: When moistened, darkens & develops a clay-like odor.]	Measurement Methods (see Table 1): NIOSH 0500, 0600

Chemical & Physical Properties: MW: varies BP: ? Sol: Insoluble Fl.P: NA IP: NA Sp.Gr: 1.8-2.6 VP: 0 mmHg (approx) MLT: ? UEL: NA LEL: NA Noncombustible Solid	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.	Respirator Recommendations (see Tables 3 and 4): Not available.

Incompatibilities and Reactivities: None reported	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Con SY: Chronic pulm fib, stomach granuloma TO: Resp sys, stomach	First Aid (see Table 6): Eye: Irr immed Breath: Fresh air

Kepone

Formula:	CAS#:	RTECS#:	IDLH:
$C_{10}Cl_{10}O$	143-50-0	PC8575000	Ca [N.D.]

Conversion: DOT:

Synonyms/Trade Names: Chlordecone; Decachlorooctahydro-1,3,4-metheno-2H-cyclobuta(cd)-pentalen-2-one; Decachlorooctahydro-kepone-2-one; Decachlorotetrahydro-4,7-methanoindeneone

Exposure Limits:
NIOSH REL: Ca
TWA 0.001 mg/m^3
See Appendix A
OSHA PEL: none

Measurement Methods (see Table 1):
NIOSH 5508

Physical Description: Tan to white, crystalline, odorless solid. [insecticide]

Chemical & Physical Properties:
MW: 490.6
BP: Sublimes
Sol(212°F): 0.5%
Fl.P: NA
IP: ?
Sp.Gr: ?
VP(77°F): 3 x 10^{-7} mmHg
MLT: 662°F (Sublimes)
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Acids, acid fumes

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Head, anxi, tremor; liver, kidney damage; vis dist; ataxia, chest pain, skin eryt; testicular atrophy, low sperm count; [carc]
TO: Eyes, skin, resp sys, CNS, liver, kidneys, repro sys [in animal: liver cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Kerosene

Formula:	CAS#:	RTECS#:	IDLH:
	8008-20-6	OA5500000	N.D.

Conversion: DOT: 1223 128

Synonyms/Trade Names: Fuel Oil No. 1, Range oil
[Note: A refined petroleum solvent (predominantly C_9-C_{16}), which typically is 25% normal paraffins, 11% branched paraffins, 30% monocycloparaffins, 12% dicycloparaffins, 1% tricycloparaffins, 16% mononuclear aromatics, and 5% dinuclear aromatics.]

Exposure Limits:
NIOSH REL: TWA 100 mg/m^3
OSHA PEL: none

Measurement Methods (see Table 1):
NIOSH 1550

Physical Description: Colorless to yellowish, oily liquid with a strong, characteristic odor.

Chemical & Physical Properties:
MW: 170 (approx)
BP: 347-617°F
Sol: Insoluble
Fl.P: 100-162°F
IP: ?
Sp.Gr: 0.81
VP(100°F): 5 mmHg
FRZ: -50°F
UEL: 5%
LEL: 0.7%
Class II Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
1000 mg/m^3: CcrOv/Sa
2500 mg/m^3: Sa:Cf/PaprOv
5000 mg/m^3: CcrFOv/GmFOv/PaprTOv/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; burning sensation in chest; head, nau, lass, restless, inco, conf, drow; vomit, diarr; derm; chemical pneu (aspir liquid)
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

Ketene

Formula:	CAS#:	RTECS#:	IDLH:
CH_2=CO	463-51-4	OA7700000	5 ppm

Conversion: 1 ppm = 1.72 mg/m^3

DOT:

Synonyms/Trade Names: Carbomethene, Ethenone, Keto-ethylene

Exposure Limits:
NIOSH REL: TWA 0.5 ppm (0.9 mg/m^3)
ST 1.5 ppm (3 mg/m^3)
OSHA PEL†: TWA 0.5 ppm (0.9 mg/m^3)

Measurement Methods (see Table 1):
NIOSH S92 (II-2)

Physical Description: Colorless gas with a penetrating odor.

Chemical & Physical Properties:
MW: 42.0
BP: -69°F
Sol: Reacts
Fl.P: NA (Gas)
IP: 9.61 eV
RGasD: 1.45
VP: >1 atm
FRZ: -238°F
UEL: ?
LEL: ?
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
5 ppm: Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Water, alcohols, ammonia
[Note: Readily polymerizes. Reacts with water to form acetic acid.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, nose, throat, resp sys; pulm edema
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Breath: Resp support

L

Lead

Formula:	CAS#:	RTECS#:	IDLH:
Pb	7439-92-1	OF7525000	100 mg/m^3 (as Pb)

Conversion:

DOT:

Synonyms/Trade Names: Lead metal, Plumbum

Exposure Limits:
NIOSH REL*: TWA 0.050 mg/m^3
See Appendix C
OSHA PEL*: [1910.1025] TWA 0.050 mg/m^3
See Appendix C
[*Note: The REL and PEL also apply to other lead compounds (as Pb) -- see Appendix C.]

Measurement Methods (see Table 1):
NIOSH 7082, 7105, 7300, 7301, 7303, 7700, 7701, 7702, 9102, 9105
OSHA ID121, ID125G, ID206

Physical Description: A heavy, ductile, soft, gray solid.

Chemical & Physical Properties:
MW: 207.2
BP: 3164°F
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 11.34
VP: 0 mmHg (approx)
MLT: 621°F
UEL: NA
LEL: NA
Noncombustible Solid in bulk form.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
0.5 mg/m^3: 100XQ/Sa
1.25 mg/m^3: Sa:Cf/PaprHie
2.5 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF
50 mg/m^3: Sa:Pd,Pp
100 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

See Appendix E (page 351)

Incompatibilities and Reactivities: Strong oxidizers, hydrogen peroxide, acids

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Lass, insom; facial pallor; anor, low-wgt, malnut; constip, abdom pain, colic; anemia; gingival lead line; tremor; para wrist, ankles; encephalopathy; kidney disease; irrit eyes; hypotension
TO: Eyes, GI tract, CNS, kidneys, blood, gingival tissue

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush prompt
Breath: Resp support
Swallow: Medical attention immed

Limestone

Formula:	CAS#:	RTECS#:	IDLH:
$CaCO_3$	1317-65-3		N.D.

Conversion:

DOT:

Synonyms/Trade Names: Calcium carbonate, Natural calcium carbonate
[Note: Calcite & aragonite are commercially important natural calcium carbonates.]

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500, 0600

Physical Description: Odorless, white to tan powder.

Chemical & Physical Properties:
MW: 100.1
BP: Decomposes
Sol: 0.001%
Fl.P: NA
IP: NA
Sp.Gr: 2.7-2.9
VP: 0 mmHg (approx)
MLT: 1517-2442°F (Decomposes)
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Fluorine, magnesium, acids, alum, ammonium salts

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, muc memb; cough, sneez, rhin; lac
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Fresh air

Lindane

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_6Cl_6$	58-89-9	GV4900000	50 mg/m^3

Conversion:

DOT: 2761 151

Synonyms/Trade Names: BHC; HCH; γ-Hexachlorocyclohexane; gamma isomer of 1,2,3,4,5,6-Hexachlorocyclohexane

Exposure Limits:
NIOSH REL: TWA 0.5 mg/m^3 [skin]
OSHA PEL: TWA 0.5 mg/m^3 [skin]

Measurement Methods (see Table 1):
NIOSH 5502

Physical Description: White to yellow, crystalline powder with a slight, musty odor. [pesticide]

Chemical & Physical Properties:
MW: 290.8
BP: 614°F
Sol: 0.001%
Fl.P: NA
IP: ?
Sp.Gr: 1.85
VP: 0.00001 mmHg
MLT: 235°F
UEL: NA
LEL: NA
Noncombustible Solid, but may be dissolved in flammable liquids.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: N.R.
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
5 mg/m^3: CcrOv95/Sa
12.5 mg/m^3: Sa:Cf*/PaprOvHie*
25 mg/m^3: CcrFOv100/GmFOv100/ PaprTOvHie*/ScbaF/SaF
50 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Corrosive to metals

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat; head; nau; clonic convuls; resp difficulty; cyan; aplastic anemia; musc spasm; in animals: liver, kidney damage
TO: Eyes, skin, resp sys, CNS, blood, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Lithium hydride

Formula:	CAS#:	RTECS#:	IDLH:
LiH	7580-67-8	OJ6300000	0.5 mg/m^3

Conversion: DOT: 1414 138; 2805 138 (fused, solid)

Synonyms/Trade Names: Lithium monohydride

Exposure Limits:
NIOSH REL: TWA 0.025 mg/m^3
OSHA PEL: TWA 0.025 mg/m^3

Measurement Methods (see Table 1):
OSHA ID121

Physical Description: Odorless, off-white to gray, translucent, crystalline mass or white powder.

Chemical & Physical Properties:
MW: 7.95
BP: Decomposes
Sol: Reacts
Fl.P: NA
IP: NA
Sp.Gr: 0.78
VP: 0 mmHg (approx)
MLT: 1256°F
UEL: NA
LEL: NA
Combustible Solid that can form airborne dust clouds which may explode on contact with flame, heat, or oxidizers.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Brush (DO NOT WASH)
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench (>0.5 mg/m^3)

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
0.25 mg/m^3: 100XQ/Sa
0.5 mg/m^3: Sa:Cf*/100F/PaprHie*/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, halogenated hydrocarbons, acids, water
[Note: May ignite SPONTANEOUSLY in air and may reignite after fire is extinguished. Reacts with water to form hydrogen & lithium hydroxide.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin; eye, skin burns; mouth, esophagus burns (if ingested); nau; musc twitches; mental conf; blurred vision
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Brush (DO NOT WASH)
Breath: Resp support
Swallow: Medical attention immed

L.P.G.

Formula:	CAS#:	RTECS#:	IDLH:
$C_3H_8/C_3H_6/C_4H_{10}/C_4H_8$	68476-85-7	SE7545000	2000 ppm [10%LEL]

Conversion: 1 ppm = 1.72-2.37 mg/m^3 DOT: 1075 115

Synonyms/Trade Names: Bottled gas, Compressed petroleum gas, Liquefied hydrocarbon gas, Liquefied petroleum gas, LPG [Note: A fuel mixture of propane, propylene, butanes & butylenes.]

Exposure Limits:
NIOSH REL: TWA 1000 ppm (1800 mg/m^3)
OSHA PEL: TWA 1000 ppm (1800 mg/m^3)

Measurement Methods (see Table 1):
NIOSH S93 (II-2)

Physical Description: Colorless, noncorrosive, odorless gas when pure.
[Note: A foul-smelling odorant is usually added. Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 42-58
BP: >-44°F
Sol: Insoluble
Fl.P: NA (Gas)
IP: 10.95 eV
RGasD: 1.45-2.00
VP: >1 atm
FRZ: ?
UEL: 9.5% (Propane) 8.5% (Butane)
LEL: 2.1% (Propane) 1.9% (Butane)
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Frostbite
Eyes: Frostbite
Wash skin: N.R.
Remove: When wet (flamm)
Change: N.R.
Provide: Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
2000 ppm: Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: ScbaE

Incompatibilities and Reactivities: Strong oxidizers, chlorine dioxide

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con (liquid)
SY: Dizz, drow, asphy; liquid: frostbite
TO: Resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed (liquid)
Skin: Water flush immed (liquid)
Breath: Resp support

Magnesite

Formula:	CAS#:	RTECS#:	IDLH:
$MgCO_3$	546-93-0	OM2470000	N.D.

Conversion: DOT:

Synonyms/Trade Names: Carbonate magnesium, Hydromagnesite, Magnesium carbonate, Magnesium(II) carbonate [Note: Magnesite is a naturally-occurring form of magnesium carbonate.]

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500, 0600

Physical Description: White, odorless, crystalline powder.

Chemical & Physical Properties:
MW: 84.3
BP: Decomposes
Sol: 0.01%
Fl.P: NA
IP: NA
Sp.Gr: 2.96
VP: 0 mmHg (approx)
MLT: 662°F (Decomposes)
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Acids, formaldehyde

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, resp sys; cough
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Breath: Fresh air

Magnesium oxide fume

Formula:	CAS#:	RTECS#:	IDLH:
MgO	1309-48-4	OM3850000	750 mg/m^3

Conversion: DOT:

Synonyms/Trade Names: Magnesia fume

Exposure Limits:
NIOSH REL: See Appendix D
OSHA PEL†: TWA 15 mg/m^3

Measurement Methods (see Table 1):
NIOSH 7300, 7301, 7303
OSHA ID121

Physical Description: Finely divided white particulate dispersed in air. [Note: Exposure may occur when magnesium is burned, thermally cut, or welded upon.]

Chemical & Physical Properties:
MW: 40.3
BP: 6512°F
Sol(86°F): 0.009%
Fl.P: NA
IP: NA
Sp.Gr: 3.58
VP: 0 mmHg (approx)
MLT: 5072°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
OSHA
150 mg/m^3: 95XQ/Sa
375 mg/m^3: Sa:Cf/PaprHie
750 mg/m^3: 100F/PaprTHie*/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Chlorine trifluoride, phosphorus pentachloride

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, nose; metal fume fever: cough, chest pain, flu-like fever
TO: Eyes, resp sys

First Aid (see Table 6):
Breath: Resp support

Malathion

Formula:	CAS#:	RTECS#:	IDLH:
$C_{10}H_{19}O_6PS_2$	121-75-5	WM8400000	250 mg/m^3

Conversion: DOT: 2783 152

Synonyms/Trade Names: S-[1,2-bis(ethoxycarbonyl) ethyl]O,O-dimethyl-phosphorodithioate; Diethyl (dimethoxyphosphinothioylthio) succinate

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 [skin]
OSHA PEL†: TWA 15 mg/m^3 [skin]

Physical Description: Deep-brown to yellow liquid with a garlic-like odor. [insecticide] [Note: A solid below 37°F.]

Measurement Methods (see Table 1):
NIOSH 5600
OSHA 62

Chemical & Physical Properties:
MW: 330.4
BP: 140°F (Decomposes)
Sol: 0.02%
Fl.P(oc): >325°F
IP: ?
Sp.Gr: 1.21
VP: 0.00004 mmHg
FRZ: 37°F
UEL: ?
LEL: ?
Class IIIB Combustible Liquid, but may be difficult to ignite.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH
100 mg/m^3: CcrOv95/Sa
250 mg/m^3: Sa:Cf*/CcrFOv100/GmFOv100/PaprOvHie*/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, magnesium, alkaline pesticides [Note: Corrosive to metals.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; miosis, aching eyes, blurred vision, lac; salv; anor, nau, vomit, abdom cramps, diarr, dizz, conf, ataxia; rhin, head; chest tight, wheez, lar spasm
TO: Eyes, skin, resp sys, liver, blood chol, CNS, CVS, GI tract

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Maleic anhydride

Formula:	CAS#:	RTECS#:	IDLH:
$C_4H_2O_3$	108-31-6	ON3675000	10 mg/m^3

Conversion: 1 ppm = 4.01 mg/m^3 DOT: 2215 156

Synonyms/Trade Names: cis-Butenedioic anhydride; 2,5-Furanedione; Maleic acid anhydride; Toxilic anhydride

Exposure Limits:
NIOSH REL: TWA 1 mg/m^3 (0.25 ppm)
OSHA PEL: TWA 1 mg/m^3 (0.25 ppm)

Physical Description: Colorless needles, white lumps, or pellets with an irritating, choking odor.

Measurement Methods (see Table 1):
NIOSH 3512
OSHA 25, 86

Chemical & Physical Properties:
MW: 98.1
BP: 396°F
Sol: Reacts
Fl.P: 218°F
IP: 9.90 eV
Sp.Gr: 1.48
VP: 0.2 mmHg
MLT: 127°F
UEL: 7.1%
LEL: 1.4%
Combustible Solid, but may be difficult to ignite.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
10 mg/m^3: Sa:Cf£/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, water, alkalis, metals, caustics, and amines above 150°F
[Note: Reacts slowly with water (hydrolyzes) to form maleic acid.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit nose, upper resp sys; conj; photo, double vision; bronchial asthma; derm
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Malonaldehyde

Formula:	CAS#:	RTECS#:	IDLH:
$CHOCH_2CHO$	542-78-9	TX6475000	Ca [N.D.]

Conversion:

DOT:

Synonyms/Trade Names: Malonic aldehyde; Malonodialdehyde; Propanedial; 1,3-Propanedial
[Note: Pure Malonaldehyde is unstable and may be used as its sodium salt.]

Exposure Limits:
NIOSH REL: Ca
See Appendix A
See Appendix C (Aldehydes)
OSHA PEL: none

Measurement Methods (see Table 1):
None available

Physical Description: Solid (needles).

Chemical & Physical Properties:
MW: 72.1
BP: ?
Sol: ?
Fl.P: ?
IP: ?
Sp.Gr: ?
VP: ?
MLT: 161°F
UEL: ?
LEL: ?

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Proteins
[Note: Pure compound is stable under neutral conditions, but not under acidic conditions.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; CNS depres; [carc]
TO: Eyes, skin, resp sys, CNS [in animals: thyroid gland tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Malononitrile

Formula:	CAS#:	RTECS#:	IDLH:
$NCCH_2CN$	109-77-3	OO3150000	N.D.

Conversion: 1 ppm = 2.70 mg/m^3

DOT: 2647 153

Synonyms/Trade Names: Cyanoacetonitrile, Dicyanomethane, Malonic dinitrile

Exposure Limits:
NIOSH REL: TWA 3 ppm (8 mg/m^3)
OSHA PEL: none

Measurement Methods (see Table 1):
NIOSH Nitriles Criteria Document

Physical Description: White powder or colorless crystals.
[Note: Melts above 90°F. Forms cyanide in the body.]

Chemical & Physical Properties:
MW: 66.1
BP: 426°F
Sol: 13%
Fl.P(oc): 266°F
IP: 12.88 eV
Sp.Gr: 1.19
VP: ?
MLT: 90°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
80 mg/m^3: Sa
200 mg/m^3: Sa:Cf
400 mg/m^3: ScbaF/SaF
667 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong bases [Note: May polymerize violently on prolonged heating at 265°F, or in contact with strong bases at lower temperatures.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat; head, dizz, lass, conf, convuls; dysp; abdom pain, nau, vomit
TO: Eyes, skin, resp sys, CNS, CVS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash immed
Breath: Resp support
Swallow: Medical attention immed

Manganese compounds and fume (as Mn)

Formula:	CAS#:	RTECS#:	IDLH:
Mn (metal)	7439-96-5 (metal)	OO9275000 (metal)	500 mg/m^3 (as Mn)

Conversion:

DOT:

Synonyms/Trade Names: Manganese metal: Colloidal manganese, Manganese-55
Synonyms of other compounds vary depending upon the specific manganese compound.

Exposure Limits:
NIOSH REL*: TWA 1 mg/m^3
ST 3 mg/m^3
[*Note: Also see specific listings for Manganese cyclopentadienyl tricarbonyl, Methyl cyclopentadienyl manganese tricarbonyl, and Manganese tetroxide.]
OSHA PEL*: C 5 mg/m^3
[*Note: Also see specific listings for Manganese cyclopentadienyl tricarbonyl and Methyl cyclopentadienyl manganese tricarbonyl.]

Measurement Methods (see Table 1):
NIOSH 7300, 7301, 7303, 9102
OSHA ID121, ID125G

Physical Description: A lustrous, brittle, silvery solid.

Chemical & Physical Properties:
MW: 54.9
BP: 3564°F
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 7.20 (metal)
VP: 0 mmHg (approx)
MLT: 2271°F
UEL: NA
LEL: NA
Metal: Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
10 mg/m^3: 95XQ/Sa
25 mg/m^3: Sa:Cf/PaprHie
50 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF
500 mg/m^3: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Oxidizers
[Note: Will react with water or steam to produce hydrogen.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing
SY: Parkinson's; asthenia, insom, mental conf; metal fume fever: dry throat, cough, chest tight, dysp, rales, flu-like fever; low-back pain; vomit; mal; lass; kidney damage
TO: Resp sys, CNS, blood, kidneys

First Aid (see Table 6):
Breath: Resp support
Swallow: Medical attention immed

Manganese cyclopentadienyl tricarbonyl (as Mn)

Formula:	CAS#:	RTECS#:	IDLH:
$C_5H_5Mn(CO)_3$	12079-65-1	OO9720000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: Cyclopentadienylmanganese tricarbonyl, Cyclopentadienyl tricarbonyl manganese, MCT

Exposure Limits:
NIOSH REL: TWA 0.1 mg/m^3 [skin]
OSHA PEL†: C 5 mg/m^3

Measurement Methods (see Table 1):
None available

Physical Description: Yellow, crystalline solid with a characteristic odor.
[Note: An antiknock additive for gasoline. May be found in an oil & gaseous solution.]

Chemical & Physical Properties:
MW: 204.1
BP: Sublimes
Sol: Slight
Fl.P: ?
IP: ?
Sp.Gr: ?
VP: ?
MLT: 167°F (Sublimes)
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Oxygen

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: In animals: irrit skin; pulm edema; convuls; CNS, resp sys, kidney changes; decr resistance to infection
TO: Skin, resp sys, CNS, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

Manganese tetroxide (as Mn)

Formula:	CAS#:	RTECS#:	IDLH:
Mn_3O_4	1317-35-7	OP0895000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: Manganese oxide, Manganomanganic oxide, Trimanganese tetraoxide, Trimanganese tetroxide

Exposure Limits:
NIOSH REL: See Appendix D
OSHA PEL†: C 5 mg/m^3

Physical Description: Brownish-black powder.
[Note: Fumes are generated whenever manganese oxides are heated strongly in air.]

Measurement Methods (see Table 1):
NIOSH 7300, 7301, 7303, 9102
OSHA ID121, ID125G

Chemical & Physical Properties:
MW: 228.8
BP: ?
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 4.88
VP: 0 mmHg (approx)
MLT: 2847°F
UEL: NA
LEL: NA

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Soluble in hydrochloric acid (liberates chlorine gas)

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Asthenia, insom, mental conf; low-back pain; vomit; mal, lass; kidney damage; pneu
TO: Resp sys, CNS, blood, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

Marble

Formula:	CAS#:	RTECS#:	IDLH:
$CaCO_3$	1317-65-3	EV9580000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: Calcium carbonate, Natural calcium carbonate
[Note: Marble is a metamorphic form of calcium carbonate.]

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Physical Description: Odorless, white powder.

Measurement Methods (see Table 1):
NIOSH 0500, 0600

Chemical & Physical Properties:
MW: 100.1
BP: Decomposes
Sol: 0.001%
Fl.P: NA
IP: NA
Sp.Gr: 2.7-2.9
VP: 0 mmHg (approx)
MLT: 1517-2442°F (Decomposes)
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Fluorine, magnesium, acids, alum, ammonium salts

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, muc memb, upper resp sys; cough, sneez, rhin; lac
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Fresh air

Mercury compounds [except (organo) alkyls] (as Hg)

Formula:	CAS#:	RTECS#:	IDLH:
Hg (metal)	7439-97-6 (metal)	OV4550000 (metal)	10 mg/m^3 (as Hg)

Conversion: DOT: 2809 172 (metal)

Synonyms/Trade Names: Mercury metal: Colloidal mercury, Metallic mercury, Quicksilver
Synonyms of "other" Hg compounds vary depending upon the specific compound.

Exposure Limits:
NIOSH REL: Hg Vapor: TWA 0.05 mg/m^3 [skin]
Other: C 0.1 mg/m^3 [skin]
OSHA PEL†: C 0.1 mg/m^3

Measurement Methods (see Table 1):
NIOSH 6009 OSHA ID140

Physical Description: Metal: Silver-white, heavy, odorless liquid.
[Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.]

Chemical & Physical Properties:
MW: 200.6
BP: 674°F
Sol: Insoluble
Fl.P: NA
IP: ?
Sp.Gr: 13.6 (metal)
VP: 0.0012 mmHg
FRZ: -38°F
UEL: NA
LEL: NA
Metal: Noncombustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: N.R.
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Incompatibilities and Reactivities: Acetylene, ammonia, chlorine dioxide, azides, calcium (amalgam formation), sodium carbide, lithium, rubidium, copper

Respirator Recommendations (see Tables 3 and 4):
Mercury vapor:
NIOSH
0.5 mg/m^3: CcrS†/Sa
1.25 mg/m^3: Sa:Cf/PaprS†(canister)
2.5 mg/m^3: CcrFS†/GmFS†/SaT:Cf/PaprTS(canister)/ScbaF/SaF
10 mg/m^3: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Other mercury compounds:
NIOSH/OSHA
1 mg/m^3: CcrS†/Sa
2.5 mg/m^3: Sa:Cf/PaprS†(canister)
5 mg/m^3: CcrFS†/GmFS†/SaT:Cf/PaprTS(canister)/ScbaF/SaF
10 mg/m^3: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; cough, chest pain, dysp, bron, pneu; tremor, insom, irrity, indecision, head, lass; stomatitis, salv; GI dist, anor, low-wgt; prot
TO: Eyes, skin, resp sys, CNS, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Mercury (organo) alkyl compounds (as Hg)

Formula:	CAS#:	RTECS#:	IDLH:
			2 mg/m^3 (as Hg)

Conversion: DOT:

Synonyms/Trade Names: Synonyms vary depending upon the specific (organo) alkyl mercury compound.

Exposure Limits:
NIOSH REL: TWA 0.01 mg/m^3
ST 0.03 mg/m^3 [skin]
OSHA PEL†: TWA 0.01 mg/m^3
C 0.04 mg/m^3

Measurement Methods (see Table 1):
None available

Physical Description: Appearance and odor vary depending upon the specific (organo) alkyl mercury compound.

Chemical & Physical Properties:
Properties vary depending upon the specific (organo) alkyl mercury compound.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
0.1 mg/m^3: Sa
0.25 mg/m^3: Sa:Cf
0.5 mg/m^3: SaT:Cf/ScbaF/SaF
2 mg/m^3: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: ScbaE

Incompatibilities and Reactivities: Strong oxidizers such as chlorine

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Pares; ataxia, dysarthria; vision, hearing dist; spasticity, jerking limbs; dizz; salv; lac; nau, vomit, diarr, constip; skin burns; emotional dist; kidney inj; possible terato effects
TO: Eyes, skin, CNS, PNS, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Mesityl oxide

Formula:	CAS#:	RTECS#:	IDLH:
$(CH_3)_2C=CHCOCH_3$	141-79-7	SB4200000	1400 ppm [10%LEL]

Conversion: 1 ppm = 4.02 mg/m^3

DOT: 1229 129

Synonyms/Trade Names: Isobutenyl methyl ketone, Isopropylideneacetone, Methyl isobutenyl ketone, 4-Methyl-3-penten-2-one

Exposure Limits:
NIOSH REL: TWA 10 ppm (40 mg/m^3)
OSHA PEL†: TWA 25 ppm (100 mg/m^3)

Physical Description: Oily, colorless to light-yellow liquid with a peppermint- or honey-like odor.

Measurement Methods (see Table 1):
NIOSH 1301, 2553
OSHA 7

Chemical & Physical Properties:
MW: 98.2
BP: 266°F
Sol: 3%
Fl.P: 87°F
IP: 9.08 eV
Sp.Gr(59°F): 0.86
VP: 9 mmHg
FRZ: -52°F
UEL: 7.2%
LEL: 1.4%
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
250 ppm: Sa:Cf£/PaprOv£
500 ppm: CcrFOv/GmFOv/PaprTOv£/ ScbaF/SaF
1400 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, acids

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, muc memb; narco, coma; in animals: liver, kidney damage; CNS effects
TO: Eyes, skin, resp sys, CNS, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Methacrylic acid

Formula:	CAS#:	RTECS#:	IDLH:
$CH_2=C(CH_3)COOH$	79-41-4	OZ2975000	N.D.

Conversion: 1 ppm = 3.52 mg/m^3

DOT: 2531 153P (inhibited)

Synonyms/Trade Names: Methacrylic acid (glacial), Methacrylic acid (inhibited), α-Methacrylic acid, 2-Methylacrylic acid, 2-Methylpropenoic acid

Exposure Limits:
NIOSH REL: TWA 20 ppm (70 mg/m^3) [skin]
OSHA PEL†: none

Physical Description: Colorless liquid or solid (below 61°F) with an acrid, repulsive odor.

Measurement Methods (see Table 1):
OSHA PV2005

Chemical & Physical Properties:
MW: 86.1
BP: 325°F
Sol(77°F): 9%
Fl.P(oc): 171°F
IP: ?
Sp.Gr: 1.02 (Liquid)
VP: 0.7 mmHg
FRZ: 61°F
UEL: ?
LEL: ?
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Oxidizers, elevated temperatures, hydrochloric acid
[Note: Typically contains 100 ppm of the monomethyl ether of hydroquinone to prevent polymerization.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, muc memb; eye, skin burns
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Methomyl	Formula: $CH_3C(SCH_3)NOC(O)NHCH_3$	CAS#: 16752-77-5	RTECS#: AK2975000	IDLH: N.D.
Conversion:	DOT: 2757 151 (carbamate pesticide, solid, toxic)			
Synonyms/Trade Names: Lannate®, Methyl N-((methylamino)carbonyl)oxy)ethanimidothioate, S-Methyl-N-(methylcarbamoyloxy)thioacetimidate				
Exposure Limits: NIOSH REL: TWA 2.5 mg/m^3 OSHA PEL†: none			Measurement Methods (see Table 1): NIOSH 5601	
Physical Description: White, crystalline solid with a slight, sulfur-like odor. [insecticide]				
Chemical & Physical Properties: MW: 162.2 BP: ? Sol(77°F): 6% Fl.P: NA IP: ? Sp.Gr(75°F): 1.29 VP(77°F): 0.00005 mmHg MLT: 172°F UEL: NA LEL: NA Noncombustible Solid, but may be dissolved in flammable liquids.	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily Provide: Quick drench		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Strong bases				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes; blurred vision, miosis; salv; abdom cramps, nau, vomit; dysp; lass, musc twitch; liver, kidney damage TO: Eyes, resp sys, CNS, CVS, liver, kidneys, blood chol	First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed			

Methoxychlor	Formula: $(C_6H_4OCH_3)_2CHCCl_3$	CAS#: 72-43-5	RTECS#: KJ3675000	IDLH: Ca [5000 mg/m^3]
Conversion:	DOT: 2761 151 (organochlorine pesticide, solid, toxic)			
Synonyms/Trade Names: p,p'-Dimethoxydiphenyltrichloroethane; DMDT; Methoxy-DDT; 2,2-bis(p-Methoxyphenyl)-1,1,1-trichloroethane; 1,1,1-Trichloro-2,2-bis-(p-methoxyphenyl)ethane				
Exposure Limits: NIOSH REL: Ca See Appendix A OSHA PEL†: TWA 15 mg/m^3			Measurement Methods (see Table 1): NIOSH S371 (II-4) OSHA PV2038	
Physical Description: Colorless to light-yellow crystals with a slight, fruity odor. [insecticide]				
Chemical & Physical Properties: MW: 345.7 BP: Decomposes Sol: 0.00001% Fl.P: ? IP: ? Sp.Gr: 1.41 VP: Very low MLT: 171°F UEL: ? LEL: ? Combustible Solid, but difficult to burn.	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: N.R. Wash skin: When contam/Daily Remove: When wet or contam Change: Daily		Respirator Recommendations (see Tables 3 and 4): NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE	
Incompatibilities and Reactivities: Oxidizers				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing SY: In animals: fasc, trembling, convuls; kidney, liver damage; [carc] TO: CNS, liver, kidneys [in animals: liver & ovarian cancer]	First Aid (see Table 6): Skin: Soap wash Breath: Fresh air Swallow: Medical attention immed			

Methoxyflurane

Formula:	CAS#:	RTECS#:	IDLH:
$CHCl_2CF_2OCH_3$	76-38-0	KN7820000	N.D.

Conversion: 1 ppm = 6.75 mg/m^3

DOT:

Synonyms/Trade Names: 2,2-Dichloro-1,1-difluoroethyl methyl ether; 2,2-Dichloro-1,1-difluoro-1-methoxyethane; Methoflurane; Methoxyfluorane; Penthrane

Exposure Limits:
NIOSH REL*: C 2 ppm (13.5 mg/m^3) [60-minute]
[*Note: REL for exposure to waste anesthetic gas.]
OSHA PEL: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless liquid with a fruity odor. [inhalation anesthetic]

Chemical & Physical Properties:
MW: 165.0
BP: 220°F
Sol: Slight
Fl.P: ?
IP: ?
Sp.Gr(77°F): 1.42
VP: 23 mmHg
FRZ: -31°F
UEL: ?
LEL(176°F): 7%
Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: Prevent eye contact
Wash skin: N.R.
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes; CNS depres, analgesia, anes, convuls, resp depres; liver, kidney inj; in animals: repro, terato effects
TO: Eyes, CNS, liver, kidneys, repro sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

M

4-Methoxyphenol

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3OC_6H_4OH$	150-76-5	SL7700000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: Hydroquinone monomethyl ether, p-Hydroxyanisole, Mequinol, p-Methoxyphenol, Monomethyl ether hydroquinone

Exposure Limits:
NIOSH REL: TWA 5 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless to white, waxy solid with an odor of caramel & phenol.

Chemical & Physical Properties:
MW: 124.2
BP: 469°F
Sol(77°F): 4%
Fl.P(oc): 270°F
IP: 7.50 eV
Sp.Gr: 1.55
VP: <0.01 mmHg
MLT: 135°F
UEL: ?
LEL: ?
Combustible Solid; under certain conditions, a dust cloud can probably explode if ignited by a spark or flame.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong oxidizers, strong bases, acid chlorides, acid anhydrides

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat, upper resp sys; eye, skin burns; CNS depres
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

Methyl acetate	Formula: CH_3COOCH_3	CAS#: 79-20-9	RTECS#: AI9100000	IDLH: 3100 ppm [10%LEL]
Conversion: 1 ppm = 3.03 mg/m^3	DOT: 1231 129			
Synonyms/Trade Names: Methyl ester of acetic acid, Methyl ethanoate				

Exposure Limits: NIOSH REL: TWA 200 ppm (610 mg/m^3) ST 250 ppm (760 mg/m^3) OSHA PEL†: TWA 200 ppm (610 mg/m^3) Physical Description: Colorless liquid with a fragrant, fruity odor.	Measurement Methods (see Table 1): NIOSH 1458 OSHA 7

Chemical & Physical Properties: MW: 74.1 BP: 135°F Sol: 25% Fl.P: 14°F IP: 10.27 eV Sp.Gr: 0.93 VP: 173 mmHg FRZ: -145°F UEL: 16% LEL: 3.1% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 2000 ppm: CcrOv*/Sa* 3100 ppm: Sa:Cf*/CcrFOv/GmFOv/ PaprOv*/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Nitrates; strong oxidizers, alkalis & acids; water [Note: Reacts slowly with water to form acetic acid & methanol.]	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose, throat; head, drow; optic nerve atrophy; chest tight; in animals: narco TO: Eyes, skin, resp sys, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed

M

Methyl acetylene	Formula: $CH_3C{\equiv}CH$	CAS#: 74-99-7	RTECS#: UK4250000	IDLH: 1700 ppm [10%LEL]
Conversion: 1 ppm = 1.64 mg/m^3	DOT:			
Synonyms/Trade Names: Allylene, Propine, Propyne, 1-Propyne				

Exposure Limits: NIOSH REL: TWA 1000 ppm (1650 mg/m^3) OSHA PEL: TWA 1000 ppm (1650 mg/m^3) Physical Description: Colorless gas with a sweet odor. [Note: A fuel that is shipped as a liquefied compressed gas.]	Measurement Methods (see Table 1): NIOSH S84 (II-5)

Chemical & Physical Properties: MW: 40.1 BP: -10°F Sol: Insoluble Fl.P: NA (Gas) IP: 10.36 eV RGasD: 1.41 VP: 5.2 atm FRZ: -153°F UEL: ? LEL: 1.7% Flammable Gas	Personal Protection/Sanitation (see Table 2): Skin: Frostbite Eyes: Frostbite Wash skin: N.R. Remove: When wet (flamm) Change: N.R. Provide: Frostbite wash	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 1700 ppm: Sa/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers (such as chlorine), copper alloys [Note: Can decompose explosively at 4.5 to 5.6 atmospheres of pressure.]	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Con (liquid) SY: Irrit resp sys; tremor, hyperexcitability, anes; liquid: frostbite TO: Resp sys, CNS	First Aid (see Table 6): Eye: Frostbite Skin: Frostbite Breath: Resp support

Methyl acetylene-propadiene mixture

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3{\equiv}CH/CH_2{=}C{=}CH_2$	59355-75-8	UK4920000	3400 ppm [10%LEL]

Conversion: 1 ppm = 1.64 mg/m^3

DOT: 1060 116P (stabilized)

Synonyms/Trade Names: MAPP gas, Methyl acetylene-allene mixture, Propadiene-methyl acetylene, Methyl acetylene-propadiene mixture (stabilized), Propyne-allene mixture, Propyne-propadiene mixture

Exposure Limits:
NIOSH REL: TWA 1000 ppm (1800 mg/m^3)
ST 1250 ppm (2250 mg/m^3)
OSHA PEL†: TWA 1000 ppm (1800 mg/m^3)

Measurement Methods (see Table 1):
NIOSH S85 (II-6)
OSHA 7

Physical Description: Colorless gas with a strong, characteristic, foul odor. [Note: A fuel that is shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 40.1
BP: -36 to -4°F
Sol: Insoluble
Fl.P: NA (Gas)
IP: ?
RGasD: 1.48
VP: >1 atm
FRZ: -213°F
UEL: 10.8%
LEL: 3.4%
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Frostbite
Eyes: Frostbite
Wash skin: N.R.
Remove: When wet (flamm)
Change: N.R.
Provide: Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
3400 ppm: Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, copper alloys
[Note: Forms explosive compounds at high pressure in contact with alloys containing more than 67% copper.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con (liquid)
SY: Irrit resp sys; excitement, conf, anes; liquid: frostbite
TO: Resp sys, CNS

First Aid (see Table 6):
Eye: Frostbite
Skin: Frostbite
Breath: Resp support

Methyl acrylate

Formula:	CAS#:	RTECS#:	IDLH:
$CH_2{=}CHCOOCH_3$	96-33-3	AT2800000	250 ppm

Conversion: 1 ppm = 3.52 mg/m^3

DOT: 1919 129P (inhibited)

Synonyms/Trade Names: Methoxycarbonylethylene, Methyl ester of acrylic acid, Methyl propenoate

Exposure Limits:
NIOSH REL: TWA 10 ppm (35 mg/m^3) [skin]
OSHA PEL: TWA 10 ppm (35 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 1459, 2552
OSHA 92

Physical Description: Colorless liquid with an acrid odor.

Chemical & Physical Properties:
MW: 86.1
BP: 176°F
Sol: 6%
Fl.P: 27°F
IP: 9.90 eV
Sp.Gr: 0.96
VP: 65 mmHg
FRZ: -106°F
UEL: 25%
LEL: 2.8%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
100 ppm: Sa*
250 ppm: Sa:Cf*/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Nitrates, oxidizers such as peroxides, strong alkalis
[Note: Polymerizes easily; usually contains an inhibitor such as hydroquinone.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, upper resp sys
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Methylacrylonitrile	Formula: $CH_2=C(CH_3)CN$	CAS#: 126-98-7	RTECS#: UD1400000	IDLH: N.D.
Conversion: 1 ppm = 2.74 mg/m^3	DOT: 3079 131P (inhibited)			

Synonyms/Trade Names: 2-Cyanopropene-1, 2-Cyano-1-propene, Isoprene cyanide, Isopropenylnitrile, Methacrylonitrile, α-Methylacrylonitrile, 2-Methylpropenenitrile

Exposure Limits: NIOSH REL: TWA 1 ppm (3 mg/m^3) [skin] OSHA PEL†: none Physical Description: Colorless liquid with an odor like bitter almonds.	Measurement Methods (see Table 1): None available

Chemical & Physical Properties: MW: 67.1 BP: 195°F Sol: 3% Fl.P: 34°F IP: ? Sp.Gr: 0.80 VP(77°F): 71 mmHg FRZ: -32°F UEL: 6.8% LEL: 2% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	Respirator Recommendations (see Tables 3 and 4): Not available.

Incompatibilities and Reactivities: Strong acids, strong oxidizers, alkali, light
[Note: Polymerization may occur due to elevated temperature, visible light, or contact with a concentrated alkali.]

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin; lac; in animals: convuls, loss of motor control in hind limbs TO: Eyes, skin, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

M

Methylal	Formula: $CH_3OCH_2OCH_3$	CAS#: 109-87-5	RTECS#: PA8750000	IDLH: 2200 ppm [10%LEL]
Conversion: 1 ppm = 3.11 mg/m^3	DOT: 1234 127			

Synonyms/Trade Names: Dimethoxymethane, Formal, Formaldehyde dimethylacetal, Methoxymethyl methyl ether, Methylene dimethyl ether

Exposure Limits: NIOSH REL: TWA 1000 ppm (3100 mg/m^3) OSHA PEL: TWA 1000 ppm (3100 mg/m^3) Physical Description: Colorless liquid with a chloroform-like odor.	Measurement Methods (see Table 1): NIOSH 1611

Chemical & Physical Properties: MW: 76.1 BP: 111°F Sol: 33% Fl.P(oc): -26°F IP: 10.00 eV Sp.Gr: 0.86 VP: 330 mmHg FRZ: -157°F UEL: 13.8% LEL: 2.2% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 2200 ppm: Sa/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, acids

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, upper resp sys; anes TO: Eyes, skin, resp sys, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed

Methyl alcohol	Formula: CH_3OH	CAS#: 67-56-1	RTECS#: PC1400000	IDLH: 6000 ppm
Conversion: 1 ppm = 1.31 mg/m^3	DOT: 1230 131			
Synonyms/Trade Names: Carbinol, Columbian spirits, Methanol, Pyroligneous spirit, Wood alcohol, Wood naphtha, Wood spirit				
Exposure Limits: NIOSH REL: TWA 200 ppm (260 mg/m^3) ST 250 ppm (325 mg/m^3) [skin] OSHA PEL†: TWA 200 ppm (260 mg/m^3) Physical Description: Colorless liquid with a characteristic pungent odor.			Measurement Methods (see Table 1): NIOSH 2000, 3800 OSHA 91	
Chemical & Physical Properties: MW: 32.1 BP: 147°F Sol: Miscible Fl.P: 52°F IP: 10.84 eV Sp.Gr: 0.79 VP: 96 mmHg FRZ: -144°F UEL: 36% LEL: 6.0% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 2000 ppm: Sa 5000 ppm: Sa:Cf 6000 ppm: SaT:Cf/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: ScbaE	
Incompatibilities and Reactivities: Strong oxidizers				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, upper resp sys; head, drow, dizz, nau, vomit; vis dist, optic nerve damage (blindness); derm TO: Eyes, skin, resp sys, CNS, GI tract		First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed		

Methylamine	Formula: CH_3NH_2	CAS#: 74-89-5	RTECS#: PF6300000	IDLH: 100 ppm
Conversion: 1 ppm = 1.27 mg/m^3	DOT: 1061 118 (anhydrous); 1235 132 (aqueous)			
Synonyms/Trade Names: Aminomethane, Methylamine (anhydrous), Methylamine (aqueous), Monomethylamine				
Exposure Limits: NIOSH REL: TWA 10 ppm (12 mg/m^3) OSHA PEL: TWA 10 ppm (12 mg/m^3) Physical Description: Colorless gas with a fish- or ammonia-like odor. [Note: A liquid below 21°F. Shipped as a liquefied compressed gas.]			Measurement Methods (see Table 1): OSHA 40	
Chemical & Physical Properties: MW: 31.1 BP: 21°F Sol: Soluble Fl.P: NA (Gas) 14°F (Liquid) IP: 8.97 eV RGasD: 1.08 Sp.Gr: 0.70 (Liquid at 13°F) VP: 3.0 atm FRZ: -136°F UEL: 20.7% LEL: 4.9% Flammable Gas	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact (solution) Frostbite Eyes: Prevent eye contact (solution) Frostbite Wash skin: When contam (solution) Remove: When wet (flamm) Change: N.R. Provide: Frostbite wash		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 100 ppm: CcrFS/GmFS/PaprS£/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS/ScbaE	
Incompatibilities and Reactivities: Mercury, strong oxidizers, nitromethane [Note: Corrosive to copper & zinc alloys, aluminum & galvanized surfaces.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs (solution), Ing (solution), Con (solution/liquid) SY: Irrit eyes, skin, resp sys; cough; skin, muc memb burns; derm; conj; liquid: frostbite TO: Eyes, skin, resp sys		First Aid (see Table 6): Eye: Irr immed (solution)/Frostbite Skin: Water flush immed (solution)/Frostbite Breath: Resp support Swallow: Medical attention immed (solution)		

Methyl (n-amyl) ketone

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3CO[CH_2]_4CH_3$	110-43-0	MJ5075000	800 ppm

Conversion: 1 ppm = 4.67 mg/m^3

DOT: 1110 127

Synonyms/Trade Names: Amyl methyl ketone, n-Amyl methyl ketone, 2-Heptanone

Exposure Limits:
NIOSH REL: TWA 100 ppm (465 mg/m^3)
OSHA PEL: TWA 100 ppm (465 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1301, 2553

Physical Description: Colorless to white liquid with a banana-like, fruity odor.

Chemical & Physical Properties:
MW: 114.2
BP: 305°F
Sol: 0.4%
Fl.P: 102°F
IP: 9.33 eV
Sp.Gr: 0.81
VP: 3 mmHg
FRZ: -32°F
UEL(250°F): 7.9%
LEL(151°F): 1.1%
Class II Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
800 ppm: CcrOv*/PaprOv*/GmFOv/Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong acids, alkalis & oxidizers [Note: Will attack some forms of plastic.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, muc memb; head; narco, coma; derm
TO: Eyes, skin, resp sys, CNS, PNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Fresh air
Swallow: Medical attention immed

M

Methyl bromide

Formula:	CAS#:	RTECS#:	IDLH:
CH_3Br	74-83-9	PA4900000	Ca [250 ppm]

Conversion: 1 ppm = 3.89 mg/m^3

DOT: 1062 123

Synonyms/Trade Names: Bromomethane, Monobromomethane

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL†: C 20 ppm (80 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 2520
OSHA PV2040

Physical Description: Colorless gas with a chloroform-like odor at high concentrations. [Note: A liquid below 38°F. Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 95.0
BP: 38°F
Sol: 2%
Fl.P: NA (Gas)
IP: 10.54 eV
RGasD: 3.36
Sp.Gr: 1.73 (Liquid at 32°F)
VP: 1.9 atm
FRZ: -137°F
UEL: 16.0%
LEL: 10%
Flammable Gas, but only in presence of a high energy ignition source.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact (liquid)
Eyes: Prevent eye contact (liquid)
Wash skin: When contam (liquid)
Remove: When wet (flamm)
Change: N.R.
Provide: Quick drench (liquid)

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Aluminum, magnesium, strong oxidizers [Note: Attacks aluminum to form aluminum trimethyl, which is SPONTANEOUSLY flammable.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs (liquid), Con (liquid)
SY: Irrit eyes, skin, resp sys; musc weak, inco, vis dist, dizz; nau, vomit, head; mal; hand tremor; convuls; dysp; skin vesic; liquid: frostbite; [carc]
TO: Eyes, skin, resp sys, CNS [in animals: lung, kidney & forestomach tumors]

First Aid (see Table 6):
Eye: Irr immed (liquid)
Skin: Water flush immed (liquid)
Breath: Resp support

Methyl Cellosolve®	Formula: $CH_3OCH_2CH_2OH$	CAS#: 109-86-4	RTECS#: KL5775000	IDLH: 200 ppm
Conversion: 1 ppm = 3.11 mg/m^3	DOT: 1188 127			
Synonyms/Trade Names: EGME, Ethylene glycol monomethyl ether, Glycol monomethyl ether, 2-Methoxyethanol				
Exposure Limits: NIOSH REL: TWA 0.1 ppm (0.3 mg/m^3) [skin] OSHA PEL: TWA 25 ppm (80 mg/m^3) [skin]				Measurement Methods (see Table 1): NIOSH 1403 OSHA 53, 79
Physical Description: Colorless liquid with a mild, ether-like odor.				

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 76.1 BP: 256°F Sol: Miscible Fl.P: 102°F IP: 9.60 eV Sp.Gr: 0.96 VP: 6 mmHg FRZ: -121°F UEL: 14% LEL: 1.8% Class II Combustible Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Quick drench	NIOSH 1 ppm: Sa* 2.5 ppm: Sa:Cf* 5 ppm: ScbaF/SaF 100 ppm: Sa:Pd,Pp* 200 ppm: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, caustics	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, nose, throat; head, drow, lass; ataxia, tremor; anemic pallor; in animals: repro, terato effects TO: Eyes, resp sys, CNS, blood, kidneys, repro sys, hemato sys	First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed

M

Methyl Cellosolve® acetate	Formula: $CH_3COOCH_2CH_2OCH_3$	CAS#: 110-49-6	RTECS#: KL5950000	IDLH: 200 ppm
Conversion: 1 ppm = 4.83 mg/m^3	DOT: 1189 129			
Synonyms/Trade Names: EGMEA, Ethylene glycol monomethyl ether acetate, Glycol monomethyl ether acetate, 2-Methoxyethyl acetate				
Exposure Limits: NIOSH REL: TWA 0.1 ppm (0.5 mg/m^3 [skin] OSHA PEL: TWA 25 ppm (120 mg/m^3) [skin]				Measurement Methods (see Table 1): NIOSH 1451 OSHA 53, 79
Physical Description: Colorless liquid with a mild, ether-like odor.				

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 118.1 BP: 293°F Sol: Miscible Fl.P: 120°F IP: ? Sp.Gr: 1.01 VP: 2 mmHg FRZ: -85°F UEL: 8.2% LEL: 1.7% Class II Combustible Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.	NIOSH 1 ppm: Sa* 2.5 ppm: Sa:Cf* 5 ppm: ScbaF/SaF 100 ppm: Sa:Pd,Pp* 200 ppm: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Nitrates; strong oxidizers, alkalis & acids	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, nose, throat; kidney, brain damage; in animals: narco; repro, terato effects TO: Eyes, resp sys, kidneys, brain, CNS, PNS, repro sys, hemato sys	First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed

Methyl chloride

Formula:	CAS#:	RTECS#:	IDLH:
CH_3Cl	74-87-3	PA6300000	Ca [2000 ppm]

Conversion: 1 ppm = 2.07 mg/m^3

DOT: 1063 115

Synonyms/Trade Names: Chloromethane, Monochloromethane

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL†: TWA 100 ppm
C 200 ppm
300 ppm (5-minute maximum peak in any 3 hours)

Measurement Methods (see Table 1):
NIOSH 1001

Physical Description: Colorless gas with a faint, sweet odor which is not noticeable at dangerous concentrations. [Note: Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 50.5
BP: -12°F
Sol: 0.5%
Fl.P: NA (Gas)
IP: 11.28 eV
RGasD: 1.78
VP: 5.0 atm
FRZ: -144°F
UEL: 17.4%
LEL: 8.1%
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Frostbite
Eyes: Frostbite
Wash skin: N.R.
Remove: When wet (flamm)
Change: N.R.
Provide: Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: ScbaE

Incompatibilities and Reactivities: Chemically-active metals such as potassium, powdered aluminum, zinc, and magnesium; water [Note: Reacts with water (hydrolyzes) to form hydrochloric acid.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con (liquid)
SY: Dizz, nau, vomit; vis dist, stagger, slurred speech, convuls, coma; liver, kidney damage; liquid: frostbite; repro, terato effects; [carc]
TO: CNS, liver, kidneys, repro sys [in animals: lung, kidney & forestomach tumors]

First Aid (see Table 6):
Eye: Frostbite
Skin: Frostbite
Breath: Resp support

Methyl chloroform

Formula:	CAS#:	RTECS#:	IDLH:
CH_3CCl_3	71-55-6	KJ2975000	700 ppm

Conversion: 1 ppm = 5.46 mg/m^3

DOT: 2831 160

Synonyms/Trade Names: Chlorothene; 1,1,1-Trichloroethane; 1,1,1-Trichloroethane (stabilized)

Exposure Limits:
NIOSH REL: C 350 ppm (1900 mg/m^3) [15-minute]
See Appendix C (Chloroethanes)
OSHA PEL†: TWA 350 ppm (1900 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1003

Physical Description: Colorless liquid with a mild, chloroform-like odor.

Chemical & Physical Properties:
MW: 133.4
BP: 165°F
Sol: 0.4%
Fl.P: ?
IP: 11.00 eV
Sp.Gr: 1.34
VP: 100 mmHg
FRZ: -23°F
UEL: 12.5%
LEL: 7.5%
Combustible Liquid, but burns with difficulty.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
700 ppm: Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong caustics; strong oxidizers; chemically-active metals such as zinc, aluminum, magnesium powders, sodium & potassium; water
[Note: Reacts slowly with water to form hydrochloric acid.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin; head, lass, CNS depres, poor equi; derm; card arrhy; liver damage
TO: Eyes, skin, CNS, CVS, liver

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Methyl-2-cyanoacrylate

Formula:	CAS#:	RTECS#:	IDLH:
$CH_2=C(CN)COOCH_3$	137-05-3	AS7000000	N.D.

Conversion: 1 ppm = 4.54 mg/m^3

DOT:

Synonyms/Trade Names: Mecrylate, Methyl cyanoacrylate, Methyl α-cyanoacrylate, Methyl ester of 2-cyanoacrylic acid

Exposure Limits:
NIOSH REL: TWA 2 ppm (8 mg/m^3)
ST 4 ppm (16 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
OSHA 55

Physical Description: Colorless liquid with a characteristic odor.

Chemical & Physical Properties:
MW: 111.1
BP: ?
Sol: 30%
Fl.P: 174°F
IP: ?
Sp.Gr(81°F): 1.10
VP(77°F): 0.2 mmHg
FRZ: ?
UEL: ?
LEL: ?
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: N.R.
Change: N.R.
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Moisture [Note: Contact with moisture causes rapid polymerization.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose; blurred vision, lac; rhinitis
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash
Breath: Resp support
Swallow: Medical attention immed

M

Methylcyclohexane

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3C_6H_{11}$	108-87-2	GV6125000	1200 ppm [LEL]

Conversion: 1 ppm = 4.02 mg/m^3

DOT: 2296 128

Synonyms/Trade Names: Cyclohexylmethane, Hexahydrotoluene

Exposure Limits:
NIOSH REL: TWA 400 ppm (1600 mg/m^3)
OSHA PEL†: TWA 500 ppm (2000 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1500
OSHA 7

Physical Description: Colorless liquid with a faint, benzene-like odor.

Chemical & Physical Properties:
MW: 98.2
BP: 214°F
Sol: Insoluble
Fl.P: 25°F
IP: 9.85 eV
Sp.Gr: 0.77
VP: 37 mmHg
FRZ: -196°F
UEL: 6.7%
LEL: 1.2%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
1200 ppm: Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; dizz, drow; in animals: narco
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Methylcyclohexanol	Formula: $CH_3C_6H_{10}OH$	CAS#: 25639-42-3	RTECS#: GW0175000	IDLH: 500 ppm
Conversion: 1 ppm = 4.67 mg/m^3	DOT: 2617 129			
Synonyms/Trade Names: Hexahydrocresol, Hexahydromethylphenol				
Exposure Limits: NIOSH REL: TWA 50 ppm (235 mg/m^3) OSHA PEL†: TWA 100 ppm (470 mg/m^3)			Measurement Methods (see Table 1): NIOSH 1404	
Physical Description: Straw-colored liquid with a weak odor like coconut oil.				
Chemical & Physical Properties: MW: 114.2 BP: 311-356°F Sol: 4% Fl.P: 149-158°F IP: 9.80 eV Sp.Gr: 0.92 VP(86°F): 2 mmHg FRZ: -58°F UEL: ? LEL: ? Class IIIA Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH 500 ppm: Sa*/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, upper resp sys; head; in animals: narco; liver, kidney damage TO: Eyes, skin, resp sys, CNS, kidneys, liver		First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed		

o-Methylcyclohexanone	Formula: $CH_3C_6H_9O$	CAS#: 583-60-8	RTECS#: GW1750000	IDLH: 600 ppm
Conversion: 1 ppm = 4.59 mg/m^3	DOT: 2297 128			
Synonyms/Trade Names: 2-Methylcyclohexanone				
Exposure Limits: NIOSH REL: TWA 50 ppm (230 mg/m^3) [skin] ST 75 ppm (345 mg/m^3) OSHA PEL†: TWA 100 ppm (460 mg/m^3) [skin]			Measurement Methods (see Table 1): NIOSH 2521	
Physical Description: Colorless liquid with a weak, peppermint-like odor.				
Chemical & Physical Properties: MW: 112.2 BP: 325°F Sol: Insoluble Fl.P: 118°F IP: ? Sp.Gr: 0.93 VP: 1 mmHg FRZ: 7°F UEL: ? LEL: ? Class II Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH 500 ppm: Sa* 600 ppm: Sa:Cf*/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: In animals: irrit eyes, muc memb; narco; derm TO: Skin, resp sys, liver, kidneys, CNS		First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed		

Methyl cyclopentadienyl manganese tricarbonyl (as Mn)	Formula: $CH_3C_5H_4Mn(CO)_3$	CAS#: 12108-13-3	RTECS#: OP1450000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: CI-2, Combustion Improver-2, Manganese tricarbonylmethylcyclopentadienyl, 2-Methylcyclopentadienyl manganese tricarbonyl, MMT

Exposure Limits: NIOSH REL: TWA 0.2 mg/m^3 [skin] OSHA PEL†: C 5 mg/m^3	Measurement Methods (see Table 1): None available
Physical Description: Yellow to dark-orange liquid with a faint, pleasant odor. [Note: A solid below 36°F.]	

Chemical & Physical Properties: MW: 218.1 BP: 449°F Sol: Insoluble Fl.P: 230°F IP: ? Sp.Gr: 1.39 VP(212°F): 7 mmHg FRZ: 36°F UEL: ? LEL: ? Class IIIB Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.	Respirator Recommendations (see Tables 3 and 4): Not available.

Incompatibilities and Reactivities: Light (decomposes)

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes; dizz, nau, head; in animals: tremor, severe clonic spasms, lass, slow respiration; liver, kidney inj TO: Eyes, CNS, liver, kidneys	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

M

Methyl demeton	Formula: $C_6H_{15}O_3PS_2$	CAS#: 8022-00-2	RTECS#: TG1760000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: Demeton methyl; O,O-Dimethyl 2-ethylmercaptoethyl thiophosphate; Metasystox®; Methyl mercaptophos; Methyl systox®

Exposure Limits: NIOSH REL: TWA 0.5 mg/m^3 [skin] OSHA PEL†: none	Measurement Methods (see Table 1): None available
Physical Description: Oily, colorless to pale-yellow liquid with an unpleasant odor. [insecticide] [Note: Technical grade consists of 2 isomers: thiono & thiolo.]	

Chemical & Physical Properties: MW: 230.3 BP: Decomposes Sol: 0.03-0.3% Fl.P: ? IP: ? Sp.Gr: 1.20 VP: 0.0004 mmHg FRZ: ? UEL: ? LEL: ? Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily Provide: Eyewash Quick drench	Respirator Recommendations (see Tables 3 and 4): Not available.

Incompatibilities and Reactivities: Strong oxidizers, alkalis, water

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin; ache eyes, rhin; nau, head, dizz, vomit TO: Eyes, skin, resp sys, CNS, CVS, blood chol	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

4,4'-Methylenebis(2-chloroaniline)	Formula: $CH_2(C_6H_4ClNH_2)_2$	CAS#: 101-14-4	RTECS#: CY1050000	IDLH: Ca [N.D.]
Conversion:	DOT:			

Synonyms/Trade Names: DACPM; 3,3'-Dichloro-4,4'-diaminodiphenylmethane; MBOCA; 4,4'-Methylenebis(o-chloro aniline); 4,4'-Methylenebis(2-chlorobenzenamine); MOCA

Exposure Limits:
NIOSH REL: Ca
TWA 0.003 mg/m^3 [skin]
See Appendix A
OSHA PEL†: none

Measurement Methods (see Table 1):
OSHA 24, 71

Physical Description: Tan-colored pellets or flakes with a faint, amine-like odor.

Chemical & Physical Properties:
MW: 267.2
BP: ?
Sol: Slight
Fl.P: ?
IP: ?
Sp.Gr: 1.44
VP(77°F): 0.00001 mmHg
MLT: 230°F
UEL: ?
LEL: ?

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Chemically-active metals (e.g., potassium, sodium, magnesium, zinc)

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Hema, cyan, nau, methemo, kidney irrit; [carc]
TO: Liver, blood, kidneys [in animals: liver, lung & bladder tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

M

Methylene bis(4-cyclohexylisocyanate)	Formula: $CH_2[(C_6H_{10})NCO]_2$	CAS#: 5124-30-1	RTECS#: NQ9250000	IDLH: N.D.
Conversion: 1 ppm = 10.73 mg/m^3	DOT:			

Synonyms/Trade Names: Dicyclohexylmethane 4,4'-diisocyanate; DMDI; bis(4-Isocyanatocyclohexyl)methane; HMDI; Hydrogenated MDI; Reduced MDI; Saturated MDI

Exposure Limits:
NIOSH REL: C 0.01 ppm (0.11 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 5525
OSHA PV2092

Physical Description: Clear, colorless to light-yellow liquid.

Chemical & Physical Properties:
MW: 262.4
BP: ?
Sol: Reacts
Fl.P: >395°F
IP: ?
Sp.Gr(77°F): 1.07
VP(77°F): 0.001 mmHg
FRZ: <14°F
UEL: ?
LEL: ?
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
0.1 ppm: Sa*
0.25 ppm: Sa:Cf*
0.5 ppm: ScbaF/SaF
1 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Water, ethanol, alcohols, amines, bases, acids, organotin catalysts [Note: May slowly polymerize if heated above 122°F.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; skin, resp sens; chest tight, dysp, cough, dry throat, wheez, pulm edema; skin blisters
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Methylene bisphenyl isocyanate	Formula: $CH_2(C_6H_4NCO)_2$	CAS#: 101-68-8	RTECS#: NQ9350000	IDLH: 75 mg/m^3
Conversion: 1 ppm = 10.24 mg/m^3	DOT:			

Synonyms/Trade Names: 4,4'-Diphenylmethane diisocyanate; MDI; Methylene bis(4-phenyl isocyanate); Methylene di-p-phenylene ester of isocyanic acid

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: TWA 0.05 mg/m^3 (0.005 ppm) C 0.2 mg/m^3 (0.020 ppm) [10-minute] OSHA PEL: C 0.2 mg/m^3 (0.02 ppm)	NIOSH 5521, 5522, 5525 OSHA 18

Physical Description: White to light-yellow, odorless flakes. [Note: A liquid above 99°F.]

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 250.3 BP: 597°F Sol: 0.2% Fl.P: 390°F IP: ? Sp.Gr: 1.23 (Solid at 77°F) 1.19 (Liquid at 122°F) VP(77°F): 0.000005 mmHg MLT: 99°F UEL: ? LEL: ? Combustible Solid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily	NIOSH 0.5 mg/m^3: Sa* 1.25 mg/m^3: Sa:Cf* 2.5 mg/m^3: ScbaF/SaF 75 mg/m^3: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong alkalis, acids, alcohol [Note: Polymerizes at 450°F.]

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Ing, Con SY: Irrit eyes, nose, throat; resp sens; cough, pulm secretions, chest pain, dysp; asthma TO: Eyes, resp sys	Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

M

Methylene chloride	Formula: CH_2Cl_2	CAS#: 75-09-2	RTECS#: PA8050000	IDLH: Ca [2300 ppm]
Conversion: 1 ppm = 3.47 mg/m^3	DOT: 1593 160			

Synonyms/Trade Names: Dichloromethane, Methylene dichloride

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: Ca See Appendix A OSHA PEL: [1910.1052] TWA 25 ppm ST 125 ppm	NIOSH 1005, 3800 OSHA 59, 80

Physical Description: Colorless liquid with a chloroform-like odor. [Note: A gas above 104°F.]

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 84.9 BP: 104°F Sol: 2% Fl.P: ? IP: 11.32 eV Sp.Gr: 1.33 VP: 350 mmHg FRZ: -139°F UEL: 23% LEL: 13% Combustible Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench	NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE See Appendix E (page 351)

Incompatibilities and Reactivities: Strong oxidizers; caustics; chemically-active metals such as aluminum, magnesium powders, potassium & sodium; concentrated nitric acid

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin; lass, drow, dizz; numb, tingle limbs; nau; [carc] TO: Eyes, skin, CVS, CNS [in animals: lung, liver, salivary & mammary gland tumors]	Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed

4,4'-Methylenedianiline

Formula:	CAS#:	RTECS#:	IDLH:
$CH_2(C_6H_4NH_2)_2$	101-77-9	BY5425000	Ca [N.D.]

Conversion:

DOT:

Synonyms/Trade Names: 4,4'-Diaminodiphenylmethane; para, para'-Diaminodiphenyl-methane; Dianilinomethane; 4,4'-Diphenylmethanediamine; MDA

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL: [1910.1050] TWA 0.010 ppm
ST 0.100 ppm

Measurement Methods (see Table 1):
NIOSH 5029

Physical Description: Pale-brown, crystalline solid with a faint, amine-like odor.

Chemical & Physical Properties:
MW: 198.3
BP: 748°F
Sol: 0.1%
Fl.P: 374°F
IP: 10.70 eV
Sp.Gr: 1.06 (Liquid at 212°F)
VP(77°F): 0.0000002 mmHg
MLT: 198°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

See Appendix E (page 351)

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes; jaun, hepatitis; myocardial damage; in animals: heart, liver, spleen damage; [carc]
TO: Eyes, liver, CVS, spleen [in animals: bladder cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Methyl ethyl ketone peroxide

Formula:	CAS#:	RTECS#:	IDLH:
$C_8H_{16}O_4$	1338-23-4	EL9450000	N.D.

Conversion: 1 ppm = 7.21 mg/m^3

DOT:

Synonyms/Trade Names: 2-Butanone peroxide, Ethyl methyl ketone peroxide, MEKP, MEK peroxide, Methyl ethyl ketone hydroperoxide

Exposure Limits:
NIOSH REL: C 0.2 ppm (1.5 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 3508
OSHA 77

Physical Description: Colorless liquid with a characteristic odor.
[Note: Explosive decomposition occurs at 230°F.]

Chemical & Physical Properties:
MW: 176.2
BP: 244°F (Decomposes)
Sol: Soluble
Fl.P(oc): 125-200°F (60% MEKP)
IP: ?
Sp.Gr(59°F): 1.12
VP: ?
FRZ: ?
UEL: ?
LEL: ?
Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Organic materials, heat, flames, sunlight, trace contaminants
[Note: A strong oxidizing agent. Pure MEKP is shock sensitive. Commercial product is diluted with 40% dimethyl phthalate, cyclohexane peroxide, or diallyl phthalate to reduce sensitivity to shock.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; cough, dysp, pulm edema; blurred vision; blisters, scars skin; abdom pain, vomit, diarr; derm; in animals: liver, kidney damage
TO: Eyes, skin, resp sys, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash immed
Breath: Resp support
Swallow: Medical attention immed

Methyl formate

Formula:	CAS#:	RTECS#:	IDLH:
$HCOOCH_3$	107-31-3	LQ8925000	4500 ppm

Conversion: 1 ppm = 2.46 mg/m^3

DOT: 1243 129

Synonyms/Trade Names: Methyl ester of formic acid, Methyl methanoate

Exposure Limits:
NIOSH REL: TWA 100 ppm (250 mg/m^3)
ST 150 ppm (375 mg/m^3)
OSHA PEL†: TWA 100 ppm (250 mg/m^3)

Measurement Methods (see Table 1):
NIOSH S291 (II-5)
OSHA PV2041

Physical Description: Colorless liquid with a pleasant odor.
[Note: A gas above 89°F.]

Chemical & Physical Properties:
MW: 60.1
BP: 89°F
Sol: 30%
Fl.P: -2°F
IP: 10.82 eV
Sp.Gr: 0.98
VP: 476 mmHg
FRZ: -148°F
UEL: 23%
LEL: 4.5%
Class IA Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1000 ppm: Sa*
2500 ppm: Sa:Cf*
4500 ppm: ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers
[Note: Reacts slowly with water to form methanol & formic acid.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, nose; chest tight, dysp; vis dist; CNS depres; in animals: pulm edema; narco
TO: Eyes, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

5-Methyl-3-heptanone

Formula:	CAS#:	RTECS#:	IDLH:
$C_2H_5COCH_2CH(CH_3)CH_2CH_3$	541-85-5	MJ7350000	100 ppm

Conversion: 1 ppm = 5.24 mg/m^3

DOT: 2271 127

Synonyms/Trade Names: Amyl ethyl ketone, Ethyl amyl ketone, 3-Methyl-5-heptanone

Exposure Limits:
NIOSH REL: TWA 25 ppm (130 mg/m^3)
OSHA PEL: TWA 25 ppm (130 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1301, 2553

Physical Description: Colorless liquid with a pungent odor.

Chemical & Physical Properties:
MW: 128.2
BP: 315°F
Sol: Insoluble
Fl.P: 138°F
IP: ?
Sp.Gr: 0.82
VP: 2 mmHg
FRZ: -70°F
UEL: ?
LEL: ?
Class II Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
100 ppm: CcrOv*/PaprOv*/GmFOv/Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, muc memb; head; narco, coma; derm
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush
Breath: Resp support
Swallow: Medical attention immed

Methyl hydrazine

Formula:	CAS#:	RTECS#:	IDLH:
CH_3NHNH_2	60-34-4	MV5600000	Ca [20 ppm]

Conversion: 1 ppm = 1.89 mg/m^3

DOT: 1244 131

Synonyms/Trade Names: MMH, Monomethylhydrazine

Exposure Limits:
NIOSH REL: Ca
C 0.04 ppm (0.08 mg/m^3) [2-hr]
See Appendix A
OSHA PEL: C 0.2 ppm (0.35 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 3510

Physical Description: Fuming, colorless liquid with an ammonia-like odor.

Chemical & Physical Properties:
MW: 46.1
BP: 190°F
Sol: Miscible
Fl.P: 17°F
IP: 8.00 eV
Sp.Gr(77°F): 0.87
VP: 38 mmHg
FRZ: -62°F
UEL: 92%
LEL: 2.5%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: ScbaE

Incompatibilities and Reactivities: Oxides of iron; copper; manganese; lead; copper alloys; porous materials such as earth, asbestos, wood & cloth; strong oxidizers such as fluorine & chlorine; nitric acid; hydrogen peroxide

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; vomit, diarr, tremor, ataxia; anoxia, cyan; convuls; [carc]
TO: Eyes, skin, resp sys, CNS, liver, blood, CVS [in animals: lung, liver, blood vessel & intestine tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

M

Methyl iodide

Formula:	CAS#:	RTECS#:	IDLH:
CH_3I	74-88-4	PA9450000	Ca [100 ppm]

Conversion: 1 ppm = 5.80 mg/m^3

DOT: 2644 151

Synonyms/Trade Names: Iodomethane, Monoiodomethane

Exposure Limits:
NIOSH REL: Ca
TWA 2 ppm (10 mg/m^3) [skin]
See Appendix A
OSHA PEL: TWA 5 ppm (28 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 1014

Physical Description: Colorless liquid with a pungent, ether-like odor. [Note: Turns yellow, red, or brown on exposure to light & moisture.]

Chemical & Physical Properties:
MW: 141.9
BP: 109°F
Sol: 1%
Fl.P: NA
IP: 9.54 eV
Sp.Gr: 2.28
VP: 400 mmHg
FRZ: -88°F
UEL: NA
LEL: NA
Noncombustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers [Note: Decomposes at 518°F.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; nau, vomit; dizz, ataxia; slurred speech, drow; derm; [carc]
TO: Eyes, skin, resp sys, CNS [in animals: lung, kidney & forestomach tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

Methyl isoamyl ketone	Formula: $CH_3COCH_2CH_2CH(CH_3)_2$	CAS#: 110-12-3	RTECS#: MP3850000	IDLH: N.D.
Conversion: 1 ppm = 4.67 mg/m^3	DOT: 2302 127			
Synonyms/Trade Names: Isoamyl methyl ketone, Isopentyl methyl ketone, 2-Methyl-5-hexanone, 5-Methyl-2-hexanone, MIAK				
Exposure Limits: NIOSH REL: TWA 50 ppm (240 mg/m^3) OSHA PEL†: TWA 100 ppm (475 mg/m^3)			Measurement Methods (see Table 1): OSHA PV2042	
Physical Description: Colorless, clear liquid with a pleasant, fruity odor.				

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 114.2 BP: 291°F Sol: 0.5% Fl.P: 97°F IP: 9.284 eV Sp.Gr: 0.81 VP: 5 mmHg FRZ: -101°F UEL(200°F): 8.2% LEL(200°F): 1.0% Class IC Flammable Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	NIOSH 500 ppm: CcrOv*/Sa* 1250 ppm: Sa:Cf*/PaprOv* 2500 ppm: CcrFOv/GmFOv/PaprTOv*/ SaT:Cf*/ScbaF/SaF 5000 ppm: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, muc memb; head, narco, coma; derm; in animals: liver, kidney damage TO: Eyes, skin, resp sys, CNS, liver, kidneys	First Aid (see Table 6): Eye: Irr immed Skin: Soap flush prompt Breath: Resp support Swallow: Medical attention immed

M

Methyl isobutyl carbinol	Formula: $(CH_3)_2CHCH_2CH(OH)CH_3$	CAS#: 108-11-2	RTECS#: SA7350000	IDLH: 400 ppm
Conversion: 1 ppm = 4.18 mg/m^3	DOT: 2053 129			
Synonyms/Trade Names: Isobutylmethylcarbinol, Methyl amyl alcohol, 4-Methyl-2-pentanol, MIBC				
Exposure Limits: NIOSH REL: TWA 25 ppm (100 mg/m^3) ST 40 ppm (165 mg/m^3) [skin] OSHA PEL†: TWA 25 ppm (100 mg/m^3) [skin]			Measurement Methods (see Table 1): NIOSH 1402, 1405 OSHA 7	
Physical Description: Colorless liquid with a mild odor.				

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 102.2 BP: 271°F Sol: 2% Fl.P: 106°F IP: ? Sp.Gr: 0.81 VP: 3 mmHg FRZ: -130°F UEL: 5.5% LEL: 1.0% Class II Combustible Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.	NIOSH/OSHA 250 ppm: Sa* 400 ppm: Sa:Cf*/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin; head, drow; derm; in animals: narco TO: Eyes, skin, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed

Methyl isocyanate	Formula: CH_3NCO	CAS#: 624-83-9	RTECS#: NQ9450000	IDLH: 3 ppm
Conversion: 1 ppm = 2.34 mg/m^3	DOT: 2480 155			
Synonyms/Trade Names: Methyl ester of isocyanic acid, MIC				
Exposure Limits: NIOSH REL: TWA 0.02 ppm (0.05 mg/m^3) [skin] OSHA PEL: TWA 0.02 ppm (0.05 mg/m^3) [skin]			Measurement Methods (see Table 1): OSHA 54	
Physical Description: Colorless liquid with a sharp, pungent odor.				

Chemical & Physical Properties: MW: 57.1 BP: 102-104°F Sol(59°F): 10% Fl.P: 19°F IP: 10.67 eV Sp.Gr: 0.96 VP: 348 mmHg FRZ: -49°F UEL: 26% LEL: 5.3% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R. Provide: Eyewash Quick drench	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 0.2 ppm: Sa* 0.5 ppm: Sa:Cf* 1 ppm: ScbaF/SaF 3 ppm: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Water, oxidizers, acids, alkalis, amines, iron, tin, copper [Note: Usually contains inhibitors to prevent polymerization.]	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, nose, throat; resp sens, cough, pulm secretions, chest pain, dysp; asthma; eye, skin damage; in animals: pulm edema TO: Eyes, skin, resp sys	First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed

M

Methyl isopropyl ketone	Formula: $CH_3COCH(CH_3)_2$	CAS#: 563-80-4	RTECS#: EL9100000	IDLH: N.D.
Conversion: 1 ppm = 3.53 mg/m^3	DOT: 2397 127			
Synonyms/Trade Names: 2-Acetyl propane, Isopropyl methyl ketone, 3-Methyl-2-butanone, 3-Methyl butan-2-one, MIPK				
Exposure Limits: NIOSH REL: TWA 200 ppm (705 mg/m^3) OSHA PEL†: none			Measurement Methods (see Table 1): None available	
Physical Description: Colorless liquid with an acetone-like odor.				

Chemical & Physical Properties: MW: 86.2 BP: 199°F Sol: Very slight Fl.P: ? IP: 9.32 eV Sp.Gr: 0.81 VP: 42 mmHg FRZ: -134°F UEL: ? LEL: ? Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.	Respirator Recommendations (see Tables 3 and 4): Not available.

Incompatibilities and Reactivities: Oxidizers	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, muc memb, resp sys; cough TO: Eyes, skin, resp sys	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

Methyl mercaptan

Formula:	CAS#:	RTECS#:	IDLH:
CH_3SH	74-93-1	PB4375000	150 ppm

Conversion: 1 ppm = 1.97 mg/m^3

DOT: 1064 117

Synonyms/Trade Names: Mercaptomethane, Methanethiol, Methyl sulfhydrate

Exposure Limits:
NIOSH REL: C 0.5 ppm (1 mg/m^3) [15-minute]
OSHA PEL†: C 10 ppm (20 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2542
OSHA 26

Physical Description: Colorless gas with a disagreeable odor like garlic or rotten cabbage. [Note: A liquid below 43°F. Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 48.1
BP: 43°F
Sol: 2%
Fl.P: NA (Gas)
(oc) 0°F (Liquid)
IP: 9.44 eV
RGasD: 1.66
Sp.Gr: 0.90 (Liquid at 32°F)
VP: 1.7 atm
FRZ: -186°F
UEL: 21.8%
LEL: 3.9%
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact (liquid)
Frostbite
Eyes: Prevent eye contact (liquid)
Frostbite
Wash skin: N.R.
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash (liquid)
Quick drench (liquid)
Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
NIOSH
5 ppm: CcrOv/Sa
12.5 ppm: Sa:Cf/PaprOv
25 ppm: CcrFOv/GmFOv/PaprTOv/
SaT:Cf/ScbaF/SaF
150 ppm: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, bleaches, copper, aluminum, nickel-copper alloys

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con (liquid)
SY: Irrit eyes, skin, resp sys; narco; cyan; convuls; liquid: frostbite
TO: Eyes, skin, resp sys, CNS, blood

First Aid (see Table 6):
Eye: Irr immed (liquid)/Frostbite
Skin: Water flush immed (liquid)/Frostbite
Breath: Resp support

Methyl methacrylate

Formula:	CAS#:	RTECS#:	IDLH:
$CH_2=C(CH_3)COOCH_3$	80-62-6	OZ5075000	1000 ppm

Conversion: 1 ppm = 4.09 mg/m^3

DOT: 1247 129P (inhibited)

Synonyms/Trade Names: Methacrylate monomer, Methyl ester of methacrylic acid, Methyl-2-methyl-2-propenoate

Exposure Limits:
NIOSH REL: TWA 100 ppm (410 mg/m^3)
OSHA PEL: TWA 100 ppm (410 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2537
OSHA 94

Physical Description: Colorless liquid with an acrid, fruity odor.

Chemical & Physical Properties:
MW: 100.1
BP: 214°F
Sol: 1.5%
Fl.P(oc): 50°F
IP: 9.70 eV
Sp.Gr: 0.94
VP: 29 mmHg
FRZ: -54°F
UEL: 8.2%
LEL: 1.7%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1000 ppm: Sa:Cf£/CcrFOv/GmFOv/
PaprOv£/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Nitrates, oxidizers, peroxides, strong alkalis, moisture [Note: May polymerize if subjected to heat, oxidizers, or ultraviolet light. Usually contains an inhibitor such as hydroquinone.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; derm
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush prompt
Breath: Resp support
Swallow: Medical attention immed

Methyl parathion

Formula: $(CH_3O)_2P(S)OC_6H_4NO_2$ | CAS#: 298-00-0 | RTECS#: TG0175000 | IDLH: N.D.

Conversion:

DOT: 2783 152 (solid); 3018 152 (liquid)

Synonyms/Trade Names: Azophos®; O,O-Dimethyl-O-p-nitrophenylphosphorothioate; Parathion methyl

Exposure Limits:
NIOSH REL: TWA 0.2 mg/m^3 [skin]
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 5600
OSHA PV2112

Physical Description: White to tan, crystalline solid or powder with a pungent, garlic-like odor. [pesticide] [Note: The commercial product in xylene is a tan liquid.]

Chemical & Physical Properties:
MW: 263.2
BP: 289°F
Sol(77°F): 0.006%
Fl.P: ?
IP: ?
Sp.Gr: 1.36
VP: 0.00001 mmHg
MLT: 99°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
2 mg/m^3: CcrOv95/Sa
5 mg/m^3: Sa:Cf/PaprOvHie
10 mg/m^3: CcrFOv100/GmFOv100/PaprTOvHie/SaT:Cf/ScbaF/SaF
200 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, water [Note: Explosive risk when heated above 122°F.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; nau, vomit, abdom cramps, diarr, salv; head, dizz, lass; rhin, chest tight; blurred vision, miosis; card irreg; musc fasc; dysp
TO: Eyes, skin, resp sys, CNS, CVS, blood chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Methyl silicate

Formula: $(CH_3O)_4Si$ | CAS#: 681-84-5 | RTECS#: VV9800000 | IDLH: N.D.

Conversion: 1 ppm = 6.23 mg/m^3

DOT: 2606 155

Synonyms/Trade Names: Methyl orthosilicate, Tetramethoxysilane, Tetramethyl ester of silicic acid, Tetramethyl silicate

Exposure Limits:
NIOSH REL: TWA 1 ppm (6 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Clear, colorless liquid. [Note: A solid below 28°F.]

Chemical & Physical Properties:
MW: 152.3
BP: 250°F
Sol: Soluble
Fl.P: 205°F
IP: ?
Sp.Gr: 1.02
VP(77°F): 12 mmHg
FRZ: 28°F
UEL: ?
LEL: ?
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: When wet or contam
Change: N.R.
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Oxidizers; hexafluorides of rhenium, molybdenum & tungsten

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, corn damage (following even short-term exposure to the vapor); lung, kidney inj; pulm edema
TO: Eyes, resp sys, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

α-Methyl styrene	Formula: $C_6H_5C(CH_3)=CH_2$	CAS#: 98-83-9	RTECS#: WL5075300	IDLH: 700 ppm
Conversion: 1 ppm = 4.83 mg/m^3	DOT:			
Synonyms/Trade Names: AMS, Isopropenyl benzene, 1-Methyl-1-phenylethylene, 2-Phenyl propylene				
Exposure Limits: NIOSH REL: TWA 50 ppm (240 mg/m^3) ST 100 ppm (485 mg/m^3) OSHA PEL†: C 100 ppm (480 mg/m^3)			Measurement Methods (see Table 1): NIOSH 1501 OSHA 7	
Physical Description: Colorless liquid with a characteristic odor.				
Chemical & Physical Properties: MW: 118.2 BP: 330°F Sol: Insoluble Fl.P: 129°F IP: 8.35 eV Sp.Gr: 0.91 VP: 2 mmHg FRZ: -10°F UEL: 6.1% LEL: 1.9% Class II Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH 500 ppm: CcrOv*/Sa* 700 ppm: Sa:Cf*/CcrFOv/GmFOv/ PaprOv*/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Oxidizers, peroxides, halogens, catalysts for vinyl or ionic polymers; aluminum, iron chloride, copper [Note: Usually contains an inhibitor such as tert-butyl catechol.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose, throat; drow; derm TO: Eyes, skin, resp sys, CNS		First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed		

Metribuzin	Formula: $C_8H_{14}N_4OS$	CAS#: 21087-64-9	RTECS#: XZ2990000	IDLH: N.D.
Conversion:	DOT:			
Synonyms/Trade Names: 4-Amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)-one				
Exposure Limits: NIOSH REL: TWA 5 mg/m^3 OSHA PEL†: none			Measurement Methods (see Table 1): OSHA PV2044	
Physical Description: Colorless, crystalline solid. [herbicide]				
Chemical & Physical Properties: MW: 214.3 BP: ? Sol: 0.1% Fl.P: NA IP: ? Sp.Gr: 1.31 VP: 0.0000004 mmHg MLT: 257°F UEL: NA LEL: NA Noncombustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: None reported				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: In animals: CNS depres; thyroid, liver enzyme changes TO: CNS, thyroid, liver		First Aid (see Table 6): Eye: Irr immed Skin: Soap wash Breath: Fresh air Swallow: Medical attention immed		

Mica (containing less than 1% quartz)	Formula:	CAS#: 12001-26-2	RTECS#: VV8760000	IDLH: 1500 mg/m^3
Conversion:	DOT:			

Synonyms/Trade Names: Biotite, Lepidolite, Margarite, Muscovite, Phlogopite, Roscoelite, Zimmwaldite

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: TWA 3 mg/m^3 (resp) OSHA PEL†: TWA 20 mppcf	NIOSH 0600

Physical Description: Colorless, odorless flakes or sheets of hydrous silicates.

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 797 (approx) BP: ? Sol: Insoluble Fl.P: NA IP: NA Sp.Gr: 2.6-3.2 VP: 0 mmHg (approx) MLT: ? UEL: NA LEL: NA Noncombustible Solid	Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.	NIOSH 15 mg/m^3: Qm 30 mg/m^3: 95XQ/Sa 75 mg/m^3: Sa:Cf/PaprHie 150 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF 1500 mg/m^3: Sa:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Con SY: Irrit eyes; pneumoconiosis, cough, dysp; lass; low-wgt TO: Resp sys	Eye: Irr immed Breath: Fresh air

M

Mineral wool fiber	Formula:	CAS#:	RTECS#: PY8070000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: Manmade mineral fibers, Rock wool, Slag wool, Synthetic vitreous fibers [Note: Produced by blowing steam or air through molten rock (rock wool) or various furnace slags that are by-products of metal smelting or refining processes (slag wool).]

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: TWA 3 fibers/cm^3 (fibers ≤ 3.5 µm diameter & ≥ 10 µm in length) TWA 5 mg/m^3 (total) OSHA PEL: TWA 15 mg/m^3 (total) TWA 5 mg/m^3 (resp)	NIOSH 0500, 7400

Physical Description: Typically, a mineral "wool" with diameters >0.5 µm & >1.5 µm in length.

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: varies BP: NA Sol: Insoluble Fl.P: NA IP: NA Sp.Gr: ? VP: 0 mmHg (approx) MLT: ? UEL: NA LEL: NA Noncombustible Fibers	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: N.R. Change: Daily	NIOSH 5X REL: Qm 10X REL: 95XQ/Sa 25X REL: Sa:Cf/PaprHie 50X REL: 100F/PaprTHie/ScbaF/SaF 1000X REL: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Con SY: Irrit eyes, skin, resp sys; dysp TO: Eyes, skin, resp sys	Eye: Irr immed Breath: Fresh air

Molybdenum

Formula:	CAS#:	RTECS#:	IDLH:
Mo	7439-98-7	QA4680000	5000 mg/m^3 (as Mo)

Conversion: DOT:

Synonyms/Trade Names: Molybdenum metal

Exposure Limits:
NIOSH REL*: See Appendix D
OSHA PEL*†: TWA 15 mg/m^3
[*Note: The REL and PEL also apply to other insoluble molybdenum compounds (as Mo).]

Measurement Methods (see Table 1):
NIOSH 7300, 7301, 7303, 9102
OSHA ID121, ID125G

Physical Description: Dark gray or black powder with a metallic luster.

Chemical & Physical Properties:
MW: 95.9
BP: 8717°F
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 10.28
VP: 0 mmHg (approx)
MLT: 4752°F
UEL: NA
LEL: NA
Combustible Solid in form of dust or powder.

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
OSHA
75 mg/m^3: Qm
150 mg/m^3: 95XQ/Sa
375 mg/m^3: Sa:Cf/PaprHie
750 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF
5000 mg/m^3: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: In animals: irrit eyes, nose, throat; anor, diarr, low-wgt; listlessness; liver, kidney damage
TO: Eyes, resp sys, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Breath: Resp support
Swallow: Medical attention immed

Molybdenum (soluble compounds, as Mo)

Formula:	CAS#:	RTECS#:	IDLH:
			1000 mg/m^3 (as Mo)

Conversion: DOT:

Synonyms/Trade Names: Synonyms vary depending upon the specific soluble molybdenum compound.

Exposure Limits:
NIOSH REL: See Appendix D
OSHA PEL: TWA 5 mg/m^3

Measurement Methods (see Table 1):
NIOSH 7300, 7301, 7303, 9102
OSHA ID121, ID125G

Physical Description: Appearance and odor vary depending upon the specific soluble molybdenum compound.

Chemical & Physical Properties:
Properties vary depending upon the specific soluble molybdenum compound.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
OSHA
25 mg/m^3: Qm*
50 mg/m^3: 95XQ*/Sa*
125 mg/m^3: Sa:Cf*/PaprHie*
250 mg/m^3: 100F/SaT:Cf*/PaprTHie*/ScbaF/SaF
1000 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Varies

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: In animals: irrit eyes, nose, throat; anor; inco; dysp; anemia
TO: Eyes, resp sys, kidneys, blood

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush
Breath: Resp support
Swallow: Medical attention immed

Monocrotophos	Formula: $C_7H_{14}NO_5P$	CAS#: 6923-22-4	RTECS#: TC4375000	IDLH: N.D.
Conversion:	DOT: 2783 152 (organophosphorus pesticide, solid)			
Synonyms/Trade Names: Azodrin®, 3-Hydroxy-N-methylcrotonamide dimethylphosphate, Monocron				
Exposure Limits: NIOSH REL: TWA 0.25 mg/m^3 OSHA PEL†: none				Measurement Methods (see Table 1): NIOSH 5600 OSHA PV2045
Physical Description: Colorless to reddish-brown solid with a mild, ester odor. [insecticide]				
Chemical & Physical Properties: MW: 223.2 BP: 257°F Sol: Miscible Fl.P: >200°F IP: ? Sp.Gr: ? VP: 0.000007 mmHg MLT: 129°F UEL: ? LEL: ? Combustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Metals, low molecular weight alcohols & glycols [Note: Corrosive to black iron, drum steel, stainless steel 304 & brass. Should be stored at 70-80°F.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, miosis, blurred vision; dizz, convuls; dysp; salv, abdom cramps, nau, diarr, vomit; in animals: possible terato effects TO: Eyes, resp sys, CNS, CVS, blood chol, repro sys		First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed		

Monomethyl aniline	Formula: $C_6H_5NHCH_3$	CAS#: 100-61-8	RTECS#: BY4550000	IDLH: 100 ppm
Conversion: 1 ppm = 4.38 mg/m^3	DOT: 2294 153			
Synonyms/Trade Names: MA, (Methylamino)benzene, N-Methyl aniline, Methylphenylamine, N-Phenylmethylamine				
Exposure Limits: NIOSH REL: TWA 0.5 ppm (2 mg/m^3) [skin] OSHA PEL†: TWA 2 ppm (9 mg/m^3) [skin]				Measurement Methods (see Table 1): NIOSH 3511
Physical Description: Yellow to light-brown liquid with a weak, ammonia-like odor.				
Chemical & Physical Properties: MW: 107.2 BP: 384°F Sol: Insoluble Fl.P: 175°F IP: 7.32 eV Sp.Gr: 0.99 VP: 0.3 mmHg FRZ: -71°F UEL: ? LEL: ? Class IIIA Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH 5 ppm: Sa 12.5 ppm: Sa:Cf 25 ppm: SaT:Cf/ScbaF/SaF 100 ppm: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS/ScbaE	
Incompatibilities and Reactivities: Strong acids, strong oxidizers				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Lass, dizz, head; dysp, cyan; methemo; pulm edema; liver, kidney damage TO: Resp sys, liver, kidneys, blood, CNS		First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed		

Morpholine

Formula:	CAS#:	RTECS#:	IDLH:
C_4H_9ON	110-91-8	QD6475000	1400 ppm [10%LEL]

Conversion: 1 ppm = 3.56 mg/m^3 | DOT: 2054 132

Synonyms/Trade Names: Diethylene imidoxide; Diethylene oximide; Tetrahydro-1,4-oxazine; Tetrahydro-p-oxazine

Exposure Limits:
NIOSH REL: TWA 20 ppm (70 mg/m^3) [skin]
ST 30 ppm (105 mg/m^3)
OSHA PEL†: TWA 20 ppm (70 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH S150 (II-3)

Physical Description: Colorless liquid with a weak, ammonia- or fish-like odor. [Note: A solid below 23°F.]

Chemical & Physical Properties:
MW: 87.1
BP: 264°F
Sol: Miscible
Fl.P(oc): 98°F
IP: 8.88 eV
Sp.Gr: 1.007
VP: 6 mmHg
FRZ: 23°F
UEL: 11.2%
LEL: 1.4%
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash (>15%)
Quick drench (>25%)

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
500 ppm: Sa:Cf£/PaprOv£
1000 ppm: CcrFOv/GmFOv/PaprTOv£/ ScbaF/SaF
1400 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong acids, strong oxidizers, metals, nitro compounds [Note: Corrosive to metals.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, resp sys; vis dist; cough; in animals: liver, kidney damage
TO: Eyes, skin, resp sys, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Naphtha (coal tar)

Formula:	CAS#:	RTECS#:	IDLH:
	8030-30-6	DE3030000	1000 ppm [10%LEL]

Conversion: 1 ppm = 4.50 mg/m^3 (approx) | DOT:

Synonyms/Trade Names: Crude solvent coal tar naphtha, High solvent naphtha, Naphtha

Exposure Limits:
NIOSH REL: TWA 100 ppm (400 mg/m^3)
OSHA PEL: TWA 100 ppm (400 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1550

Physical Description: Reddish-brown, mobile liquid with an aromatic odor.

Chemical & Physical Properties:
MW: 110 (approx)
BP: 320-428°F
Sol: Insoluble
Fl.P: 100-109°F
IP: ?
Sp.Gr: 0.89-0.97
VP: <5 mmHg
FRZ: ?
UEL: ?
LEL: ?
Class II Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1000 ppm: Sa:Cf£/CcrFOv/GmFOv/ PaprOv£/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose; dizz, drow; derm; in animals: liver, kidney damage
TO: Eyes, skin, resp sys, CNS, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Naphthalene	Formula: $C_{10}H_8$	CAS#: 91-20-3	RTECS#: QJ0525000	IDLH: 250 ppm
Conversion: 1 ppm = 5.24 mg/m^3	DOT: 1334 133 (crude or refined); 2304 133 (molten)			
Synonyms/Trade Names: Naphthalin, Tar camphor, White tar				

Exposure Limits: NIOSH REL: TWA 10 ppm (50 mg/m^3) ST 15 ppm (75 mg/m^3) OSHA PEL†: TWA 10 ppm (50 mg/m^3)	Measurement Methods (see Table 1): NIOSH 1501 OSHA 35
Physical Description: Colorless to brown solid with an odor of mothballs. [Note: Shipped as a molten solid.]	

Chemical & Physical Properties: MW: 128.2 BP: 424°F Sol: 0.003% Fl.P: 174°F IP: 8.12 eV Sp.Gr: 1.15 VP: 0.08 mmHg MLT: 176°F UEL: 5.9% LEL: 0.9% Combustible Solid, but will take some effort to ignite.	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 100 ppm: CcrOv95*/Sa* 250 ppm: Sa:Cf*/CcrFOv100/ PaprOvHie*/ ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, chromic anhydride	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes; head, conf, excitement, mal; nau, vomit, abdom pain; irrit bladder; profuse sweat; jaun; hema, renal shutdown; derm, optical neuritis, corn damage TO: Eyes, skin, blood, liver, kidneys, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Molten flush immed/sol-liq soap wash prompt Breath: Resp support Swallow: Medical attention immed

Naphthalene diisocyanate	Formula: $C_{10}H_6(NCO)_2$	CAS#: 3173-72-6	RTECS#: NQ9600000	IDLH: N.D.
Conversion: 1 ppm = 8.60 mg/m^3	DOT:			
Synonyms/Trade Names: 1,5-Diisocyanatonaphthalene; 1,5-Naphthalene diisocyanate; 1,5-Naphthalene ester of isocyanic acid; NDI				

Exposure Limits: NIOSH REL: TWA 0.040 mg/m^3 (0.005 ppm) C 0.170 mg/m^3 (0.020 ppm) [10-minute] OSHA PEL: none	Measurement Methods (see Table 1): NIOSH 5525 OSHA PV2046
Physical Description: White to light-yellow, crystalline flakes.	

Chemical & Physical Properties: MW: 210.2 BP: 505°F Sol: ? Fl.P(oc): 311°F IP: ? Sp.Gr: ? VP(75°F): 0.003 mmHg MLT: 261°F UEL: ? LEL: ? Combustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily	Respirator Recommendations (see Tables 3 and 4): NIOSH 0.05 ppm: Sa* 0.125 ppm: Sa:Cf* 0.25 ppm: ScbaF/SaF 1 ppm: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: None reported	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, nose, throat; resp sens, cough, pulm secretions, chest pain, dysp; asthma TO: Eyes, resp sys	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

α-Naphthylamine	Formula: $C_{10}H_7NH_2$	CAS#: 134-32-7	RTECS#: QM1400000	IDLH: Ca [N.D.]
Conversion:	DOT: 2077 153			
Synonyms/Trade Names: 1-Aminonaphthalene, 1-Naphthylamine				

Exposure Limits: NIOSH REL: Ca See Appendix A OSHA PEL: [1910.1004] See Appendix B	Measurement Methods (see Table 1): NIOSH 5518 OSHA 93
Physical Description: Colorless crystals with an ammonia-like odor. [Note: Darkens in air to a reddish-purple color.]	

Chemical & Physical Properties: MW: 143.2 BP: 573°F Sol: 0.002% Fl.P: 315°F IP: 7.30 eV Sp.Gr: 1.12 VP(220°F): 1 mmHg MLT: 122°F UEL: ? LEL: ? Combustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily Provide: Eyewash Quick drench	Respirator Recommendations (see Tables 3 and 4): NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE See Appendix E (page 351)

Incompatibilities and Reactivities: Oxidizes in air	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Derm; hemorrhagic cystitis; dysp, ataxia, methemo; hema; dysuria; [carc] TO: Bladder, skin [bladder cancer]	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

N

β-Naphthylamine	Formula: $C_{10}H_7NH_2$	CAS#: 91-59-8	RTECS#: QM2100000	IDLH: Ca [N.D.]
Conversion:	DOT: 1650 153			
Synonyms/Trade Names: 2-Aminonaphthalene, 2-Naphthylamine				

Exposure Limits: NIOSH REL: Ca See Appendix A OSHA PEL: [1910.1009] See Appendix B	Measurement Methods (see Table 1): NIOSH 5518 OSHA 93
Physical Description: Odorless, white to red crystals with a faint, aromatic odor. [Note: Darkens in air to a reddish-purple color.]	

Chemical & Physical Properties: MW: 143.2 BP: 583°F Sol: Miscible in hot water Fl.P: 315°F IP: 9.71 eV Sp.Gr(208°F): 1.06 VP(226°F): 1 mmHg MLT: 232°F UEL: ? LEL: ? Combustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily Provide: Eyewash Quick drench	Respirator Recommendations (see Tables 3 and 4): NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE See Appendix E (page 351)

Incompatibilities and Reactivities: None reported	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Derm; hemorrhagic cystitis; dysp; ataxia; methemo, hema; dysuria; [carc] TO: Bladder, skin [bladder cancer]	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

Niax® Catalyst ESN	Formula:	CAS#: 62765-93-9	RTECS#: QR3900000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: None
[Note: A mixture of 95% dimethylaminopropionitrile & 5% bis(2-dimethylamino)ethyl ether.]

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: See Appendix C OSHA PEL: See Appendix C	None available

Physical Description: A liquid mixture.
[Note: Used in the past as a catalyst in the manufacture of flexible polyurethane foams.]

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: mixture BP: ? Sol: ? Fl.P: ? IP: ? Sp.Gr: ? VP: ? FRZ: ? UEL: ? LEL: ?	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily Provide: Eyewash Quick drench	NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin; urinary dist; neurological disorders; pins & needles in hands & feet; musc weak, lass, nau, vomit; decr nerve conduction in lower legs TO: Eyes, skin, urinary tract, PNS	Eye: Irr immed Skin: Soap flush immed Breath: Resp support Swallow: Medical attention immed

N

Nickel carbonyl	Formula: $Ni(CO)_4$	CAS#: 13463-39-3	RTECS#: QR6300000	IDLH: Ca [2 ppm]
Conversion: 1 ppm = 6.98 mg/m^3	DOT: 1259 131			

Synonyms/Trade Names: Nickel tetracarbonyl, Tetracarbonyl nickel

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: Ca TWA 0.001 ppm (0.007 mg/m^3) See Appendix A OSHA PEL: TWA 0.001 ppm (0.007 mg/m^3)	NIOSH 6007

Physical Description: Colorless to yellow liquid with a musty odor. [Note: A gas above 110°F.]

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 170.7 BP: 110°F Sol: 0.05% Fl.P: <-4°F IP: 8.28 eV Sp.Gr(63°F): 1.32 VP: 315 mmHg FRZ: -13°F UEL: ? LEL: 2% Class IB Flammable Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R. Provide: Eyewash Quick drench	NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Nitric acid, bromine, chlorine & other oxidizers; flammable materials

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Ing, Abs, Con SY: Head, dizz; nau, vomit, epigastric pain; substernal pain; cough, hyperpnea; cyan; lass; leucyt, pneu; delirium, convuls; [carc]; in animals: repro, terato effects TO: Lungs, paranasal sinus, CNS, repro sys [lung & nasal cancer]	Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

Nickel metal and other compounds (as Ni)

Formula:	CAS#:	RTECS#:	IDLH:
Ni (metal)	7440-02-0 (metal)	QR5950000 (metal)	Ca [10 mg/m^3 (as Ni)]

Conversion: DOT:

Synonyms/Trade Names: Nickel metal: Elemental nickel, Nickel catalyst
Synonyms of other nickel compounds vary depending upon the specific compound.

Exposure Limits:
NIOSH REL*: Ca
TWA 0.015 mg/m^3
See Appendix A
OSHA PEL*†: TWA 1 mg/m^3
[*Note: The REL and PEL do not apply to Nickel carbonyl.]

Measurement Methods (see Table 1):
NIOSH 7300, 7301, 7303, 9102
OSHA ID121, ID125G

Physical Description: Metal: Lustrous, silvery, odorless solid.

Chemical & Physical Properties:
MW: 58.7
BP: 5139°F
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 8.90 (Metal)
VP: 0 mmHg (approx)
MLT: 2831°F
UEL: NA
LEL: NA
Metal: Combustible Solid; nickel sponge catalyst may ignite SPONTANEOUSLY in air.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: N.R.
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Strong acids, sulfur, selenium, wood & other combustibles, nickel nitrate

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Sens derm, allergic asthma, pneu; [carc]
TO: Nasal cavities, lungs, skin [lung and nasal cancer]

First Aid (see Table 6):
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

N

Nicotine

Formula:	CAS#:	RTECS#:	IDLH:
$C_5H_4NC_4H_7NCH_3$	54-11-5	QS5250000	5 mg/m^3

Conversion: DOT: 1654 151

Synonyms/Trade Names: 3-(1-Methyl-2-pyrrolidyl)pyridine

Exposure Limits:
NIOSH REL: TWA 0.5 mg/m^3 [skin]
OSHA PEL: TWA 0.5 mg/m^3 [skin]

Measurement Methods (see Table 1):
NIOSH 2544, 2551

Physical Description: Pale-yellow to dark-brown liquid with a fish-like odor when warm. [insecticide]

Chemical & Physical Properties:
MW: 162.2
BP: 482°F (Decomposes)
Sol: Miscible
Fl.P: 203°F
IP: 8.01 eV
Sp.Gr: 1.01
VP: 0.08 mmHg
FRZ: -110°F
UEL: 4.0%
LEL: 0.7%
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
5 mg/m^3: Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong acids

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Nau, salv, abdom pain, vomit, diarr; head, dizz, hearing, vis dist; conf, lass, inco; card arrhy; convuls, dysp; in animals: terato effects
TO: CNS, CVS, lungs, GI tract, repro sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Nitric acid

Formula:	CAS#:	RTECS#:	IDLH:
HNO_3	7697-37-2	QU5775000	25 ppm

Conversion: 1 ppm = 2.58 mg/m^3

DOT: 2032 157 (fuming); 2031 157 (other than red fuming)

Synonyms/Trade Names: Aqua fortis, Engravers acid, Hydrogen nitrate, Red fuming nitric acid (RFNA), White fuming nitric acid (WFNA)

Exposure Limits:
NIOSH REL: TWA 2 ppm (5 mg/m^3)
ST 4 ppm (10 mg/m^3)
OSHA PEL†: TWA 2 ppm (5 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 7903
OSHA ID165SG

Physical Description: Colorless, yellow, or red, fuming liquid with an acrid, suffocating odor. [Note: Often used in an aqueous solution. Fuming nitric acid is concentrated nitric acid that contains dissolved nitrogen dioxide.]

Chemical & Physical Properties:
MW: 63.0
BP: 181°F
Sol: Miscible
Fl.P: NA
IP: 11.95 eV
Sp.Gr(77°F): 1.50
VP: 48 mmHg
FRZ: -44°F
UEL: NA
LEL: NA
Noncombustible Liquid, but increases the flammability of combustible materials.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash (pH<2.5)
Quick drench (pH<2.5)

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
25 ppm: Sa:Cf*/CcrFS¿/GmFS¿/ ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS¿/ScbaE

Incompatibilities and Reactivities: Combustible materials, metallic powders, hydrogen sulfide, carbides, alcohols [Note: Reacts with water to produce heat. Corrosive to metals.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, muc memb; delayed pulm edema, pneu, bron; dental erosion
TO: Eyes, skin, resp sys, teeth

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

N

Nitric oxide

Formula:	CAS#:	RTECS#:	IDLH:
NO	10102-43-9	QX0525000	100 ppm

Conversion: 1 ppm = 1.23 mg/m^3

DOT: 1660 124

Synonyms/Trade Names: Mononitrogen monoxide, Nitrogen monoxide

Exposure Limits:
NIOSH REL: TWA 25 ppm (30 mg/m^3)
OSHA PEL: TWA 25 ppm (30 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 6014
OSHA ID190

Physical Description: Colorless gas. [Note: Shipped as a nonliquefied compressed gas.]

Chemical & Physical Properties:
MW: 30.0
BP: -241°F
Sol: 5%
Fl.P: NA
IP: 9.27 eV
RGasD: 1.04
VP: 34.2 atm
FRZ: -263°F
UEL: NA
LEL: NA
Nonflammable Gas, but will accelerate the burning of combustible materials.

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
100 ppm: Sa:Cf*/CcrFS¿/PaprS*¿/ GmFS¿/Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS¿/ScbaE

Incompatibilities and Reactivities: Fluorine, combustible materials, ozone, NH_3, chlorinated hydrocarbons, metals, carbon disulfide [Note: Reacts with water to form nitric acid. Rapidly converted in air to nitrogen dioxide.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh
SY: Irrit eyes, wet skin, nose, throat; drow, uncon; methemo
TO: Eyes, skin, resp sys, blood, CNS

First Aid (see Table 6):
Breath: Resp support

p-Nitroaniline	Formula: $NO_2C_6H_4NH_2$	CAS#: 100-01-6	RTECS#: BY7000000	IDLH: 300 mg/m^3
Conversion:	DOT: 1661 153			
Synonyms/Trade Names: para-Aminonitrobenzene, 4-Nitroaniline, 4-Nitrobenzenamine, p-Nitrophenylamine, PNA				

Exposure Limits:
NIOSH REL: TWA 3 mg/m^3 [skin]
OSHA PEL†: TWA 6 mg/m^3 (1 ppm) [skin]

Measurement Methods (see Table 1):
NIOSH 5033

Physical Description: Bright yellow, crystalline powder with a slight ammonia-like odor.

Chemical & Physical Properties:
MW: 138.1
BP: 630°F
Sol: 0.08%
Fl.P: 390°F
IP: 8.85 eV
Sp.Gr: 1.42
VP: 0.00002 mmHg
MLT: 295°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
30 mg/m^3: Sa*
75 mg/m^3: Sa:Cf*
150 mg/m^3: ScbaF/SaF
300 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong reducers
[Note: May result in spontaneous heating of organic materials in the presence of moisture.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit nose, throat; cyan, ataxia; tacar, tachypnea; dysp; irrity; vomit, diarr; convuls; resp arrest; anemia; methemo; jaundice
TO: Resp sys, blood, heart, liver

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

N

Nitrobenzene	Formula: $C_6H_5NO_2$	CAS#: 98-95-3	RTECS#: DA6475000	IDLH: 200 ppm
Conversion: 1 ppm = 5.04 mg/m^3	DOT: 1662 152			
Synonyms/Trade Names: Essence of mirbane, Nitrobenzol, Oil of mirbane				

Exposure Limits:
NIOSH REL: TWA 1 ppm (5 mg/m^3) [skin]
OSHA PEL: TWA 1 ppm (5 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 2005, 2017

Physical Description: Yellow, oily liquid with a pungent odor like paste shoe polish.
[Note: A solid below 42°F.]

Chemical & Physical Properties:
MW: 123.1
BP: 411°F
Sol: 0.2%
Fl.P: 190°F
IP: 9.92 eV
Sp.Gr: 1.20
VP(77°F): 0.3 mmHg
FRZ: 42°F
UEL: ?
LEL(200°F): 1.8%
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: N.R.
Remove: When wet or contam
Change: Daily
Provide: Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
10 ppm: CcrOv*/Sa*
25 ppm: Sa:Cf*/PaprOv*
50 ppm: CcrFOv/GmFOv/PaprTOv*/ ScbaF/SaF
200 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Concentrated nitric acid, nitrogen tetroxide, caustics, phosphorus pentachloride, chemically-active metals such as tin or zinc

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; anoxia; derm; anemia; methemo; in animals: liver, kidney damage; testicular effects
TO: Eyes, skin, blood, liver, kidneys, CVS, repro sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

4-Nitrobiphenyl	Formula: $C_6H_5C_6H_4NO_2$	CAS#: 92-93-3	RTECS#: DV5600000	IDLH: Ca [N.D.]
Conversion:	DOT:			

Synonyms/Trade Names: p-Nitrobiphenyl, p-Nitrodiphenyl, 4-Nitrodiphenyl, p-Phenylnitrobenzene, 4-Phenylnitrobenzene, PNB

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: Ca See Appendix A OSHA PEL: [1910.1003] See Appendix B	NIOSH P&CAM273 (II-4) OSHA PV2082

Physical Description: White to yellow, needle-like, crystalline solid with a sweetish odor.

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 199.2 BP: 644°F Sol: Insoluble Fl.P: 290°F IP: ? Sp.Gr: ? VP: ? MLT: 237°F UEL: ? LEL: ? Combustible Solid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily Provide: Eyewash Quick drench	NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE See Appendix E (page 351)

Incompatibilities and Reactivities: Strong reducers

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Abs, Ing, Con SY: Head, drow, dizz; dysp; ataxia, lass; methemo; urinary burning; acute hemorrhagic cystitis; [carc] TO: Bladder, blood [in animals: bladder tumors]	Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

N

p-Nitrochlorobenzene	Formula: $ClC_6H_4NO_2$	CAS#: 100-00-5	RTECS#: CZ1050000	IDLH: Ca [100 mg/m^3]
Conversion:	DOT: 1578 152			

Synonyms/Trade Names: p-Chloronitrobenzene, 4-Chloronitrobenzene, 1-Chloro-4-nitrobenzene, 4-Nitrochlorobenzene, PCNB, PNCB

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: Ca See Appendix A [skin] OSHA PEL: TWA 1 mg/m^3 [skin]	NIOSH 2005

Physical Description: Yellow, crystalline solid with a sweet odor.

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 157.6 BP: 468°F Sol: Slight Fl.P: 261°F IP: 9.96 eV Sp.Gr: 1.52 VP(86°F): 0.2 mmHg MLT: 182°F UEL: ? LEL: ? Solid that does not burn, or burns with difficulty.	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily Provide: Eyewash Quick drench	NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, alkalis

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Abs, Ing, Con SY: Anoxia; unpleasant taste; anemia; methemo; in animals: hema; spleen, kidney, bone marrow changes; repro effects; [carc] TO: Blood, liver, kidneys, CVS, spleen, bone marrow, repro sys [in animals: vascular & liver tumors]	Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

Nitroethane

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3CH_2NO_2$	79-24-3	KI5600000	1000 ppm

Conversion: 1 ppm = 3.07 mg/m^3

DOT: 2842 129

Synonyms/Trade Names: Nitroetan

Exposure Limits:
NIOSH REL: TWA 100 ppm (310 mg/m^3)
OSHA PEL: TWA 100 ppm (310 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2526

Physical Description: Colorless, oily liquid with a mild, fruity odor.

Chemical & Physical Properties:
MW: 75.1
BP: 237°F
Sol: 5%
Fl.P: 82°F
IP: 10.88 eV
Sp.Gr: 1.05
VP(77°F): 21 mmHg
FRZ: -130°F
UEL: ?
LEL: 3.4%
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1000 ppm: ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: ScbaE

Incompatibilities and Reactivities: Amines; strong acids, alkalis & oxidizers; hydrocarbons; combustibles; metal oxides

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Derm; in animals: lac; dysp, pulm rales, edema; liver, kidney inj; narco
TO: Skin, resp sys, CNS, kidneys, liver

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Nitrogen dioxide

Formula:	CAS#:	RTECS#:	IDLH:
NO_2	10102-44-0	QW9800000	20 ppm

Conversion: 1 ppm = 1.88 mg/m^3

DOT: 1067 124

Synonyms/Trade Names: Dinitrogen tetroxide (N_2O_4), Nitrogen peroxide

Exposure Limits:
NIOSH REL: ST 1 ppm (1.8 mg/m^3)
OSHA PEL†: C 5 ppm (9 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 6014
OSHA ID182

Physical Description: Yellowish-brown liquid or reddish-brown gas (above 70°F) with a pungent, acrid odor. [Note: In solid form (below 15°F) it is found structurally as N_2O_4.]

Chemical & Physical Properties:
MW: 46.0
BP: 70°F
Sol: Reacts
Fl.P: NA
IP: 9.75 eV
RGasD: 2.62
Sp.Gr: 1.44 (Liquid at 68°F)
VP: 720 mmHg
FRZ: 15°F
UEL: NA
LEL: NA
Noncombustible Liquid/Gas, but will accelerate the burning of combustible materials.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
20 ppm: Sa:Cf£/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS¿/ScbaE

Incompatibilities and Reactivities: Combustible material, water, chlorinated hydrocarbons, carbon disulfide, ammonia [Note: Reacts with water to form nitric acid.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, nose, throat; cough, mucoid frothy sputum, decr pulm func, chronic bron, dysp; chest pain; pulm edema, cyan, tachypnea, tacar
TO: Eyes, resp sys, CVS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Nitrogen trifluoride

Formula:	CAS#:	RTECS#:	IDLH:
NF_3	7783-54-2	QX1925000	1000 ppm

Conversion: 1 ppm = 2.90 mg/m^3

DOT: 2451 122

Synonyms/Trade Names: Nitrogen fluoride, Trifluoramine, Trifluorammonia

Exposure Limits:
NIOSH REL: TWA 10 ppm (29 mg/m^3)
OSHA PEL: TWA 10 ppm (29 mg/m^3)

Measurement Methods (see Table 1):
None available

Physical Description: Colorless gas with a moldy odor.
[Note: Shipped as a nonliquefied compressed gas.]

Chemical & Physical Properties:
MW: 71.0
BP: -200°F
Sol: Slight
Fl.P: NA
IP: 12.97 eV
RGasD: 2.46
VP: >1 atm
FRZ: -340°F
UEL: NA
LEL: NA
Nonflammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
100 ppm: CcrS/Sa
250 ppm: Sa:Cf/PaprS
500 ppm: CcrFS/GmFS/PaprTS*/SaT:Cf*/ScbaF/SaF
1000 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Water, oil, grease, oxidizable materials, ammonia, carbon monoxide, methane, hydrogen, hydrogen sulfide, activated charcoal, diborane

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh
SY: In animals: anoxia, cyan; methemo; lass, dizz, head; liver, kidney inj
TO: Blood, liver, kidneys

First Aid (see Table 6):
Breath: Resp support

Nitroglycerine

Formula:	CAS#:	RTECS#:	IDLH:
$CH_2NO_3CHNO_3CH_2NO_3$	55-63-0	QX2100000	75 mg/m^3

Conversion: 1 ppm = 9.29 mg/m^3

DOT: 1204 127 (≤ 1% solution in alcohol);
3064 127 (1-5% solution in alcohol)

Synonyms/Trade Names: Glyceryl trinitrate; NG; 1,2,3-Propanetriol trinitrate; Trinitroglycerine

Exposure Limits:
NIOSH REL: ST 0.1 mg/m^3 [skin]
OSHA PEL†: C 0.2 ppm (2 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 2507
OSHA 43

Physical Description: Colorless to pale-yellow, viscous liquid or solid (below 56°F).
[Note: An explosive ingredient in dynamite (20-40%) with ethylene glycol dinitrate (80-60%).]

Chemical & Physical Properties:
MW: 227.1
BP: Begins to decompose at 122-140°F
Sol: 0.1%
Fl.P: Explodes
IP: ?
Sp.Gr: 1.60
VP: 0.0003 mmHg
FRZ: 56°F
UEL: ?
LEL: ?
Explosive Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: Daily
Provide: Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
1 mg/m^3: Sa*
2.5 mg/m^3: Sa:Cf*
5 mg/m^3: SaT:Cf*/ScbaF/SaF
75 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Heat, ozone, shock, acids [Note: An OSHA Class A Explosive (1910.109).]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Throb head; dizz; nau, vomit, abdom pain; hypotension; flush; palp; methemo; delirium, CNS depres; angina; skin irrit
TO: CVS, blood, skin, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Nitromethane

Formula:	CAS#:	RTECS#:	IDLH:
CH_3NO_2	75-52-5	PA9800000	750 ppm

Conversion: 1 ppm = 2.50 mg/m^3

DOT: 1261 129

Synonyms/Trade Names: Nitrocarbol

Exposure Limits:
NIOSH REL: See Appendix D
OSHA PEL: TWA 100 ppm (250 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2527

Physical Description: Colorless, oily liquid with a disagreeable odor.

Chemical & Physical Properties:
MW: 61.0
BP: 214°F
Sol: 10%
Fl.P: 95°F
IP: 11.08 eV
Sp.Gr: 1.14
VP: 28 mmHg
FRZ: -20°F
UEL: ?
LEL: 7.3%
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
OSHA
750 ppm: Sa:Cf£/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: ScbaE

Incompatibilities and Reactivities: Amines; strong acids, alkalis & oxidizers; hydrocarbons & other combustible materials; metallic oxides [Note: Slowly corrodes steel & copper when wet.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Derm; in animals: irrit eyes, resp sys; convuls, narco; liver damage
TO: Eyes, skin, CNS, liver

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

2-Nitronaphthalene

Formula:	CAS#:	RTECS#:	IDLH:
$C_{10}H_7NO_2$	581-89-5	QJ9760000	Ca [N.D.]

Conversion:

DOT: 2538 133

Synonyms/Trade Names: β-Nitronaphthalene

Exposure Limits:
NIOSH REL: Ca*
See Appendix A
[*Note: Since metabolized to β-Naphthylamine.]
OSHA PEL: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless solid.

Chemical & Physical Properties:
MW: 178.2
BP: ?
Sol: Insoluble
Fl.P: ?
IP: 8.67 eV
Sp.Gr: ?
VP: ?
MLT: 174°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: For "Nitrates" in general: Aluminum, cyanides, esters, phosphorus, tin chlorides, thiocyanates, sodium hypophosphite

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit skin, resp sys; derm; [carc]
TO: Skin, resp sys [bladder cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

1-Nitropropane	Formula: $CH_3CH_2CH_2NO_2$	CAS#: 108-03-2	RTECS#: TZ5075000	IDLH: 1000 ppm
Conversion: 1 ppm = 3.64 mg/m^3	DOT: 2608 129			
Synonyms/Trade Names: Nitropropane, 1-NP				

Exposure Limits:
NIOSH REL: TWA 25 ppm (90 mg/m^3)
OSHA PEL: TWA 25 ppm (90 mg/m^3)

Measurement Methods (see Table 1):
OSHA 46

Physical Description: Colorless liquid with a somewhat disagreeable odor.

Chemical & Physical Properties:
MW: 89.1
BP: 269°F
Sol: 1%
Fl.P: 96°F
IP: 10.81 eV
Sp.Gr: 1.00
VP: 8 mmHg
FRZ: -162°F
UEL: ?
LEL: 2.2%
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: Prevent eye contact
Wash skin: N.R.
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
250 ppm: Sa*
625 ppm: Sa:Cf*
1000 ppm: ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: ScbaE

Incompatibilities and Reactivities: Amines; strong acids, alkalis & oxidizers; hydrocarbons & other combustible materials; metal oxides

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes; head, nau, vomit, diarr; in animals: liver, kidney damage
TO: Eyes, CNS, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

2-Nitropropane	Formula: $(CH_3)_2CH(NO_2)$	CAS#: 79-46-9	RTECS#: TZ5250000	IDLH: Ca [100 ppm]
Conversion: 1 ppm = 3.64 mg/m^3	DOT: 2608 129			
Synonyms/Trade Names: Dimethylnitromethane, iso-Nitropropane, 2-NP				

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL†: TWA 25 ppm (90 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2528
OSHA 15, 46

Physical Description: Colorless liquid with a pleasant, fruity odor.

Chemical & Physical Properties:
MW: 89.1
BP: 249°F
Sol: 2%
Fl.P: 75°F
IP: 10.71 eV
Sp.Gr: 0.99
VP: 13 mmHg
FRZ: -135°F
UEL: 11.0%
LEL: 2.6%
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: ScbaE

Incompatibilities and Reactivities: Amines; strong acids, alkalis & oxidizers; metal oxides; combustible materials

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, resp sys; head, anor, nau, vomit, diarr; kidney, liver damage; [carc]
TO: Eyes, skin, resp sys, CNS, kidneys, liver [in animals: liver tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

N-Nitrosodimethylamine

Formula:	CAS#:	RTECS#:	IDLH:
$(CH_3)_2N_2O$	62-75-9	IQ0525000	Ca [N.D.]

Conversion:

DOT:

Synonyms/Trade Names: Dimethylnitrosamine; N,N-Dimethylnitrosamine; DMNA; N-Methyl-N-nitroso-methanamine; NDMA; N-Nitroso-N,N-dimethylamine

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL: [1910.1016] See Appendix B

Measurement Methods (see Table 1):
NIOSH 2522
OSHA 38

Physical Description: Yellow, oily liquid with a faint, characteristic odor.

Chemical & Physical Properties:
MW: 74.1
BP: 306°F
Sol: Soluble
Fl.P: ?
IP: 8.69 eV
Sp.Gr: 1.005
VP: 3 mmHg
FRZ: ?
UEL: ?
LEL: ?
Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

See Appendix E (page 351)

Incompatibilities and Reactivities: Strong oxidizers [Note: Should be stored in dark bottles.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Nau, vomit, diarr, abdom cramps; head; fever; enlarged liver, jaun; decr liver, kidney, pulm func; [carc]
TO: Liver, kidneys,lungs [in animals; lung, kidney, liver & nasal cavity tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

m-Nitrotoluene

Formula:	CAS#:	RTECS#:	IDLH:
$NO_2C_6H_4CH_3$	99-08-1	XT2975000	200 ppm

Conversion: 1 ppm = 5.61 mg/m^3

DOT: 1664 152

Synonyms/Trade Names: m-Methylnitrobenzene, 3-Methylnitrobenzene, meta-Nitrotoluene, 3-Nitrotoluene

Exposure Limits:
NIOSH REL: TWA 2 ppm (11 mg/m^3) [skin]
OSHA PEL†: TWA 5 ppm (30 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 2005

Physical Description: Yellow liquid with a weak, aromatic odor. [Note: A solid below 59°F.]

Chemical & Physical Properties:
MW: 137.1
BP: 450°F
Sol: 0.05%
Fl.P: 223°F
IP: 9.48 eV
Sp.Gr: 1.16
VP: 0.1 mmHg
FRZ: 59°F
UEL: ?
LEL: 1.6%
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
20 ppm: Sa*
50 ppm: Sa:Cf*
100 ppm: SaT:Cf*/ScbaF/SaF
200 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, sulfuric acid

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Anoxia, cyan; head, lass, dizz; ataxia; dysp; tacar; nau, vomit
TO: Blood, CNS, CVS, skin, GI tract

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

o-Nitrotoluene

Formula:	CAS#:	RTECS#:	IDLH:
$NO_2C_6H_4CH_3$	88-72-2	XT3150000	200 ppm

Conversion: 1 ppm = 5.61 mg/m^3

DOT: 1664 152

Synonyms/Trade Names: o-Methylnitrobenzene, 2-Methylnitrobenzene, ortho-Nitrotoluene, 2-Nitrotoluene

Exposure Limits:
NIOSH REL: TWA 2 ppm (11 mg/m^3) [skin]
OSHA PEL†: TWA 5 ppm (30 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 2005

Physical Description: Yellow liquid with a weak, aromatic odor.
[Note: A solid below 25°F.]

Chemical & Physical Properties:
MW: 137.1
BP: 432°F
Sol: 0.07%
Fl.P: 223°F
IP: 9.43 eV
Sp.Gr: 1.16
VP: 0.1 mmHg
FRZ: 25°F
UEL: ?
LEL: 2.2%
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
20 ppm: Sa*
50 ppm: Sa:Cf*
100 ppm: SaT:Cf*/ScbaF/SaF
200 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, sulfuric acid

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Anoxia, cyan; head, lass, dizz; ataxia; dysp; tacar; nau, vomit
TO: Blood, CNS, CVS, skin, GI tract

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

p-Nitrotoluene

Formula:	CAS#:	RTECS#:	IDLH:
$NO_2C_6H_4CH_3$	99-99-0	XT3325000	200 ppm

Conversion: 1 ppm = 5.61 mg/m^3

DOT: 1664 152

Synonyms/Trade Names: p-Methylnitrobenzene, 4-Methylnitrobenzene, para-Nitrotoluene, 4-Nitrotoluene

Exposure Limits:
NIOSH REL: TWA 2 ppm (11 mg/m^3) [skin]
OSHA PEL†: TWA 5 ppm (30 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 2005

Physical Description: Crystalline solid with a weak, aromatic odor.

Chemical & Physical Properties:
MW: 137.1
BP: 460°F
Sol: 0.04%
Fl.P: 223°F
IP: 9.50 eV
Sp.Gr: 1.12
VP: 0.1 mmHg
MLT: 126°F
UEL: ?
LEL: 1.6%
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH
20 ppm: Sa*
50 ppm: Sa:Cf*
100 ppm: SaT:Cf*/ScbaF/SaF
200 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, sulfuric acid

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Anoxia, cyan; head, lass, dizz; ataxia; dysp; tacar; nau, vomit
TO: Blood, CNS, CVS, skin, GI tract

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Nitrous oxide

Formula:	CAS#:	RTECS#:	IDLH:
N_2O	10024-97-2	QX1350000	N.D.

Conversion: 1 ppm = 1.80 mg/m^3

DOT: 1070 122; 2201 122 (refrigerated liquid)

Synonyms/Trade Names: Dinitrogen monoxide, Hyponitrous acid anhydride, Laughing gas

Exposure Limits:
NIOSH REL*: TWA 25 ppm (46 mg/m^3) (TWA over the time exposed)
[*Note: REL for exposure to waste anesthetic gas.]
OSHA PEL: none

Measurement Methods (see Table 1):
NIOSH 3800, 6600
OSHA ID166

Physical Description: Colorless gas with a slightly sweet odor. [inhalation anesthetic] [Note: Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 44.0
BP: -127°F
Sol(77°F): 0.1%
Fl.P: NA
IP: 12.89 eV
RGasD: 1.53
VP: 51.3 atm
FRZ: -132°F
UEL: NA
LEL: NA
Nonflammable Gas, but supports combustion at elevated temperatures.

Personal Protection/Sanitation (see Table 2):
Skin: Frostbite
Eyes: Frostbite
Wash skin: N.R.
Remove: N.R.
Change: N.R.
Provide: Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Aluminum, boron, hydrazine, lithium hydride, phosphine, sodium

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con (liquid)
SY: Dysp; drow, head; asphy; repro effects; liquid: frostbite
TO: Resp sys, CNS, repro sys

First Aid (see Table 6):
Eye: Frostbite
Skin: Frostbite
Breath: Fresh air

N

Nonane

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3(CH_2)_7CH_3$	111-84-2	RA6115000	N.D.

Conversion: 1 ppm = 5.25 mg/m^3

DOT: 1920 128

Synonyms/Trade Names: n-Nonane, Nonyl hydride

Exposure Limits:
NIOSH REL: TWA 200 ppm (1050 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless liquid with a gasoline-like odor.

Chemical & Physical Properties:
MW: 128.3
BP: 303°F
Sol: Insoluble
Fl.P: 88°F
IP: 10.21 eV
Sp.Gr: 0.72
VP: 3 mmHg
FRZ: -60°F
UEL: 2.9%
LEL: 0.8%
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: Prevent eye contact
Wash skin: Daily
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong oxidizers (e.g., peroxides, nitrates, perchlorates)

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; head, drow, dizz, conf, nau, tremor, inco; chemical pneu (aspir liquid)
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

1-Nonanethiol	Formula: $CH_3(CH_2)_8SH$	CAS#: 1455-21-6	RTECS#:	IDLH: N.D.
Conversion: 1 ppm = 6.56 mg/m^3	DOT: 1228 131			
Synonyms/Trade Names: 1-Mercaptononane, n-Nonyl mercaptan, Nonylthiol				
Exposure Limits: NIOSH REL: C 0.5 ppm (3.3 mg/m^3) [15-minute] OSHA PEL: none				Measurement Methods (see Table 1): None available
Physical Description: Liquid.				

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 160.3 BP: ? Sol: Insoluble Fl.P: ? IP: ? Sp.Gr: ? VP: ? FRZ: ? UEL: ? LEL: ? Combustible Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.	NIOSH 5 ppm: CcrOv/Sa 12.5 ppm: Sa:Cf/PaprOv 25 ppm: CcrFOv/GmFOv/PaprTOv/ ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, reducing agents, strong acids & bases, alkali metals	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose, throat; lass, cyan, incr respiration, nau, drow, head, vomit TO: Eyes, skin, resp sys, blood, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash Breath: Resp support Swallow: Medical attention immed

O

Octachloronaphthalene	Formula: $C_{10}C_{l8}$	CAS#: 2234-13-1	RTECS#: QK0250000	IDLH: See Appendix F
Conversion:	DOT:			
Synonyms/Trade Names: Halowax® 1051; 1,2,3,4,5,6,7,8-Octachloronaphthalene; Perchloronaphthalene				
Exposure Limits: NIOSH REL: TWA 0.1 mg/m^3 ST 0.3 mg/m^3 [skin] OSHA PEL†: TWA 0.1 mg/m^3 [skin]				Measurement Methods (see Table 1): NIOSH S97 (II-2)
Physical Description: Waxy, pale-yellow solid with an aromatic odor.				

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 403.7 BP: 770°F Sol: Insoluble Fl.P: NA IP: ? Sp.Gr: 2.00 VP: <1 mmHg MLT: 365°F UEL: NA LEL: NA Noncombustible Solid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily	NIOSH/OSHA 1 mg/m^3: Sa/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE See Appendix F

Incompatibilities and Reactivities: Strong oxidizers	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Acne-form derm; liver damage, jaun TO: Skin, liver	First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed

1-Octadecanethiol

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3(CH_2)_{17}SH$	2885-00-9		N.D.

Conversion: 1 ppm = 11.72 mg/m^3

DOT: 1228 131 (liquid)

Synonyms/Trade Names: 1-Mercaptooctadecane, Octadecyl mercaptan, Stearyl mercaptan

Exposure Limits:
NIOSH REL: C 0.5 ppm (5.9 mg/m^3) [15-minute]
OSHA PEL: none

Measurement Methods (see Table 1):
None available

Physical Description: Solid or liquid (above 77°F).

Chemical & Physical Properties:
MW: 286.6
BP: ?
Sol: Insoluble
Fl.P: ?
IP: ?
Sp.Gr: 0.85
VP: ?
MLT: 77°F
UEL: ?
LEL: ?
Combustible Solid
Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH
5 ppm: CcrOv/Sa
12.5 ppm: Sa:Cf/PaprOv
25 ppm: CcrFOv/GmFOv/PaprTOv/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, reducing agents, strong acids & bases, alkali metals

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; head, dizz, lass, cyan, nau, convuls
TO: Eyes, skin, resp sys, CNS, blood

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Octane

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3[CH_2]_6CH_3$	111-65-9	RG8400000	1000 ppm [10%LEL]

Conversion: 1 ppm = 4.67 mg/m^3

DOT: 1262 128

Synonyms/Trade Names: n-Octane, normal-Octane

Exposure Limits:
NIOSH REL: TWA 75 ppm (350 mg/m^3)
C 385 ppm (1800 mg/m^3) [15-minute]
OSHA PEL†: TWA 500 ppm (2350 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1500
OSHA 7

Physical Description: Colorless liquid with a gasoline-like odor.

Chemical & Physical Properties:
MW: 114.2
BP: 258°F
Sol(77°F): 0.00007%
Fl.P: 56°F
IP: 9.82 eV
Sp.Gr: 0.70
VP: 10 mmHg
FRZ: -70°F
UEL: 6.5%
LEL: 1.0%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
750 ppm: Sa*
1000 ppm: Sa:Cf*/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, nose; drow; derm; chemical pneu (aspir liquid); in animals: narco
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

1-Octanethiol	Formula: $CH_3(CH_2)_7SH$	CAS#: 111-88-6	RTECS#:	IDLH: N.D.
Conversion: 1 ppm = 5.98 mg/m^3	DOT: 1228 131			
Synonyms/Trade Names: 1-Mercaptooctane, n-Octyl mercaptan, Octylthiol, 1-Octylthiol				
Exposure Limits: NIOSH REL: C 0.5 ppm (3.0 mg/m^3) [15-minute] OSHA PEL: none			Measurement Methods (see Table 1): NIOSH 2510	
Physical Description: Water-white liquid with a mild odor.				
Chemical & Physical Properties: MW: 146.3 BP: 390°F Sol: Insoluble Fl.P(oc): 115°F IP: ? Sp.Gr: 0.84 VP(212°F): 3 mmHg FRZ: -57°F UEL: ? LEL: ? Class II Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH 5 ppm: CcrOv/Sa 12.5 ppm: Sa:Cf/PaprOv 25 ppm: CcrFOv/GmFOv/PaprTOv/ ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Oxidizers, reducing agents, strong acids & bases, alkali metals				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose, throat; lass, cyan, incr respiration, nau, drow, head, vomit TO: Eyes, skin, resp sys, blood, CNS			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed	

Oil mist (mineral)	Formula:	CAS#: 8012-95-1	RTECS#: PY8030000	IDLH: 2500 mg/m^3
Conversion:	DOT:			
Synonyms/Trade Names: Heavy mineral oil mist, Paraffin oil mist, White mineral oil mist				
Exposure Limits: NIOSH REL: TWA 5 mg/m^3 ST 10 mg/m^3 OSHA PEL: TWA 5 mg/m^3			Measurement Methods (see Table 1): NIOSH 5026, 5524	
Physical Description: Colorless, oily liquid aerosol dispersed in air. [Note: Has an odor like burned lubricating oil.]				
Chemical & Physical Properties: MW: Varies BP: 680°F Sol: Insoluble Fl.P(oc): 380°F IP: ? Sp.Gr: 0.90 VP: <0.5 mmHg FRZ: 0°F UEL: ? LEL: ? Class IIIB Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: N.R. Wash skin: When contam Remove: When wet or contam Change: Daily		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 50 mg/m^3: 100XQ/Sa 125 mg/m^3: Sa:Cf/PaprHie 250 mg/m^3: 100F/SaT:Cf/PaprTHie/ ScbaF/SaF 2500 mg/m^3: Sa:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE	
Incompatibilities and Reactivities: None reported				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Con SY: Irrit eyes, skin, resp sys TO: Eyes, skin, resp sys			First Aid (see Table 6): Skin: Soap wash Breath: Fresh air	

Osmium tetroxide

Formula:	CAS#:	RTECS#:	IDLH:
OsO_4	20816-12-0	RN1140000	1 mg/m^3

Conversion: 1 ppm = 10.40 mg/m^3

DOT: 2471 154

Synonyms/Trade Names: Osmic acid anhydride, Osmium oxide

Exposure Limits:
NIOSH REL: TWA 0.002 mg/m^3 (0.0002 ppm)
ST 0.006 mg/m^3 (0.0006 ppm)
OSHA PEL†: TWA 0.002 mg/m^3

Measurement Methods (see Table 1):
None available

Physical Description: Colorless, crystalline solid or pale-yellow mass with an unpleasant, acrid, chlorine-like odor. [Note: A liquid above 105°F.]

Chemical & Physical Properties:
MW: 254.2
BP: 266°F
Sol(77°F): 6%
Fl.P: NA
IP: 12.60 eV
Sp.Gr: 5.10
VP: 7 mmHg
MLT: 105°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
0.1 mg/m^3: CcrFS100/GmFS100/ScbaF/SaF
1 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS100/ScbaE

Incompatibilities and Reactivities: Hydrochloric acid, easily oxidized organic materials
[Note: Begins to sublime below BP. Contact with other materials may cause fire.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, resp sys; lac, vis dist; conj; head; cough, dysp; derm
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Oxalic acid

Formula:	CAS#:	RTECS#:	IDLH:
HOOCCOOH×2H_2O	144-62-7	RO2450000	500 mg/m^3

Conversion:

DOT:

Synonyms/Trade Names: Ethanedioic acid, Oxalic acid (aqueous), Oxalic acid dihydrate

Exposure Limits:
NIOSH REL: TWA 1 mg/m^3
ST 2 mg/m^3
OSHA PEL†: TWA 1 mg/m^3

Measurement Methods (see Table 1):
None available

Physical Description: Colorless, odorless powder or granular solid.
[Note: The anhydrous form $(COOH)_2$ is an odorless, white solid.]

Chemical & Physical Properties:
MW: 126.1
BP: Sublimes
Sol: 14%
Fl.P: ?
IP: ?
Sp.Gr: 1.90
VP: <0.001 mmHg
MLT: 215°F (Sublimes)
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
25 mg/m^3: Sa:Cf£/PaprHie£
50 mg/m^3: 100F/ScbaF/SaF
500 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, silver compounds, strong alkalis, chlorites
[Note: Gives off water of crystallization at 215°F and begins to sublime.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, muc memb; eye burns; local pain, cyan; shock, collapse, convuls; kidney damage
TO: Eyes, skin, resp sys, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush prompt
Breath: Resp support
Swallow: Medical attention immed

Oxygen difluoride	Formula: OF_2	CAS#: 7783-41-7	RTECS#: RS2100000	IDLH: 0.5 ppm
Conversion: 1 ppm = 2.21 mg/m^3	DOT: 2190 124			
Synonyms/Trade Names: Difluorine monoxide, Fluorine monoxide, Oxygen fluoride				
Exposure Limits: NIOSH REL: C 0.05 ppm (0.1 mg/m^3) OSHA PEL†: TWA 0.05 ppm (0.1 mg/m^3)			Measurement Methods (see Table 1): None available	
Physical Description: Colorless gas with a peculiar, foul odor. [Note: Shipped as a nonliquefied compressed gas.]				
Chemical & Physical Properties: MW: 54.0 BP: -230°F Sol: 0.02% Fl.P: NA IP: 13.11 eV RGasD: 1.88 VP: >1 atm FRZ: -371°F UEL: NA LEL: NA Nonflammable Gas, but a strong oxidizer.	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 0.5 ppm: Sa/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS¿/ScbaE	
Incompatibilities and Reactivities: Combustible materials, chlorine, bromine, iodine, platinum, metal oxides, moist air, hydrogen sulfide, hydrocarbons, water [Note: Reacts very slowly with water to form hydrofluoric acid.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Con SY: Irrit eyes, skin, resp sys; head; pulm edema; eye, skin burns (from contact with the gas under pressure) TO: Eyes, skin, resp sys		First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support		

Ozone	Formula: O_3	CAS#: 10028-15-6	RTECS#: RS8225000	IDLH: 5 ppm
Conversion: 1 ppm = 1.96 mg/m^3	DOT:			
Synonyms/Trade Names: Triatomic oxygen				
Exposure Limits: NIOSH REL: C 0.1 ppm (0.2 mg/m^3) OSHA PEL†: TWA 0.1 ppm (0.2 mg/m^3)			Measurement Methods (see Table 1): OSHA ID214	
Physical Description: Colorless to blue gas with a very pungent odor.				
Chemical & Physical Properties: MW: 48.0 BP: -169°F Sol(32°F): 0.001% Fl.P: NA IP: 12.52 eV RGasD: 1.66 VP: >1 atm FRZ: -315°F UEL: NA LEL: NA Nonflammable Gas, but a powerful oxidizer.	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 1 ppm: CcrS¿/Sa 2.5 ppm: Sa:Cf/PaprS¿ 5 ppm: CcrFS¿/GmFS¿/SaT:Cf/ ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS¿/ScbaE	
Incompatibilities and Reactivities: All oxidizable materials (both organic & inorganic)				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Con SY: Irrit eyes, muc memb; pulm edema; chronic resp disease TO: Eyes, resp sys		First Aid (see Table 6): Eye: Medical attention Breath: Fresh air; 100% O_2		

Paraffin wax fume

Formula:	CAS#:	RTECS#:	IDLH:
C_nH_{2n+2}	8002-74-2	RV0350000	N.D.

Conversion: DOT:

Synonyms/Trade Names: Paraffin fume, Paraffin scale fume

Exposure Limits:
NIOSH REL: TWA 2 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
OSHA PV2047

Physical Description: Paraffin wax is a white to slightly yellowish, odorless solid.
[Note: Consists of a mixture of high molecular weight hydrocarbons (e.g., $C_{36}H_{74}$).]

Chemical & Physical Properties:
MW: 350-420
BP: ?
Sol: Insoluble
Fl.P: 390°F
IP: ?
Sp.Gr: 0.88-0.92
VP: ?
MLT: 115-154°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: Prevent eye contact
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, resp sys; discomfort, nau
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Breath: Resp support

Paraquat (Paraquat dichloride)

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3(C_5H_4N)_2CH_3\times2Cl$	1910-42-5	DW2275000	1 mg/m^3

Conversion: DOT:

Synonyms/Trade Names: 1,1'-Dimethyl-4,4'-bipyridinium dichloride; N,N'-Dimethyl-4,4'-bipyridinium dichloride; Paraquat chloride; Paraquat dichloride
[Note: Paraquat is a cation ($C_{12}H_{14}N_2^{++}$; 1,1-Dimethyl-4,4-bipyridinium ion); the commercial product is the dichloride salt of paraquat.]

Exposure Limits:
NIOSH REL: TWA 0.1 mg/m^3 (resp) [skin]
OSHA PEL†: TWA 0.5 mg/m^3 (resp) [skin]

Measurement Methods (see Table 1):
NIOSH 5003

Physical Description: Yellow solid with a faint, ammonia-like odor. [herbicide]
[Note: Paraquat may also be found commercially as a methyl sulfate salt $C_{12}H_{14}N_2\times2CH_3SO_4$.]

Chemical & Physical Properties:
MW: 257.2
BP: Decomposes
Sol: Miscible
Fl.P: NA
IP: ?
Sp.Gr: 1.24
VP: <0.0000001 mmHg
MLT: 572°F (Decomposes)
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
1 mg/m^3: CcrOv95*/PaprOvHie*/ Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, alkylaryl-sulfonate wetting agents
[Note: Corrosive to metals. Decomposes in presence of ultraviolet light.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat, resp sys; epis; derm; fingernail damage; irrit GI tract; heart, liver, kidney damage
TO: Eyes, skin, resp sys, heart, liver, kidneys, GI tract

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Parathion	Formula: $(C_2H_5O)_2P(S)OC_6H_4NO_2$	CAS#: 56-38-2	RTECS#: TF4550000	IDLH: 10 mg/m^3
Conversion:	DOT: 2783 152			

Synonyms/Trade Names: O,O-Diethyl-O(p-nitrophenyl) phosphorothioate; Diethyl parathion; Ethyl parathion; Parathion-ethyl

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: TWA 0.05 mg/m^3 [skin] OSHA PEL: TWA 0.1 mg/m^3 [skin]	NIOSH 5600 OSHA 62
Physical Description: Pale-yellow to dark-brown liquid with a garlic-like odor. [Note: A solid below 43°F. Pesticide that may be absorbed on a dry carrier.]	

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 291.3 BP: 707°F Sol: 0.001% Fl.P(oc): 392°F IP: ? Sp.Gr: 1.27 VP: 0.00004 mmHg FRZ: 43°F UEL: ? LEL: ? Class IIIB Combustible Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily Provide: Eyewash Quick drench	NIOSH 0.5 mg/m^3: CcrOv95/Sa 1.25 mg/m^3: Sa:Cf/PaprOvHie 2.5 mg/m^3: CcrFOv100/SaT:Cf/ PaprTOvHie/ScbaF/SaF 10 mg/m^3: Sa:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, alkaline materials

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, resp sys; miosis; rhin; head; chest tight, wheez, lar spasm, salv, cyan; anor, nau, vomit, abdom cramps, diarr; sweat; musc fasc, lass, para; dizz, conf, ataxia; convuls, coma; low BP; card irreg TO: Eyes, skin, resp sys, CNS, CVS, blood chol	Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

P

Particulates not otherwise regulated	Formula:	CAS#:	RTECS#:	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: "Inert" dusts, Nuisance dusts, PNOR
[Note: Includes all inert or nuisance dusts, whether mineral, inorganic, not listed specifically in 1910.1000.]

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: See Appendix D OSHA PEL: TWA 15 mg/m^3 (total) TWA 5 mg/m^3 (resp)	NIOSH 0500, 0600
Physical Description: Dusts from solid substances without specific occupational exposure standards.	

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
Properties vary depending upon the specific solid.	Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.	Not available.

Incompatibilities and Reactivities: Varies

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Con SY: Irrit eyes, skin, throat, upper resp sys TO: Eyes, skin, resp sys	Eye: Irr immed Breath: Fresh air

Pentaborane

Formula:	CAS#:	RTECS#:	IDLH:
B_5H_9	19624-22-7	RY8925000	1 ppm

Conversion: 1 ppm = 2.58 mg/m^3

DOT: 1380 135

Synonyms/Trade Names: Pentaboron nonahydride

Exposure Limits:
NIOSH REL: TWA 0.005 ppm (0.01 mg/m^3)
ST 0.015 ppm (0.03 mg/m^3)
OSHA PEL†: TWA 0.005 ppm (0.01 mg/m^3)

Measurement Methods (see Table 1):
None available

Physical Description: Colorless liquid with a pungent odor like sour milk.

Chemical & Physical Properties:
MW: 63.1
BP: 140°F
Sol: Reacts
Fl.P: 86°F
IP: 9.90 eV
Sp.Gr: 0.62
VP: 171 mmHg
FRZ: -52°F
UEL: ?
LEL: 0.42%
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
0.05 ppm: Sa
0.125 ppm: Sa:Cf
0.25 ppm: SaT:Cf/ScbaF/SaF
1 ppm: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Oxidizers, halogens, water, halogenated hydrocarbons
[Note: May ignite SPONTANEOUSLY in moist air. Corrosive to natural rubber. Hydrolyzes slowly with heat in water to form boric acid.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; dizz, head, drow, inco, tremor, convuls, behavioral changes; tonic spasm face, neck, abdom, limbs
TO: Eyes, skin, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

P

Pentachloroethane

Formula:	CAS#:	RTECS#:	IDLH:
$CHCl_2CCl_3$	76-01-7	KI6300000	N.D.

Conversion:

DOT: 1669 151

Synonyms/Trade Names: Ethane pentachloride, Pentalin

Exposure Limits:
NIOSH REL: Handle with care in the workplace.
See Appendix C (Chloroethanes)
OSHA PEL: none

Measurement Methods (see Table 1):
NIOSH 2517

Physical Description: Colorless liquid with a sweetish, chloroform-like odor.

Chemical & Physical Properties:
MW: 202.3
BP: 322°F
Sol: 0.05%
Fl.P: ?
IP: 11.28 eV
Sp.Gr: 1.68
VP: 3 mmHg
FRZ: -20°F
UEL: ?
LEL: ?
Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: (Sodium-potassium alloy + bromoform), alkalis, metals, water
[Note: Hydrolysis produces dichloroacetic acid. Reaction with alkalis & metals produces spontaneously explosive chloroacetylenes.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: In animals: irrit eyes, skin; lass, restless, irreg respiration, musc inco; liver, kidney, lung changes
TO: Eyes, skin, resp sys, CNS, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

Pentachloronaphthalene

Formula:	CAS#:	RTECS#:	IDLH:
$C_{10}H_3Cl_5$	1321-64-8	QK0300000	See Appendix F

Conversion: DOT:

Synonyms/Trade Names: Halowax® 1013; 1,2,3,4,5-Pentachloronaphthalene

Exposure Limits:
NIOSH REL: TWA 0.5 mg/m^3 [skin]
OSHA PEL: TWA 0.5 mg/m^3 [skin]

Measurement Methods (see Table 1):
NIOSH S96 (II-2)

Physical Description: Pale-yellow or white solid or powder with an aromatic odor.

Chemical & Physical Properties:
MW: 300.4
BP: 636°F
Sol: Insoluble
Fl.P: NA
IP: ?
Sp.Gr: 1.67
VP: <1 mmHg
MLT: 248°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
5 mg/m^3: Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

See Appendix F

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Head, lass, dizz, anor; pruritus, acne-form skin eruptions; jaun, liver nec
TO: Skin, liver, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap prompt/molten flush immed
Breath: Resp support
Swallow: Medical Attention immed

Pentachlorophenol

Formula:	CAS#:	RTECS#:	IDLH:
C_6Cl_5OH	87-86-5	SM6300000	2.5 mg/m^3

Conversion: DOT: 3155 154

Synonyms/Trade Names: PCP; Penta; 2,3,4,5,6-Pentachlorophenol

Exposure Limits:
NIOSH REL: TWA 0.5 mg/m^3 [skin]
OSHA PEL: TWA 0.5 mg/m^3 [skin]

Measurement Methods (see Table 1):
NIOSH 5512

Physical Description: Colorless to white, crystalline solid with a benzene-like odor. [fungicide]

Chemical & Physical Properties:
MW: 266.4
BP: 588°F (Decomposes)
Sol: 0.001%
Fl.P: NA
IP: NA
Sp.Gr: 1.98
VP(77°F): 0.0001 mmHg
MLT: 374°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
2.5 mg/m^3: CcrOv95*/PaprOvHie*/Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, acids, alkalis

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, nose, throat; sneez, cough; lass, anor, low-wgt; sweat; head, dizz; nau, vomit; dysp, chest pain; high fever; derm
TO: Eyes, skin, resp sys, CVS, liver, kidneys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Pentaerythritol

Formula:	CAS#:	RTECS#:	IDLH:
$C(CH_2OH)_4$	115-77-5	RZ2490000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: 2,2-bis(Hydroxymethyl)-1,3-propanediol; Methane tetramethylol; Monopentaerythritol; PE; Tetrahydroxymethylolmethane; Tetramethylolmethane

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL†: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500, 0600

Physical Description: Colorless to white, crystalline, odorless powder.
[Note: Technical grade is 88% monopentaerythritol & 12% dipentaerythritol.]

Chemical & Physical Properties:
MW: 136.2
BP: Sublimes
Sol(59°F): 6%
Fl.P: ?
IP: ?
Sp.Gr: 1.38
VP: 0.00000008 mmHg
MLT: 500°F (Sublimes)
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Organic acids, oxidizers
[Note: Explosive compound is formed when a mixture of PE & thiophosphoryl chloride is heated.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, resp sys
TO: Eyes, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash
Breath: Fresh air
Swallow: Medical attention immed

P

n-Pentane

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3[CH_2]_3CH_3$	109-66-0	RZ9450000	1500 ppm [10%LEL]

Conversion: 1 ppm = 2.95 mg/m^3

DOT: 1265 128

Synonyms/Trade Names: Pentane, normal-Pentane

Exposure Limits:
NIOSH REL: TWA 120 ppm (350 mg/m^3)
C 610 ppm (1800 mg/m^3) [15-minute]
OSHA PEL†: TWA 1000 ppm (2950 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1500
OSHA 7

Physical Description: Colorless liquid with a gasoline-like odor.
[Note: A gas above 97°F. May be utilized as a fuel.]

Chemical & Physical Properties:
MW: 72.2
BP: 97°F
Sol: 0.04%
Fl.P: -57°F
IP: 10.34 eV
Sp.Gr: 0.63
VP: 420 mmHg
FRZ: -202°F
UEL: 7.8%
LEL: 1.5%
Class IA Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
1200 ppm: Sa
1500 ppm: Sa:Cf/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose; derm; chemical pneu (aspir liquid); drow; in animals: narco
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash prompt
Breath: Resp support
Swallow: Medical attention immed

1-Pentanethiol	Formula: $CH_3(CH_2)_4SH$	CAS#: 110-66-7	RTECS#: SA3150000	IDLH: N.D.
Conversion: 1 ppm = 4.26 mg/m^3	DOT: 1111 130			
Synonyms/Trade Names: Amyl hydrosulfide, Amyl mercaptan, Amyl sulfhydrate, Pentyl mercaptan				
Exposure Limits: NIOSH REL: C 0.5 ppm (2.1 mg/m^3) [15-minute] OSHA PEL: none				Measurement Methods (see Table 1): None available
Physical Description: Water-white to yellowish liquid with a strong, garlic-like odor.				

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 104.2 BP: 260°F Sol: Insoluble Fl.P(oc): 65°F IP: ? Sp.Gr: 0.84 VP(77°F): 14 mmHg FRZ: -104°F UEL: ? LEL: ? Class IB Flammable Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	NIOSH 5 ppm: CcrOv/Sa 12.5 ppm: Sa:Cf/PaprOv 25 ppm: CcrFOv/GmFOv/PaprTOv/ ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, reducing agents, alkali metals, calcium hypochlorite, concentrated nitric acid	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose, throat, resp sys; head, nau, dizz; vomit, diarr; derm, skin sens TO: Eyes, skin, resp sys, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

2-Pentanone	Formula: $CH_3COCH_2CH_2CH_3$	CAS#: 107-87-9	RTECS#: SA7875000	IDLH: 1500 ppm
Conversion: 1 ppm = 3.52 mg/m^3	DOT: 1249 127			
Synonyms/Trade Names: Ethyl acetone, Methyl propyl ketone, MPK				
Exposure Limits: NIOSH REL: TWA 150 ppm (530 mg/m^3) OSHA PEL†: TWA 200 ppm (700 mg/m^3)				Measurement Methods (see Table 1): NIOSH 1300, 2555
Physical Description: Colorless to water-white liquid with a characteristic acetone-like odor.				

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 86.1 BP: 215°F Sol: 6% Fl.P: 45°F IP: 9.39 eV Sp.Gr: 0.81 VP: 27 mmHg FRZ: -108°F UEL: 8.2% LEL: 1.5% Class IB Flammable Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	NIOSH 1500 ppm: CcrOv*/PaprOv*/GmFOv/ Sa*/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, bromine trifluoride	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, muc memb; head; derm; narco, coma TO: Eyes, skin, resp sys, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Water flush Breath: Resp support Swallow: Medical attention immed

Perchloromethyl mercaptan

Formula:	CAS#:	RTECS#:	IDLH:
Cl_3CSCl	594-42-3	PB0370000	10 ppm

Conversion: 1 ppm = 7.60 mg/m^3 DOT: 1670 157

Synonyms/Trade Names: PCM, PMM, Trichloromethane sulfenyl chloride, Trichloromethyl sulfur chloride

Exposure Limits:
NIOSH REL: TWA 0.1 ppm (0.8 mg/m^3)
OSHA PEL: TWA 0.1 ppm (0.8 mg/m^3)

Measurement Methods (see Table 1):
None available

Physical Description: Pale-yellow, oily liquid with an unbearable, acrid odor.

Chemical & Physical Properties:
MW: 185.9
BP: 297°F (Decomposes)
Sol: Insoluble
Fl.P: NA
IP: ?
Sp.Gr: 1.69
VP: 3 mmHg
FRZ: ?
UEL: NA
LEL: NA
Noncombustible Liquid, but will support combustion.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1 ppm: CcrOv*/Sa*
2.5 ppm: Sa:Cf*/PaprOv*
5 ppm: CcrFOv/GmFOv/PaprTOv*/SaT:Cf*/ScbaF/SaF
10 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Alkalis, amines, hot iron, water
[Note: Corrosive to most metals. Forms HCl, sulfur & CO_2 on contact with water.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat; lac; cough, dysp, deep breath pain, coarse rales; vomit; pallor, tacar; acidosis; anuria; liver, kidney damage
TO: Eyes, skin, resp sys, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

P

Perchloryl fluoride

Formula:	CAS#:	RTECS#:	IDLH:
ClO_3F	7616-94-6	SD1925000	100 ppm

Conversion: 1 ppm = 4.19 mg/m^3 DOT: 3083 124

Synonyms/Trade Names: Chlorine fluoride oxide, Chlorine oxyfluoride, Trioxychlorofluoride

Exposure Limits:
NIOSH REL: TWA 3 ppm (14 mg/m^3)
ST 6 ppm (28 mg/m^3)
OSHA PEL†: TWA 3 ppm (13.5 mg/m^3)

Measurement Methods (see Table 1):
None available

Physical Description: Colorless gas with a characteristic, sweet odor.
[Note: Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 102.5
BP: -52°F
Sol: 0.06%
Fl.P: NA
IP: 13.60 eV
RGasD: 3.64
VP: 10.5 atm
FRZ: -234°F
UEL: NA
LEL: NA
Nonflammable Gas, but will support combustion.

Personal Protection/Sanitation (see Table 2):
Skin: Frostbite
Eyes: Frostbite
Wash skin: N.R.
Remove: N.R.
Change: N.R.
Provide: Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
30 ppm: Sa
75 ppm: Sa:Cf*
100 ppm: ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS¿/ScbaE

Incompatibilities and Reactivities: Combustibles, strong bases, amines, finely divided metals, reducing agents, alcohols

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con (liquid)
SY: Irrit resp sys; liquid: frostbite; in animals: methemo; cyan; lass, dizz, head; pulm edema; pneu; anoxia
TO: Skin, resp sys, blood

First Aid (see Table 6):
Eye: Frostbite
Skin: Frostbite
Breath: Resp support

Perlite

Formula:

CAS#: 93763-70-3

RTECS#: SD5254000

IDLH: N.D.

Conversion:

DOT:

Synonyms/Trade Names: Expanded perlite
[Note: An amorphous material consisting of fused sodium potassium aluminum silicate.]

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500, 0600

Physical Description: Odorless, light-gray to glassy-black solid.
[Note: Expanded perlite is a fluffy, white particulate.]

Chemical & Physical Properties:
MW: varies
BP: ?
Sol: <1%
Fl.P: NA
IP: NA
Sp.Gr: 2.2 - 2.4 (crude)
0.05 - 0.3 (expanded)
VP: 0 mmHg (approx)
MLT: >2000°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, throat, upper resp sys
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Breath: Fresh air

P

Petroleum distillates (naphtha)

Formula:

CAS#: 8002-05-9

RTECS#: SE7449000

IDLH: 1100 ppm [10%LEL]

Conversion: 1 ppm = 4.05 mg/m^3

DOT:

Synonyms/Trade Names: Aliphatic petroleum naphtha, Petroleum naphtha, Rubber solvent

Exposure Limits:
NIOSH REL: TWA 350 mg/m^3
C 1800 mg/m^3 [15-minute]
OSHA PEL†: TWA 500 ppm (2000 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1550

Physical Description: Colorless liquid with a gasoline- or kerosene-like odor.
[Note: A mixture of paraffins (C_5 to C_{13}) that may contain a small amount of aromatic hydrocarbons.]

Chemical & Physical Properties:
MW: 99 (approx)
BP: 86-460°F
Sol: Insoluble
Fl.P: -40 to -86°F
IP: ?
Sp.Gr: 0.63-0.66
VP: 40 mmHg (approx)
FRZ: -99°F
UEL: 5.9%
LEL: 1.1%
Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
850 ppm: Sa
1100 ppm: Sa:Cf*/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, nose, throat; dizz, drow, head, nau; dry cracked skin; chemical pneu (aspir liquid)
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Phenol

Formula:	CAS#:	RTECS#:	IDLH:
C_6H_5OH	108-95-2	SJ3325000	250 ppm

Conversion: 1 ppm = 3.85 mg/m^3

DOT: 1671 153 (solid); 2312 153 (molten); 2821 153 (solution)

Synonyms/Trade Names: Carbolic acid, Hydroxybenzene, Monohydroxybenzene, Phenyl alcohol, Phenyl hydroxide

Exposure Limits:
NIOSH REL: TWA 5 ppm (19 mg/m^3) [skin]
C 15.6 ppm (60 mg/m^3) [15-minute]
OSHA PEL: TWA 5 ppm (19 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 2546
OSHA 32

Physical Description: Colorless to light-pink, crystalline solid with a sweet, acrid odor. [Note: Phenol liquefies by mixing with about 8% water.]

Chemical & Physical Properties:
MW: 94.1
BP: 359°F
Sol(77°F): 9%
Fl.P: 175°F
IP: 8.50 eV
Sp.Gr: 1.06
VP: 0.4 mmHg
MLT: 109°F
UEL: 8.6%
LEL: 1.8%
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
50 ppm: CcrOv95/Sa
125 ppm: Sa:Cf/PaprOvHie
250 ppm: CcrFOv100/GmFOv100/PaprTOvHie/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, calcium hypochlorite, aluminum chloride, acids

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, nose, throat; anor, low-wgt; lass, musc ache, pain; dark urine; cyan; liver, kidney damage; skin burns; derm; ochronosis; tremor, convuls, twitch
TO: Eyes, skin, resp sys, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

P

Phenothiazine

Formula:	CAS#:	RTECS#:	IDLH:
$S(C_6H_4)_2NH$	92-84-2	SN5075000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: Dibenzothiazine, Fenothiazine, Thiodiphenylamine

Exposure Limits:
NIOSH REL: TWA 5 mg/m^3 [skin]
OSHA PEL†: none

Measurement Methods (see Table 1):
OSHA PV2048

Physical Description: Grayish-green to greenish-yellow solid. [insecticide]

Chemical & Physical Properties:
MW: 199.3
BP: 700°F
Sol: Insoluble
Fl.P: ?
IP: ?
Sp.Gr: ?
VP: 0 mmHg (approx)
MLT: 365°F
UEL: ?
LEL: ?
Combustible Solid, but not a high fire risk.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: N.R.
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Itching, irrit, reddening skin; hepatitis, hemolytic anemia, abdom cramps, tacar; kidney damage; skin photo sens
TO: Skin, CVS, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

p-Phenylene diamine	Formula: $C_6H_4(NH_2)_2$	CAS#: 106-50-3	RTECS#: SS8050000	IDLH: 25 mg/m^3
Conversion:	DOT: 1673 153			
Synonyms/Trade Names: 4-Aminoaniline; 1,4-Benzenediamine; p-Diaminobenzene; 1,4-Diaminobenzene; 1,4-Phenylene diamine				
Exposure Limits: NIOSH REL: TWA 0.1 mg/m^3 [skin] OSHA PEL: TWA 0.1 mg/m^3 [skin]			Measurement Methods (see Table 1): OSHA 87	
Physical Description: White to slightly red, crystalline solid.				
Chemical & Physical Properties: MW: 108.2 BP: 513°F Sol(75°F): 4% Fl.P: 312°F IP: 6.89 eV Sp.Gr: ? VP: <1 mmHg MLT: 295°F UEL: ? LEL: ? Combustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 2.5 mg/m^3: Sa:Cf£ 5 mg/m^3: ScbaF/SaF 25 mg/m^3: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS100/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit pharynx, larynx; bronchial asthma; sens derm TO: Resp sys, skin		First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed		

Phenyl ether (vapor)	Formula: $C_6H_5OC_6H_5$	CAS#: 101-84-8	RTECS#: KN8970000	IDLH: 100 ppm
Conversion: 1 ppm = 6.96 mg/m^3	DOT:			
Synonyms/Trade Names: Diphenyl ether, Diphenyl oxide, Phenoxy benzene, Phenyl oxide				
Exposure Limits: NIOSH REL: TWA 1 ppm (7 mg/m^3) OSHA PEL: TWA 1 ppm (7 mg/m^3)			Measurement Methods (see Table 1): NIOSH 1617 OSHA PV2022	
Physical Description: Colorless, crystalline solid or liquid (above 82°F) with a geranium-like odor.				
Chemical & Physical Properties: MW: 170.2 BP: 498°F Sol: Insoluble Fl.P: 239°F IP: 8.09 eV Sp.Gr: 1.08 VP(77°F): 0.02 mmHg MLT: 82°F UEL: 6.0% LEL: 0.7% Combustible Solid Class IIIB Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 25 ppm: Sa:Cf£/PaprOvHie£ 50 ppm: CcrFOv100/GmFOv100/ ScbaF/SaF 100 ppm: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Con SY: Irrit eyes, nose, skin; nau TO: Eyes, skin, resp sys		First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support		

Phenyl ether-biphenyl mixture (vapor)

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_5OC_6H_5/C_6H_5C_6H_5$	8004-13-5	DV1500000	10 ppm

Conversion: 1 ppm = 6.79 mg/m^3 (approx)

DOT:

Synonyms/Trade Names: Diphenyl oxide-diphenyl mixture, Dowtherm® A

Exposure Limits:
NIOSH REL: TWA 1 ppm (7 mg/m^3)
OSHA PEL: TWA 1 ppm (7 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2013

Physical Description: Colorless to straw-colored liquid or solid (below 54°F) with a disagreeable, aromatic odor.
[Note: A mixture typically contains 75% phenyl ether & 25% biphenyl.]

Chemical & Physical Properties:
MW: 166 (approx)
BP: 495°F
Sol: Insoluble
Fl.P: 239°F
IP: ?
Sp.Gr(77°F): 1.06
VP(77°F): 0.08 mmHg
FRZ: 54°F
UEL: ?
LEL: ?
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
10 ppm: Sa:Cf£/CcrFOv100/GmFOv100/
PaprOvHie£/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, nose, skin; nau
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support

P

Phenyl glycidyl ether

Formula:	CAS#:	RTECS#:	IDLH:
$C_9H_{10}O_2$	122-60-1	TZ3675000	Ca [100 ppm]

Conversion: 1 ppm = 6.14 mg/m^3

DOT:

Synonyms/Trade Names: 1,2-Epoxy-3-phenoxy propane; Glycidyl phenyl ether; PGE; Phenyl 2,3-epoxypropyl ether

Exposure Limits:
NIOSH REL: Ca
C 1 ppm (6 mg/m^3) [15-minute]
See Appendix A
OSHA PEL†: TWA 10 ppm (60 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1619
OSHA 7

Physical Description: Colorless liquid. [Note: A solid below 38°F.]

Chemical & Physical Properties:
MW: 150.1
BP: 473°F
Sol: 0.2%
Fl.P: 248°F
IP: ?
Sp.Gr: 1.11
VP: 0.01 mmHg
FRZ: 38°F
UEL: ?
LEL: ?
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, amines, strong acids, strong bases

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; upper resp sys; skin sens; narco; possible hemato, repro effects; [carc]
TO: Eyes, skin, CNS, hemato sys, repro sys [in animals: nasal cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Phenylhydrazine

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_5NHNH_2$	100-63-0	MV8925000	Ca [15 ppm]

Conversion: 1 ppm = 4.42 mg/m^3

DOT: 2572 153

Synonyms/Trade Names: Hydrazinobenzene, Monophenylhydrazine

Exposure Limits:
NIOSH REL: Ca
C 0.14 ppm (0.6 mg/m^3) [2-hr] [skin]
See Appendix A
OSHA PEL†: TWA 5 ppm (22 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 3518

Physical Description: Colorless to pale-yellow liquid or solid (below 67°F) with a faint, aromatic odor.

Chemical & Physical Properties:
MW: 108.1
BP: 470°F (Decomposes)
Sol: Slight
Fl.P: 190°F
IP: 7.64 eV
Sp.Gr: 1.10
VP(77°F): 0.04 mmHg
FRZ: 67°F
UEL: ?
LEL: ?
Class IIIA Combustible Liquid
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: ScbaE

Incompatibilities and Reactivities: Strong oxidizers, lead dioxide

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Skin sens, hemolytic anemia, dysp, cyan; jaun; kidney damage; vascular thrombosis; [carc]
TO: Blood, resp sys, liver, kidneys, skin [in animals: tumors of the lungs, liver, blood vessels & intestine]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

N-Phenyl- β-naphthylamine

Formula:	CAS#:	RTECS#:	IDLH:
$C_{10}H_7NHC_6H_5$	135-88-6	QM4550000	Ca [N.D.]

Conversion:

DOT:

Synonyms/Trade Names: 2-Anilinonaphthalene, β-Naphthylphenylamine, PBNA, 2-Phenylaminonaphthalene, Phenyl-β-naphthylamine

Exposure Limits:
NIOSH REL: Ca*
See Appendix A
[*Note: Since metabolized to β-Naphthylamine.]
OSHA PEL: none

Measurement Methods (see Table 1):
OSHA 96

Physical Description: White to yellow crystals or gray to tan flakes or powder.
[Note: Commercial product may contain 20-30 ppm of β-Naphthylamine.]

Chemical & Physical Properties:
MW: 219.3
BP: 743°F
Sol: Insoluble
Fl.P: ?
IP: ?
Sp.Gr: 1.24
VP: ?
MLT: 226°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irritation; leucoplakia; acne, hypersensitivity to sunlight; [carc]
TO: Eyes, skin, bladder [bladder cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Phenylphosphine

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_5PH_2$	638-21-1	SZ2100000	N.D.

Conversion: 1 ppm = 4.50 mg/m^3

DOT:

Synonyms/Trade Names: Fenylfosfin, PF, Phosphaniline

Exposure Limits:
NIOSH REL: C 0.05 ppm (0.25 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Clear, colorless liquid with a foul odor.

Chemical & Physical Properties:
MW: 110.1
BP: 320°F
Sol: Insoluble
Fl.P: ?
IP: ?
Sp.Gr(59°F): 1.001
VP: ?
FRZ: ?
UEL: ?
LEL: ?
Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported [Note: Spontaneously combustible in high concentrations in air. Potential exposure to gaseous PF when polyphosphinates are heated above 392°F.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: In animals: blood changes, anemia, testicular degeneration; loss of appetite, diarr, lac, hind leg tremor; derm
TO: Blood, CNS, skin, repro sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

P

Phorate

Formula:	CAS#:	RTECS#:	IDLH:
$(C_2H_5O)_2P(S)SCH_2SC_2H_5$	298-02-2	TD9450000	N.D.

Conversion:

DOT: 3018 152 (organophosphorus pesticide, liquid, toxic)

Synonyms/Trade Names: O,O-Diethyl S-(ethylthio)methylphosphorodithioate; O,O-Diethyl S-ethylthiomethylthiothionophosphate; Thimet; Timet

Exposure Limits:
NIOSH REL: TWA 0.05 mg/m^3
ST 0.2 mg/m^3 [skin]
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 5600

Physical Description: Clear liquid with a skunk-like odor. [insecticide]

Chemical & Physical Properties:
MW: 260.4
BP: ?
Sol: 0.005%
Fl.P(oc): 320°F
IP: ?
Sp.Gr(77°F): 1.16
VP: 0.0008 mmHg
FRZ: -45°F
UEL: ?
LEL: ?
Class IIIB Combustible Liquid, but does not readily ignite.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Water, alkalis [Note: Hydrolyzed in the presence of moisture and by alkalis.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; miosis; rhin; head; chest tight, wheez, lar spasm, salv, cyan; anor, nau, vomit, abdom cramps, diarr; sweat; musc fasc, lass, para; dizz, conf, ataxia; convuls, coma; low BP; card irreg
TO: Eyes, skin, resp sys, CNS, CVS, blood chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

Phosdrin

Formula:	CAS#:	RTECS#:	IDLH:
$C_7H_{13}PO_6$	7786-34-7	GQ5250000	4 ppm

Conversion: 1 ppm = 9.17 mg/m^3 DOT: 2783 152

Synonyms/Trade Names: 2-Carbomethoxy-1-methylvinyl dimethyl phosphate, Mevinphos
[Note: Commercial product is a mixture of the cis- & trans-isomers.]

Exposure Limits:
NIOSH REL: TWA 0.01 ppm (0.1 mg/m^3) [skin]
ST 0.03 ppm (0.3 mg/m^3)
OSHA PEL†: TWA 0.1 mg/m^3 [skin]

Measurement Methods (see Table 1):
NIOSH 5600

Physical Description: Pale-yellow to orange liquid with a weak odor.
[Note: Insecticide that may be absorbed on a dry carrier.]

Chemical & Physical Properties:
MW: 224.2
BP: Decomposes
Sol: Miscible
Fl.P(oc): 347°F
IP: ?
Sp.Gr: 1.25
VP: 0.003 mmHg
FRZ: 44°F (trans-)
70°F (cis-)
UEL: ?
LEL: ?
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
0.1 ppm: Sa
0.25 ppm: Sa:Cf
0.5 ppm: SaT:Cf/ScbaF/SaF
4 ppm: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers [Note: Corrosive to cast iron, some stainless steels & brass.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; miosis; rhin; head; chest tight, wheez, lar spasm, salv, cyan; anor, nau, vomit, abdom cramps, diarr; para; ataxia, convuls; low BP, card irreg
TO: Eyes, skin, resp sys, CNS, CVS, blood chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

P

Phosgene

Formula:	CAS#:	RTECS#:	IDLH:
$COCl_2$	75-44-5	SY5600000	2 ppm

Conversion: 1 ppm = 4.05 mg/m^3 DOT: 1076 125

Synonyms/Trade Names: Carbon oxychloride, Carbonyl chloride, Carbonyl dichloride, Chloroformyl chloride

Exposure Limits:
NIOSH REL: TWA 0.1 ppm (0.4 mg/m^3)
C 0.2 ppm (0.8 mg/m^3) [15-minute]
OSHA PEL: TWA 0.1 ppm (0.4 mg/m^3)

Measurement Methods (see Table 1):
OSHA 61

Physical Description: Colorless gas with a suffocating odor like musty hay.
[Note: A fuming liquid below 47°F. Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 98.9
BP: 47°F
Sol: Slight
Fl.P: NA
IP: 11.55 eV
RGasD: 3.48
Sp.Gr: 1.43 (Liquid at 32°F)
VP: 1.6 atm
FRZ: -198°F
UEL: NA
LEL: NA
Nonflammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact (liquid)
Eyes: Prevent eye contact (liquid)
Wash skin: When contam (liquid)
Remove: When wet or contam (liquid)
Change: N.R.
Provide: Quick drench (liquid)

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1 ppm: Sa*
2 ppm: ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Moisture, alkalis, ammonia, alcohols, copper
[Note: Reacts slowly in water to form hydrochloric acid & carbon dioxide.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con (liquid)
SY: Irrit eyes; dry burning throat; vomit; cough, foamy sputum, dysp, chest pain, cyan; liquid: frostbite
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed (liquid)
Skin: Water flush immed (liquid)
Breath: Resp support

Phosphine

Formula:	CAS#:	RTECS#:	IDLH:
PH_3	7803-51-2	SY7525000	50 ppm

Conversion: 1 ppm = 1.39 mg/m^3

DOT: 2199 119

Synonyms/Trade Names: Hydrogen phosphide, Phosphorated hydrogen, Phosphorus hydride, Phosphorus trihydride

Exposure Limits:
NIOSH REL: TWA 0.3 ppm (0.4 mg/m^3)
ST 1 ppm (1 mg/m^3)
OSHA PEL†: TWA 0.3 ppm (0.4 mg/m^3)

Measurement Methods (see Table 1):
OSHA 1003, ID180

Physical Description: Colorless gas with a fish- or garlic-like odor. [pesticide]
[Note: Shipped as a liquefied compressed gas. Pure compound is odorless.]

Chemical & Physical Properties:
MW: 34.0
BP: -126°F
Sol: Slight
Fl.P: NA (Gas)
IP: 9.96 eV
RGasD: 1.18
VP: 41.3 atm
FRZ: -209°F
UEL: ?
LEL: 1.79%
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Frostbite
Eyes: Frostbite
Wash skin: N.R.
Remove: When wet (flamm)
Change: N.R.
Provide: Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
3 ppm: Sa
7.5 ppm: Sa:Cf
15 ppm: GmFS/ScbaF/SaF
50 ppm: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Air, oxidizers, chlorine, acids, moisture, halogenated hydrocarbons, copper
[Note: May ignite SPONTANEOUSLY on contact with air.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con (liquid)
SY: Nau, vomit, abdom pain, diarr; thirst; chest tight, dysp; musc pain, chills; stupor or syncope; pulm edema; liquid: frostbite
TO: Resp sys

First Aid (see Table 6):
Eye: Frostbite
Skin: Frostbite
Breath: Resp support

Phosphoric acid

Formula:	CAS#:	RTECS#:	IDLH:
H_3PO_4	7664-38-2	TB6300000	1000 mg/m^3

Conversion:

DOT: 1805 154 (liquid or solution); 3453 154 (solid)

Synonyms/Trade Names: Orthophosphoric acid, Phosphoric acid (aqueous), White phosphoric acid

Exposure Limits:
NIOSH REL: TWA 1 mg/m^3
ST 3 mg/m^3
OSHA PEL†: TWA 1 mg/m^3

Measurement Methods (see Table 1):
NIOSH 7903
OSHA ID165SG

Physical Description: Thick, colorless, odorless, crystalline solid. [Note: Often used in an aqueous solution.]

Chemical & Physical Properties:
MW: 98.0
BP: 415°F
Sol: Miscible
Fl.P: NA
IP: ?
Sp.Gr(77°F): 1.87 (pure)
1.33 (50% solution)
VP: 0.03 mmHg
MLT: 108°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash (>1.6%)
Quick drench (>1.6%)

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
25 mg/m^3: Sa:Cf*
50 mg/m^3: 100F/ScbaF/SaF
1000 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Strong caustics, most metals [Note: Readily reacts with metals to form flammable hydrogen gas. DO NOT MIX WITH SOLUTIONS CONTAINING BLEACH OR AMMONIA.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, upper resp sys; eye, skin, burns; derm
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush Immed
Breath: Resp support
Swallow: Medical attention immed

Phosphorus (yellow)

Formula:	CAS#:	RTECS#:	IDLH:
P_4	7723-14-0	TH3500000	5 mg/m^3

Conversion:

DOT: 1381 136

Synonyms/Trade Names: Elemental phosphorus, White phosphorus

Exposure Limits:
NIOSH REL: TWA 0.1 mg/m^3
OSHA PEL: TWA 0.1 mg/m^3

Measurement Methods (see Table 1):
NIOSH 7905

Physical Description: White to yellow, soft, waxy solid with acrid fumes in air.
[Note: Usually shipped or stored in water.]

Chemical & Physical Properties:
MW: 124.0
BP: 536°F
Sol: 0.0003%
Fl.P: ?
IP: ?
Sp.Gr: 1.82
VP: 0.03 mmHg
MLT: 111°F
UEL: ?
LEL: ?
Flammable Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact*
[*Note: Flame retardant personal protective equipment should be provided.]
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1 mg/m^3: Sa
2.5 mg/m^3: Sa:Cf£
5 mg/m^3: ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: ScbaE

Incompatibilities and Reactivities: Air, oxidizers (including elemental sulfur & strong caustics), halogens
[Note: Ignites SPONTANEOUSLY in moist air.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, resp tract; eye, skin burns; abdom pain, nau, jaun; anemia; cachexia; dental pain, salv, jaw pain, swell
TO: Eyes, skin, resp sys, liver, kidneys, jaw, teeth, blood

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Phosphorus oxychloride

Formula:	CAS#:	RTECS#:	IDLH:
$POCl_3$	10025-87-3	TH4897000	N.D.

Conversion: 1 ppm = 6.27 mg/m^3

DOT: 1810 137

Synonyms/Trade Names: Phosphorus chloride, Phosphorus oxytrichloride, Phosphoryl chloride

Exposure Limits:
NIOSH REL: TWA 0.1 ppm (0.6 mg/m^3)
ST 0.5 ppm (3 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Clear, colorless to yellow, oily liquid with a pungent & musty odor.
[Note: A solid below 34°F.]

Chemical & Physical Properties:
MW: 153.3
BP: 222°F
Sol: Decomposes
Fl.P: NA
IP: ?
Sp.Gr(77°F): 1.65
VP(81°F): 40 mmHg
FRZ: 34°F
UEL: NA
LEL: NA
Noncombustible Liquid, but may set fire to combustible materials.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Water, combustible materials, carbon disulfide, dimethyl-formamide, metals (except nickel & lead) [Note: Decomposes in water to hydrochloric & phosphoric acids.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; eye, skin burns; dysp, cough, pulm edema; dizz, head, lass; abdom pain, nau, vomit; neph
TO: Eyes, skin, resp sys, CNS, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Phosphorus pentachloride

Formula:	CAS#:	RTECS#:	IDLH:
PCl_5	10026-13-8	TB6125000	70 mg/m^3

Conversion: DOT: 1806 137

Synonyms/Trade Names: Pentachlorophosphorus, Phosphoric chloride, Phosphorus perchloride

Exposure Limits:
NIOSH REL: TWA 1 mg/m^3
OSHA PEL: TWA 1 mg/m^3

Measurement Methods (see Table 1):
NIOSH S257 (II-5)

Physical Description: White to pale-yellow, crystalline solid with a pungent, unpleasant odor.

Chemical & Physical Properties:
MW: 208.3
BP: Sublimes
Sol: Reacts
Fl.P: NA
IP: ?
Sp.Gr: 3.60
VP(132°F): 1 mmHg
MLT: 324°F (Sublimes)
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
10 mg/m^3: Sa*
25 mg/m^3: Sa:Cf*
50 mg/m^3: ScbaF/SaF
70 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Water, magnesium oxide, chemically-active metals such as sodium and potassium, alkalis, amines
[Note: Hydrolyzes in water (even in humid air) to form hydrochloric acid & phosphoric acid. Corrosive to metals.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; bron; derm
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

P

Phosphorus pentasulfide

Formula:	CAS#:	RTECS#:	IDLH:
P_2S_5/P_4S_{10}	1314-80-3	TH4375000	250 mg/m^3

Conversion: DOT: 1340 139

Synonyms/Trade Names: Phosphorus persulfide, Phosphorus sulfide, Sulfur phosphide

Exposure Limits:
NIOSH REL: TWA 1 mg/m^3
ST 3 mg/m^3
OSHA PEL†: TWA 1 mg/m^3

Measurement Methods (see Table 1):
None available

Physical Description: Greenish-gray to yellow, crystalline solid with an odor of rotten eggs.

Chemical & Physical Properties:
MW: 222.3 (P_2S_5)
444.6 (P_4S_{10})
BP: 957°F
Sol: Reacts
Fl.P: ?
IP: ?
Sp.Gr: 2.09
VP(572°F): 1 mmHg
MLT: 550°F
UEL: ?
LEL: ?
Flammable Solid, which may SPONTANEOUSLY ignite in presence of moisture.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
10 mg/m^3: Sa*
25 mg/m^3: Sa:Cf*
50 mg/m^3: ScbaF/SaF
250 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS100/ScbaE

Incompatibilities and Reactivities: Water, alcohols, strong oxidizers, acids, alkalis [Note: Reacts with water to form hydrogen sulfide, sulfur dioxide, and phosphoric acid.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; apnea, coma, convuls; conj pain, lac, photo, kerato-conj, corn vesic; dizz; head; lass; irrity, insom; GI dist
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Dust off solid; water flush
Breath: Resp support
Swallow: Medical attention immed

Phosphorus trichloride

Formula:	CAS#:	RTECS#:	IDLH:
PCl_3	7719-12-2	TH3675000	25 ppm

Conversion: 1 ppm = 5.62 mg/m^3

DOT: 1809 137

Synonyms/Trade Names: Phosphorus chloride

Exposure Limits:
NIOSH REL: TWA 0.2 ppm (1.5 mg/m^3)
ST 0.5 ppm (3 mg/m^3)
OSHA PEL†: TWA 0.5 ppm (3 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 6402

Physical Description: Colorless to yellow, fuming liquid with an odor like hydrochloric acid.

Chemical & Physical Properties:
MW: 137.4
BP: 169°F
Sol: Reacts
Fl.P: NA
IP: 9.91 eV
Sp.Gr: 1.58
VP: 100 mmHg
FRZ: -170°F
UEL: NA
LEL: NA
Noncombustible Liquid; however, a strong oxidizer that may ignite combustibles upon contact.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
10 ppm: ScbaF/SaF
25 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS¿/ScbaE

Incompatibilities and Reactivities: Water, chemically-active metals such as sodium & potassium, aluminum, strong nitric acid, acetic acid, organic matter [Note: Hydrolyzes in water to form hydrochloric acid and phosphoric acid.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; pulm edema; eye, skin burns
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

P

Phthalic anhydride

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_4(CO)_2O$	85-44-9	TI3150000	60 mg/m^3

Conversion: 1 ppm = 6.06 mg/m^3

DOT: 2214 156

Synonyms/Trade Names: 1,2-Benzenedicarboxylic anhydride; PAN; Phthalic acid anhydride

Exposure Limits:
NIOSH REL: TWA 6 mg/m^3 (1 ppm)
OSHA PEL†: TWA 12 mg/m^3 (2 ppm)

Measurement Methods (see Table 1):
NIOSH S179 (II-3)
OSHA 90

Physical Description: White solid (flake) or a clear, colorless, mobile liquid (molten) with a characteristic, acrid odor.

Chemical & Physical Properties:
MW: 148.1
BP: 563°F
Sol: 0.6%
Fl.P: 305°F
IP: 10.00 eV
Sp.Gr: 1.53 (Flake)
1.20 (Molten)
VP: 0.0015 mmHg
MLT: 267°F
UEL: 10.5%
LEL: 1.7%
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH
30 mg/m^3: Qm*
60 mg/m^3: 95XQ*/95F/PaprHie*/
Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, water [Note: Converted to phthalic acid in hot water.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, upper resp sys; conj; nasal ulcer bleeding; bron, bronchial asthma; derm; in animals: liver, kidney damage
TO: Eyes, skin, resp sys, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

m-Phthalodinitrile	Formula: $C_6H_4(CN)_2$	CAS#: 626-17-5	RTECS#: CZ1900000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: 1,3-Benzenedicarbonitrile; m-Dicyanobenzene; 1,3-Dicyanobenzene; Isophthalodinitrile; m-PDN

Exposure Limits:
NIOSH REL: TWA 5 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Needle-like, colorless to white, crystalline, flaky solid with an almond-like odor.

Chemical & Physical Properties:
MW: 128.1
BP: Sublimes
Sol: Slight
Fl.P: ?
IP: ?
Sp.Gr: 4.42
VP: 0.01 mmHg
MLT: 324°F (Sublimes)
UEL: ?
LEL: ?
Combustible Solid and a severe explosion hazard.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong oxidizers (e.g., chlorine, bromine, fluorine)

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Head, nau, conf; in animals: irrit eyes, skin
TO: Eyes, skin, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

P

Picloram	Formula: $C_6H_3Cl_3O_2N_2$	CAS#: 1918-02-1	RTECS#: TJ7525000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: 4-Amino-3,5,6-trichloropicolinic acid; 4-Amino-3,5,6-trichloro-2-picolinic acid; ATCP; Tordon®

Exposure Limits:
NIOSH REL: See Appendix D
OSHA PEL†: TWA 15 mg/m^3 (total) TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500, 0600

Physical Description: Colorless to white crystals with a chlorine-like odor. [herbicide]

Chemical & Physical Properties:
MW: 241.5
BP: Decomposes
Sol: 0.04%
Fl.P: ?
IP: ?
Sp.Gr: ?
VP(95°F): 0.0000006 mmHg
MLT: 424°F (Decomposes)
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: N.R.
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Hot concentrated alkali (hydrolyzes)

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; nau; in animals: liver, kidney changes
TO: Eyes, skin, resp sys, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Fresh air
Swallow: Medical attention immed

Picric acid	Formula: $(NO_2)_3C_6H_2OH$	CAS#: 88-89-1	RTECS#: TJ7875000	IDLH: 75 mg/m^3
Conversion: 1 ppm = 9.37 mg/m^3	DOT: 1344 113 (wet, ≥ 10% water); 3364 113 (wetted, ≥ 10% water)			
Synonyms/Trade Names: Phenol trinitrate; 2,4,6-Trinitrophenol [Note: An OSHA Class A Explosive (1910.109).]				
Exposure Limits: NIOSH REL: TWA 0.1 mg/m^3 ST 0.3 mg/m^3 [skin] OSHA PEL: TWA 0.1 mg/m^3 [skin]				Measurement Methods (see Table 1): NIOSH S228 (II-4)
Physical Description: Yellow, odorless solid. [Note: Usually used as an aqueous solution.]				
Chemical & Physical Properties: MW: 229.1 BP: Explodes above 572°F Sol: 1% Fl.P: 302°F IP: ? Sp.Gr: 1.76 VP(383°F): 1 mmHg MLT: 252°F UEL: ? LEL: ? Combustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 0.5 mg/m^3: Qm 1 mg/m^3: 95XQ/Sa 2.5 mg/m^3: Sa:Cf/PaprHie 5 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF 75 mg/m^3: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE	
Incompatibilities and Reactivities: Copper, lead, zinc & other metals; salts; plaster; concrete; ammonia [Note: Corrosive to metals. An explosive mixture results when the aqueous solution crystallizes.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin; sens derm; yellow-stained hair, skin; lass, myalgia, anuria, polyuria; bitter taste, GI dist; hepatitis, hema, album, neph TO: Eyes, skin, kidneys, liver, blood			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed	

P

Pindone	Formula: $C_9H_5O_2C(O)C(CH_3)_3$	CAS#: 83-26-1	RTECS#: NK6300000	IDLH: 100 mg/m^3
Conversion:	DOT:			
Synonyms/Trade Names: tert-Butyl valone; 1,3-Dioxo-2-pivaloy-lindane; Pival®; Pivalyl; 2-Pivalyl-1,3-indandione				
Exposure Limits: NIOSH REL: TWA 0.1 mg/m^3 OSHA PEL: TWA 0.1 mg/m^3				Measurement Methods (see Table 1): None available
Physical Description: Bright-yellow powder with almost no odor. [rodenticide]				
Chemical & Physical Properties: MW: 230.3 BP: Decomposes Sol(77°F): 0.002% Fl.P: ? IP: ? Sp.Gr: 1.06 VP: Very low MLT: 230°F UEL: ? LEL: ?	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: Daily		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 0.5 mg/m^3: Qm 1 mg/m^3: 95XQ/Sa 2.5 mg/m^3: Sa:Cf/PaprHie 5 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF 100 mg/m^3: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE	
Incompatibilities and Reactivities: None reported				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing SY: Epis, excess bleeding from minor cuts, bruises; smoky urine, black tarry stools; abdom, back pain TO: Blood prothrombin			First Aid (see Table 6): Eye: Irr immed Breath: Resp support Swallow: Medical attention immed	

Piperazine dihydrochloride

Formula:	CAS#:	RTECS#:	IDLH:
$C_4H_{10}N_2 \times 2HCl$	142-64-3	TL4025000	N.D.

Conversion: DOT:

Synonyms/Trade Names: Piperazine hydrochloride
[Note: The monochloride, $C_4H_{10}N_2 \times HCl$ is also commercially available.]

Exposure Limits:
NIOSH REL: TWA 5 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: White to cream-colored needles or powder.

Chemical & Physical Properties:
MW: 159.1
BP: ?
Sol: 41%
Fl.P: ?
IP: ?
Sp.Gr: ?
VP: ?
MLT: 635°F
UEL: ?
LEL: ?
Combustible Solid, but does not ignite easily.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Water [Note: Slightly hygroscopic (i.e., absorbs moisture from the air).]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; skin burns, sens; asthma; GI upset, head, nau, vomit, inco, musc weak
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

P

Plaster of Paris

Formula:	CAS#:	RTECS#:	IDLH:
$CaSO_4 \cdot 0.5H_2O$	26499-65-0	TP0700000	N.D.

Conversion: DOT:

Synonyms/Trade Names: Calcium sulfate hemihydrate, Dried calcium sulfate, Gypsum hemihydrate, Hemihydrate gypsum
[Note: Plaster of Paris is the hemihydrate form of Calcium Sulfate & Gypsum is the dihydrate form.]

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500, 0600

Physical Description: White or yellowish, finely divided, odorless powder.

Chemical & Physical Properties:
MW: 145.2
BP: ?
Sol(77°F): 0.3%
Fl.P: NA
IP: NA
Sp.Gr: 2.5
VP: 0 mmHg (approx)
MLT: 325°F (Loses H_2O)
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Moisture, water
[Note: Hygroscopic (i.e., absorbs moisture from the air). Reacts with water to form Gypsum.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, muc memb, resp sys; cough
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Breath: Resp support
Swallow: Medical attention immed

Platinum	Formula: Pt	CAS#: 7440-06-4	RTECS#: TP2160000	IDLH: N.D.
Conversion:	DOT:			
Synonyms/Trade Names: Platinum black, Platinum metal, Platinum sponge				
Exposure Limits: NIOSH REL: TWA 1 mg/m^3 OSHA PEL†: none			Measurement Methods (see Table 1): NIOSH 7300, 7303 OSHA ID121, ID130SG	
Physical Description: Silvery, whitish-gray, malleable, ductile metal.				
Chemical & Physical Properties: MW: 195.1 BP: 6921°F Sol: Insoluble Fl.P: NA IP: NA Sp.Gr: 21.45 VP: 0 mmHg (approx) MLT: 3222°F UEL: NA LEL: NA Noncombustible Solid in bulk form, but finely divided powder can be dangerous to handle.	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: Daily		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Aluminum, acetone, arsenic, ethane, hydrazine, hydrogen peroxide, lithium, phosphorus, selenium, tellurium, various fluorides				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit skin, resp sys; derm TO: Eyes, skin, resp sys		First Aid (see Table 6): Eye: Irr immed Skin: Soap wash Breath: Resp support Swallow: Medical attention immed		

Platinum (soluble salts, as Pt)	Formula:	CAS#:	RTECS#:	IDLH: 4 mg/m^3 (as Pt)
Conversion:	DOT:			
Synonyms/Trade Names: Synonyms vary depending upon the specific soluble platinum salt.				
Exposure Limits: NIOSH REL: TWA 0.002 mg/m^3 OSHA PEL: TWA 0.002 mg/m^3			Measurement Methods (see Table 1): NIOSH 7300, 7303, S191 (II-7)	
Physical Description: Appearance and odor vary depending upon the specific soluble platinum salt.				
Chemical & Physical Properties: Properties vary depending upon the specific soluble platinum salt.	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 0.05 mg/m^3: Sa:Cf£ 0.1 mg/m^3: 100F/ScbaF/SaF 4 mg/m^3: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE	
Incompatibilities and Reactivities: Varies				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, nose; cough, dysp, wheez, cyan; derm, sens skin; lymphocytosis TO: Eyes, skin, resp sys		First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed		

Portland cement

Formula:	CAS#:	RTECS#:	IDLH:
	65997-15-1	VV8770000	5000 mg/m^3

Conversion: DOT:

Synonyms/Trade Names: Cement, Hydraulic cement, Portland cement silicate [Note: A class of hydraulic cements containing tri- and dicalcium silicate in addition to alumina, tricalcium aluminate, and iron oxide.]

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL†: TWA 50 mppcf

Measurement Methods (see Table 1):
NIOSH 0500
OSHA ID207

Physical Description: Gray, odorless powder.

Chemical & Physical Properties:
MW: ?
BP: NA
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: ?
VP: 0 mmHg (approx)
MLT: NA
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
50 mg/m^3: Qm
100 mg/m^3: 95XQ/Sa
250 mg/m^3: Sa:Cf/PaprHie
500 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF
5000 mg/m^3: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose; cough, expectoration; exertional dysp, wheez, chronic bron; derm
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Fresh air
Swallow: Medical attention immed

P

Potassium cyanide (as CN)

Formula:	CAS#:	RTECS#:	IDLH:
KCN	151-50-8	TS8750000	25 mg/m^3 (as CN)

Conversion: DOT: 1680 157 (solid); 3413 157 (solution)

Synonyms/Trade Names: Potassium salt of hydrocyanic acid

Exposure Limits:
NIOSH REL*: C 5 mg/m^3 (4.7 ppm) [10-minute]
OSHA PEL*: TWA 5 mg/m^3
[*Note: The REL and PEL also apply to other cyanides (as CN) except Hydrogen cyanide.]

Measurement Methods (see Table 1):
NIOSH 6010, 7904

Physical Description: White, granular or crystalline solid with a faint, almond-like odor.

Chemical & Physical Properties:
MW: 65.1
BP: 2957°F
Sol(77°F): 72%
Fl.P: NA
IP: NA
Sp.Gr: 1.55
VP: 0 mmHg (approx)
MLT: 1173°F
UEL: NA
LEL: NA
Noncombustible Solid, but contact with acids releases highly flammable hydrogen cyanide.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
25 mg/m^3: Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers (such as acids, acid salts, chlorates & nitrates)
[Note: Absorbs moisture from the air forming a syrup.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, upper resp sys; asphy; lass, head, conf; nau, vomit; incr resp rate, slow gasping respiration; thyroid, blood changes
TO: Eyes, skin, resp sys, CVS, CNS, thyroid, blood

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Potassium hydroxide

Formula:	CAS#:	RTECS#:	IDLH:
KOH	1310-58-3	TT2100000	N.D.

Conversion:

DOT: 1813 154 (dry, solid); 1814 154 (solution)

Synonyms/Trade Names: Caustic potash, Lye, Potassium hydrate

Exposure Limits:
NIOSH REL: C 2 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 7401

Physical Description: Odorless, white or slightly yellow lumps, rods, flakes, sticks, or pellets. [Note: May be used as an aqueous solution.]

Chemical & Physical Properties:
MW: 56.1
BP: 2415°F
Sol(59°F): 107%
Fl.P: NA
IP: ?
Sp.Gr: 2.04
VP(1317°F): 1 mmHg
MLT: 716°F
UEL: NA
LEL: NA
Noncombustible Solid; however, may react with H_2O & other substances and generate sufficient heat to ignite combustible materials.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Acids, water, metals (when wet), halogenated hydrocarbons, maleic anhydride [Note: Heat is generated if KOH comes in contact with H_2O & CO_2 from the air.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; cough, sneez; eye, skin burns; vomit, diarr
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

P

Propane

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3CH_2CH_3$	74-98-6	TX2275000	2100 ppm [10%LEL]

Conversion: 1 ppm = 1.80 mg/m^3

DOT: 1075 115; 1978 115

Synonyms/Trade Names: Bottled gas, Dimethyl methane, n-Propane, Propyl hydride

Exposure Limits:
NIOSH REL: TWA 1000 ppm (1800 mg/m^3)
OSHA PEL: TWA 1000 ppm (1800 mg/m^3)

Measurement Methods (see Table 1):
NIOSH S87 (II-2)
OSHA PV2077

Physical Description: Colorless, odorless gas. [Note: A foul-smelling odorant is often added when used for fuel purposes. Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 44.1
BP: -44°F
Sol: 0.01%
Fl.P: NA (Gas)
IP: 11.07 eV
RGasD: 1.55
VP(70°F): 8.4 atm
FRZ: -306°F
UEL: 9.5%
LEL: 2.1%
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Frostbite
Eyes: Frostbite
Wash skin: N.R.
Remove: When wet (flamm)
Change: N.R.
Provide: Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
2100 ppm: Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con (liquid)
SY: Dizz, conf, excitation, asphy; liquid: frostbite
TO: CNS

First Aid (see Table 6):
Eye: Frostbite
Skin: Frostbite
Breath: Resp support

Propane sultone

Formula:	CAS#:	RTECS#:	IDLH:
$C_3H_6O_3S$	1120-71-4	RP5425000	Ca [N.D.]

Conversion:

DOT:

Synonyms/Trade Names: 3-Hydroxy-1-propanesulphonic acid sultone; 1,3-Propane sultone

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL: none

Measurement Methods (see Table 1):
None available

Physical Description: White, crystalline solid or a colorless liquid (above 86°F). [Note: Releases a foul odor as it melts.]

Chemical & Physical Properties:
MW: 122.2
BP: ?
Sol: 10%
Fl.P: >235°F
IP: ?
Sp.Gr: 1.39
VP: ?
MLT: 86°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; [carc]
TO: Eyes, skin, resp sys [in animals: skin tumors, leukemia, gliomas]

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

P

1-Propanethiol

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3CH_2CH_2SH$	107-03-9	TZ7300000	N.D.

Conversion: 1 ppm = 3.12 mg/m^3

DOT: 2402 130

Synonyms/Trade Names: 3-Mercaptopropane, Propane-1-thiol, Propyl mercaptan, n-Propyl mercaptan

Exposure Limits:
NIOSH REL: C 0.5 ppm (1.6 mg/m^3) [15-minute]
OSHA PEL: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless liquid with an offensive, cabbage-like odor.

Chemical & Physical Properties:
MW: 76.2
BP: 153°F
Sol: Slight
Fl.P: -5°F
IP: 9.195 eV
Sp.Gr: 0.84
VP(77°F): 155 mmHg
FRZ: -172°F
UEL: ?
LEL: ?
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: Prevent eye contact
Wash skin: N.R.
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
NIOSH
5 ppm: CcrOv/Sa
12.5 ppm: Sa:Cf/PaprOv
25 ppm: CcrFOv/GmFOv/PaprTOv/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, reducing agents, strong acids & bases, alkali metals, calcium hypochlorite

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat, resp sys; head, nau, dizz, cyan; in animals: liver, kidney damage
TO: Eyes, skin, resp sys, CNS, blood, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

Propargyl alcohol

Formula:	CAS#:	RTECS#:	IDLH:
C_3H_3OH	107-19-7	UK5075000	N.D.

Conversion: 1 ppm = 2.29 mg/m^3

DOT: 1986 131

Synonyms/Trade Names: 1-Propyn-3-ol; 2-Propyn-1-ol; 2-Propynyl alcohol

Exposure Limits:
NIOSH REL: TWA 1 ppm (2 mg/m^3) [skin]
OSHA PEL†: none

Measurement Methods (see Table 1):
OSHA 97

Physical Description: Colorless to straw-colored liquid with a mild, geranium odor.

Chemical & Physical Properties:
MW: 56.1
BP: 237°F
Sol: Miscible
Fl.P(oc): 97°F
IP: 10.51 eV
Sp.Gr: 0.97
VP: 12 mmHg
FRZ: -62°F
UEL: ?
LEL: ?
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Phosphorus pentoxide, oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit skin, muc memb; CNS depres; in animals: liver, kidney damage
TO: Skin, resp sys, CNS, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush prompt
Breath: Resp support
Swallow: Medical attention immed

β-Propiolactone

Formula:	CAS#:	RTECS#:	IDLH:
$C_3H_4O_2$	57-57-8	RQ7350000	Ca [N.D]

Conversion:

DOT:

Synonyms/Trade Names: BPL; Hydroacrylic acid, β-lactone; 3-Hydroxy-β-lactone; 3-Hydroxy-propionic acid; β-Lactone; 2-Oxetanone; 3-Propiolactone

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL: [1910.1013]
See Appendix B

Measurement Methods (see Table 1):
None available

Physical Description: Colorless liquid with a slightly sweet odor.

Chemical & Physical Properties:
MW: 72.1
BP: 323°F (Decomposes)
Sol: 37%
Fl.P: 165°F
IP: ?
Sp.Gr: 1.15
VP(77°F): 3 mmHg
FRZ: -28°F
UEL: ?
LEL: 2.9%
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

See Appendix E (page 351)

Incompatibilities and Reactivities: Acetates, halogens, thiocyanates, thiosulfates
[Note: May polymerize upon storage.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Skin irrit, blistering, burns; corn opac; frequent urination; dysuria; hema; [carc]
TO: Kidneys, skin, lungs, eyes [in animals: tumors of the liver, skin & stomach]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Propionic acid	Formula: CH_3CH_2COOH	CAS#: 79-09-4	RTECS#: UE5950000	IDLH: N.D.
Conversion: 1 ppm = 3.03 mg/m^3	DOT: 1848 132			
Synonyms/Trade Names: Carboxyethane, Ethanecarboxylic acid, Ethylformic acid, Metacetonic acid, Methyl acetic acid, Propanoic acid				
Exposure Limits: NIOSH REL: TWA 10 ppm (30 mg/m^3) ST 15 ppm (45 mg/m^3) OSHA PEL†: none			Measurement Methods (see Table 1): None available	
Physical Description: Colorless, oily liquid with a pungent, disagreeable, rancid odor. [Note: A solid below 5°F.]				
Chemical & Physical Properties: MW: 74.1 BP: 286°F Sol: Miscible Fl.P: 126°F IP: 10.24 eV Sp.Gr: 0.99 VP: 3 mmHg FRZ: 5°F UEL: 12.1% LEL: 2.9% Class II Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Alkalis, strong oxidizers (e.g., chromium trioxide) [Note: Corrosive to steel.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, nose, throat; blurred vision, corn burns; skin burns; abdom pain, nau, vomit TO: Eyes, skin, resp sys		First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed		

P

Propionitrile	Formula: CH_3CH_2CN	CAS#: 107-12-0	RTECS#: UF9625000	IDLH: N.D.
Conversion: 1 ppm = 2.25 mg/m^3	DOT: 2404 131			
Synonyms/Trade Names: Cyanoethane, Ethyl cyanide, Propanenitrile, Propionic nitrile, Propiononitrile				
Exposure Limits: NIOSH REL: TWA 6 ppm (14 mg/m^3) OSHA PEL: none			Measurement Methods (see Table 1): NIOSH 1606 (adapt)	
Physical Description: Colorless liquid with a pleasant, sweetish, ethereal odor. [Note: Forms cyanide in the body.]				
Chemical & Physical Properties: MW: 55.1 BP: 207°F Sol: 11.9% Fl.P: 36°F IP: 11.84 eV Sp.Gr: 0.78 VP: 35 mmHg FRZ: -133°F UEL: ? LEL: 3.1% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH 60 ppm: CcrOv/Sa 150 ppm: Sa:Cf/PaprOv 300 ppm: CcrFOv/GmFOv/PaprTOv/ScbaF/SaF 1000 ppm: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers & reducing agents, strong acids & bases [Note: Hydrogen cyanide is produced when propionitrile is heated to decomposition.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, resp sys; nau, vomit; chest pain; lass; stupor, convuls; in animals: liver, kidney damage TO: Eyes, skin, resp sys, CVS, CNS, liver, kidneys		First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed		

Propoxur	Formula: $CH_3NHCOOC_6H_4OCH(CH_3)_2$	CAS#: 114-26-1	RTECS#: FC3150000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: Aprocarb®, o-Isopropoxyphenyl-N-methylcarbamate, N-Methyl-2-isopropoxyphenyl-carbamate

Exposure Limits:
NIOSH REL: TWA 0.5 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 5601
OSHA PV2007

Physical Description: White to tan, crystalline powder with a faint, characteristic odor. [insecticide]

Chemical & Physical Properties:
MW: 209.3
BP: Decomposes
Sol: 0.2%
Fl.P: >300°F
IP: ?
Sp.Gr: ?
VP: 0.000007 mmHg
MLT: 187-197°F
UEL: ?
LEL: ?
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong oxidizers, alkalis
[Note: Emits highly toxic methyl isocyanate fumes when heated to decomposition.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Miosis, blurred vision; sweat, salv; abdom cramps, nau, diarr, vomit; head, lass, musc twitch
TO: CNS, liver, kidneys, GI tract, blood chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

P

n-Propyl acetate	Formula: $CH_3COOCH_2CH_2CH_3$	CAS#: 109-60-4	RTECS#: AJ3675000	IDLH: 1700 ppm
Conversion: 1 ppm = 4.18 mg/m^3	DOT: 1276 129			

Synonyms/Trade Names: Propylacetate, n-Propyl ester of acetic acid

Exposure Limits:
NIOSH REL: TWA 200 ppm (840 mg/m^3)
ST 250 ppm (1050 mg/m^3)
OSHA PEL†: TWA 200 ppm (840 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1450
OSHA 7

Physical Description: Colorless liquid with a mild, fruity odor.

Chemical & Physical Properties:
MW: 102.2
BP: 215°F
Sol: 2%
Fl.P: 55°F
IP: 10.04 eV
Sp.Gr: 0.84
VP: 25 mmHg
FRZ: -134°F
UEL: 8%
LEL(100°F): 1.7%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1700 ppm: Sa:Cf£/CcrFOv/GmFOv/PaprOv£/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Nitrates; strong oxidizers, alkalis & acids

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: In animals: irrit eyes, nose, throat; narco; derm
TO: Eyes, skin, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush prompt
Breath: Resp support
Swallow: Medical attention immed

n-Propyl alcohol

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3CH_2CH_2OH$	71-23-8	UH8225000	800 ppm

Conversion: 1 ppm = 2.46 mg/m^3

DOT: 1274 129

Synonyms/Trade Names: Ethyl carbinol, 1-Propanol, n-Propanol, Propyl alcohol

Exposure Limits:
NIOSH REL: TWA 200 ppm (500 mg/m^3) [skin]
ST 250 ppm (625 mg/m^3)
OSHA PEL†: TWA 200 ppm (500 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1401, 1405
OSHA 7

Physical Description: Colorless liquid with a mild, alcohol-like odor.

Chemical & Physical Properties:
MW: 60.1
BP: 207°F
Sol: Miscible
Fl.P: 72°F
IP: 10.15 eV
Sp.Gr: 0.81
VP: 15 mmHg
FRZ: -196°F
UEL: 13.7%
LEL: 2.2%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
800 ppm: CcrOv*/PaprOv*/GmFOv/Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, nose, throat; dry cracking skin; drow, head; ataxia, GI pain; abdom cramps, nau, vomit, diarr; in animals: narco
TO: Eyes, skin, resp sys, GI tract, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush
Breath: Resp support
Swallow: Medical attention immed

P

Propylene dichloride

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3CHClCH_2Cl$	78-87-5	TX9625000	Ca [400 ppm]

Conversion: 1 ppm = 4.62 mg/m^3

DOT: 1279 130

Synonyms/Trade Names: Dichloro-1,2-propane; 1,2-Dichloropropane

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL†: TWA 75 ppm (350 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1013
OSHA 7

Physical Description: Colorless liquid with a chloroform-like odor. [pesticide]

Chemical & Physical Properties:
MW: 113.0
BP: 206°F
Sol: 0.3%
Fl.P: 60°F
IP: 10.87 eV
Sp.Gr: 1.16
VP: 40 mmHg
FRZ: -149°F
UEL: 14.5%
LEL: 3.4%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong acids, active metals

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; drow, dizz; liver, kidney damage; in animals: CNS depres; [carc]
TO: Eyes, skin, resp sys, liver, kidneys, CNS [in animals: liver & mammary gland tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Propylene glycol dinitrate	Formula: $CH_3CNO_2OHCHNO_2OH$	CAS#: 6423-43-4	RTECS#: TY6300000	IDLH: N.D.
Conversion: 1 ppm = 6.79 mg/m^3	DOT:			

Synonyms/Trade Names: PGDN; Propylene glycol-1,2-dinitrate; 1,2-Propylene glycol dinitrate

Exposure Limits: NIOSH REL: TWA 0.05 ppm (0.3 mg/m^3) [skin] OSHA PEL†: none	Measurement Methods (see Table 1): None available
Physical Description: Colorless liquid with a disagreeable odor. [Note: A solid below 18°F.]	

Chemical & Physical Properties: MW: 166.1 BP: ? Sol: 0.1% Fl.P: ? IP: ? Sp.Gr(77°F): 1.23 VP(72°F): 0.07 mmHg FRZ: 18°F UEL: ? LEL: ? Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: N.R. Remove: N.R. Change: N.R.	Respirator Recommendations (see Tables 3 and 4): Not available.

Incompatibilities and Reactivities: Ammonia compounds, amines, oxidizers, reducing agents, combustible materials [Note: Similar to Ethylene glycol dinitrate in explosion potential.]

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes; conj; methemo; head, impaired balance, vis dist; in animals: liver, kidney damage TO: Eyes, CNS, blood, liver, kidneys	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash Breath: Resp support Swallow: Medical attention immed

Propylene glycol monomethyl ether	Formula: $CH_3OCH_2CHOHCH_3$	CAS#: 107-98-2	RTECS#: UB7700000	IDLH: N.D.
Conversion: 1 ppm = 3.69 mg/m^3	DOT:			

Synonyms/Trade Names: Dowtherm® 209, 1-Methoxy-2-hydroxypropane, 1-Methoxy-2-propanol, 2-Methoxy-1-methylethanol, Propylene glycol methyl ether

Exposure Limits: NIOSH REL: TWA 100 ppm (360 mg/m^3) ST 150 ppm (540 mg/m^3) OSHA PEL†: none	Measurement Methods (see Table 1): NIOSH 2554 OSHA 99
Physical Description: Clear, colorless liquid with a mild, ethereal odor.	

Chemical & Physical Properties: MW: 90.1 BP: 248°F Sol: Miscible Fl.P: 97°F IP: ? Sp.Gr: 0.96 VP(77°F): 12 mmHg FRZ: -139°F (Sets to glass) UEL(calc): 13.8% LEL(calc.): 1.6% Class IC Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: Prevent eye contact Wash skin: N.R. Remove: When wet (flamm) Change: N.R.	Respirator Recommendations (see Tables 3 and 4): Not available.

Incompatibilities and Reactivities: Oxidizers, strong acids [Note: Hygroscopic (i.e., absorbs moisture from air). May slowly form reactive peroxides during prolonged storage.]

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose, throat; head, nau, dizz, drow, inco; vomit, diarr TO: Eyes, skin, resp sys, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Water wash Breath: Resp support Swallow: Medical attention immed

Propylene imine	Formula: C_3H_7N	CAS#: 75-55-8	RTECS#: CM8050000	IDLH: Ca [100 ppm]
Conversion: 1 ppm = 2.34 mg/m^3	DOT: 1921 131P (inhibited)			
Synonyms/Trade Names: 2-Methylaziridine, 2-Methylethyleneimine, Propyleneimine, Propylene imine (inhibited), Propylenimine				
Exposure Limits: NIOSH REL: Ca TWA 2 ppm (5 mg/m^3) [skin] See Appendix A OSHA PEL: TWA 2 ppm (5 mg/m^3) [skin]			Measurement Methods (see Table 1): None available	
Physical Description: Colorless, oily liquid with an ammonia-like odor.				
Chemical & Physical Properties: MW: 57.1 BP: 152°F Sol: Miscible Fl.P: 25°F IP: 9.00 eV Sp.Gr: 0.80 VP: 112 mmHg FRZ: -85°F UEL: ? LEL: ? Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R. Provide: Eyewash Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS/ScbaE	
	Incompatibilities and Reactivities: Acids, strong oxidizers, water, carbonyl compounds, quinones, sulfonyl halides [Note: Subject to violent polymerization in contact with acids. Hydrolyzes in water to form methylethanolamine.]			
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Eye, skin burns; [carc] TO: Eyes, skin [in animals: nasal tumors]		First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed		

P

Propylene oxide	Formula: C_3H_6O	CAS#: 75-56-9	RTECS#: TZ2975000	IDLH: Ca [400 ppm]
Conversion: 1 ppm = 2.38 mg/m^3	DOT: 1280 127P			
Synonyms/Trade Names: 1,2-Epoxy propane; Methyl ethylene oxide; Methyloxirane; Propene oxide; 1,2-Propylene oxide				
Exposure Limits: NIOSH REL: Ca See Appendix A OSHA PEL†: TWA 100 ppm (240 mg/m^3)			Measurement Methods (see Table 1): NIOSH 1612 OSHA 88	
Physical Description: Colorless liquid with a benzene-like odor. [Note: A gas above 94°F.]				
Chemical & Physical Properties: MW: 58.1 BP: 94°F Sol: 41% Fl.P: -35°F IP: 9.81 eV Sp.Gr: 0.83 VP: 445 mmHg FRZ: -170°F UEL: 36% LEL: 2.3% Class IA Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R. Provide: Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS/ScbaE	
Incompatibilities and Reactivities: Anhydrous chlorides of iron, tin, and aluminum; peroxides of iron and aluminum; alkali metal hydroxides; iron; strong acids, caustics & peroxides [Note: Polymerization may occur due to high temperatures or contamination with alkalis, aqueous acids, amines & acidic alcohols.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, resp sys; skin blisters, burns; [carc] TO: Eyes, skin, resp sys [in animals: nasal tumors]		First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed		

n-Propyl nitrate	Formula: $CH_3CH_2CH_2ONO_2$	CAS#: 627-13-4	RTECS#: UK0350000	IDLH: 500 ppm
Conversion: 1 ppm = 4.30 mg/m^3	DOT: 1865 131			
Synonyms/Trade Names: Propyl ester of nitric acid				

Exposure Limits: NIOSH REL: TWA 25 ppm (105 mg/m^3) ST 40 ppm (170 mg/m^3) OSHA PEL†: TWA 25 ppm (110 mg/m^3) Physical Description: Colorless to straw-colored liquid with an ether-like odor.	Measurement Methods (see Table 1): NIOSH S227 (II-3) OSHA 7

Chemical & Physical Properties: MW: 105.1 BP: 231°F Sol: Slight Fl.P: 68°F IP: 11.07 eV Sp.Gr: 1.07 VP: 18 mmHg FRZ: -148°F UEL: 100% LEL: 2% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 250 ppm: Sa 500 ppm: Sa:Cf/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS¿/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, combustible materials [Note: Forms explosive mixtures with combustible materials.]	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: In animals: irrit eyes, skin; methemo, anoxia, cyan; dysp, lass, dizz, head TO: Eyes, skin, blood	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed

P

Pyrethrum	Formula: $C_{20}H_{28}O_3/C_{21}H_{28}O_5/C_{21}H_{30}O_3/C_{22}H_{30}O_5/C_{21}H_{28}O_3/C_{22}H_{28}O_5$	CAS#: 8003-34-7	RTECS#: UR4200000	IDLH: 5000 mg/m^3
Conversion:	DOT:			
Synonyms/Trade Names: Cinerin I or II, Jasmolin I or II, Pyrethrin I or II, Pyrethrum I or II [Note: Pyrethrum is a variable mixture of Cinerin, Jasmolin, and Pyrethrin.]				

Exposure Limits: NIOSH REL: TWA 5 mg/m^3 OSHA PEL: TWA 5 mg/m^3 Physical Description: Brown, viscous oil or solid. [insecticide]	Measurement Methods (see Table 1): NIOSH 5008 OSHA 70

Chemical & Physical Properties: MW: 316-374 BP: ? Sol: Insoluble Fl.P: 180-190°F IP: ? Sp.Gr: 1 (approx) VP: Low MLT: ? UEL: ? LEL: ? Class IIIA Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 50 mg/m^3: CcrOv95*/Sa* 125 mg/m^3: Sa:Cf*/PaprOvHie* 250 mg/m^3: CcrFOv100/PaprTOvHie*/ScbaF/SaF 5000 mg/m^3: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Erythema, derm, papules, pruritus, rhin; sneez; asthma TO: Resp sys, skin, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

Pyridine

Formula:	CAS#:	RTECS#:	IDLH:
C_5H_5N	110-86-1	UR8400000	1000 ppm

Conversion: 1 ppm = 3.24 mg/m^3 | DOT: 1282 129

Synonyms/Trade Names: Azabenzene, Azine

Exposure Limits:
NIOSH REL: TWA 5 ppm (15 mg/m^3)
OSHA PEL: TWA 5 ppm (15 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1613
OSHA 7

Physical Description: Colorless to yellow liquid with a nauseating, fish-like odor.

Chemical & Physical Properties:
MW: 79.1
BP: 240°F
Sol: Miscible
Fl.P: 68°F
IP: 9.27 eV
Sp.Gr: 0.98
VP: 16 mmHg
FRZ: -44°F
UEL: 12.4%
LEL: 1.8%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
125 ppm: Sa:Cf£/PaprOv£
50 ppm: CcrFOv/GmFOv/PaprTOv£/ScbaF/SaF
1000 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong acids

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes; head, anxi, dizz, insom; nau, anor; derm; liver, kidney damage
TO: Eyes, skin, CNS, liver, kidneys, GI tract,

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Quinone

Formula:	CAS#:	RTECS#:	IDLH:
OC_6H_4O	106-51-4	DK2625000	100 mg/m^3

Conversion: 1 ppm = 4.42 mg/m^3 | DOT: 2587 153

Synonyms/Trade Names: 1,4-Benzoquinone; p-Benzoquinone; 1,4-Cyclohexadiene dioxide; p-Quinone

Exposure Limits:
NIOSH REL: TWA 0.4 mg/m^3 (0.1 ppm)
OSHA PEL: TWA 0.4 mg/m^3 (0.1 ppm)

Measurement Methods (see Table 1):
NIOSH S181 (II-4)

Physical Description: Pale-yellow solid with an acrid, chlorine-like odor.

Chemical & Physical Properties:
MW: 108.1
BP: Sublimes
Sol: Slight
Fl.P: 100-200°F
IP: 9.68 eV
Sp.Gr: 1.32
VP(77°F): 0.1 mmHg
MLT: 240°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
10 mg/m^3: Sa:Cf£
20 mg/m^3: ScbaF/SaF
100 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Eye irrit, conj; kera; skin irrit
TO: Eyes, skin

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Resorcinol

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_4(OH)_2$	108-46-3	VG9625000	N.D.

Conversion: 1 ppm = 4.50 mg/m^3

DOT: 2876 153

Synonyms/Trade Names: 1,3-Benzenediol; m-Benzenediol; 1,3-Dihydroxybenzene; m-Dihydroxybenzene; 3-Hydroxyphenol; m-Hydroxyphenol

Exposure Limits:
NIOSH REL: TWA 10 ppm (45 mg/m^3)
ST 20 ppm (90 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 5701
OSHA PV2053

Physical Description: White needles, plates, crystals, flakes, or powder with a faint odor. [Note: Turns pink on exposure to air or light, or contact with iron.]

Chemical & Physical Properties:
MW: 110.1
BP: 531°F
Sol: 110%
Fl.P: 261°F
IP: 8.63 eV
Sp.Gr: 1.27
VP(77°F): 0.0002 mmHg
MLT: 228°F
UEL: ?
LEL(392°F): 1.4%
Class IIIB Combustible Liquid, but may be difficult to ignite.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Acetanilide, albumin, alkalis, antipyrine, camphor, ferric salts, menthol, spirit nitrous ether, strong oxidizers & bases
[Note: Hygroscopic (i.e., absorbs moisture from the air).]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat, upper resp sys; methemo; cyan, convuls; restless, bluish skin, incr heart rate, dysp; dizz, drow, hypothermia, hema; spleen, kidney, liver changes; derm
TO: Eyes, skin, resp sys, CVS, CNS, blood, spleen, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash immed
Breath: Resp support
Swallow: Medical attention immed

Rhodium (metal fume and insoluble compounds, as Rh)

Formula:	CAS#:	RTECS#:	IDLH:
Rh (metal)	7440-16-6 (metal)	VI9069000	100 mg/m^3 (as Rh)

Conversion:

DOT:

Synonyms/Trade Names: Rhodium metal: Elemental rhodium
Synonyms of other insoluble rhodium compounds vary depending upon the specific compound.

Exposure Limits:
NIOSH REL: TWA 0.1 mg/m^3
OSHA PEL: TWA 0.1 mg/m^3

Measurement Methods (see Table 1):
NIOSH S188 (II-3)

Physical Description: Metal: White, hard, ductile, malleable solid with a bluish-gray luster.

Chemical & Physical Properties:
MW: 102.9
BP: 6741°F
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 12.41 (metal)
VP: 0 mmHg (approx)
MLT: 3571°F
UEL: NA
LEL: NA
Metal: Noncombustible Solid in bulk form, but flammable as dust or powder.

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
0.5 mg/m^3: Qm
1 mg/m^3: 95XQ/Sa
2.5 mg/m^3: Sa:Cf/PaprHie
5 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF
100 mg/m^3: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Chlorine trifluoride, oxygen difluoride

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh
SY: Possible resp sens
TO: Resp sys

First Aid (see Table 6):
Breath: Resp support
Swallow: Medical attention immed

Rhodium (soluble compounds, as Rh)	Formula:	CAS#:	RTECS#:	IDLH: 2 mg/m^3 (as Rh)
Conversion:	DOT:			

Synonyms/Trade Names: Synonyms vary depending upon the specific soluble rhodium compound.

Exposure Limits: NIOSH REL: TWA 0.001 mg/m^3 OSHA PEL: TWA 0.001 mg/m^3	Measurement Methods (see Table 1): NIOSH S189 (II-3)
Physical Description: Appearance and odor vary depending upon the specific soluble rhodium compound.	

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
Properties vary depending upon the specific soluble rhodium compound.	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.	NIOSH/OSHA 0.01 mg/m^3: 100XQ*/Sa* 0.025 mg/m^3: Sa:Cf*/PaprHie* 0.05 mg/m^3: 100F/PaprTHie*/ScbaF/SaF 2 mg/m^3: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE

Incompatibilities and Reactivities: Varies

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Ing, Con SY: In animals: irrit eyes; CNS damage TO: Eyes, CNS	Eye: Irr immed Skin: Water flush Breath: Resp support Swallow: Medical attention immed

Ronnel	Formula: $(CH_3O)_2P(S)OC_6H_2Cl_3$	CAS#: 299-84-3	RTECS#: TG0525000	IDLH: 300 mg/m^3
Conversion:	DOT:			

Synonyms/Trade Names: O,O-Dimethyl O-(2,4,5-trichlorophenyl) phosphorothioate; Fenchlorophos

Exposure Limits: NIOSH REL: TWA 10 mg/m^3 OSHA PEL†: TWA 15 mg/m^3	Measurement Methods (see Table 1): NIOSH 5600 OSHA PV2054
Physical Description: White to light-tan, crystalline solid. [insecticide] [Note: A liquid above 106°F.]	

R

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 321.6 BP: Decomposes Sol(77°F): 0.004% Fl.P: NA IP: ? Sp.Gr(77°F): 1.49 VP(77°F): 0.0008 mmHg MLT: 106°F UEL: NA LEL: NA Noncombustible Solid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily	NIOSH 100 mg/m^3: CcrOv95/Sa 250 mg/m^3: Sa:Cf/PaprOvHie 300 mg/m^3: CcrFOv100/GmFOv100/ PaprTOvHie*/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Ing, Con SY: In animals: irrit eyes; chol inhibition; liver, kidney damage TO: Eyes, liver, kidneys, blood plasma	Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed

Rosin core solder, pyrolysis products (as formaldehyde)	Formula:	CAS#:	RTECS#:	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: Rosin flux pyrolysis products, Rosin core soldering flux pyrolysis products

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL*: TWA 0.1 mg/m^3 [*Note: "Ca" in the presence of formaldehyde, acetaldehyde, or malonaldehyde. See Appendices A & C (Aldehydes).] OSHA PEL†: none	NIOSH 2541, 3500

Physical Description: Pyrolysis products of rosin core solder include acetone, aliphatic aldehydes, methyl alcohol, methane, ethane, various abietic acids (the major components of rosin), CO & CO_2.

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
Properties vary depending upon the specific rosin core solder being used.	Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.	Not available. In the presence of Formaldeyde, Acetaldehyde, or Malonaldehyde: NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Varies

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh SY: Irrit eyes, nose, throat, upper resp sys [carc (in the presence of Formaldehyde, Acetaldehyde, or Malonaldehyde)] TO: Eyes, resp sys [nasal cancer; thyroid gland tumors in animals (in the presence of Formaldehyde, Acetaldehyde, or Malonaldehyde)]	Eye: Irr immed Breath: Resp support

Rotenone	Formula: $C_{23}H_{22}O_6$	CAS#: 83-79-4	RTECS#: DJ2800000	IDLH: 2500 mg/m^3
Conversion:	DOT:			

Synonyms/Trade Names:
1,2,12,12a-Tetrahydro-8,9-dimethoxy-2-(1-methylethenyl)-[1]benzopyrano[3,4-b]furo[2,3-h][1]benzopyran-6(6aH)-one

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: TWA 5 mg/m^3 OSHA PEL: TWA 5 mg/m^3	NIOSH 5007

Physical Description: Colorless to red, odorless, crystalline solid. [insecticide]

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 394.4 BP: Decomposes Sol: Insoluble Fl.P: ? IP: ? Sp.Gr: 1.27 VP: <0.00004 mmHg MLT: 330°F UEL: ? LEL: ? Combustible Solid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily	NIOSH/OSHA 5 mg/m^3: CcrOv95/Sa 125 mg/m^3: Sa:Cf/PaprOvHie 250 mg/m^3: CcrFOv100/GmFOv100/ PaprTOvHie/SaT:Cf/ ScbaF/SaF 2500 mg/m^3: Sa:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, alkalis

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Ing, Con SY: Irrit eyes, skin, resp sys; numb muc memb; nau, vomit, abdom pain; musc tremor, inco, clonic convuls, stupor TO: Eyes, skin, resp sys, CNS	Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed

Rouge

Formula:	CAS#:	RTECS#:	IDLH:
Fe_2O_3	1309-37-1	NO7400000	N.D.

Conversion: DOT:

Synonyms/Trade Names: Iron(III)oxide, Iron oxide red, Red iron oxide, Red oxide

Exposure Limits:
NIOSH REL: See Appendix D
OSHA PEL†: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500, 0600

Physical Description: A fine, red powder of ferric oxide.
[Note: Usually used in cake form or impregnated in paper or cloth.]

Chemical & Physical Properties:
MW: 159.7
BP: ?
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 5.24
VP: 0 mmHg (approx)
MLT: 2849°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Calcium hypochlorite, carbon monoxide, hydrogen peroxide

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, resp sys
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Breath: Fresh air

Selenium

Formula:	CAS#:	RTECS#:	IDLH:
Se	7782-49-2	VS7700000	1 mg/m^3 (as Se)

Conversion: DOT: 2658 152 (powder)

Synonyms/Trade Names: Elemental selenium, Selenium alloy

Exposure Limits:
NIOSH REL*: TWA 0.2 mg/m^3
OSHA PEL*: TWA 0.2 mg/m^3
[*Note: The REL and PEL also apply to other selenium compounds (as Se) except Selenium hexafluoride.]

Measurement Methods (see Table 1):
NIOSH 7300, 7301, 7303, 9102, S190 (II-7)
OSHA ID121

Physical Description: Amorphous or crystalline, red to gray solid.
[Note: Occurs as an impurity in most sulfide ores.]

Chemical & Physical Properties:
MW: 79.0
BP: 1265°F
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 4.28
VP: 0 mmHg (approx)
MLT: 392°F
UEL: NA
LEL: NA
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: N.R.
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1 mg/m^3: Qm*/95XQ*/100F/PaprHie*/PaprHie*/Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Acids, strong oxidizers, chromium trioxide, potassium bromate, cadmium

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; vis dist; head; chills, fever; dysp, bron; metallic taste, garlic breath, GI dist; derm; eye, skin burns; in animals: anemia; liver nec, cirr; kidney, spleen damage
TO: Eyes, skin, resp sys, liver, kidneys, blood, spleen

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Selenium hexafluoride	Formula: SeF_6	CAS#: 7783-79-1	RTECS#: VS9450000	IDLH: 2 ppm
Conversion: 1 ppm = 7.89 mg/m^3	DOT: 2194 125			
Synonyms/Trade Names: Selenium fluoride				
Exposure Limits: NIOSH REL: TWA 0.05 ppm OSHA PEL: TWA 0.05 ppm (0.4 mg/m^3)			Measurement Methods (see Table 1): None available	
Physical Description: Colorless gas.				
Chemical & Physical Properties: MW: 193.0 BP: -30°F Sol: Insoluble Fl.P: NA IP: ? RGasD: 6.66 VP: >1 atm FRZ: -59°F UEL: NA LEL: NA Nonflammable Gas	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 0.5 ppm: Sa 1.25 ppm: Sa:Cf 2 ppm: SaT:Cf/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS/ScbaE	
Incompatibilities and Reactivities: Water [Note: Hydrolyzes very slowly in cold water.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh SY: In animals: pulm irrit, edema TO: Resp sys			First Aid (see Table 6): Breath: Resp support	

Silica, amorphous	Formula: SiO_2	CAS#: 7631-86-9	RTECS#: VV7310000	IDLH: 3000 mg/m^3
Conversion:	DOT:			
Synonyms/Trade Names: Diatomaceous earth, Diatomaceous silica, Diatomite, Precipitated amorphous silica, Silica gel, Silicon dioxide (amorphous)				
Exposure Limits: NIOSH REL: TWA 6 mg/m^3 OSHA PEL†: TWA 20 mppcf [(80 mg/m^3)/%SiO_2]			Measurement Methods (see Table 1): NIOSH 7501	
Physical Description: Transparent to gray, odorless powder. [Note: Amorphous silica is the non-crystalline form of SiO_2.]				
Chemical & Physical Properties: MW: 60.1 BP: 4046°F Sol: Insoluble Fl.P: NA IP: NA Sp.Gr: 2.20 VP: 0 mmHg (approx) MLT: 3110°F UEL: NA LEL: NA Noncombustible Solid	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH 30 mg/m^3: Qm 60 mg/m^3: 95XQ/Sa 150 mg/m^3: Sa:Cf/PaprHie 300 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF 3000 mg/m^3: Sa:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE	
Incompatibilities and Reactivities: Fluorine, oxygen difluoride, chlorine trifluoride				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Con SY: Irrit eyes, pneumoconiosis TO: Eyes, resp sys			First Aid (see Table 6): Eye: Irr immed Breath: Fresh air	

Silica, crystalline (as respirable dust)	Formula: SiO_2	CAS#: 14808-60-7	RTECS#: VV7330000	IDLH: Ca [25 mg/m^3 (cristobalite, tridymite); 50 mg/m^3 (quartz, tripoli)]
Conversion:	DOT:			
Synonyms/Trade Names: Cristobalite, Quartz, Tridymite, Tripoli				

Exposure Limits: NIOSH REL: Ca TWA 0.05 mg/m^3 See Appendix A OSHA PEL†: See Appendix C (Mineral Dusts)	Measurement Methods (see Table 1): NIOSH 7500, 7601, 7602 OSHA ID142
Physical Description: Colorless, odorless solid. [Note: A component of many mineral dusts.]	

Chemical & Physical Properties: MW: 60.1 BP: 4046°F Sol: Insoluble Fl.P: NA IP: NA Sp.Gr: 2.66 VP: 0 mmHg (approx) MLT: 3110°F UEL: NA LEL: NA Noncombustible Solid	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH 0.5 mg/m^3: 95XQ 1.25 mg/m^3: PaprHie/Sa:Cf 2.5 mg/m^3: 100F/PaprTHie 25 mg/m^3: Sa:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE
	Incompatibilities and Reactivities: Powerful oxidizers: fluorine, chlorine trifluoride, manganese trioxide, oxygen difluoride, hydrogen peroxide, etc.; acetylene; ammonia	

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Con SY: Cough, dysp, wheez; decr pulm func, progressive resp symptoms (silicosis); irrit eyes; [carc] TO: Eyes, resp sys [in animals: lung cancer]	First Aid (see Table 6): Eye: Irr immed Breath: Fresh air

Silicon	Formula: Si	CAS#: 7440-21-3	RTECS#: VW0400000	IDLH: N.D.
Conversion:	DOT: 1346 170 (amorphous powder)			
Synonyms/Trade Names: Elemental silicon [Note: Does not occur free in nature, but is found in silicon dioxide (silica) & in various silicates.]				

Exposure Limits: NIOSH REL: TWA 10 mg/m^3 (total) TWA 5 mg/m^3 (resp) OSHA PEL†: TWA 15 mg/m^3 (total) TWA 5 mg/m^3 (resp)	Measurement Methods (see Table 1): NIOSH 0500, 0600
Physical Description: Black to gray, lustrous, needle-like crystals. [Note: The amorphous form is a dark-brown powder.]	

Chemical & Physical Properties: MW: 28.1 BP: 4271°F Sol: Insoluble Fl.P: NA IP: NA Sp.Gr(77°F): 2.33 VP: 0 mmHg (approx) MLT: 2570°F UEL: NA LEL: NA MEC: 160 g/m^3 Combustible Solid in powder form.	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: Prevent eye contact Wash skin: N.R. Remove: N.R. Change: N.R.	Respirator Recommendations (see Tables 3 and 4): Not available.
	Incompatibilities and Reactivities: Chlorine, fluorine, oxidizers, calcium, cesium carbide, alkaline carbonates	

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, upper resp sys; cough TO: Eyes, skin, resp sys	First Aid (see Table 6): Eye: Irr immed Breath: Fresh air Swallow: Medical attention immed

Silicon carbide	Formula: SiC	CAS#: 409-21-2	RTECS#: VW0450000	IDLH: N.D.
Conversion:	DOT:			
Synonyms/Trade Names: Carbon silicide, Carborundum®, Silicon monocarbide				
Exposure Limits: NIOSH REL: TWA 10 mg/m^3 (total) TWA 5 mg/m^3 (resp) OSHA PEL†: TWA 15 mg/m^3 (total) TWA 5 mg/m^3 (resp)			Measurement Methods (see Table 1): NIOSH 0500, 0600	
Physical Description: Yellow to green to bluish-black, iridescent crystals.				
Chemical & Physical Properties: MW: 40.1 BP: Sublimes Sol: Insoluble Fl.P: NA IP: 9.30 eV Sp.Gr: 3.23 VP: 0 mmHg (approx) MLT: 4892°F (Sublimes) UEL: NA LEL: NA Noncombustible Solid	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: None reported [Note: Sublimes with decomposition at 4892°F.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, upper resp sys; cough TO: Eyes, skin, resp sys		First Aid (see Table 6): Eye: Irr immed Breath: Fresh air Swallow: Medical attention immed		

Silicon tetrahydride	Formula: SiH_4	CAS#: 7803-62-5	RTECS#: VV1400000	IDLH: N.D.
Conversion: 1 ppm = 1.31 mg/m^3	DOT: 2203 116			
Synonyms/Trade Names: Monosilane, Silane, Silicane				
Exposure Limits: NIOSH REL: TWA 5 ppm (7 mg/m^3) OSHA PEL†: none			Measurement Methods (see Table 1): None available	
Physical Description: Colorless gas with a repulsive odor.				
Chemical & Physical Properties: MW: 32.1 BP: -169°F Sol: Decomposes Fl.P: NA (Gas) IP: ? RGasD: 1.11 VP: >1 atm FRZ: -301°F UEL: ? LEL: ? Flammable Gas (may ignite SPONTANEOUSLY in air).	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Halogens (bromine, chlorine, carbonyl chloride, antimony pentachloride, tin(IV) chloride), water				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh SY: Irrit eyes, skin, muc memb; nau, head TO: Eyes, skin, resp sys, CNS		First Aid (see Table 6): Breath: Resp support		

Silver (metal dust and soluble compounds, as Ag)

Formula:	CAS#:	RTECS#:	IDLH:
Ag (metal)	7440-22-4 (metal)	VW3500000 (metal)	10 mg/m^3 (as Ag)

Conversion: DOT:

Synonyms/Trade Names: Silver metal: Argentum
Synonyms of soluble silver compounds such as Silver nitrate ($AgNO_3$) vary depending upon the specific compound.

Exposure Limits:
NIOSH REL: TWA 0.01 mg/m^3
OSHA PEL: TWA 0.01 mg/m^3

Measurement Methods (see Table 1):
NIOSH 7300, 7301, 9102
OSHA ID121

Physical Description: Metal: White, lustrous solid.

Chemical & Physical Properties:
MW: 107.9
BP: 3632°F
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 10.49 (metal)
VP: 0 mmHg (approx)
MLT: 1761°F
UEL: NA
LEL: NA
Metal: Noncombustible Solid, but flammable in form of dust or powder.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam ($AgNO_3$)
Change: Daily
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
0.25 mg/m^3: Sa:Cf£/PaprHie£
0.5 mg/m^3: 100F/ScbaF/SaF
10 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Acetylene, ammonia, hydrogen peroxide, bromoazide, chlorine trifluoride, ethyleneimine, oxalic acid, tartaric acid

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Blue-gray eyes, nasal septum, throat, skin; irrit, ulceration skin; GI dist
TO: Nasal septum, skin, eyes

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush
Breath: Resp support
Swallow: Medical attention immed

Soapstone (containing less than 1% quartz)

Formula:	CAS#:	RTECS#:	IDLH:
3MgO-4SiO_2-H_2O		VV8780000	3000 mg/m^3

Conversion: DOT:

Synonyms/Trade Names: Massive talc, Soapstone silicate, Steatite

Exposure Limits:
NIOSH REL: TWA 6 mg/m^3 (total)
TWA 3 mg/m^3 (resp)
OSHA PEL†: TWA 20 mppcf

Measurement Methods (see Table 1):
NIOSH 0500

Physical Description: Odorless, white-gray powder.

Chemical & Physical Properties:
MW: 379.3
BP: ?
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 2.7-2.8
VP: 0 mmHg (approx)
MLT: ?
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
30 mg/m^3: Qm
60 mg/m^3: 95XQ/Sa
150 mg/m^3: PaprHie
300 mg/m^3: 100F/SaT:Cf*/PaprTHie*/ ScbaF/SaF
3000 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Pneumoconiosis: cough, dysp; digital clubbing; cyan; basal crackles, cor pulmonale
TO: Resp sys, CVS

First Aid (see Table 6):
Eye: Irr immed
Breath: Resp support

Sodium aluminum fluoride (as F)	Formula: Na_3AlF_6	CAS#: 15096-52-3	RTECS#: WA9625000	IDLH: 250 mg/m^3 (as F)
Conversion:	DOT:			
Synonyms/Trade Names: Cryocide, Cryodust, Cryolite, Sodium hexafluoroaluminate				

Exposure Limits: NIOSH REL*: TWA 2.5 mg/m^3 OSHA PEL*: TWA 2.5 mg/m^3 [*Note: The REL and PEL also apply to other inorganic, solid fluorides (as F).]	Measurement Methods (see Table 1): NIOSH 7902 OSHA ID110
Physical Description: Colorless to dark odorless solid. [pesticide] [Note: Loses color on heating.]	

Chemical & Physical Properties: MW: 209.9 BP: Decomposes Sol: 0.04% Fl.P: NA IP: NA Sp.Gr: 2.90 VP: 0 mmHg (approx) MLT: 1832°F UEL: NA LEL: NA Noncombustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 12.5 mg/m^3: Qm 25 mg/m^3: 95XQ*/Sa* 62.5 mg/m^3: Sa:Cf*/PaprHie*+ 125 mg/m^3: 100F+/ScbaF/SaF 250 mg/m^3: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F+/ScbaE +Note: May need acid gas sorbent

Incompatibilities and Reactivities: Strong oxidizers	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, resp sys; nau, abdom pain, diarr; salv, thirst, sweat; stiff spine; derm; calcification of ligaments of ribs, pelvis TO: Eyes, skin, resp sys, CNS, skeleton, kidneys	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Fresh air Swallow: Medical attention immed

Sodium azide	Formula: NaN_3	CAS#: 26628-22-8	RTECS#: VY8050000	IDLH: N.D.
Conversion:	DOT: 1687 153			
Synonyms/Trade Names: Azide, Azium, Sodium salt of hydrazoic acid				

Exposure Limits: NIOSH REL: C 0.1 ppm (as HN_3) [skin] C 0.3 mg/m^3 (as NaN_3) [skin] OSHA PEL†: none	Measurement Methods (see Table 1): OSHA ID121, ID211
Physical Description: Colorless to white, odorless, crystalline solid. [pesticide] [Note: Forms hydrazoic acid (HN_3) in water.]	

Chemical & Physical Properties: MW: 65.0 BP: Decomposes Sol(63°F): 42% Fl.P: ? IP: 11.70 eV Sp.Gr: 1.85 VP: ? MLT: 527°F (Decomposes) UEL: ? LEL: ? Combustible Solid (if heated above 572°F).	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily Provide: Eyewash Quick drench	Respirator Recommendations (see Tables 3 and 4): Not available.

Incompatibilities and Reactivities: Acids, metals, water [Note: Over a period of time, sodium azide may react with copper, lead, brass, or solder in plumbing systems to form an accumulation of the HIGHLY EXPLOSIVE compounds of lead azide & copper azide.]	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin; head, dizz, lass, blurred vision; low BP, bradycardia; kidney changes TO: Eyes, skin, CNS, CVS, kidneys	First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed

Sodium bisulfite

Formula:	CAS#:	RTECS#:	IDLH:
$NaHSO_3$	7631-90-5	VZ2000000	N.D.

Conversion: DOT: 2693 154 (solution)

Synonyms/Trade Names: Monosodium salt of sulfurous acid, Sodium acid bisulfite, Sodium bisulphite, Sodium hydrogen sulfite

Exposure Limits:
NIOSH REL: TWA 5 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 0500

Physical Description: White crystals or powder with a slight odor of sulfur dioxide.

Chemical & Physical Properties:
MW: 104.1
BP: Decomposes
Sol: 29%
Fl.P: NA
IP: NA
Sp.Gr: 1.48
VP: ?
MLT: Decomposes
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Heat (decomposes) [Note: Slowly oxidized to the sulfate on exposure to air.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, muc memb
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Breath: Fresh air
Swallow: Medical attention immed

Sodium cyanide (as CN)

Formula:	CAS#:	RTECS#:	IDLH:
NaCN	143-33-9	VZ7525000	25 mg/m^3 (as CN)

Conversion: DOT: 1689 157 (solid); 3414 157 (solution)

Synonyms/Trade Names: Sodium salt of hydrocyanic acid

Exposure Limits:
NIOSH REL*: C 5 mg/m^3 (4.7 ppm) [10-minute]
OSHA PEL*: TWA 5 mg/m^3
[*Note: The REL and PEL also apply to other cyanides (as CN) except Hydrogen cyanide.]

Measurement Methods (see Table 1):
NIOSH 6010, 7904

Physical Description: White, granular or crystalline solid with a faint, almond-like odor.

Chemical & Physical Properties:
MW: 49.0
BP: 2725°F
Sol(77°F): 58%
Fl.P: NA
IP: NA
Sp.Gr: 1.60
VP: 0 mmHg (approx)
MLT: 1047°F
UEL: NA
LEL: NA
Noncombustible Solid, but contact with acids releases highly flammable hydrogen cyanide.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
25 mg/m^3: Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers (such as acids, acid salts, chlorates & nitrates) [Note: Absorbs moisture from the air forming a syrup.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; asphy; lass, head, conf; nau, vomit; incr resp rate; slow gasping respiration; thyroid, blood changes
TO: Eyes, skin, CVS, CNS, thyroid, blood

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Sodium fluoride (as F)

Formula:	CAS#:	RTECS#:	IDLH:
NaF	7681-49-4	WB0350000	250 mg/m^3 (as F)

Conversion: DOT: 1690 154

Synonyms/Trade Names: Floridine, Sodium monofluoride

Exposure Limits:
NIOSH REL*: TWA 2.5 mg/m^3
OSHA PEL*: TWA 2.5 mg/m^3
[*Note: The REL and PEL also apply to other inorganic, solid fluorides (as F).]

Measurement Methods (see Table 1):
NIOSH 7902, 7906
OSHA ID110

Physical Description: Odorless, white powder or colorless crystals. [Note: Pesticide grade is often dyed blue.]

Chemical & Physical Properties:
MW: 42.0
BP: 3099°F
Sol: 4%
Fl.P: NA
IP: NA
Sp.Gr: 2.78
VP: 0 mmHg (approx)
MLT: 1819°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
12.5 mg/m^3: Qm
25 mg/m^3: 95XQ*/Sa*
62.5 mg/m^3: Sa:Cf*/PaprHie*+
125 mg/m^3: 100F+/ScbaF/SaF
250 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F+/ScbaE

+Note: May need acid gas sorbent

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, resp sys; nau, abdom pain, diarr; salv, thirst, sweat; stiff spine; derm; calcification of ligaments of ribs, pelvis
TO: Eyes, skin, resp sys, CNS, skeleton, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Fresh air
Swallow: Medical attention immed

Sodium fluoroacetate

Formula:	CAS#:	RTECS#:	IDLH:
FCH_2COONa	62-74-8	AH9100000	2.5 mg/m^3

Conversion: DOT: 2629 151

Synonyms/Trade Names: SFA, Sodium monofluoroacetate

Exposure Limits:
NIOSH REL: TWA 0.05 mg/m^3
ST 0.15 mg/m^3 [skin]
OSHA PEL†: TWA 0.05 mg/m^3 [skin]

Measurement Methods (see Table 1):
NIOSH S301 (II-5)

Physical Description: Fluffy, colorless to white (sometimes dyed black), odorless powder. [Note: A liquid above 95°F.] [rodenticide]

Chemical & Physical Properties:
MW: 100.0
BP: Decomposes
Sol: Miscible
Fl.P: NA
IP: ?
Sp.Gr: ?
VP: Low
MLT: 392°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
0.25 mg/m^3: Qm
0.5 mg/m^3: 95XQ/Sa
1.25 mg/m^3: Sa:Cf/PaprHie
2.5 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Vomit; anxi, auditory halu; facial pares; twitch face musc; pulsus altenans, ectopic heartbeat, tacar, card arrhy; pulm edema; nystagmus; convuls; liver, kidney damage
TO: Resp sys, CVS, liver, kidneys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Sodium hydroxide

Formula:	CAS#:	RTECS#:	IDLH:
NaOH	1310-73-2	WB4900000	10 mg/m^3

Conversion: DOT: 1823 154 (dry, solid); 1824 154 (solution)

Synonyms/Trade Names: Caustic soda, Lye, Soda lye, Sodium hydrate

Exposure Limits:
NIOSH REL: C 2 mg/m^3
OSHA PEL†: TWA 2 mg/m^3

Measurement Methods (see Table 1):
NIOSH 7401

Physical Description: Colorless to white, odorless solid (flakes, beads, granular form).

Chemical & Physical Properties:
MW: 40.0
BP: 2534°F
Sol: 111%
Fl.P: NA
IP: NA
Sp.Gr: 2.13
VP: 0 mmHg (approx)
MLT: 605°F
UEL: NA
LEL: NA
Noncombustible Solid, but when in contact with water may generate sufficient heat to ignite combustible materials.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
10 mg/m^3: Sa:Cf£/100F/PaprHie£/ ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Water; acids; flammable liquids; organic halogens; metals such as aluminum, tin & zinc; nitromethane [Note: Corrosive to metals.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, muc memb; pneu; eye, skin burns; temporary loss of hair
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Sodium metabisulfite

Formula:	CAS#:	RTECS#:	IDLH:
$Na_2S_2O_5$	7681-57-4	UX8225000	N.D.

Conversion: DOT:

Synonyms/Trade Names: Disodium pyrosulfite, Sodium metabisulphite, Sodium pyrosulfite

Exposure Limits:
NIOSH REL: TWA 5 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 0500

Physical Description: White to yellowish crystals or powder with an odor of sulfur dioxide.

Chemical & Physical Properties:
MW: 190.1
BP: Decomposes
Sol: 54%
Fl.P: NA
IP: NA
Sp.Gr: 1.4
VP: ?
MLT: >302°F (Decomposes)
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Heat (decomposes)
[Note: Slowly oxidized to the sulfate on exposure to air & moisture.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, muc memb
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Breath: Fresh air
Swallow: Medical attention immed

Starch

Formula:	CAS#:	RTECS#:	IDLH:
$(C_6H_{10}O_5)n$	9005-25-8	GM5090000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: Corn starch, Rice starch, Sorghum gum, α-Starch, Starch gum, Tapioca starch

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500, 0600

Physical Description: Fine, white, odorless powder.
[Note: A carbohydrate polymer composed of 25% amylose & 75% amylpectin.]

Chemical & Physical Properties:
MW: varies
BP: Decomposes
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 1.45
VP: 0 mmHg (approx)
MLT: Decomposes
UEL: NA
LEL: NA
MEC: 50 g/m^3
Noncombustible Solid, but may form explosive mixture with air.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Oxidizers, acids, iodine, alkalis

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, muc memb; cough, chest pain; derm; rhin
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Fresh air
Swallow: Medical attention immed

Stibine

Formula:	CAS#:	RTECS#:	IDLH:
SbH_3	7803-52-3	WJ0700000	5 ppm

Conversion: 1 ppm = 5.10 mg/m^3

DOT: 2676 119

Synonyms/Trade Names: Antimony hydride, Antimony trihydride, Hydrogen antimonide

Exposure Limits:
NIOSH REL: TWA 0.1 ppm (0.5 mg/m^3)
OSHA PEL: TWA 0.1 ppm (0.5 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 6008

Physical Description: Colorless gas with a disagreeable odor like hydrogen sulfide.

Chemical & Physical Properties:
MW: 124.8
BP: -1°F
Sol: Slight
Fl.P: NA (Gas)
IP: 9.51 eV
RGasD: 4.31
VP: >1 atm
FRZ: -126°F
UEL: ?
LEL: ?
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1 ppm: Sa
2.5 ppm: Sa:Cf
5 ppm: SaT:Cf/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Acids, halogenated hydrocarbons, oxidizers, moisture, chlorine, ozone, ammonia

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh
SY: Head, lass; nau, abdom pain; lumbar pain, hema, hemolytic anemia; jaun; pulm irrit
TO: Blood, liver, kidneys, resp sys

First Aid (see Table 6):
Breath: Resp support

Stoddard solvent

Formula:	CAS#:	RTECS#:	IDLH:
	8052-41-3	WJ8925000	20,000 mg/m^3

Conversion: DOT: 1268 128 (petroleum distillates, n.o.s.)

Synonyms/Trade Names: Dry cleaning safety solvent, Mineral spirits, Petroleum solvent, Spotting naphtha [Note: A refined petroleum solvent with a flash point of 102-110°F, boiling point of 309-396°F, and containing >65% C_{10} or higher hydrocarbons.]

Exposure Limits:
NIOSH REL: TWA 350 mg/m^3
C 1800 mg/m^3 [15-minute]
OSHA PEL†: TWA 500 ppm (2900 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1550

Physical Description: Colorless liquid with a kerosene-like odor.

Chemical & Physical Properties:
MW: Varies
BP: 309-396°F
Sol: Insoluble
Fl.P: 102-110°F
IP: ?
Sp.Gr: 0.78
VP: ?
FRZ: ?
UEL: ?
LEL: ?
Class II Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
3500 mg/m^3: CcrOv*/Sa*
8750 mg/m^3: Sa:Cf*/PaprOv*
17,500 mg/m^3: CcrFOv/GmFOv/PaprTOv*/ScbaF/SaF
20,000 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, nose, throat; dizz; derm; chemical pneu (aspir liquid); in animals: kidney damage
TO: Eyes, skin, resp sys, CNS, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Strychnine

Formula:	CAS#:	RTECS#:	IDLH:
$C_{21}H_{22}N_2O_2$	57-24-9	WL2275000	3 mg/m^3

Conversion: DOT: 1692 151

Synonyms/Trade Names: Nux vomica, Strynchnos

Exposure Limits:
NIOSH REL: TWA 0.15 mg/m^3
OSHA PEL: TWA 0.15 mg/m^3

Measurement Methods (see Table 1):
NIOSH 5016

Physical Description: Colorless to white, odorless, crystalline solid. [pesticide]

Chemical & Physical Properties:
MW: 334.4
BP: Decomposes
Sol: 0.02%
Fl.P: ?
IP: ?
Sp.Gr: 1.36
VP: Low
MLT: 514°F
UEL: ?
LEL: ?
Combustible Solid, but difficult to ignite.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: N.R.
Wash skin: When contam
Remove: N.R.
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
0.75 mg/m^3: Qm
1.5 mg/m^3: 95XQ/Sa
3 mg/m^3: Sa:Cf/PaprHie/100F/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Stiff neck, facial musc; restless, anxi, incr acuity of perception; incr reflex excitability; cyan; tetanic convuls with opisthotonos
TO: CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Styrene	Formula: $C_6H_5CH=CH_2$	CAS#: 100-42-5	RTECS#: WL3675000	IDLH: 700 ppm
Conversion: 1 ppm = 4.26 mg/m^3	DOT: 2055 128P (inhibited)			
Synonyms/Trade Names: Ethenyl benzene, Phenylethylene, Styrene monomer, Styrol, Vinyl benzene				

Exposure Limits:
NIOSH REL: TWA 50 ppm (215 mg/m^3)
ST 100 ppm (425 mg/m^3)
OSHA PEL†: TWA 100 ppm
C 200 ppm
600 ppm (5-minute maximum peak in any 3 hours)

Measurement Methods (see Table 1):
NIOSH 1501, 3800
OSHA 9, 89

Physical Description: Colorless to yellow, oily liquid with a sweet, floral odor.

Chemical & Physical Properties:
MW: 104.2
BP: 293°F
Sol: 0.03%
Fl.P: 88°F
IP: 8.40 eV
Sp.Gr: 0.91
VP: 5 mmHg
FRZ: -23°F
UEL: 6.8%
LEL: 0.9%
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
500 ppm: CcrOv*/Sa*
700 ppm: Sa:Cf*/CcrFOv/GmFOv/PaprOv*/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, catalysts for vinyl polymers, peroxides, strong acids, aluminum chloride [Note: May polymerize if contaminated or subjected to heat. Usually contains an inhibitor such as tert-butylcatechol.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, nose, resp sys; head, lass, dizz, conf, mal, drow, unsteady gait; narco; defatting derm; possible liver inj; repro effects
TO: Eyes, skin, resp sys, CNS, liver, repro sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush
Breath: Resp support
Swallow: Medical attention immed

Subtilisins	Formula:	CAS#: 1395-21-7 (BPN) 9014-01-1 (Carlsburg)	RTECS#: CO9450000 (BPN) CO9550000 (Carlsburg)	IDLH: N.D.
Conversion:	DOT:			
Synonyms/Trade Names: Bacillus subtilis, Bacillus subtilis BPN, Bacillus subtilis Carlsburg, Proteolytic enzymes, Subtilisin BPN, Subtilisin Carlsburg [Note: Commercial proteolytic enzymes are used in laundry detergents.]				

Exposure Limits:
NIOSH REL: ST 0.00006 mg/m^3 [60-minute]
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Light-colored, free-flowing powders.
[Note: A protein containing numerous amino acids.]

Chemical & Physical Properties:
MW: 28,000 (approx)
BP: ?
Sol: ?
Fl.P: NA
IP: NA
Sp.Gr: ?
VP: 0 mmHg (approx)
MLT: ?
UEL: NA
LEL: NA

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; resp sens (enzyme asthma): sweat, head, chest pain, flu-like symptoms, cough, breathlessness, wheez
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

Succinonitrile

Formula:	CAS#:	RTECS#:	IDLH:
$NCCH_2CH_2CN$	110-61-2	WN3850000	N.D.

Conversion: 1 ppm = 3.28 mg/m^3

DOT:

Synonyms/Trade Names: Butanedinitrile; 1,2-Dicyanoethane; Dinile; Ethylene cyanide; Ethylene dicyanide; Succinic dinitrile

Exposure Limits:
NIOSH REL: TWA 6 ppm (20 mg/m^3)
OSHA PEL: none

Measurement Methods (see Table 1):
NIOSH Nitriles Criteria Document

Physical Description: Colorless, odorless, waxy solid.
[Note: Forms cyanide in the body.]

Chemical & Physical Properties:
MW: 80.1
BP: 509°F
Sol: 13%
Fl.P: 270°F
IP: ?
Sp.Gr: 0.99
VP(212°F): 2 mmHg
MLT: 134°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
NIOSH
60 ppm: Sa
150 ppm: Sa:Cf
250 ppm: ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; head, dizz, lass, conf, convuls; blurred vision; dysp; abdom pain, nau, vomit
TO: Eyes, skin, resp sys, CNS, CVS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash immed
Breath: Resp support
Swallow: Medical attention immed

Sucrose

Formula:	CAS#:	RTECS#:	IDLH:
$C_{12}H_{22}O_{11}$	57-50-1	WN6500000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: Beet sugar, Cane sugar, Confectioner's sugar, Granulated sugar, Rock candy, Saccarose, Sugar, Table sugar

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500, 0600

Physical Description: Hard, white, odorless crystals, lumps, or powder.
[Note: May have a characteristic, caramel odor when heated.]

Chemical & Physical Properties:
MW: 342.3
BP: Decomposes
Sol: 200%
Fl.P: NA
IP: NA
Sp.Gr: 1.59
VP: 0 mmHg (approx)
MLT: 320-367°F (Decomposes)
UEL: NA
LEL: NA
MEC: 45 g/m^3
Noncombustible Solid, but fine airborne dust may explode.

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Oxidizers, sulfuric acid, nitric acid

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, upper resp sys; cough
TO: Eyes, resp sys

First Aid (see Table 6):
Eye: Irr immed
Breath: Fresh air

Sulfur dioxide	Formula: SO_2	CAS#: 7446-09-5	RTECS#: WS4550000	IDLH: 100 ppm
Conversion: 1 ppm = 2.62 mg/m^3	DOT: 1079 125			
Synonyms/Trade Names: Sulfurous acid anhydride, Sulfurous oxide, Sulfur oxide				

Exposure Limits: NIOSH REL: TWA 2 ppm (5 mg/m^3) ST 5 ppm (13 mg/m^3) OSHA PEL†: TWA 5 ppm (13 mg/m^3)	Measurement Methods (see Table 1): NIOSH 3800, 6004 OSHA ID104, ID200
Physical Description: Colorless gas with a characteristic, irritating, pungent odor. [Note: A liquid below 14°F. Shipped as a liquefied compressed gas.]	

Chemical & Physical Properties: MW: 64.1 BP: 14°F Sol: 10% Fl.P: NA IP: 12.30 eV RGasD: 2.26 VP: 3.2 atm FRZ: -104°F UEL: NA LEL: NA Nonflammable Gas	Personal Protection/Sanitation (see Table 2): Skin: Frostbite Eyes: Frostbite Wash skin: N.R. Remove: When wet or contam (liquid) Change: N.R. Provide: Frostbite wash	Respirator Recommendations (see Tables 3 and 4): NIOSH 20 ppm: CcrS*/Sa* 50 ppm: Sa:Cf*/PaprS* 100 ppm: CcrFS/GmFS/PaprTS*/SaT:Cf*/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Powdered alkali metals (such as sodium & potassium), water, ammonia, zinc, aluminum, brass, copper [Note: Reacts with water to form sulfurous acid (H_2SO_3).]	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Con SY: Irrit eyes, nose, throat; rhin; choking, cough; reflex bronchoconstriction; liquid: frostbite TO: Eyes, skin, resp sys	First Aid (see Table 6): Eye: Frostbite Skin: Frostbite Breath: Resp support

Sulfur hexafluoride	Formula: SF_6	CAS#: 2551-62-4	RTECS#: WS4900000	IDLH: N.D.
Conversion: 1 ppm = 5.98 mg/m^3	DOT: 1080 126			
Synonyms/Trade Names: Sulfur fluoride [Note: May contain highly toxic sulfur pentafluoride as an impurity.]				

Exposure Limits: NIOSH REL: TWA 1000 ppm (6000 mg/m^3) OSHA PEL: TWA 1000 ppm (6000 mg/m^3)	Measurement Methods (see Table 1): NIOSH 6602
Physical Description: Colorless, odorless gas. [Note: Shipped as a liquefied compressed gas. Condenses directly to a solid upon cooling.]	

Chemical & Physical Properties: MW: 146.1 BP: Sublimes Sol(77°F): 0.003% Fl.P: NA IP: 19.30 eV RGasD: 5.11 VP: 21.5 atm FRZ: -83°F (Sublimes) UEL: NA LEL: NA Nonflammable Gas	Personal Protection/Sanitation (see Table 2): Skin: Frostbite Eyes: Frostbite Wash skin: N.R. Remove: N.R. Change: N.R. Provide: Frostbite wash	Respirator Recommendations (see Tables 3 and 4): Not available.

Incompatibilities and Reactivities: Disilane	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh SY: Asphy: incr breath rate, pulse rate; slight musc inco, emotional upset; lass, nau, vomit, convuls; liquid: frostbite TO: Resp sys	First Aid (see Table 6): Eye: Frostbite Skin: Frostbite Breath: Resp support

Sulfuric acid

Formula:	CAS#:	RTECS#:	IDLH:
H_2SO_4	7664-93-9	WS5600000	15 mg/m^3

Conversion:

DOT: 1830 137; 1831 137 (fuming); 1832 137 (spent)

Synonyms/Trade Names: Battery acid, Hydrogen sulfate, Oil of vitriol, Sulfuric acid (aqueous)

Exposure Limits:
NIOSH REL: TWA 1 mg/m^3
OSHA PEL: TWA 1 mg/m^3

Measurement Methods (see Table 1):
NIOSH 7903
OSHA ID113, ID165SG

Physical Description: Colorless to dark-brown, oily, odorless liquid.
[Note: Pure compound is a solid below 51°F. Often used in an aqueous solution.]

Chemical & Physical Properties:
MW: 98.1
BP: 554°F
Sol: Miscible
Fl.P: NA
IP: ?
Sp.Gr: 1.84 (96-98% acid)
VP: 0.001 mmHg
FRZ: 51°F
UEL: NA
LEL: NA
Noncombustible Liquid, but capable of igniting finely divided combustible materials.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash (>1%)
Quick drench (>1%)

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
15 mg/m^3: Sa:Cf£/PaprAgHie£/
CcrFAg100/GmFAg100/
ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFAg100/ScbaE

Incompatibilities and Reactivities: Organic materials, chlorates, carbides, fulminates, water, powdered metals
[Note: Reacts violently with water with evolution of heat. Corrosive to metals.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; pulm edema, bron; emphy; conj; stomatis; dental erosion; eye, skin burns; derm
TO: Eyes, skin, resp sys, teeth

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Sulfur monochloride

Formula:	CAS#:	RTECS#:	IDLH:
S_2Cl_2	10025-67-9	WS4300000	5 ppm

Conversion: 1 ppm = 5.52 mg/m^3

DOT: 1828 137

Synonyms/Trade Names: Sulfur chloride, Sulfur subchloride, Thiosulfurous dichloride

Exposure Limits:
NIOSH REL: C 1 ppm (6 mg/m^3)
OSHA PEL†: TWA 1 ppm (6 mg/m^3)

Measurement Methods (see Table 1):
None available

Physical Description: Light-amber to yellow-red, oily liquid with a pungent, nauseating, irritating odor.

Chemical & Physical Properties:
MW: 135.0
BP: 280°F
Sol: Decomposes
Fl.P: 245°F
IP: 9.40 eV
Sp.Gr: 1.68
VP: 7 mmHg
FRZ: -107°F
UEL: ?
LEL: ?
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
5 ppm: CcrFS/GmFS/PaprS£/
ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Peroxides, oxides of phosphorous, organics, water
[Note: Decomposes violently in water to form hydrochloric acid, sulfur dioxide, sulfur, sulfite, thiosulfate, and hydrogen sulfide. Corrosive to metals.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, muc memb; lac; cough; eye, skin burns; pulm edema
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Sulfur pentafluoride	Formula: S_2F_{10}	CAS#: 5714-22-7	RTECS#: WS4480000	IDLH: 1 ppm
Conversion: 1 ppm = 10.39 mg/m^3	DOT:			
Synonyms/Trade Names: Disulfur decafluoride, Sulfur decafluoride				
Exposure Limits: NIOSH REL: C 0.01 ppm (0.1 mg/m^3) OSHA PEL†: TWA 0.025 ppm (0.25 mg/m^3)			Measurement Methods (see Table 1): None available	
Physical Description: Colorless liquid or gas (above 84°F) with an odor like sulfur dioxide.				
Chemical & Physical Properties: MW: 254.1 BP: 84°F Sol: Insoluble Fl.P: NA IP: ? RGasD: 8.77 Sp.Gr(32°F): 2.08 VP: 561 mmHg FRZ: -134°F UEL: NA LEL: NA Noncombustible Liquid Nonflammable Gas	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: N.R. Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH 0.1 ppm: Sa 0.25 ppm: Sa:Cf 0.5 ppm: SaT:Cf/ScbaF/SaF 1 ppm: Sa:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFAg/ScbaE	
Incompatibilities and Reactivities: None reported				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, resp sys; in animals: pulm edema, hemorr TO: Eyes, skin, resp sys, CNS			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed	

Sulfur tetrafluoride	Formula: SF_4	CAS#: 7783-60-0	RTECS#: WT4800000	IDLH: N.D.
Conversion: 1 ppm = 4.42 mg/m^3	DOT: 2418 125			
Synonyms/Trade Names: Tetrafluorosulfurane				
Exposure Limits: NIOSH REL: C 0.1 ppm (0.4 mg/m^3) OSHA PEL†: none			Measurement Methods (see Table 1): OSHA ID110	
Physical Description: Colorless gas with an odor like sulfur dioxide. [Note: Shipped as a liquefied compressed gas.]				
Chemical & Physical Properties: MW: 108.1 BP: -41°F Sol: Reacts Fl.P: NA IP: 12.63 eV RGasD: 3.78 VP(70°F): 10.5 atm FRZ: -185°F UEL: NA LEL: NA Nonflammable Gas	Personal Protection/Sanitation (see Table 2): Skin: Frostbite Eyes: Frostbite Wash skin: N.R. Remove: N.R. Change: N.R. Provide: Frostbite wash		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Moisture, concentrated sulfuric acid, dioxygen difluoride [Note: Readily hydrolyzed by moisture, forming hydrofluoric acid & thionyl fluoride.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Con SY: Irrit eyes, skin, muc memb; eye, skin burns (from SF_4 releasing hydrofluoric acid on exposure to moisture); liquid: frostbite; in animals: dysp, lass, rhin TO: Eyes, skin, resp sys			First Aid (see Table 6): Eye: Frostbite Skin: Frostbite Breath: Resp support	

Sulfuryl fluoride

Formula:	CAS#:	RTECS#:	IDLH:
SO_2F_2	2699-79-8	WT5075000	200 ppm

Conversion: 1 ppm = 4.18 mg/m^3

DOT: 2191 123

Synonyms/Trade Names: Sulfur difluoride dioxide, Vikane®

Exposure Limits:
NIOSH REL: TWA 5 ppm (20 mg/m^3)
ST 10 ppm (40 mg/m^3)
OSHA PEL†: TWA 5 ppm (20 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 6012

Physical Description: Colorless, odorless gas. [insecticide/fumigant]
[Note: Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 102.1
BP: -68°F
Sol(32°F): 0.2%
Fl.P: NA
IP: 13.04 eV
RGasD: 3.72
VP(70°F): 15.8 atm
FRZ: -212°F
UEL: NA
LEL: NA
Nonflammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Frostbite
Eyes: Frostbite
Wash skin: N.R.
Remove: N.R.
Change: N.R.
Provide: Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
50 ppm: Sa*
125 ppm: Sa:Cf*
200 ppm: ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con (liquid)
SY: Conj, rhinitis, pharyngitis, pares; liquid: frostbite: in animals: narco, tremor, convuls; pulm edema; kidney inj
TO: Eyes, skin, resp sys, CNS, kidneys

First Aid (see Table 6):
Eye: Frostbite
Skin: Frostbite
Breath: Resp support

Sulprofos

Formula:	CAS#:	RTECS#:	IDLH:
$C_{12}H_{19}O_2PS_3$	35400-43-2	TE4165000	N.D.

Conversion: 1 ppm = 13.19 mg/m^3

DOT:

Synonyms/Trade Names: Bolstar®, O-Ethyl O-(4-methylthio)phenyl S-propylphosphorodithioate

Exposure Limits:
NIOSH REL: TWA 1 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 5600
OSHA PV2037

Physical Description: Tan-colored liquid with a sulfide-like odor.

Chemical & Physical Properties:
MW: 322.5
BP: ?
Sol: Low
Fl.P: ?
IP: ?
Sp.Gr: 1.20
VP: <8 mmHg
FRZ: ?
UEL: ?
LEL: ?

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: N.R.
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing
SY: Nau, vomit, abdom cramps, diarr, salv; head, dizz, lass; rhin, chest tight; blurred vision, miosis; card irreg; musc fasc; dysp
TO: Resp sys, CNS, CVS, blood chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

2,4,5-T	Formula: $Cl_3C_6H_2OCH_2COOH$	CAS#: 93-76-5	RTECS#: AJ8400000	IDLH: 250 mg/m^3
Conversion:	DOT: 2765 152			
Synonyms/Trade Names: 2,4,5-Trichlorophenoxyacetic acid				

Exposure Limits: NIOSH REL: TWA 10 mg/m^3 OSHA PEL: TWA 10 mg/m^3	Measurement Methods (see Table 1): NIOSH 5001
Physical Description: Colorless to tan, odorless, crystalline solid. [herbicide]	

Chemical & Physical Properties: MW: 255.5 BP: Decomposes Sol(77°F): 0.03% Fl.P: ? IP: ? Sp.Gr: 1.80 VP: 1 x 10^{-7} mmHg MLT: 307°F UEL: ? LEL: ? Combustible Solid, but burns with difficulty.	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 50 mg/m^3: Qm 100 mg/m^3: 95XQ/Sa 250 mg/m^3: Sa:Cf/100F/PaprHie/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE

Incompatibilities and Reactivities: None reported	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: In animals: ataxia; skin irrit, acne-like rash; liver damage TO: Skin, liver, GI tract	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash Breath: Resp support Swallow: Medical attention immed

Talc (containing no asbestos and less than 1% quartz)	Formula: $Mg_3Si_4O_{10}(OH)_2$	CAS#: 14807-96-6	RTECS#: WW2710000	IDLH: 1000 mg/m^3
Conversion:	DOT:			
Synonyms/Trade Names: Hydrous magnesium silicate, Steatite talc				

Exposure Limits: NIOSH REL: TWA 2 mg/m^3 (resp) OSHA PEL†: TWA 20 mppcf	Measurement Methods (see Table 1): NIOSH P&CAM355 (III)
Physical Description: Odorless, white powder.	

Chemical & Physical Properties: MW: Varies BP: ? Sol: Insoluble Fl.P: NA IP: NA Sp.Gr: 2.70-2.80 VP: 0 mmHg (approx) MLT: 1652°F to 1832°F UEL: NA LEL: NA Noncombustible Solid	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH 10 mg/m^3: Qm 20 mg/m^3: 95XQ/Sa 50 mg/m^3: PaprHie/Sa:Cf 100 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF 1000 mg/m^3: Sa:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE

Incompatibilities and Reactivities: None reported	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Con SY: Fibrotic pneumoconiosis, irrit eyes TO: Eyes, resp sys, CVS	First Aid (see Table 6): Eye: Irr immed Breath: Fresh air

Tantalum (metal and oxide dust, as Ta)

Formula:	CAS#:	RTECS#:	IDLH:
Ta (metal)	7440-25-7 (metal)	WW5505000 (metal)	2500 mg/m^3 (as Ta)

Conversion: DOT:

Synonyms/Trade Names: Tantalum metal: Tantalum-181
Synonyms of other tantalum dusts (including oxide dusts) vary depending upon the specific compound.

Exposure Limits:
NIOSH REL: TWA 5 mg/m^3
ST 10 mg/m^3
OSHA PEL: TWA 5 mg/m^3

Measurement Methods (see Table 1):
NIOSH 0500

Physical Description: Metal: Steel-blue to gray solid or black, odorless powder.

Chemical & Physical Properties:
MW: 180.9
BP: 9797°F
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 16.65 (metal)
14.40 (powder)
VP: 0 mmHg (approx)
MLT: 5425°F
UEL: NA
LEL: NA
MEC: <200 g/m^3
Metal: Combustible Solid; powder ignites SPONTANEOUSLY in air.

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
25 mg/m^3: Qm
50 mg/m^3: 95XQ/Sa
125 mg/m^3: Sa:Cf/PaprHie
250 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF
2500 mg/m^3: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: HieF/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, bromine trifluoride, fluorine

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin; in animals: pulm irrit
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Breath: Resp support

TEDP

Formula:	CAS#:	RTECS#:	IDLH:
$[(CH_3CH_2O)_2PS]_2O$	3689-24-5	XN4375000	10 mg/m^3

Conversion: 1 ppm = 13.18 mg/m^3 DOT: 1704 153

Synonyms/Trade Names: Bladafum®, Dithion®, Sulfotep, Tetraethyl dithionopyrophosphate, Tetraethyl dithiopyrophosphate, Thiotepp®

Exposure Limits:
NIOSH REL: TWA 0.2 mg/m^3 [skin]
OSHA PEL: TWA 0.2 mg/m^3 [skin]

Measurement Methods (see Table 1):
None available

Physical Description: Pale-yellow liquid with a garlic-like odor. [Note: A pesticide that may be absorbed on a solid carrier or mixed in a more flammable liquid.]

Chemical & Physical Properties:
MW: 322.3
BP: Decomposes
Sol: 0.0007%
Fl.P: ?
IP: ?
Sp.Gr(77°F): 1.20
VP: 0.0002 mmHg
FRZ: ?
UEL: ?
LEL: ?
Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
2 mg/m^3: Sa
5 mg/m^3: Sa:Cf
10 mg/m^3: ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, iron [Note: Corrosive to iron.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; eye pain, blurred vision, lac; rhin; head; cyan; anor, nau, vomit, diarr; local sweat, lass, twitch, para, Cheyne-Stokes respiration, convuls, low BP, card irreg
TO: Eyes, skin, resp sys, CNS, CVS, blood chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Tellurium	Formula: Te	CAS#: 13494-80-9	RTECS#: WY2625000	IDLH: 25 mg/m^3 (as Te)
Conversion:	DOT:			
Synonyms/Trade Names: Aurum paradoxum, Metallum problematum				

Exposure Limits: NIOSH REL*: TWA 0.1 mg/m^3 OSHA PEL*: TWA 0.1 mg/m^3 [*Note: The REL and PEL also apply to other tellurium compounds (as Te) except Tellurium hexafluoride and Bismuth telluride.]	Measurement Methods (see Table 1): NIOSH 7300, 7301, 7303, 9102 OSHA ID121

Physical Description: Odorless, dark-gray to brown, amorphous powder or grayish-white, brittle solid.

Chemical & Physical Properties: MW: 127.6 BP: 1814°F Sol: Insoluble Fl.P: NA IP: NA Sp.Gr: 6.24 VP: 0 mmHg (approx) MLT: 842°F UEL: NA LEL: NA Combustible Solid	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 0.5 mg/m^3: Qm 1 mg/m^3: 95XQ/Sa 2.5 mg/m^3: Sa:Cf/PaprHie 5 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF 25 mg/m^3: Sa:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE

Incompatibilities and Reactivities: Oxidizers, chlorine, cadmium

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Garlic breath, sweat; dry mouth, metallic taste; drow; anor, nau, no sweat; derm; in animals: CNS, red blood cell changes TO: Skin, CNS, blood	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed

Tellurium hexafluoride	Formula: TeF_6	CAS#: 7783-80-4	RTECS#: WY2800000	IDLH: 1 ppm
Conversion: 1 ppm = 9.88 mg/m^3	DOT: 2195 125			
Synonyms/Trade Names: Tellurium fluoride				

Exposure Limits: NIOSH REL: TWA 0.02 ppm (0.2 mg/m^3) OSHA PEL: TWA 0.02 ppm (0.2 mg/m^3)	Measurement Methods (see Table 1): NIOSH S187 (II-3)

Physical Description: Colorless gas with a repulsive odor.

Chemical & Physical Properties: MW: 241.6 BP: Sublimes Sol: Decomposes Fl.P: NA IP: ? RGasD: 8.34 VP: >1 atm FRZ: -36°F (Sublimes) UEL: NA LEL: NA Nonflammable Gas	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 0.2 ppm: Sa 0.5 ppm: Sa:Cf 1 ppm: SaT:Cf/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Water [Note: Hydrolyzes slowly in water to telluric acid.]

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh SY: Head; dysp; garlic breath; in animals: pulm edema TO: Resp sys	First Aid (see Table 6): Breath: Resp support

Temephos

Formula:	CAS#:	RTECS#:	IDLH:
$S[C_6H_4OP(S)(OCH_3)_2]_2$	3383-96-8	TF6890000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: Abate®; Temefos; O,O,O'O'-Tetramethyl O,O'-thiodi-p-phenylene phosphorothioate

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL†: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500, 0600
OSHA PV2056

Physical Description: White, crystalline solid or liquid (above 87°F). [insecticide]
[Note: Technical grade is a viscous, brown liquid.]

Chemical & Physical Properties:
MW: 466.5
BP: 248-257°F (Decomposes)
Sol: Insoluble
Fl.P: ?
IP: ?
Sp.Gr: 1.32
VP(77°F): 0.00000007 mmHg
MLT: 87°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, blurred vision; dizz; dysp; salv; abdom cramps, nau, diarr, vomit
TO: Eyes, resp sys, CNS, CVS, blood chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

TEPP

Formula:	CAS#:	RTECS#:	IDLH:
$[(CH_3CH_2O)_2PO]_2O$	107-49-3	UX6825000	5 mg/m^3

Conversion: 1 ppm = 11.87 mg/m^3

DOT: 2783 152 (solid); 3018 152 (liquid)

Synonyms/Trade Names: Ethyl pyrophosphate, Tetraethyl pyrophosphate, Tetron®

Exposure Limits:
NIOSH REL: TWA 0.05 mg/m^3 [skin]
OSHA PEL: TWA 0.05 mg/m^3 [skin]

Measurement Methods (see Table 1):
NIOSH 2504

Physical Description: Colorless to amber liquid with a faint, fruity odor. [insecticide]
[Note: A solid below 32°F.]

Chemical & Physical Properties:
MW: 290.2
BP: Decomposes
Sol: Miscible
Fl.P: NA
IP: ?
Sp.Gr: 1.19
VP: 0.0002 mmHg
FRZ: 32°F
UEL: NA
LEL: NA
Noncombustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
0.5 mg/m^3: Sa
1.25 mg/m^3: Sa:Cf
2.5 mg/m^3: SaT:Cf/ScbaF/SaF
5 mg/m^3: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, alkalis, water
[Note: Hydrolyzes quickly in water to form pyrophosphoric acid.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Eye pain, blurred vision, lac; rhin; head, chest tight, cyan; anor, nau, vomit, diarr; lass, twitch, para, Cheyne-Stokes respiration, convuls; low BP, card irreg; sweat
TO: Eyes, resp sys, CNS, CVS, GI tract, blood chol

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

m-Terphenyl	Formula: $C_6H_5C_6H_4C_6H_5$	CAS#: 92-06-8	RTECS#: WZ6470000	IDLH: 500 mg/m^3
Conversion: 1 ppm = 9.57 mg/m^3	DOT:			

Synonyms/Trade Names: m-Diphenylbenzene; 1,3-Diphenylbenzene; Isodiphenylbenzene; 3-Phenylbiphenyl; 1,3-Terphenyl; meta-Terphenyl; m-Triphenyl

Exposure Limits:
NIOSH REL: C 5 mg/m^3 (0.5 ppm)
OSHA PEL†: C 9 mg/m^3 (1 ppm)

Measurement Methods (see Table 1):
NIOSH 5021

Physical Description: Yellow solid (needles).

Chemical & Physical Properties:
MW: 230.3
BP: 689°F
Sol: Insoluble
Fl.P(oc): 375°F
IP: 8.01
Sp.Gr: 1.23
VP(200°F): 0.01 mmHg
MLT: 192°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
25 mg/m^3: Qm£
50 mg/m^3: 95XQ£/Sa£
125 mg/m^3: Sa:Cf£/PaprHie£
250 mg/m^3: 100F/ScbaF/SaF
500 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, muc memb; thermal skin burns; head; sore throat; in animals: liver, kidney damage
TO: Eyes, skin, resp sys, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

o-Terphenyl	Formula: $C_6H_5C_6H_4C_6H_5$	CAS#: 84-15-1	RTECS#: WZ6472000	IDLH: 500 mg/m^3
Conversion: 1 ppm = 9.42 mg/m^3	DOT:			

Synonyms/Trade Names: o-Diphenylbenzene; 1,2-Diphenylbenzene; 2-Phenylbiphenyl; 1,2-Terphenyl; ortho-Terphenyl; o-Triphenyl

Exposure Limits:
NIOSH REL: C 5 mg/m^3 (0.5 ppm)
OSHA PEL†: C 9 mg/m^3 (1 ppm)

Measurement Methods (see Table 1):
NIOSH 5021

Physical Description: Colorless or light-yellow solid.

Chemical & Physical Properties:
MW: 230.3
BP: 630°F
Sol: Insoluble
Fl.P(oc): 325°F
IP: 7.99 eV
Sp.Gr: 1.1
VP(200°F): 0.09 mmHg
MLT: 136°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
25 mg/m^3: Qm£
50 mg/m^3: 95XQ£/Sa£
125 mg/m^3: Sa:Cf£/PaprHie£
250 mg/m^3: 100F/ScbaF/SaF
500 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, muc memb; thermal skin burns; head; sore throat; in animals: liver, kidney damage
TO: Eyes, skin, resp sys, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

p-Terphenyl	Formula: $C_6H_5C_6H_4C_6H_5$	CAS#: 92-94-4	RTECS#: WZ6475000	IDLH: 500 mg/m^3
Conversion: 1 ppm = 9.57 mg/m^3	DOT:			

Synonyms/Trade Names: p-Diphenylbenzene; 1,4-Diphenylbenzene; 4-Phenylbiphenyl; 1,4-Terphenyl; para-Terphenyl; p-Triphenyl

Exposure Limits:
NIOSH REL: C 5 mg/m^3 (0.5 ppm)
OSHA PEL†: C 9 mg/m^3 (1 ppm)

Measurement Methods (see Table 1):
NIOSH 5021

Physical Description: White or light-yellow solid.

Chemical & Physical Properties:
MW: 230.3
BP: 761°F
Sol: Insoluble
Fl.P: 405°F
IP: 7.78
Sp.Gr: 1.23
VP: Very low
MLT: 415°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
25 mg/m^3: Qm£
50 mg/m^3: 95XQ£/Sa£
125 mg/m^3: Sa:Cf£/PaprHie£
250 mg/m^3: 100F/ScbaF/SaF
500 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, muc memb; thermal skin burns; head; sore throat; in animals: liver, kidney damage
TO: Eyes, skin, resp sys, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

2,3,7,8-Tetrachloro-dibenzo-p-dioxin	Formula: $C_{12}H_4Cl_4O_2$	CAS#: 1746-01-6	RTECS#: HP3500000	IDLH: Ca [N.D.]
Conversion:	DOT:			

Synonyms/Trade Names: Dioxin; Dioxine; TCDBD; TCDD; 2,3,7,8-TCDD
[Note: Formed during past production of 2,4,5-trichlorophenol, 2,4,5-T & 2(2,4,5-trichlorophenoxy)propionic acid.]

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless to white, crystalline solid.
[Note: Exposure may occur through contact at previously contaminated worksites.]

Chemical & Physical Properties:
MW: 322.0
BP: Decomposes
Sol: 0.00000002%
Fl.P: ?
IP: ?
Sp.Gr: ?
VP(77°F): 0.000002 mmHg
MLT: 581°F
UEL: ?
LEL: ?

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: UV light (decomposes)

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes; allergic derm, chloracne; porphyria; GI dist; possible repro, terato effects; in animals: liver, kidney damage; hemorr; [carc]
TO: Eyes, skin, liver, kidneys, repro sys [in animals: tumors at many sites]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

1,1,1,2-Tetrachloro-2,2-difluoroethane	Formula: CCl_3CClF_2	CAS#: 76-11-9	RTECS#: KI1425000	IDLH: 2000 ppm
Conversion: 1 ppm = 8.34 mg/m^3	DOT:			
Synonyms/Trade Names: 2,2-Difluoro-1,1,1,2-tetrachloroethane; Freon® 112a; Halocarbon 112a; Refrigerant 112a				

Exposure Limits: NIOSH REL: TWA 500 ppm (4170 mg/m^3) OSHA PEL: TWA 500 ppm (4170 mg/m^3)	Measurement Methods (see Table 1): NIOSH 1016 OSHA 7
Physical Description: Colorless solid with a slight, ether-like odor. [Note: A liquid above 105°F.]	

Chemical & Physical Properties: MW: 203.8 BP: 197°F Sol: 0.01% Fl.P: NA IP: ? Sp.Gr: 1.65 VP: 40 mmHg MLT: 105°F UEL: NA LEL: NA Noncombustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 2000 ppm: Sa/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Chemically-active metals such as potassium, beryllium, powdered aluminum, zinc, calcium, magnesium & sodium; acids	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin; CNS depres; pulm edema; drow; dysp TO: Eyes, skin, resp sys, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed

1,1,2,2-Tetrachloro-1,2-difluoroethane	Formula: CCl_2FCCl_2F	CAS#: 76-12-0	RTECS#: KI1420000	IDLH: 2000 ppm
Conversion: 1 ppm = 8.34 mg/m^3	DOT:			
Synonyms/Trade Names: 1,2-Difluoro-1,1,2,2-tetrachloroethane; Freon® 112; Halocarbon 112; Refrigerant 112				

Exposure Limits: NIOSH REL: TWA 500 ppm (4170 mg/m^3) OSHA PEL: TWA 500 ppm (4170 mg/m^3)	Measurement Methods (see Table 1): NIOSH 1016 OSHA 7
Physical Description: Colorless solid or liquid (above 77°F) with a slight, ether-like odor.	

Chemical & Physical Properties: MW: 203.8 BP: 199°F Sol(77°F): 0.01% Fl.P: NA IP: 11.30 eV Sp.Gr: 1.65 VP: 40 mmHg MLT: 77°F UEL: NA LEL: NA Noncombustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 2000 ppm: Sa/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Chemically-active metals such as potassium, beryllium, powdered aluminum, zinc, magnesium, calcium & sodium; acids	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: In animals: irrit eyes, skin; conj; pulm edema; narco TO: Eyes, skin, resp sys, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed

1,1,1,2-Tetrachloroethane	Formula: CCl_3CH_2Cl	CAS#: 630-20-6	RTECS#: KI8450000	IDLH: N.D.
Conversion:	DOT: 1702 151			

Synonyms/Trade Names: None

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: Handle with caution in the workplace. See Appendix C (Chloroethanes) OSHA PEL: none	None available

Physical Description: Yellowish-red liquid.

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 167.9 BP: 267°F Sol: 0.1% Fl.P: ? IP: ? Sp.Gr: 1.54 VP(77°F): 14 mmHg FRZ: -94°F UEL: ? LEL: ?	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench	Not available.

Incompatibilities and Reactivities: Potassium; sodium; dinitrogen tetraoxide; potassium hydroxide; nitrogen tetroxide; sodium potassium alloy; 2,4-dinitrophenyl disulfide

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Ing, Con SY: Irrit eyes, skin; lass, restless, irreg respiration, musc inco; in animals: liver changes TO: Eyes, skin, CNS, liver	Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

1,1,2,2-Tetrachloroethane	Formula: $CHCl_2CHCl_2$	CAS#: 79-34-5	RTECS#: KI8575000	IDLH: Ca [100 ppm]
Conversion: 1 ppm = 6.87 mg/m^3	DOT: 1702 151			

Synonyms/Trade Names: Acetylene tetrachloride, Symmetrical tetrachloroethane

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: Ca TWA 1 ppm (7 mg/m^3) [skin] See Appendix A See Appendix C (Chloroethanes) OSHA PEL†: TWA 5 ppm (35 mg/m^3) [skin]	NIOSH 1019, 2562 OSHA 7

Physical Description: Colorless to pale-yellow liquid with a pungent, chloroform-like odor.

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 167.9 BP: 296°F Sol: 0.3% Fl.P: NA IP: 11.10 eV Sp.Gr(77°F): 1.59 VP: 5 mmHg FRZ: -33°F UEL: NA LEL: NA Noncombustible Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench	NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Chemically-active metals, strong caustics, fuming sulfuric acid [Note: Degrades slowly when exposed to air.]

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Abs, Ing, Con SY: Nau, vomit, abdom pain; tremor fingers; jaun, hepatitis, liver tend; derm; leucyt; kidney damage; [carc] TO: Skin, liver, kidneys, CNS, GI tract [in animals: liver tumors]	Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed

Tetrachloroethylene

Formula:	CAS#:	RTECS#:	IDLH:
$Cl_2C=CCl_2$	127-18-4	KX3850000	Ca [150 ppm]

Conversion: 1 ppm = 6.78 mg/m^3

DOT: 1897 160

Synonyms/Trade Names: Perchlorethylene, Perchloroethylene, Perk, Tetrachlorethylene

Exposure Limits:
NIOSH REL: Ca
Minimize workplace exposure concentrations.
See Appendix A
OSHA PEL†: TWA 100 ppm
C 200 ppm (for 5 mins. in any 3-hr. period), with a maximum peak of 300 ppm

Measurement Methods (see Table 1):
NIOSH 1003
OSHA 1001

Physical Description: Colorless liquid with a mild, chloroform-like odor.

Chemical & Physical Properties:
MW: 165.8
BP: 250°F
Sol: 0.02%
Fl.P: NA
IP: 9.32 eV
Sp.Gr: 1.62
VP: 14 mmHg
FRZ: -2°F
UEL: NA
LEL: NA
Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers; chemically-active metals such as lithium, beryllium & barium; caustic soda; sodium hydroxide; potash

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat, resp sys; nau; flush face, neck; dizz, inco; head, drow; skin eryt; liver damage; [carc]
TO: Eyes, skin, resp sys, liver, kidneys, CNS [in animals: liver tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Tetrachloronaphthalene

Formula:	CAS#:	RTECS#:	IDLH:
$C_{10}H_4Cl_4$	1335-88-2	QK3700000	See Appendix F

Conversion:

DOT:

Synonyms/Trade Names: Halowax®, Nibren wax, Seekay wax

Exposure Limits:
NIOSH REL: TWA 2 mg/m^3 [skin]
OSHA PEL: TWA 2 mg/m^3 [skin]

Measurement Methods (see Table 1):
NIOSH S130 (II-2)

Physical Description: Colorless to pale-yellow solid with an aromatic odor.

Chemical & Physical Properties:
MW: 265.9
BP: 599-680°F
Sol: Insoluble
Fl.P(oc): 410°F
IP: ?
Sp.Gr: 1.59-1.65
VP: <1 mmHg
MLT: 360°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
20 mg/m^3: ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

See Appendix F

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Acne-form derm; head, lass, anor, dizz; jaun, liver inj
TO: Liver, skin, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Tetraethyl lead (as Pb)

Formula:	CAS#:	RTECS#:	IDLH:
$Pb(C_2H_5)_4$	78-00-2	TP4550000	40 mg/m^3 (as Pb)

Conversion: DOT: 1649 131

Synonyms/Trade Names: Lead tetraethyl, TEL, Tetraethylplumbane

Exposure Limits:
NIOSH REL: TWA 0.075 mg/m^3 [skin]
OSHA PEL: TWA 0.075 mg/m^3 [skin]

Measurement Methods (see Table 1):
NIOSH 2533

Physical Description: Colorless liquid (unless dyed red, orange, or blue) with a pleasant, sweet odor. [Note: Main usage is in anti-knock additives for gasoline.]

Chemical & Physical Properties:
MW: 323.5
BP: 228°F (Decomposes)
Sol: 0.00002%
Fl.P: 200°F
IP: 11.10 eV
Sp.Gr: 1.65
VP: 0.2 mmHg
FRZ: -202°F
UEL: ?
LEL: 1.8%
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact (>0.1%)
Eyes: Prevent eye contact
Wash skin: When contam (>0.1%)
Remove: When wet or contam (>0.1%)
Change: Daily
Provide: Quick drench (>0.1%)

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
0.75 mg/m^3: Sa
1.875 mg/m^3: Sa:Cf
3.75 mg/m^3: SaT:Cf/ScbaF/SaF
40 mg/m^3: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, sulfuryl chloride, rust, potassium permanganate
[Note: Decomposes slowly at room temperature and more rapidly at higher temperatures.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Insom, lass, anxiety; tremor, hyper-reflexia, spasticity; bradycardia, hypotension, hypothermia, pallor, nau, anor, low-wgt; conf, halu, psychosis, mania, convuls, coma; eye irrit
TO: CNS, CVS, kidneys, eyes

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Tetrahydrofuran

Formula:	CAS#:	RTECS#:	IDLH:
C_4H_8O	109-99-9	LU5950000	2000 ppm [10%LEL]

Conversion: 1 ppm = 2.95 mg/m^3 DOT: 2056 127

Synonyms/Trade Names: Diethylene oxide; 1,4-Epoxybutane; Tetramethylene oxide; THF

Exposure Limits:
NIOSH REL: TWA 200 ppm (590 mg/m^3)
ST 250 ppm (735 mg/m^3)
OSHA PEL†: TWA 200 ppm (590 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1609, 3800
OSHA 7

Physical Description: Colorless liquid with an ether-like odor.

Chemical & Physical Properties:
MW: 72.1
BP: 151°F
Sol: Miscible
Fl.P: 6°F
IP: 9.45 eV
Sp.Gr: 0.89
VP: 132 mmHg
FRZ: -163°F
UEL: 11.8%
LEL: 2%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
2000 ppm: Sa:Cf£/CcrFOv/GmFOv/PaprOv£/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, lithium-aluminum alloys
[Note: Peroxides may accumulate upon prolonged storage in presence of air.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con, Ing
SY: Irrit eyes, upper resp sys; nau, dizz, head, CNS depres
TO: Eyes, resp sys, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush prompt
Breath: Resp support
Swallow: Medical attention immed

Tetramethyl lead (as Pb)	Formula: $Pb(CH_3)_4$	CAS#: 75-74-1	RTECS#: TP4725000	IDLH: 40 mg/m^3 (as Pb)
Conversion:	DOT:			
Synonyms/Trade Names: Lead tetramethyl, Tetramethylplumbane, TML				
Exposure Limits: NIOSH REL: TWA 0.075 mg/m^3 [skin] OSHA PEL: TWA 0.075 mg/m^3 [skin]				Measurement Methods (see Table 1): NIOSH 2534
Physical Description: Colorless liquid (unless dyed red, orange, or blue) with a fruity odor. [Note: Main usage is in anti-knock additives for gasoline.]				
Chemical & Physical Properties: MW: 267.3 BP: 212°F (Decomposes) Sol: 0.002% Fl.P: 100°F IP: 8.50 eV Sp.Gr: 2.00 VP: 23 mmHg FRZ: -15°F UEL: ? LEL: ? Class II Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact (>0.1%) Eyes: Prevent eye contact Wash skin: When contam (>0.1%) Remove: When wet or contam (>0.1%) Change: Daily Provide: Quick drench (>0.1%)		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 0.75 mg/m^3: Sa 1.875 mg/m^3: Sa:Cf 3.75 mg/m^3: SaT:Cf/ScbaF/SaF 40 mg/m^3: Sa:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers such as sulfuryl chloride or potassium permanganate				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Insom, bad dreams, restless, anxious; hypotension; nau, anor; delirium, mania, convuls; coma TO: CNS, CVS, kidneys			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed	

Tetramethyl succinonitrile	Formula: $(CH_3)_2C(CN)C(CN)(CH_3)_2$	CAS#: 3333-52-6	RTECS#: WN4025000	IDLH: 5 ppm
Conversion: 1 ppm = 5.57 mg/m^3	DOT:			
Synonyms/Trade Names: Tetramethyl succinodinitrile, TMSN				
Exposure Limits: NIOSH REL: TWA 3 mg/m^3 (0.5 ppm) [skin] OSHA PEL: TWA 3 mg/m^3 (0.5 ppm) [skin]				Measurement Methods (see Table 1): NIOSH S155 (II-3) OSHA 7
Physical Description: Colorless, odorless solid. [Note: Forms cyanide in the body.]				
Chemical & Physical Properties: MW: 136.2 BP: Sublimes Sol: Insoluble Fl.P: ? IP: ? Sp.Gr: 1.07 VP: ? MLT: 338°F (Sublimes) UEL: ? LEL: ? Combustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 28 mg/m^3: Sa/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Head, nau; convuls, coma; liver, kidney, GI effects TO: CNS, liver, kidneys, GI tract			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed	

Tetranitromethane

Formula:	CAS#:	RTECS#:	IDLH:
$C(NO_2)_4$	509-14-8	PB4025000	4 ppm

Conversion: 1 ppm = 8.02 mg/m^3

DOT: 1510 143

Synonyms/Trade Names: Tetan, TNM

Exposure Limits:
NIOSH REL: TWA 1 ppm (8 mg/m^3)
OSHA PEL: TWA 1 ppm (8 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 3513

Physical Description: Colorless to pale-yellow liquid or solid (below 57°F) with a pungent odor.

Chemical & Physical Properties:
MW: 196.0
BP: 259°F
Sol: Insoluble
Fl.P: ?
IP: ?
Sp.Gr: 1.62
VP: 8 mmHg
FRZ: 57°F
UEL: ?
LEL: ?
Combustible Liquid, but difficult to ignite.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: Daily
Provide: Eyewash

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
4 ppm: Sa:Cf£/CcrFS¿/GmFS¿/PaprS¿£/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS¿/ScbaE

Incompatibilities and Reactivities: Hydrocarbons, alkalis, metals, oxidizers, aluminum, toluene, cotton
[Note: Combustible material wet with tetranitromethane may be highly explosive.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; dizz, head; chest pain, dysp; methemo, cyan; skin burns
TO: Eyes, skin, resp sys, blood, CNS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Tetrasodium pyrophosphate

Formula:	CAS#:	RTECS#:	IDLH:
$Na_4P_2O_7$	7722-88-5	UX7350000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: Pyrophosphate, Sodium pyrophosphate, Tetrasodium diphosphate, Tetrasodium pyrophosphate (anhydrous), TSPP

Exposure Limits:
NIOSH REL: TWA 5 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 0500

Physical Description: Odorless, white powder or granules.
[Note: The decahydrate ($Na_4P_2O_7 \times 10H_2O$) is in the form of colorless, transparent crystals.]

Chemical & Physical Properties:
MW: 265.9
BP: Decomposes
Sol(77°F): 7%
Fl.P: NA
IP: NA
Sp.Gr: 2.45
VP: 0 mmHg (approx)
MLT: 1810°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash (solution)

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong acids

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; derm
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash prompt
Breath: Resp support
Swallow: Medical attention immed

Tetryl	Formula: $(NO_2)_3C_6H_2N(NO_2)CH_3$	CAS#: 479-45-8	RTECS#: BY6300000	IDLH: 750 mg/m^3
Conversion:	DOT:			

Synonyms/Trade Names: N-Methyl-N,2,4,6-tetranitroaniline; Nitramine; 2,4,6-Tetryl; 2,4,6-Trinitrophenyl-N-methylnitramine

Exposure Limits: NIOSH REL: TWA 1.5 mg/m^3 [skin] OSHA PEL: TWA 1.5 mg/m^3 [skin]	Measurement Methods (see Table 1): NIOSH S225 (II-3)
Physical Description: Colorless to yellow, odorless, crystalline solid.	

Chemical & Physical Properties: MW: 287.2 BP: 356-374°F (Explodes) Sol: 0.02% Fl.P: Explodes IP: ? Sp.Gr: 1.57 VP: <1 mmHg MLT: 268°F UEL: ? LEL: ? Combustible Solid (Class A Explosive)	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 7.5 mg/m^3: Qm 15 mg/m^3: 95XQ*/Sa* 37.5 mg/m^3: Sa:Cf*/PaprHie* 75 mg/m^3: 100F/ScbaF/SaF 750 mg/m^3: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE

Incompatibilities and Reactivities: Oxidizable materials, hydrazine

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Sens derm, itch, eryt; edema on nasal folds, cheeks, neck; kera; sneez; anemia; cough, coryza; irrity; mal, head, lass, insom; nau, vomit; liver, kidney damage TO: Eyes, skin, resp sys, CNS, liver, kidneys	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed

Thallium (soluble compounds, as Tl)	Formula:	CAS#:	RTECS#:	IDLH: 15 mg/m^3 (as Tl)
Conversion:	DOT: 1707 151 (compounds, n.o.s.)			

Synonyms/Trade Names: Synonyms vary depending upon the specific soluble thallium compound.

Exposure Limits: NIOSH REL: TWA 0.1 mg/m^3 [skin] OSHA PEL: TWA 0.1 mg/m^3 [skin]	Measurement Methods (see Table 1): NIOSH 7300, 7301, 7303, 9102 OSHA ID121
Physical Description: Appearance and odor vary depending upon the specific soluble thallium compound.	

Chemical & Physical Properties: Properties vary depending upon the specific soluble thallium compound.	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 0.5 mg/m^3: Qm 1 mg/m^3: 95XQ/Sa 2.5 mg/m^3: Sa:Cf/PaprHie 5 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF 15 mg/m^3: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE

Incompatibilities and Reactivities: Varies

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Nau, diarr, abdom pain, vomit; ptosis, strabismus; peri neuritis, tremor; retster tight, chest pain, pulm edema; convuls, chorea, psychosis; liver, kidney damage; alopecia; pares legs TO: Eyes, resp sys, CNS, liver, kidneys, GI tract, body hair	First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed

4,4'-Thiobis(6-tert-butyl-m-cresol)	Formula: $[CH_3(OH)C_6H_2C(CH_3)_3]_2S$	CAS#: 96-69-5	RTECS#: GP3150000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: 4,4'-Thiobis(3-methyl-6-tert-butylphenol); 1,1'-Thiobis(2-methyl-4-hydroxy-5-tert-butylbenzene)

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL†: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500, 0600

Physical Description: Light-gray to tan powder with a slightly aromatic odor.

Chemical & Physical Properties:
MW: 358.6
BP: ?
Sol: 0.08%
Fl.P: 420°F
IP: ?
Sp.Gr: 1.10
VP: 0.0000006 mmHg
MLT: 302°F
UEL: NA
LEL: NA
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Breath: Fresh air
Swallow: Medical attention immed

Thioglycolic acid	Formula: $HSCH_2COOH$	CAS#: 68-11-1	RTECS#: AI5950000	IDLH: N.D.
Conversion: 1 ppm = 3.77 mg/m^3	DOT: 1940 153			

Synonyms/Trade Names: Acetyl mercaptan, Mercaptoacetate, Mercaptoacetic acid, 2-Mercaptoacetic acid, 2-Thioglycolic acid, Thiovanic acid

Exposure Limits:
NIOSH REL: TWA 1 ppm (4 mg/m^3) [skin]
OSHA PEL†: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless liquid with a strong, disagreeable odor characteristic of mercaptans. [Note: Olfactory fatigue may occur after short exposures.]

Chemical & Physical Properties:
MW: 92.1
BP: ?
Sol: Miscible
Fl.P: >230°F
IP: ?
Sp.Gr: 1.32
VP(64°F): 10 mmHg
FRZ: 2°F
UEL: ?
LEL: 5.9%
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Air, strong oxidizers, bases, active metals (e.g., sodium potassium, magnesium, calcium) [Note: Readily oxidized by air.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat; lac, corn damage; skin burns, blisters; in animals: lass; gasping respirations; convuls
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Thionyl chloride	Formula: $SOCl_2$	CAS#: 7719-09-7	RTECS#: XM5150000	IDLH: N.D.
Conversion: 1 ppm = 4.87 mg/m^3	DOT: 1836 137			
Synonyms/Trade Names: Sulfinyl chloride, Sulfur chloride oxide, Sulfurous dichloride, Sulfurous oxychloride, Thionyl dichloride				
Exposure Limits: NIOSH REL: C 1 ppm (5 mg/m^3) OSHA PEL†: none				Measurement Methods (see Table 1): None available
Physical Description: Colorless to yellow to reddish liquid with a pungent odor like sulfur dioxide. [Note: Fumes form when exposed to moist air.]				
Chemical & Physical Properties: MW: 119.0 BP: 169°F Sol: Reacts Fl.P: NA IP: ? Sp.Gr: 1.64 VP(70°F): 100 mmHg FRZ: -156°F UEL: NA LEL: NA Noncombustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Water, acids, alkalis, ammonia, chloryl perchlorate [Note: Reacts violently with water to form sulfur dioxide & hydrogen chloride.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, muc memb; eye, skin burns TO: Eyes, skin, resp sys			First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed	

Thiram	Formula: $C_6H_{12}N_2S_4$	CAS#: 137-26-8	RTECS#: JO1400000	IDLH: 100 mg/m^3
Conversion:	DOT: 2771 151			
Synonyms/Trade Names: bis(Dimethylthiocarbamoyl) disulfide, Tetramethylthiuram disulfide				
Exposure Limits: NIOSH REL: TWA 5 mg/m^3 OSHA PEL: TWA 5 mg/m^3				Measurement Methods (see Table 1): NIOSH 5005
Physical Description: Colorless to yellow, crystalline solid with a characteristic odor. [Note: Commercial pesticide products may be dyed blue.]				
Chemical & Physical Properties: MW: 240.4 BP: Decomposes Sol: 0.003% Fl.P: ? IP: ? Sp.Gr: 1.29 VP: 0.000008 mmHg MLT: 312°F UEL: ? LEL: ? Combustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 50 mg/m^3: CcrOv95*/Sa* 100 mg/m^3: Sa:Cf*/CcrFOv100/GmFOv100/ PaprOvHie*/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers, strong acids, oxidizable materials				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, muc memb; derm; Antabuse-like effects TO: Eyes, skin, resp sys, CNS			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed	

Tin

Formula:	CAS#:	RTECS#:	IDLH:
Sn	7440-31-5	XP7320000	100 mg/m^3 (as Sn)

Conversion: DOT:

Synonyms/Trade Names: Metallic tin, Tin flake, Tin metal, Tin powder

Exposure Limits:
NIOSH REL*: TWA 2 mg/m^3
OSHA PEL*: TWA 2 mg/m^3
[*Note: The REL and PEL also apply to other inorganic tin compounds (as Sn) except tin oxides.]

Measurement Methods (see Table 1):
NIOSH 7300, 7301, 7303
OSHA ID121, ID206

Physical Description: Gray to almost silver-white, ductile, malleable, lustrous solid.

Chemical & Physical Properties:
MW: 118.7
BP: 4545°F
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 7.28
VP: 0 mmHg (approx)
MLT: 449°F
UEL: NA
LEL: NA
Noncombustible Solid, but powdered form may ignite.

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
10 mg/m^3: Qm*
20 mg/m^3: 95XQ*/Sa*
50 mg/m^3: Sa:Cf*/PaprHie*
100 mg/m^3: 100F/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Chlorine, turpentine, acids, alkalis

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, resp sys; in animals: vomit, diarr, para with musc twitch
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Tin (organic compounds, as Sn)

Formula:	CAS#:	RTECS#:	IDLH:
			25 mg/m^3 (as Sn)

Conversion: DOT:

Synonyms/Trade Names: Synonyms vary depending upon the specific organic tin compound.
[Note: Also see specific listing for Cyhexatin.]

Exposure Limits:
NIOSH REL*: TWA 0.1 mg/m^3 [skin]
[*Note: The REL applies to all organic tin compounds except Cyhexatin.]
OSHA PEL*: TWA 0.1 mg/m^3
[*Note: The PEL applies to all organic tin compounds.]

Measurement Methods (see Table 1):
NIOSH 5504

Physical Description: Appearance and odor vary depending upon the specific organic tin compound.

Chemical & Physical Properties:
Properties vary depending upon the specific organic tin compound.

Personal Protection/Sanitation (see Table 2):
Recommendations regarding personal protective clothing vary depending upon the specific compound.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
1 mg/m^3: CcrOv95/Sa
2.5 mg/m^3: Sa:Cf/PaprOvHie
5 mg/m^3: CcrFOv100/GmFOv100/PaprTOvHie/SaT:Cf/ScbaF/SaF
25 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Varies

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, resp sys; head, dizz; psycho-neurologic dist; sore throat, cough; abdom pain, vomit; urine retention; paresis, focal anes; skin burns, pruritus; in animals: hemolysis; hepatic nec; kidney damage
TO: Eyes, skin, resp sys, CNS, liver, kidneys, urinary tract, blood

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

Tin(II) oxide (as Sn)	Formula: SnO	CAS#: 21651-19-4	RTECS#: XQ3700000	IDLH: N.D.
Conversion:	DOT:			
Synonyms/Trade Names: Stannous oxide, Tin protoxide [Note: Also see specific listing for Tin(IV) oxide (as Sn).]				
Exposure Limits: NIOSH REL: TWA 2 mg/m^3 OSHA PEL†: none			Measurement Methods (see Table 1): NIOSH 7300, 7301, 7303	
Physical Description: Brownish-black powder.				
Chemical & Physical Properties: MW: 134.7 BP: Decomposes Sol: Insoluble Fl.P: NA IP: NA Sp.Gr: 6.3 VP: 0 mmHg (approx) MLT(600 mmHg): 1976°F (Decomposes) UEL: NA LEL: NA	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: None reported				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Con SY: Stannosis (benign pneumoconiosis): dysp, decr pulm func TO: Resp sys		First Aid (see Table 6): Eye: Irr immed Breath: Fresh air		

Tin(IV) oxide (as Sn)	Formula: SnO_2	CAS#: 18282-10-5	RTECS#: XQ4000000	IDLH: N.D.
Conversion:	DOT:			
Synonyms/Trade Names: Stannic dioxide, Stannic oxide, White tin oxide [Note: Also see specific listing for Tin(II) oxide (as Sn).]				
Exposure Limits: NIOSH REL: TWA 2 mg/m^3 OSHA PEL†: none			Measurement Methods (see Table 1): NIOSH 7300, 7301, 7303	
Physical Description: White or slightly gray powder.				
Chemical & Physical Properties: MW: 150.7 BP: Decomposes Sol: Insoluble Fl.P: NA IP: NA Sp.Gr: 6.95 VP: 0 mmHg (approx) MLT: 2966°F (Decomposes) UEL: NA LEL: NA	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Chlorine trifluoride				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Con SY: Stannosis (benign pneumoconiosis): dysp, decr pulm func TO: Resp sys		First Aid (see Table 6): Eye: Irr immed Breath: Fresh air		

Titanium dioxide

Formula:	CAS#:	RTECS#:	IDLH:
TiO_2	13463-67-7	XR2275000	Ca [5000 mg/m^3]

Conversion: DOT:

Synonyms/Trade Names: Rutile, Titanium oxide, Titanium peroxide

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL†: TWA 15 mg/m^3

Measurement Methods (see Table 1):
NIOSH S385 (II-3)

Physical Description: White, odorless powder.

Chemical & Physical Properties:
MW: 79.9
BP: 4532-5432°F
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 4.26
VP: 0 mmHg (approx)
MLT: 3326-3362°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh
SY: Lung fib; [carc]
TO: Resp sys [in animals: lung tumors]

First Aid (see Table 6):
Breath: Resp support

o-Tolidine

Formula:	CAS#:	RTECS#:	IDLH:
$C_{14}H_{16}N_2$	119-93-7	DD1225000	Ca [N.D.]

Conversion: DOT:

Synonyms/Trade Names: 4,4'-Diamino-3,3'-dimethylbiphenyl; Diaminoditolyl; 3,3'-Dimethylbenzidine; 3,3'-Dimethyl-4,4'-diphenyldiamine; 3,3'-Tolidine

Exposure Limits:
NIOSH REL: Ca
C 0.02 mg/m^3 [60-minute] [skin]
See Appendix A
See Appendix C
OSHA PEL: See Appendix C

Measurement Methods (see Table 1):
NIOSH 5013
OSHA 71

Physical Description: White to reddish crystals or powder.
[Note: Darkens on exposure to air. Often used in paste or wet cake form. Used as a basis for many dyes.]

Chemical & Physical Properties:
MW: 212.3
BP: 572°F
Sol: 0.1%
Fl.P: ?
IP: ?
Sp.Gr: ?
VP: ?
MLT: 264°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, nose; in animals: liver, kidney damage; [carc]
TO: Eyes, resp sys, liver, kidneys [in animals: liver, bladder & mammary gland tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

Toluene	Formula: $C_6H_5CH_3$	CAS#: 108-88-3	RTECS#: XS5250000	IDLH: 500 ppm
Conversion: 1 ppm = 3.77 mg/m^3	DOT: 1294 130			
Synonyms/Trade Names: Methyl benzene, Methyl benzol, Phenyl methane, Toluol				

Exposure Limits: NIOSH REL: TWA 100 ppm (375 mg/m^3) ST 150 ppm (560 mg/m^3) OSHA PEL†: TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)	Measurement Methods (see Table 1): NIOSH 1500, 1501, 3800, 4000 OSHA 111

Physical Description: Colorless liquid with a sweet, pungent, benzene-like odor.

Chemical & Physical Properties: MW: 92.1 BP: 232°F Sol(74°F): 0.07% Fl.P: 40°F IP: 8.82 eV Sp.Gr: 0.87 VP: 21 mmHg FRZ: -139°F UEL: 7.1% LEL: 1.1% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH 500 ppm: CcrOv*/PaprOv*/ GmFOv/Sa*/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, nose; lass, conf, euph, dizz, head; dilated pupils, lac; anxi, musc ftg, insom; pares; derm; liver, kidney damage TO: Eyes, skin, resp sys, CNS, liver, kidneys	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed

Toluenediamine	Formula: $CH_3C_6H_3(NH_2)_2$	CAS#: 25376-45-8 95-80-7 (2,4-TDA)	RTECS#: XS9445000 XS9625000 (2,4-TDA)	IDLH: Ca [N.D.]
Conversion:	DOT: 1709 151 (2,4-Toluenediamine)			
Synonyms/Trade Names: Diaminotoluene, Methylphenylene diamine, TDA, Toluenediamine isomers, Tolylenediamine [Note: Various isomers of TDA exist.]				

Exposure Limits: NIOSH REL: Ca (all isomers) See Appendix A OSHA PEL: none	Measurement Methods (see Table 1): NIOSH 5516 OSHA 65

Physical Description: Colorless to brown, needle-shaped crystals or powder.
[Note: Tends to darken on storage and exposure to air. Properties given are for 2,4-TDA.]

Chemical & Physical Properties: MW: 122.2 BP: 558°F Sol: Soluble Fl.P: 300°F IP: ? Sp.Gr: 1.05 (Liquid at 212°F) VP(224°F): 1 mmHg MLT: 210°F UEL: ? LEL: ? Combustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily Provide: Eyewash Quick drench	Respirator Recommendations (see Tables 3 and 4): NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE
	Incompatibilities and Reactivities: None reported	

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, nose, throat; derm; ataxia, tacar, nau, vomit, convuls, resp depres; methemo, cyan, head, lass, dizz, bluish skin; liver inj; [carc] TO: Eyes, skin, resp sys, blood, CVS, liver [in animals: liver, skin & mammary gland tumors]	First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed

Toluene-2,4-diisocyanate

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3C_6H_3(NCO)_2$	584-84-9	CZ6300000	Ca [2.5 ppm]

Conversion: 1 ppm = 7.13 mg/m^3

DOT: 2078 156

Synonyms/Trade Names: TDI; 2,4-TDI; 2,4-Toluene diisocyanate

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL†: C 0.02 ppm (0.14 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 2535, 5521, 5522, 5525
OSHA 18, 33, 42

Physical Description: Colorless to pale-yellow solid or liquid (above 71°F) with a sharp, pungent odor.

Chemical & Physical Properties:
MW: 174.2
BP: 484°F
Sol: Insoluble
Fl.P: 260°F
IP: ?
Sp.Gr: 1.22
VP(77°F): 0.01 mmHg
MLT: 71°F
UEL: 9.5%
LEL: 0.9%
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, water, acids, bases & amines (may cause foam & spatter); alcohols [Note: Reacts slowly with water to form carbon dioxide and polyureas.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; choke, paroxysmal cough; chest pain, retster soreness; nau, vomit, abdom pain; bron, bronchospasm, pulm edema; dysp, asthma; conj, lac; derm, skin sens; [carc]
TO: Eyes, skin, resp sys [in animals: pancreas, liver, mammary gland, circulatory sys & skin tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

m-Toluidine

Formula:	CAS#:	RTECS#:	IDLH:
$CH_3C_6H_4NH_2$	108-44-1	XU2800000	N.D.

Conversion:

DOT: 1708 153

Synonyms/Trade Names: 3-Amino-1-methylbenzene, 1-Aminophenylmethane, m-Aminotoluene, 3-Methylaniline, 3-Methylbenzenamine, 3-Toluidine, meta-Toluidine, m-Tolylamine

Exposure Limits:
NIOSH REL: See Appendix D
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 2002
OSHA 73

Physical Description: Colorless to light-yellow liquid with an aromatic, amine-like odor. [Note: Used as a basis for many dyes.]

Chemical & Physical Properties:
MW: 107.2
BP: 397°F
Sol: 2%
Fl.P: 187°F
IP: 7.50 eV
Sp.Gr: 0.999
VP(106°F): 1 mmHg
FRZ: -23°F
UEL: ?
LEL: ?
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Oxidizers, acids

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; derm; hema, methemo; cyan, nau, vomit, low BP, convuls; anemia, lass
TO: Eyes, skin, blood, CVS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

o-Toluidine	Formula: $CH_3C_6H_4NH_2$	CAS#: 95-53-4	RTECS#: XU2975000	IDLH: Ca [50 ppm]
Conversion: 1 ppm = 4.38 mg/m^3	DOT: 1708 153			
Synonyms/Trade Names: o-Aminotoluene, 2-Aminotoluene, 1-Methyl-2-aminobenzene, o-Methylaniline, 2-Methylaniline, ortho-Toluidine, o-Tolylamine				
Exposure Limits: NIOSH REL: Ca [skin] See Appendix A OSHA PEL: TWA 5 ppm (22 mg/m^3) [skin]			Measurement Methods (see Table 1): NIOSH 2002, 2017, 8317 OSHA 73	
Physical Description: Colorless to pale-yellow liquid with an aromatic, aniline-like odor.				
Chemical & Physical Properties: MW: 107.2 BP: 392°F Sol: 2% Fl.P: 185°F IP: 7.44 eV Sp.Gr: 1.01 VP: 0.3 mmHg FRZ: 6°F UEL: ? LEL: ? Class IIIA Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers, nitric acid, bases				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes; anoxia, head, cyan; lass, dizz, drow; micro hema; eye burns; derm; [carc] TO: Eyes, skin, blood, kidneys, liver, CVS [bladder cancer]			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed	

p-Toluidine	Formula: $CH_3C_6H_4NH_2$	CAS#: 106-49-0	RTECS#: XU3150000	IDLH: Ca [N.D.]
Conversion:	DOT: 1708 153			
Synonyms/Trade Names: 4-Aminotoluene, 4-Methylaniline, 4-Methylbenzenamine, 4-Toluidine, para-Toluidine, p-Tolylamine				
Exposure Limits: NIOSH REL: Ca See Appendix A OSHA PEL†: none			Measurement Methods (see Table 1): NIOSH 2002 OSHA 73	
Physical Description: White solid with an aromatic odor. [Note: Used as a basis for many dyes.]				
Chemical & Physical Properties: MW: 107.2 BP: 393°F Sol: 0.7% Fl.P: 188°F IP: 7.50 eV Sp.Gr: 1.05 VP(108°F): 1 mmHg MLT: 111°F UEL: ? LEL: ? Combustible Solid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily Provide: Eyewash Quick drench		Respirator Recommendations (see Tables 3 and 4): NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE	
Incompatibilities and Reactivities: Oxidizers, acids				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin; derm; hema, methemo; cyan, nau, vomit, low BP, convuls; anemia, lass; [carc] TO: Eyes, skin, blood, CVS [in animals: liver tumors]			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed	

Tributyl phosphate

Formula:	CAS#:	RTECS#:	IDLH:
$(CH_3[CH_2]_3O)_3PO$	126-73-8	TC7700000	30 ppm

Conversion: 1 ppm = 10.89 mg/m^3

DOT:

Synonyms/Trade Names: Butyl phosphate, TBP, Tributyl ester of phosphoric acid, Tri-n-butyl phosphate

Exposure Limits:
NIOSH REL: TWA 0.2 ppm (2.5 mg/m^3)
OSHA PEL†: TWA 5 mg/m^3

Measurement Methods (see Table 1):
NIOSH 5034

Physical Description: Colorless to pale-yellow, odorless liquid.

Chemical & Physical Properties:
MW: 266.3
BP: 552°F (Decomposes)
Sol: 0.6%
Fl.P(oc): 295°F
IP: ?
Sp.Gr: 0.98
VP(77°F): 0.004 mmHg
FRZ: -112°F
UEL: ?
LEL: ?
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
2 ppm: Sa
5 ppm: Sa:Cf
10 ppm: ScbaF/SaF
30 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Alkalis, oxidizers, water, moist air

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys, head; nau
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Trichloroacetic acid

Formula:	CAS#:	RTECS#:	IDLH:
CCl_3COOH	76-03-9	AJ7875000	N.D.

Conversion: 1 ppm = 6.68 mg/m^3

DOT: 1839 153 (solid); 2564 153 (solution)

Synonyms/Trade Names: TCA, Trichloroethanoic acid

Exposure Limits:
NIOSH REL: TWA 1 ppm (7 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
OSHA PV2017

Physical Description: Colorless to white, crystalline solid with a sharp, pungent odor.

Chemical & Physical Properties:
MW: 163.4
BP: 388°F
Sol: Miscible
Fl.P: NA
IP: ?
Sp.Gr: 1.62
VP(124°F): 1 mmHg
MLT: 136°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Moisture, iron, zinc, aluminum, strong oxidizers
[Note: Decomposes on heating to form phosgene & hydrogen chloride. Corrosive to metals.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat, resp sys; cough, dysp, delayed pulm edema; eye, skin burns; derm; salv, vomit, diarr
TO: Eyes, skin, resp sys, GI tract

First Aid (see Table 6):
Eye: Irr immed
Skin: Water flush immed
Breath: Resp support
Swallow: Medical attention immed

1,2,4-Trichlorobenzene

Formula:	CAS#:	RTECS#:	IDLH:
$C_6H_3Cl_3$	120-82-1	DC2100000	N.D.

Conversion: 1 ppm = 7.42 mg/m^3

DOT: 2321 153 (liquid)

Synonyms/Trade Names: unsym-Trichlorobenzene; 1,2,4-Trichlorobenzol

Exposure Limits:
NIOSH REL: C 5 ppm (40 mg/m^3)
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 5517

Physical Description: Colorless liquid or crystalline solid (below 63°F) with an aromatic odor.

Chemical & Physical Properties:
MW: 181.4
BP: 416°F
Sol: 0.003%
Fl.P: 222°F
IP: ?
Sp.Gr: 1.45
VP: 1 mmHg
FRZ: 63°F
UEL(302°F): 6.6%
LEL(302°F): 2.5%
Class IIIB Combustible Liquid
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Acids, acid fumes, oxidizers, steam

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, muc memb; in animals: liver, kidney damage; possible terato effects
TO: Eyes, skin, resp sys, liver, repro sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

1,1,2-Trichloroethane

Formula:	CAS#:	RTECS#:	IDLH:
$CHCl_2CH_2Cl$	79-00-5	KJ3150000	Ca [100 ppm]

Conversion: 1 ppm = 5.46 mg/m^3

DOT:

Synonyms/Trade Names: Ethane trichloride, β-Trichloroethane, Vinyl trichloride

Exposure Limits:
NIOSH REL: Ca
TWA 10 ppm (45 mg/m^3) [skin]
See Appendix A
See Appendix C (Chloroethanes)
OSHA PEL: TWA 10 ppm (45 mg/m^3) [skin]

Measurement Methods (see Table 1):
NIOSH 1003
OSHA 11

Physical Description: Colorless liquid with a sweet, chloroform-like odor.

Chemical & Physical Properties:
MW: 133.4
BP: 237°F
Sol: 0.4%
Fl.P: ?
IP: 11.00 eV
Sp.Gr: 1.44
VP: 19 mmHg
FRZ: -34°F
UEL: 15.5%
LEL: 6%
Combustible Liquid, forms dense soot.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers & caustics; chemically-active metals (such as aluminum, magnesium powders, sodium & potassium)

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, nose; CNS depres; liver, kidney damage; derm; [carc]
TO: Eyes, resp sys, CNS, liver, kidneys [in animals: liver cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Trichloroethylene

Formula:	CAS#:	RTECS#:	IDLH:
$ClCH=CCl_2$	79-01-6	KX4550000	Ca [1000 ppm]

Conversion: 1 ppm = 5.37 mg/m^3

DOT: 1710 160

Synonyms/Trade Names: Ethylene trichloride, TCE, Trichloroethene, Trilene

Exposure Limits:
NIOSH REL: Ca
See Appendix A
See Appendix C
OSHA PEL†: TWA 100 ppm
C 200 ppm
300 ppm (5-minute maximum peak in any 2 hours)

Measurement Methods (see Table 1):
NIOSH 1022, 3800
OSHA 1001

Physical Description: Colorless liquid (unless dyed blue) with a chloroform-like odor.

Chemical & Physical Properties:
MW: 131.4
BP: 189°F
Sol: 0.1%
Fl.P: ?
IP: 9.45 eV
Sp.Gr: 1.46
VP: 58 mmHg
FRZ: -99°F
UEL(77°F): 10.5%
LEL(77°F): 8%
Combustible Liquid, but burns with difficulty.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong caustics & alkalis; chemically-active metals (such as barium, lithium, sodium, magnesium, titanium & beryllium)

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; head, vis dist, lass, dizz, tremor, drow, nau, vomit; derm; card arrhy, pares; liver inj; [carc]
TO: Eyes, skin, resp sys, heart, liver, kidneys, CNS [in animals: liver & kidney cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Trichloronaphthalene

Formula:	CAS#:	RTECS#:	IDLH:
$C_{10}H_5Cl_3$	1321-65-9	QK4025000	See Appendix F

Conversion:

DOT:

Synonyms/Trade Names: Halowax®, Nibren wax, Seekay wax

T

Exposure Limits:
NIOSH REL: TWA 5 mg/m^3 [skin]
OSHA PEL: TWA 5 mg/m^3 [skin]

Measurement Methods (see Table 1):
NIOSH S128 (II-2)

Physical Description: Colorless to pale-yellow solid with an aromatic odor.

Chemical & Physical Properties:
MW: 231.5
BP: 579-669°F
Sol: Insoluble
Fl.P(oc): 392°F
IP: ?
Sp.Gr: 1.58
VP: <1 mmHg
MLT: 199°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
50 mg/m^3: ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

See Appendix F

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Anor, nau; dizz; jaun, liver inj
TO: Liver

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

1,2,3-Trichloropropane

Formula:	CAS#:	RTECS#:	IDLH:
$CH_2ClCHClCH_2Cl$	96-18-4	TZ9275000	Ca [100 ppm]

Conversion: 1 ppm = 6.03 mg/m^3

DOT:

Synonyms/Trade Names: Allyl trichloride, Glycerol trichlorohydrin, Glyceryl trichlorohydrin, Trichlorohydrin

Exposure Limits:
NIOSH REL: Ca
TWA 10 ppm (60 mg/m^3) [skin]
See Appendix A
OSHA PEL†: TWA 50 ppm (300 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1003
OSHA 7

Physical Description: Colorless liquid with a chloroform-like odor.

Chemical & Physical Properties:
MW: 147.4
BP: 314°F
Sol: 0.1%
Fl.P: 160°F
IP: ?
Sp.Gr: 1.39
VP: 3 mmHg
FRZ: 6°F
UEL(302°F): 12.6%
LEL(248°F): 3.2%
Class IIIA Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Chemically-active metals, strong caustics & oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, nose, throat; CNS depres; in animals: liver, kidney inj; [carc]
TO: Eyes, skin, resp sys, CNS, liver, kidneys [in animals: forestomach, liver & mammary gland cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

1,1,2-Trichloro-1,2,2-trifluoroethane

Formula:	CAS#:	RTECS#:	IDLH:
CCl_2FCClF_2	76-13-1	KJ4000000	2000 ppm

Conversion: 1 ppm = 7.67 mg/m^3

DOT:

Synonyms/Trade Names: Chlorofluorocarbon-113, CFC-113, Freon® 113, Genetron® 113, Halocarbon 113, Refrigerant 113, TTE

Exposure Limits:
NIOSH REL: TWA 1000 ppm (7600 mg/m^3)
ST 1250 ppm (9500 mg/m^3)
OSHA PEL†: TWA 1000 ppm (7600 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1020
OSHA 113

Physical Description: Colorless to water-white liquid with an odor like carbon tetrachloride at high concentrations. [Note: A gas above 118°F.]

Chemical & Physical Properties:
MW: 187.4
BP: 118°F
Sol(77°F): 0.02%
Fl.P: ?
IP: 11.99 eV
Sp.Gr(77°F): 1.56
VP: 285 mmHg
FRZ: -31°F
UEL: ?
LEL: ?
Noncombustible Liquid at ordinary temperatures, but the gas will ignite and burn weakly at 1256°F.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
2000 ppm: Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Chemically-active metals such as calcium, powdered aluminum, zinc, magnesium & beryllium [Note: Decomposes if in contact with alloys containing >2% magnesium.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit skin, throat, drow, derm; CNS depres; in animals: card arrhy, narco
TO: Skin, heart, CNS, CVS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Triethylamine	Formula: $(C_2H_5)_3N$	CAS#: 121-44-8	RTECS#: YE0175000	IDLH: 200 ppm
Conversion: 1 ppm = 4.14 mg/m^3	DOT: 1296 132			
Synonyms/Trade Names: TEA				

Exposure Limits: NIOSH REL: See Appendix D OSHA PEL†: TWA 25 ppm (100 mg/m^3)	Measurement Methods (see Table 1): NIOSH S152 (II-3) OSHA PV2060
Physical Description: Colorless liquid with a strong, ammonia-like odor.	

Chemical & Physical Properties: MW: 101.2 BP: 193°F Sol: 2% Fl.P: 20°F IP: 7.50 eV Sp.Gr: 0.73 VP: 54 mmHg FRZ: -175°F UEL: 8.0% LEL: 1.2% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R. Provide: Eyewash (>1%) Quick drench (>1%)	Respirator Recommendations (see Tables 3 and 4): OSHA 200 ppm: Sa:Cf£/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFS/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong acids, chlorine, hypochlorite, halogenated compounds	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, resp sys; in animals: myocardial, kidney, liver damage TO: Eyes, skin, resp sys, CVS, liver, kidneys	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

Trifluorobromomethane	Formula: $CBrF_3$	CAS#: 75-63-8	RTECS#: PA5425000	IDLH: 40,000 ppm
Conversion: 1 ppm = 6.09 mg/m^3	DOT: 1009 126			
Synonyms/Trade Names: Bromotrifluoromethane, Fluorocarbon 1301, Freon® 13B1, Halocarbon 13B1, Halon® 1301, Monobromotrifluoromethane, Refrigerant 13B1, Trifluoromonobromomethane				

Exposure Limits: NIOSH REL: TWA 1000 ppm (6100 mg/m^3) OSHA PEL: TWA 1000 ppm (6100 mg/m^3)	Measurement Methods (see Table 1): NIOSH 1017
Physical Description: Colorless, odorless gas. [Note: Shipped as a liquefied compressed gas.]	

Chemical & Physical Properties: MW: 148.9 BP: -72°F Sol: 0.03% Fl.P: NA IP: 11.78 eV RGasD: 5.14 VP: >1 atm FRZ: -267°F UEL: NA LEL: NA Nonflammable Gas	Personal Protection/Sanitation (see Table 2): Skin: Frostbite Eyes: Frostbite Wash skin: N.R. Remove: N.R. Change: N.R. Provide: Frostbite wash	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 10,000 ppm: Sa 25,000 ppm: Sa:Cf 40,000 ppm: SaT:Cf/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Chemically-active metals (such as calcium, powdered aluminum, zinc, and magnesium)	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Con (liquid) SY: Dizz; card arrhy; liquid: frostbite TO: CNS, heart	First Aid (see Table 6): Eye: Frostbite Skin: Frostbite Breath: Resp support

Trimellitic anhydride

Formula:	CAS#:	RTECS#:	IDLH:
$C_9H_4O_5$	552-30-7	DC2050000	N.D.

Conversion: 1 ppm = 7.86 mg/m^3

DOT:

Synonyms/Trade Names: 1,2,4-Benzenetricarboxylic anhydride; 4-Carboxyphthalic anhydride; TMA; TMAN; Trimellic acid anhydride [Note: TMA is also a synonym for Trimethylamine.]

Exposure Limits:
NIOSH REL: TWA 0.005 ppm (0.04 mg/m^3)
Should be handled in the workplace as an extremely toxic substance.
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 5036
OSHA 98

Physical Description: Colorless solid.

Chemical & Physical Properties:
MW: 192.1
BP: ?
Sol: ?
Fl.P: NA
IP: ?
Sp.Gr: ?
VP: 0.000004 mmHg
MLT: 322°F
UEL: NA
LEL: NA
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, resp sys; pulm edema, resp sens; rhinitis, asthma, cough, wheez, dysp, mal, fever, musc aches, sneez
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support
Swallow: Medical attention immed

Trimethylamine

Formula:	CAS#:	RTECS#:	IDLH:
$(CH_3)_3N$	75-50-3	PA0350000	N.D.

Conversion: 1 ppm = 2.42 mg/m^3

DOT: 1083 118 (anhydrous); 1297 132 (aqueous solution)

Synonyms/Trade Names: N,N-Dimethylmethanamine; TMA
[Note: May be used in an aqueous solution (typically 25%, 30%, or 40% TMA.]

Exposure Limits:
NIOSH REL: TWA 10 ppm (24 mg/m^3) OSHA PEL†: none
ST 15 ppm (36 mg/m^3)

Measurement Methods (see Table 1):
OSHA PV2060

Physical Description: Colorless gas with a fishy, amine odor.
[Note: A liquid below 37°F. Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 59.1
BP: 37°F
Sol(86°F): 48%
Fl.P: NA (Gas)
20°F (Liquid)
IP: 7.82 eV
RGasD: 2.09
VP(70°F): 1454 mmHg
FRZ: -179°F
UEL: 11.6%
LEL: 2.0%
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact (liquid/solution)
Frostbite
Eyes: Prevent eye contact (liquid/solution)
Frostbite
Wash skin: When contam (solution)
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash (liquid/solution)
Quick drench (liquid/solution)
Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Strong oxidizers (including bromine), ethylene oxide, nitrosating agents (e.g., sodium nitrite), mercury, strong acids [Note: Corrosive to many metals (e.g., zinc, brass, aluminum, copper).]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing (solution), Con
SY: Irrit eyes, skin, nose, throat, resp sys; cough, dysp, delayed pulm edema; blurred vision, corn nec; skin burns; liquid: frostbite
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed (liquid/solution)/Frostbite
Skin: Water flush immed (liquid/solution)/Frostbite
Breath: Resp support
Swallow: Medical attention immed (solution)

1,2,3-Trimethylbenzene	Formula: $C_6H_3(CH_3)_3$	CAS#: 526-73-8	RTECS#: DC3300000	IDLH: N.D.
Conversion: 1 ppm = 4.92 mg/m^3	DOT:			

Synonyms/Trade Names: Hemellitol
[Note: Hemimellitene is a mixture of the 1,2,3-isomer with up to 10% of related aromatics such as the 1,2,4-isomer.]

Exposure Limits: NIOSH REL: TWA 25 ppm (125 mg/m^3) OSHA PEL†: none	Measurement Methods (see Table 1): OSHA PV2091
Physical Description: Clear, colorless liquid with a distinctive, aromatic odor.	

Chemical & Physical Properties: MW: 120.2 BP: 349°F Sol: Low Fl.P: ? IP: 8.48 eV Sp.Gr: 0.89 VP(62°F): 1 mmHg FRZ: -14°F UEL: 6.6% LEL: 0.8% Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.	Respirator Recommendations (see Tables 3 and 4): Not available.

Incompatibilities and Reactivities: Oxidizers, nitric acid

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose, throat, resp sys; bron; hypochromic anemia; head, drow, lass, dizz, nau, inco; vomit, conf; chemical pneu (aspir liquid) TO: Eyes, skin, resp sys, CNS, blood	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash Breath: Resp support Swallow: Medical attention immed

1,2,4-Trimethylbenzene	Formula: $C_6H_3(CH_3)_3$	CAS#: 95-63-6	RTECS#: DC3325000	IDLH: N.D.
Conversion: 1 ppm = 4.92 mg/m^3	DOT:			

Synonyms/Trade Names: Asymetrical trimethylbenzene, psi-Cumene, Pseudocumene
[Note: Hemimellitene is a mixture of the 1,2,3-isomer with up to 10% of related aromatics such as the 1,2,4-isomer.]

Exposure Limits: NIOSH REL: TWA 25 ppm (125 mg/m^3) OSHA PEL†: none	Measurement Methods (see Table 1): OSHA PV2091
Physical Description: Clear, colorless liquid with a distinctive, aromatic odor.	

Chemical & Physical Properties: MW: 120.2 BP: 337°F Sol: 0.006% Fl.P: 112°F IP: 8.27 eV Sp.Gr: 0.88 VP(56°F): 1 mmHg FRZ: -77°F UEL: 6.4% LEL: 0.9% Class II Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.	Respirator Recommendations (see Tables 3 and 4): Not available.

Incompatibilities and Reactivities: Oxidizers, nitric acid

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose, throat, resp sys; bron; hypochromic anemia; head, drow, lass, dizz, nau, inco; vomit, conf; chemical pneu (aspir liquid) TO: Eyes, skin, resp sys, CNS, blood	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash Breath: Resp support Swallow: Medical attention immed

1,3,5-Trimethylbenzene	Formula: $C_6H_3(CH_3)_3$	CAS#: 108-67-8	RTECS#: OX6825000	IDLH: N.D.
Conversion: 1 ppm = 4.92 mg/m^3	DOT: 2325 129			
Synonyms/Trade Names: Mesitylene, Symmetrical trimethylbenzene, sym-Trimethylbenzene				
Exposure Limits: NIOSH REL: TWA 25 ppm (125 mg/m^3) OSHA PEL†: none			Measurement Methods (see Table 1): OSHA PV2091	
Physical Description: Clear, colorless liquid with a distinctive, aromatic odor.				
Chemical & Physical Properties: MW: 120.2 BP: 329°F Sol: 0.002% Fl.P: 122°F IP: 8.39 eV Sp.Gr: 0.86 VP: 2 mmHg FRZ: -49°F UEL: ? LEL: ? Class II Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Oxidizers, nitric acid				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose, throat, resp sys; bron; hypochromic anemia; head, drow, lass, dizz, nau, inco; vomit, conf; chemical pneu (aspir liquid) TO: Eyes, skin, resp sys, CNS, blood			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash Breath: Resp support Swallow: Medical attention immed	

Trimethyl phosphite	Formula: $(CH_3O)_3P$	CAS#: 121-45-9	RTECS#: TH1400000	IDLH: N.D.
Conversion: 1 ppm = 5.08 mg/m^3	DOT: 2329 129			
Synonyms/Trade Names: Methyl phosphite, Trimethoxyphosphine, Trimethyl ester of phosphorous acid				
Exposure Limits: NIOSH REL: TWA 2 ppm (10 mg/m^3) OSHA PEL†: none			Measurement Methods (see Table 1): None available	
Physical Description: Colorless liquid with a distinctive, pungent odor.				
Chemical & Physical Properties: MW: 124.1 BP: 232°F Sol: Reacts Fl.P: 82°F IP: ? Sp.Gr: 1.05 VP(77°F): 24 mmHg FRZ: -108°F UEL: ? LEL: ? Class IC Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R. Provide: Quick drench		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: Magnesium perchlorate, water [Note: Reacts (hydrolyzes) with water.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, upper resp sys; derm; in animals: terato effects TO: Eyes, skin, resp sys, repro sys			First Aid (see Table 6): Eye: Irr immed Skin: Soap flush immed Breath: Resp support Swallow: Medical attention immed	

2,4,6-Trinitrotoluene	Formula: $CH_3C_6H_2(NO_2)_3$	CAS#: 118-96-7	RTECS#: XU0175000	IDLH: 500 mg/m^3
Conversion:	DOT: 1356 113 (wet)			
Synonyms/Trade Names: 1-Methyl-2,4,6-trinitrobenzene; TNT; Trinitrotoluene; sym-Trinitrotoluene; Trinitrotoluol				
Exposure Limits: NIOSH REL: TWA 0.5 mg/m^3 [skin] OSHA PEL†: TWA 1.5 mg/m^3 [skin]			Measurement Methods (see Table 1): OSHA 44	
Physical Description: Colorless to pale-yellow, odorless solid or crushed flakes.				
Chemical & Physical Properties: MW: 227.1 BP: 464°F (Explodes) Sol(77°F): 0.01% Fl.P: ? (Explodes) IP: 10.59 eV Sp.Gr: 1.65 VP: 0.0002 mmHg MLT: 176°F UEL: ? LEL: ? Combustible Solid (Class A Explosive)	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily		Respirator Recommendations (see Tables 3 and 4): NIOSH 5 mg/m^3: Sa* 12.5 mg/m^3: Sa:Cf* 25 mg/m^3: ScbaF/SaF 500 mg/m^3: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv100/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers, ammonia, strong alkalis, combustible materials, heat [Note: Rapid heating will result in detonation.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit skin, muc memb; liver damage, jaun; cyan; sneez; cough, sore throat; peri neur, musc pain; kidney damage; cataract; sens derm; leucyt; anemia; card irreg TO: Eyes, skin, resp sys, blood, liver, CVS, CNS, kidneys			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed	

Triorthocresyl phosphate	Formula: $(CH_3C_6H_4O)_3PO$	CAS#: 78-30-8	RTECS#: TD0350000	IDLH: 40 mg/m^3
Conversion:	DOT: 2574 151			
Synonyms/Trade Names: TCP, TOCP, Tri-o-cresyl ester of phosphoric acid, Tri-o-cresyl phosphate				
Exposure Limits: NIOSH REL: TWA 0.1 mg/m^3 [skin] OSHA PEL†: TWA 0.1 mg/m^3			Measurement Methods (see Table 1): NIOSH 5037	
Physical Description: Colorless to pale-yellow, odorless liquid or solid (below 52°F).				
Chemical & Physical Properties: MW: 368.4 BP: 770°F (Decomposes) Sol: Slight Fl.P: 437°F IP: ? Sp.Gr: 1.20 VP(77°F): 0.00002 mmHg FRZ: 52°F UEL: ? LEL: ? Class IIIB Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: N.R. Wash skin: When contam Remove: When wet or contam Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 0.5 mg/m^3: Qm 1 mg/m^3: 95XQ/Sa 2.5 mg/m^3: Sa:Cf/PaprHie 5 mg/m^3: 100F/SaT:Cf/PaprTHie/ ScbaF/SaF 40 mg/m^3: Sa:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE	
Incompatibilities and Reactivities: Oxidizers				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: GI dist; peri neur; cramps in calves, pares in feet or hands; weak feet, wrist drop, para TO: PNS, CNS			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed	

Triphenylamine	Formula: $(C_6H_5)_3N$	CAS#: 603-34-9	RTECS#: YK2680000	IDLH: N.D.
Conversion:	DOT:			
Synonyms/Trade Names: N,N-Diphenylaniline; N,N-Diphenylbenzenamine				
Exposure Limits: NIOSH REL: TWA 5 mg/m^3 OSHA PEL†: none			Measurement Methods (see Table 1): None available	
Physical Description: Colorless solid.				
Chemical & Physical Properties: MW: 245.3 BP: 689°F Sol: Insoluble Fl.P: ? IP: 7.60 eV Sp.Gr: 0.77 VP: ? MLT: 261°F UEL: ? LEL: ?	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: N.R. Change: Daily		Respirator Recommendations (see Tables 3 and 4): Not available.	
Incompatibilities and Reactivities: None reported				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: In animals: irrit skin TO: Skin		First Aid (see Table 6): Eye: Irr immed Skin: Soap wash Breath: Resp support Swallow: Medical attention immed		

Triphenyl phosphate	Formula: $(C_6H_5O)_3PO$	CAS#: 115-86-6	RTECS#: TC8400000	IDLH: 1000 mg/m^3
Conversion:	DOT:			
Synonyms/Trade Names: Phenyl phosphate, TPP, Triphenyl ester of phosphoric acid				
Exposure Limits: NIOSH REL: TWA 3 mg/m^3 OSHA PEL: TWA 3 mg/m^3			Measurement Methods (see Table 1): NIOSH 5038	
Physical Description: Colorless, crystalline powder with a phenol-like odor.				
Chemical & Physical Properties: MW: 326.3 BP: 776°F Sol(129°F): 0.002% Fl.P: 428°F IP: ? Sp.Gr: 1.29 VP(380°F): 1 mmHg MLT: 120°F UEL: ? LEL: ? Combustible Solid	Personal Protection/Sanitation (see Table 2): Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 15 mg/m^3: Qm 30 mg/m^3: 95XQ/Sa 75 mg/m^3: Sa:Cf/PaprHie 150 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF 1000 mg/m^3: Sa:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE	
Incompatibilities and Reactivities: None reported				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing SY: Minor changes in blood enzymes; in animals: musc weak, para TO: Blood, PNS		First Aid (see Table 6): Breath: Resp support Swallow: Medical attention immed		

Tungsten

Formula:	CAS#:	RTECS#:	IDLH:
W	7440-33-7	YO7175000	N.D.

Conversion: DOT:

Synonyms/Trade Names: Tungsten metal, Wolfram

Exposure Limits:
NIOSH REL*: TWA 5 mg/m^3
ST 10 mg/m^3
[*Note: The REL also applies to other insoluble tungsten compounds (as W).]
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 7074, 7300, 7301
OSHA ID213

Physical Description: Hard, brittle, steel-gray to tin-white solid.

Chemical & Physical Properties:
MW: 183.9
BP: 10,701°F
Sol: Insoluble
Fl.P: NA
IP: NA
Sp.Gr: 19.3
VP: 0 mmHg (approx)
MLT: 6170°F
UEL: NA
LEL: NA
Combustible in the form of finely divided powder; may ignite spontaneously.

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
50 mg/m^3: 100XQ/Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100XQ/ScbaE

Incompatibilities and Reactivities: Bromine trifluoride, chlorine trifluoride, fluorine, iodine pentafluoride

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; diffuse pulm fib; loss of appetite, nau, cough; blood changes
TO: Eyes, skin, resp sys, blood

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Fresh air
Swallow: Medical attention immed

Tungsten (soluble compounds, as W)

Formula:	CAS#:	RTECS#:	IDLH:
			N.D.

Conversion: DOT:

Synonyms/Trade Names: Synonyms vary depending upon the specific soluble tungsten compound.

Exposure Limits:
NIOSH REL: TWA 1 mg/m^3
ST 3 mg/m^3
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 7074, 7300, 7301
OSHA ID213

Physical Description: Appearance and odor vary depending upon the specific soluble tungsten compound.

Chemical & Physical Properties:
Properties vary depending upon the specific soluble tungsten compound.

Personal Protection/Sanitation (see Table 2):
Recommendations regarding personal protective clothing vary depending upon the specific compound.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
10 mg/m^3: 100XQ/Sa
25 mg/m^3: Sa:Cf
50 mg/m^3: 100F/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Varies

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; in animals: CNS disturbances; diarr; resp failure; behavioral, body weight, blood changes
TO: Eyes, skin, resp sys, CNS, GI tract

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash
Breath: Resp support
Swallow: Medical attention immed

Tungsten carbide (cemented)

Formula:	CAS#:	RTECS#:	IDLH:
WC/Co/Ni/Ti	1: 11107-01-0 2: 12718-69-3 3: 37329-49-0	1: YO7350000 2: YO7525000 3: YO7700000	N.D.

Conversion:

DOT:

Synonyms/Trade Names: Cemented tungsten carbide, Cemented WC, Hard metal
[Note: The tungsten carbide (WC) content is generally 85-95% & the cobalt content is generally 5-15%.]
[1: 85% WC, 15% Co; 2: 92% WC, 8% Co; 3: 78% WC, 14% Co, 8% Ti]

Exposure Limits:
NIOSH REL: See Appendix C OSHA PEL†: See Appendix C

Measurement Methods (see Table 1):
None available

Physical Description: A mixture of tungsten carbide, cobalt, and sometimes other metals & metal oxides or carbides.

Chemical & Physical Properties:
Properties vary depending upon the specific mixture.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam/Daily (Ni)
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH
0.25 mg Co/m^3: Qm
0.5 mg Co/m^3: 95XQ*/Sa*
1.25 mg Co/m^3: Sa:Cf*/PaprHie*/PaprHie*
2.5 mg Co/m^3: 100F/ScbaF/SaF
20 mg Co/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Tungsten carbide (cemented) containing Nickel:
NIOSH
¥:ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Tungsten carbide: Fluorine, chlorine trifluoride, oxides of nitrogen, lead dioxide

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, resp sys; possible skin sens to cobalt, nickel; diffuse pulm fib; loss of appetite, nau, cough; blood changes
TO: Eyes, skin, resp sys, blood

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Fresh air
Swallow: Medical attention immed

Turpentine

Formula:	CAS#:	RTECS#:	IDLH:
$C_{10}H_{16}$ (approx)	8006-64-2	YO8400000	800 ppm

Conversion: 1 ppm = 5.56 mg/m^3 (approx)

DOT: 1299 128

Synonyms/Trade Names: Gumspirits, Gum turpentine, Spirits of turpentine, Steam distilled turpentine, Sulfate wood turpentine, Turps, Wood turpentine

Exposure Limits:
NIOSH REL: TWA 100 ppm (560 mg/m^3)
OSHA PEL: TWA 100 ppm (560 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1551

Physical Description: Colorless liquid with a characteristic odor.

Chemical & Physical Properties:
MW: 136 (approx)
BP: 309-338°F
Sol: Insoluble
Fl.P: 95°F
IP: ?
Sp.Gr: 0.86
VP: 4 mmHg
FRZ: -58 to -76°F
UEL: ?
LEL: 0.8%
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
800 ppm: Sa:Cf£/PaprOv£/CcrFOv/GmFOv/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, chlorine, chromic anhydride, stannic chloride, chromyl chloride

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat; head, dizz, convuls; skin sens; hema, prot; kidney damage; abdom pain, nau, vomit, diarr; chemical pneu (aspir liquid)
TO: Eyes, skin, resp sys, CNS, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

1-Undecanethiol	Formula: $CH_3(CH_2)_{10}SH$	CAS#: 5332-52-5	RTECS#:	IDLH: N.D.
Conversion: 1 ppm = 7.71 mg/m^3	DOT: 1228 131			
Synonyms/Trade Names: Undecyl mercaptan				
Exposure Limits: NIOSH REL: C 0.5 ppm (3.9 mg/m^3) [15-minute] OSHA PEL: none			Measurement Methods (see Table 1): None available	
Physical Description: Liquid.				
Chemical & Physical Properties: MW: 188.4 BP: 495°F Sol: Insoluble Fl.P: ? IP: ? Sp.Gr: 0.84 VP: ? FRZ: 27°F UEL: ? LEL: ? Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH 5 ppm: CcrOv/Sa 12.5 ppm: Sa:Cf/PaprOv 25 ppm: CcrFOv/GmFOv/PaprTOv/ ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Oxidizers, reducing agents, strong acids & bases, alkali metals				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, resp sys; conf, dizz, head, drow, nau, vomit, lass, convuls TO: Eyes, skin, resp sys, CNS			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash Breath: Resp support Swallow: Medical attention immed	

Uranium (insoluble compounds, as U)	Formula: U (metal)	CAS#: 7440-61-1 (metal)	RTECS#: YR3490000 (metal)	IDLH: Ca [10 mg/m^3 (as U)]
Conversion:	DOT: 2979 162 (metal, pyrophoric)			
Synonyms/Trade Names: Uranium metal: Uranium I Synonyms of other insoluble uranium compounds vary depending upon the specific compound.				
Exposure Limits: NIOSH REL: Ca TWA 0.2 mg/m^3 ST 0.6 mg/m^3 See Appendix A OSHA PEL†: TWA 0.25 mg/m^3			Measurement Methods (see Table 1): None available	
Physical Description: Metal: Silver-white, malleable, ductile, lustrous solid. [Note: Weakly radioactive.]				
Chemical & Physical Properties: MW: 238.0 BP: 6895°F Sol: Insoluble Fl.P: NA IP: NA Sp.Gr: 19.05 (metal) VP: 0 mmHg (approx) MLT: 2097°F UEL: NA LEL: NA MEC: 60 g/m^3 Metal: Combustible Solid, especially turnings and powder.	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily Provide: Eyewash		Respirator Recommendations (see Tables 3 and 4): NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE	
	Incompatibilities and Reactivities: Carbon dioxide, carbon tetrachloride, nitric acid, fluorine [Note: Complete coverage of uranium metal scrap with oil is essential for prevention of fire.]			
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Derm; kidney damage; blood changes; [carc]; in animals: lung, lymph node damage; [carc] Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g., radon). TO: Skin, kidneys, bone marrow, lymphatic sys [lung cancer]			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed	

Uranium (soluble compounds, as U)	Formula:	CAS#:	RTECS#:	IDLH: Ca [10 mg/m^3 (as U)]
Conversion:	DOT:			
Synonyms/Trade Names: Synonyms vary depending upon the specific soluble uranium compound.				
Exposure Limits: NIOSH REL: Ca TWA 0.05 mg/m^3 See Appendix A OSHA PEL: TWA 0.05 mg/m^3				Measurement Methods (see Table 1): None available
Physical Description: Appearance and odor vary depending upon the specific soluble uranium compound.				
Chemical & Physical Properties: Properties vary depending upon the specific soluble uranium compound.	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet or contam Change: Daily Provide: Eyewash (UF_6), Quick drench	Respirator Recommendations (see Tables 3 and 4): NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape (Halides): GmFAg100/ScbaE Escape (Non-halides): 100F/ScbaE		
Incompatibilities and Reactivities: Uranyl nitrate: combustibles; Uranium hexafluoride: water				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Lac, conj; short breath, cough, chest rales; nau, vomit; skin burns; RBC, casts in urine; prot; high BUN; [carc] Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g., radon). TO: Resp sys, blood, liver, kidneys, lymphatic sys, skin, bone marrow [lung cancer]				First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed

n-Valeraldehyde	Formula: $CH_3(CH_2)_3CHO$	CAS#: 110-62-3	RTECS#: YV3600000	IDLH: N.D.
Conversion: 1 ppm = 3.53 mg/m^3	DOT: 2058 129			
Synonyms/Trade Names: Amyl aldehyde, Pentanal, Valeral, Valeraldehyde, Valeric aldehyde				
Exposure Limits: NIOSH REL: TWA 50 ppm (175 mg/m^3) See Appendix C (Aldehydes) OSHA PEL†: none				Measurement Methods (see Table 1): NIOSH 2018, 2536 OSHA 85
Physical Description: Colorless liquid with a strong, acrid, pungent odor.				
Chemical & Physical Properties: MW: 86.2 BP: 217°F Sol: Slight Fl.P: 54°F IP: 9.82 eV Sp.Gr: 0.81 VP: 26 mmHg FRZ: -133°F UEL: ? LEL: ? Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R. Provide: Eyewash Quick drench	Respirator Recommendations (see Tables 3 and 4): Not available.		
Incompatibilities and Reactivities: None reported				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose, throat TO: Eyes, skin, resp sys		First Aid (see Table 6): Eye: Irr immed Skin: Soap flush immed Breath: Resp support Swallow: Medical attention immed		

Vanadium dust

Formula:	CAS#:	RTECS#:	IDLH:
V_2O_5	1314-62-1	YW2450000	35 mg/m^3 (as V)

Conversion: DOT: 2862 151

Synonyms/Trade Names: Divanadium pentoxide dust, Vanadic anhydride dust, Vanadium oxide dust, Vanadium pentaoxide dust. Other synonyms vary depending upon the specific vanadium compound.

Exposure Limits:
NIOSH REL*: C 0.05 mg V/m^3 [15-minute]
[*Note: The REL applies to all vanadium compounds except Vanadium metal and Vanadium carbide (see Ferrovanadium dust).]
OSHA PEL†: C 0.5 mg V_2O_5/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 7300, 7301, 7303, 7504, 9102
OSHA ID185

Physical Description: Yellow-orange powder or dark-gray, odorless flakes dispersed in air.

Chemical & Physical Properties:
MW: 181.9
BP: 3182°F (Decomposes)
Sol: 0.8%
Fl.P: NA
IP: NA
Sp.Gr: 3.36
VP: 0 mmHg (approx)
MLT: 1274°F
UEL: NA
LEL: NA
Noncombustible Solid, but may increase intensity of fire when in contact with combustible materials.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH (as V)
0.5 mg/m^3: 100XQ*/Sa*
1.25 mg/m^3: Sa:Cf*/PaprHie*
2.5 mg/m^3: 100F/PaprTHie*/ScbaF/SaF
35 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Lithium, chlorine trifluoride

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, throat; green tongue, metallic taste, eczema; cough; fine rales, wheez, bron, dysp
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Vanadium fume

Formula:	CAS#:	RTECS#:	IDLH:
V_2O_5	1314-62-1	YW2460000	35 mg/m^3 (as V)

Conversion: DOT: 2862 151

Synonyms/Trade Names: Divanadium pentoxide fume, Vanadic anhydride fume, Vanadium oxide fume, Vanadium pentaoxide fume. Other synonyms vary depending upon the specific vanadium compound.

Exposure Limits:
NIOSH REL: C 0.05 mg V/m^3 [15-minute]
OSHA PEL†: C 0.1 mg V_2O_5/m^3

Measurement Methods (see Table 1):
NIOSH 7300, 7301, 7303, 7504
OSHA ID185

Physical Description: Finely divided particulate dispersed in air.

Chemical & Physical Properties:
MW: 181.9
BP: 3182°F (Decomposes)
Sol: 0.8%
Fl.P: NA
IP: NA
Sp.Gr: 3.36
VP: 0 mmHg (approx)
MLT: 1274°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH (as V)
0.5 mg/m^3: 100XQ*/Sa*
1.25 mg/m^3: Sa:Cf*/PaprHie*
2.5 mg/m^3: 100F/PaprTHie*/ScbaF/SaF
35 mg/m^3: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Lithium, chlorine trifluoride

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, throat; green tongue, metallic taste; cough, fine rales, wheez, bron, dysp; eczema
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Breath: Resp support

Vegetable oil mist

Formula:	CAS#:	RTECS#:	IDLH:
	68956-68-3	YX1850000	N.D.

Conversion: | DOT:

Synonyms/Trade Names: Vegetable mist

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500, 0600

Physical Description: An oil extracted from the seeds, fruit, or nuts of vegetables or other plant matter.

Chemical & Physical Properties:
MW: varies
BP: ?
Sol: Insoluble
Fl.P: 323-540°F
IP: ?
Sp.Gr: 0.91-0.95
VP: ?
FRZ: ?
UEL: ?
LEL: ?
Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, resp sys; lac
TO: Eyes, skin, resp sys Determine based on working conditions

First Aid (see Table 6):
Eye: Irr immed
Breath: Fresh air

Vinyl acetate

Formula:	CAS#:	RTECS#:	IDLH:
CH_2=CHOOCCH$_3$	108-05-4	AK0875000	N.D.

Conversion: 1 ppm = 3.52 mg/m^3 | DOT: 1301 129P

Synonyms/Trade Names: 1-Acetoxyethylene, Ethenyl acetate, Ethenyl ethanoate, VAC, Vinyl acetate monomer, Vinyl ethanoate

Exposure Limits:
NIOSH REL: C 4 ppm (15 mg/m^3) [15-minute]
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 1453
OSHA 51

Physical Description: Colorless liquid with a pleasant, fruity odor.
[Note: Raw material for many polyvinyl resins.]

Chemical & Physical Properties:
MW: 86.1
BP: 162°F
Sol: 2%
Fl.P: 18°F
IP: 9.19 eV
Sp.Gr: 0.93
VP: 83 mmHg
FRZ: -136°F
UEL: 13.4%
LEL: 2.6%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
40 ppm: CcrOv*/Sa*
100 ppm: Sa:Cf*/PaprOv*
200 ppm: CcrFOv/GmFOv/PaprTOv*/ScbaF/SaF
4000 ppm: Sa:Pd,Pp*
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Acids, bases, silica gel, alumina, oxidizers, azo compounds, ozone
[Note: Usually contains a stabilizer (e.g., hydroquinone or diphenylamine) to prevent polymerization.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, nose, throat; hoarseness, cough; loss of smell; eye burns, skin blisters
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap flush immed
Breath: Resp support
Swallow: Medical attention immed

Vinyl bromide

Formula:	CAS#:	RTECS#:	IDLH:
CH_2=CHBr	593-60-2	KU8400000	Ca [N.D.]

Conversion: 1 ppm = 4.38 mg/m^3

DOT: 1085 116P (inhibited)

Synonyms/Trade Names: Bromoethene, Bromoethylene, Monobromoethylene

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 1009
OSHA 8

Physical Description: Colorless gas or liquid (below 60°F) with a pleasant odor.
[Note: Shipped as a liquefied compressed gas with 0.1% phenol added to prevent polymerization.]

Chemical & Physical Properties:
MW: 107.0
BP: 60°F
Sol: Insoluble
Fl.P: NA (Gas)
IP: 9.80 eV
RGasD: 3.79
Sp.Gr: 1.49 (Liquid at 60°F)
VP: 1.4 atm
FRZ: -219°F
UEL: 15%
LEL: 9%
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact (liquid)
Eyes: Prevent eye contact (liquid)
Wash skin: When contam (liquid)
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers (e.g., perchlorates, peroxides, chlorates, permanganates & nitrates.)
[Note: May polymerize in sunlight.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing (liquid), Con
SY: Irrit eyes, skin; dizz, conf, inco, narco, nau, vomit; liquid: frostbite; [carc]
TO: Eyes, skin, CNS, liver [in animals: liver & lymph node tumors]

First Aid (see Table 6):
Eye: Irr immed (liquid)
Skin: Water flush immed (liquid)
Breath: Resp support
Swallow: Medical attention immed (liquid)

Vinyl chloride

Formula:	CAS#:	RTECS#:	IDLH:
CH_2=CHCl	75-01-4	KU9625000	Ca [N.D.]

Conversion: 1 ppm = 2.56 mg/m^3

DOT: 1086 116P (inhibited)

Synonyms/Trade Names: Chloroethene, Chloroethylene, Ethylene monochloride, Monochloroethene, Monochloroethylene, VC, Vinyl chloride monomer (VCM)

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL: [1910.1017] TWA 1 ppm
C 5 ppm [15-minute]

Measurement Methods (see Table 1):
NIOSH 1007
OSHA 4, 75

Physical Description: Colorless gas or liquid (below 7°F) with a pleasant odor at high concentrations.
[Note: Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 62.5
BP: 7°F
Sol(77°F): 0.1%
Fl.P: NA (Gas)
IP: 9.99 eV
RGasD: 2.21
VP: 3.3 atm
FRZ: -256°F
UEL: 33.0%
LEL: 3.6%
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Frostbite
Eyes: Frostbite
Wash skin: N.R.
Remove: When wet (flamm)
Change: N.R.
Provide: Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS/ScbaE

See Appendix E (page 351)

Incompatibilities and Reactivities: Copper, oxidizers, aluminum, peroxides, iron, steel [Note: Polymerizes in air, sunlight, or heat unless stabilized by inhibitors such as phenol. Attacks iron & steel in presence of moisture.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con (liquid)
SY: Lass; abdom pain, GI bleeding; enlarged liver; pallor or cyan of extremities; liquid: frostbite; [carc]
TO: Liver, CNS, blood, resp sys, lymphatic sys [liver cancer]

First Aid (see Table 6):
Eye: Frostbite
Skin: Frostbite
Breath: Resp support

Vinyl cyclohexene dioxide

Formula:	CAS#:	RTECS#:	IDLH:
$C_8H_{12}O_2$	106-87-6	RN8640000	Ca [N.D.]

Conversion: 1 ppm = 5.73 mg/m^3

DOT:

Synonyms/Trade Names: 1-Epoxyethyl-3,4-epoxy-cyclohexane; 4-Vinylcyclohexene diepoxide; 4-Vinyl-1-cyclohexene dioxide

Exposure Limits:
NIOSH REL: Ca
TWA 10 ppm (60 mg/m^3) [skin]
See Appendix A
OSHA PEL†: none

Measurement Methods (see Table 1):
OSHA PV2083

Physical Description: Colorless liquid.

Chemical & Physical Properties:
MW: 140.2
BP: 441°F
Sol: High
Fl.P(oc): 230°F
IP: ?
Sp.Gr: 1.10
VP: 0.1 mmHg
FRZ: -164°F
UEL: ?
LEL: ?
Class IIIB Combustible Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Alcohols, amines, water [Note: Slowly hydrolyzes in water.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: In animals: irrit eyes, skin, resp sys; testicular atrophy; leupen, nec thymus; skin sens; [carc]
TO: Eyes, skin, resp sys, blood, thymus, repro sys [in animals: skin tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Water wash immed
Breath: Resp support
Swallow: Medical attention immed

Vinyl fluoride

Formula:	CAS#:	RTECS#:	IDLH:
CH_2=CHF	75-02-5	YZ3510000	N.D.

Conversion: 1 ppm = 1.89 mg/m^3

DOT: 1860 116P (inhibited)

Synonyms/Trade Names: Fluoroethene, Fluoroethylene, Monofluoroethylene, Vinyl fluoride monomer

Exposure Limits:
NIOSH REL: TWA 1 ppm
C 5 ppm [use 1910.1017]
OSHA PEL: none

Measurement Methods (see Table 1):
None available

Physical Description: Colorless gas with a faint, ethereal odor. [Note: Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:
MW: 46.1
BP: -98°F
Sol: Insoluble
Fl.P: NA (Gas)
IP: 10.37 eV
RGasD: 1.60
VP: 25.2 atm
FRZ: -257°F
UEL: 21.7%
LEL: 2.6%
Flammable Gas

Personal Protection/Sanitation (see Table 2):
Skin: Frostbite
Eyes: Frostbite
Wash skin: N.R.
Remove: When wet (flamm)
Change: N.R.
Provide: Frostbite wash

Respirator Recommendations (see Tables 3 and 4):
NIOSH
10 ppm: CcrOv/Sa
25 ppm: Sa:Cf/PaprOv
50 ppm: CcrFOv/GmFOv/PaprTOv/ScbaF/SaF
200 ppm: SaF:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: None reported [Note: Inhibited with 0.2% terpenes to prevent polymerization.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con (liquid)
SY: Head, dizz, conf, inco, narco, nau, vomit; liquid: frostbite
TO: CNS

First Aid (see Table 6):
Eye: Frostbite
Skin: Frostbite
Breath: Resp support

Vinylidene chloride	Formula: $CH_2=CCl_2$	CAS#: 75-35-4	RTECS#: KV9275000	IDLH: Ca [N.D.]
Conversion:	DOT: 1303 130P (inhibited)			

Synonyms/Trade Names: 1,1-DCE; 1,1-Dichloroethene; 1,1-Dichloroethylene; VDC; Vinylidene chloride monomer; Vinylidene dichloride

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: Ca See Appendix A OSHA PEL†: none	NIOSH 1015 OSHA 19

Physical Description: Colorless liquid or gas (above 89°F) with a mild, sweet, chloroform-like odor.

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 96.9 BP: 89°F Sol: 0.04% Fl.P: -2°F IP: 10.00 eV Sp.Gr: 1.21 VP: 500 mmHg FRZ: -189°F UEL: 15.5% LEL: 6.5% Class IA Flammable Liquid	Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R. Provide: Eyewash Quick drench	NIOSH ¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Aluminum, sunlight, air, copper, heat
[Note: Polymerization may occur if exposed to oxidizers, chlorosulfonic acid, nitric acid, or oleum. Inhibitors such as the monomethyl ether of hydroquinone are added to prevent polymerization.]

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, throat; dizz, head, nau, dysp; liver, kidney dist; pneu; [carc] TO: Eyes, skin, resp sys, CNS, liver, kidneys [in animals: liver & kidney tumors]	Eye: Irr immed Skin: Soap flush immed Breath: Resp support Swallow: Medical attention immed

Vinylidene fluoride	Formula: $CH_2=CF_2$	CAS#: 75-38-7	RTECS#: KW0560000	IDLH: N.D.
Conversion: 1 ppm = 2.62 mg/m^3	DOT: 1959 116P			

Synonyms/Trade Names: Difluoro-1,1-ethylene; 1,1-Difluoroethene; 1,1-Difluoroethylene; Halocarbon 1132A; VDF; Vinylidene difluoride

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL: TWA 1 ppm C 5 ppm [use 1910.1017] OSHA PEL: none	NIOSH 3800

Physical Description: Colorless gas with a faint, ethereal odor. [Note: Shipped as a liquefied compressed gas.]

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 64.0 BP: -122°F Sol: Insoluble Fl.P: NA (Gas) IP: 10.29 eV RGasD: 2.21 VP: 35.2 atm FRZ: -227°F UEL: 21.3% LEL: 5.5% Flammable Gas	Skin: Frostbite Eyes: Frostbite Wash skin: N.R. Remove: When wet (flamm) Change: N.R. Provide: Frostbite wash	NIOSH 10 ppm: CcrOv/Sa 25 ppm: Sa:Cf/PaprOv 50 ppm: CcrFOv/GmFOv/PaprTOv/ScbaF/SaF 200 ppm: SaF:Pd,Pp §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, aluminum chloride
[Note: Violent reaction with hydrogen chloride when heated under pressure.]

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Con (liquid) SY: Dizz, head, nau; liquid: frostbite TO: CNS	Eye: Frostbite Skin: Frostbite Breath: Resp support

Vinyl toluene	Formula: CH_2=$CHC_6H_4CH_3$	CAS#: 25013-15-4 (inhibited)	RTECS#: WL5075000	IDLH: 400 ppm
Conversion: 1 ppm = 4.83 mg/m^3	DOT: 2618 130P (inhibited)			
Synonyms/Trade Names: Ethenylmethylbenzene, Methylstyrene, Tolyethylene				

Exposure Limits: NIOSH REL: TWA 100 ppm (480 mg/m^3) OSHA PEL: TWA 100 ppm (480 mg/m^3) Physical Description: Colorless liquid with a strong, disagreeable odor.	Measurement Methods (see Table 1): NIOSH 1501 OSHA 7

Chemical & Physical Properties: MW: 118.2 BP: 339°F Sol: 0.009% Fl.P: 127°F IP: 8.20 eV Sp.Gr: 0.89 VP: 1 mmHg FRZ: -106°F UEL: 11.0% LEL: 0.8% Class II Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 400 ppm: CcrOv*/PaprOv*/ GmFOv/Sa*/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Oxidizers, peroxides, strong acids, iron or aluminum salts [Note: Usually inhibited with tert-butyl catechol to prevent polymerization.]	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, upper resp sys; drow; in animals: narco TO: Eyes, skin, resp sys, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Soap flush prompt Breath: Resp support Swallow: Medical attention immed

VM & P Naphtha	Formula:	CAS#: 8032-32-4	RTECS#: OI6180000	IDLH: N.D.
Conversion:	DOT: 1268 128 (petroleum distillates, n.o.s.)			
Synonyms/Trade Names: Ligroin, Painters naphtha, Petroleum ether, Petroleum spirit, Refined solvent naphtha, Varnish makers' & painters' naphtha				

Exposure Limits: NIOSH REL: TWA 350 mg/m^3 C 1800 mg/m^3 [15-minute] OSHA PEL†: none Physical Description: Clear to yellowish liquid with a pleasant, aromatic odor.	Measurement Methods (see Table 1): NIOSH 1550 OSHA 48

Chemical & Physical Properties: MW: 87-114 (approx) BP: 203-320°F Sol: Insoluble Fl.P: 20-55°F IP: ? Sp.Gr(60°F): 0.73-0.76 VP: 2-20 mmHg FRZ: ? UEL: 6.0% LEL: 1.2% Class IB Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	Respirator Recommendations (see Tables 3 and 4): NIOSH 3500 mg/m^3: CcrOv/Sa 8750 mg/m^3: Sa:Cf/PaprOv 17,500 mg/m^3: CcrFOv/GmFOv/PaprTOv/ ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: None reported [Note: VM&P Naphtha is a refined petroleum solvent predominantly C_7-C_{11} which is typically 55% paraffins, 30% monocycloparaffins, 2% dicycloparaffins & 12% alklybenzenes.]	
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, upper resp sys; derm; CNS depres; chemical pneu (aspir liquid) TO: Eyes, skin, resp sys, CNS	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed

Warfarin

Formula:	CAS#:	RTECS#:	IDLH:
$C_{19}H_{16}O_4$	81-81-2	GN4550000	100 mg/m^3

Conversion: DOT:

Synonyms/Trade Names: 3-(α-Acetonyl)-benzyl-4-hydroxycoumarin; 4-Hydroxy-3-(3-oxo-1-phenyl butyl)-2H-1-benzopyran-2-one; WARF

Exposure Limits:
NIOSH REL: TWA 0.1 mg/m^3
OSHA PEL: TWA 0.1 mg/m^3

Measurement Methods (see Table 1):
NIOSH 5002

Physical Description: Colorless, odorless, crystalline powder. [rodenticide]

Chemical & Physical Properties:
MW: 308.3
BP: Decomposes
Sol: 0.002%
Fl.P: ?
IP: ?
Sp.Gr: ?
VP(71°F): 0.09 mmHg
MLT: 322°F
UEL: ?
LEL: ?
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: N.R.
Wash skin: When contam
Remove: When wet or contam
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
0.5 mg/m^3: Qm
1 mg/m^3: 95XQ/Sa
2.5 mg/m^3: Sa:Cf/PaprHie
5 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF
100 mg/m^3: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Hema, back pain; hematoma arms, legs; epis, bleeding lips, muc memb hemorr; abdom pain, vomit, fecal blood; petechial rash; abnor hematologic indices
TO: Blood, CVS

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Welding fumes

Formula:	CAS#:	RTECS#:	IDLH:
		ZC2550000	Ca [N.D.]

Conversion: DOT:

Synonyms/Trade Names: Synonyms vary depending upon the specific component of the welding fumes.

Exposure Limits:
NIOSH REL: Ca
See Appendix A
OSHA PEL†: none

Measurement Methods (see Table 1):
NIOSH 7300, 7301, 7303

Physical Description: Fumes generated by the process of joining or cutting pieces of metal by heat, pressure, or both.

Chemical & Physical Properties:
Properties vary depending upon the specific component of the welding fumes.

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Varies

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Symptoms vary depending upon the specific component of the welding fumes; metal fume fever: flu-like symptoms, dysp, cough, musc pain, fever, chills; interstitial pneu; [carc]
TO: Eyes, skin, resp sys, CNS [lung cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Resp support

Wood dust	Formula:	CAS#:	RTECS#:	IDLH:
			ZC9850000	Ca [N.D.]

Conversion: DOT:

Synonyms/Trade Names: Hard wood dust, Soft wood dust, Western red cedar dust

Exposure Limits:
NIOSH REL: Ca
TWA 1 mg/m^3
See Appendix A
OSHA PEL†: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500

Physical Description: Dust from various types of wood.

Chemical & Physical Properties:
MW: varies
BP: NA
Sol: ?
Fl.P: NA
IP: NA
Sp.Gr: ?
VP: 0 mmHg (approx)
MLT: NA
UEL: NA
LEL: NA
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes; epis; derm; resp hypersensitivity; granulomatous pneu; asthma, cough, wheez, sinusitis; prolonged colds; [carc]
TO: Eyes, skin, resp sys [nasal cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Fresh air

m-Xylene	Formula:	CAS#:	RTECS#:	IDLH:
	$C_6H_4(CH_3)_2$	108-38-3	ZE2275000	900 ppm

Conversion: 1 ppm = 4.34 mg/m^3 DOT: 1307 130

Synonyms/Trade Names: 1,3-Dimethylbenzene; meta-Xylene; m-Xylol

Exposure Limits:
NIOSH REL: TWA 100 ppm (435 mg/m^3)
ST 150 ppm (655 mg/m^3)
OSHA PEL†: TWA 100 ppm (435 mg/m^3)

Measurement Methods (see Table 1):
NIOSH 1501, 3800
OSHA 1002

Physical Description: Colorless liquid with an aromatic odor.

Chemical & Physical Properties:
MW: 106.2
BP: 282°F
Sol: Slight
Fl.P: 82°F
IP: 8.56 eV
Sp.Gr: 0.86
VP: 9 mmHg
FRZ: -54°F
UEL: 7.0%
LEL: 1.1%
Class IC Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
900 ppm: CcrOv*/PaprOv*/
Sa*/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, strong acids

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat; dizz, excitement, drow, inco, staggering gait; corn vacuolization; anor, nau, vomit, abdom pain; derm
TO: Eyes, skin, resp sys, CNS, GI tract, blood, liver, kidneys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

o-Xylene	Formula: $C_6H_4(CH_3)_2$	CAS#: 95-47-6	RTECS#: ZE2450000	IDLH: 900 ppm
Conversion: 1 ppm = 4.34 mg/m^3	DOT: 1307 130			
Synonyms/Trade Names: 1,2-Dimethylbenzene; ortho-Xylene; o-Xylol				
Exposure Limits: NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3) OSHA PEL†: TWA 100 ppm (435 mg/m^3)			Measurement Methods (see Table 1): NIOSH 1501, 3800 OSHA 1002	
Physical Description: Colorless liquid with an aromatic odor.				
Chemical & Physical Properties: MW: 106.2 BP: 292°F Sol: 0.02% Fl.P: 90°F IP: 8.56 eV Sp.Gr: 0.88 VP: 7 mmHg FRZ: -13°F UEL: 6.7% LEL: 0.9% Class IC Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 900 ppm: CcrOv*/PaprOv*/ Sa*/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers, strong acids				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, nose, throat; dizz, excitement, drow, inco, staggering gait; corn vacuolization; anor, nau, vomit, abdom pain; derm TO: Eyes, skin, resp sys, CNS, GI tract, blood, liver, kidneys			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed	

p-Xylene	Formula: $C_6H_4(CH_3)_2$	CAS#: 106-42-3	RTECS#: ZE2625000	IDLH: 900 ppm
Conversion: 1 ppm = 4.41 mg/m^3	DOT: 1307 130			
Synonyms/Trade Names: 1,4-Dimethylbenzene; para-Xylene; p-Xylol				
Exposure Limits: NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3) OSHA PEL†: TWA 100 ppm (435 mg/m^3)			Measurement Methods (see Table 1): NIOSH 1501, 3800 OSHA 1002	
Physical Description: Colorless liquid with an aromatic odor. [Note: A solid below 56°F.]				
Chemical & Physical Properties: MW: 106.2 BP: 281°F Sol: 0.02% Fl.P: 81°F IP: 8.44 eV Sp.Gr: 0.86 VP: 9 mmHg FRZ: 56°F UEL: 7.0% LEL: 1.1% Class IC Flammable Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 900 ppm: CcrOv*/PaprOv*/ Sa*/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers, strong acids				
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Irrit eyes, skin, nose, throat; dizz, excitement, drow, inco, staggering gait; corn vacuolization; anor, nau, vomit, abdom pain; derm TO: Eyes, skin, resp sys, CNS, GI tract, blood, liver, kidneys			First Aid (see Table 6): Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed	

m-Xylene α,α'-diamine	Formula: $C_6H_4(CH_2NH_2)_2$	CAS#: 1477-55-0	RTECS#: PF8970000	IDLH: N.D.
Conversion:	DOT:			

Synonyms/Trade Names: 1,3-bis(Aminomethyl)benzene; 1,3-Benzenedimethanamine; MXDA; m-Phenylenebis(methylamine); m-Xylylenediamine

Exposure Limits: NIOSH REL: C 0.1 mg/m^3 [skin] OSHA PEL†: none Physical Description: Colorless liquid.	Measurement Methods (see Table 1): OSHA 105

Chemical & Physical Properties: MW: 136.2 BP: 477°F Sol: Miscible Fl.P: 243°F IP: ? Sp.Gr: 1.032 VP(77°F): 0.03 mmHg FRZ: 58°F UEL: ? LEL: ? Class IIIB Combustible Liquid	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench	Respirator Recommendations (see Tables 3 and 4): Not available.

Incompatibilities and Reactivities: None reported

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: In animals: irrit eyes, skin; liver, kidney, lung damage TO: Eyes, skin, resp sys, liver, kidneys	First Aid (see Table 6): Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed

Xylidine	Formula: $(CH_3)_2C_6H_3NH_2$	CAS#: 1300-73-8	RTECS#: ZE8575000	IDLH: 50 ppm
Conversion: 1 ppm = 4.96 mg/m^3	DOT: 1711 153			

Synonyms/Trade Names: Aminodimethylbenzene, Aminoxylene, Dimethylaminobenzene, Dimethylaniline, Xylidine isomers (e.g., 2,4-Dimethylaniline)
[Note: Dimethylaniline is also used as a synonym for N,N-Dimethylaniline.]

Exposure Limits: NIOSH REL: TWA 2 ppm (10 mg/m^3) [skin] OSHA PEL†: TWA 5 ppm (25 mg/m^3) [skin] Physical Description: Pale-yellow to brown liquid with a weak, aromatic, amine-like odor.	Measurement Methods (see Table 1): NIOSH 2002

Chemical & Physical Properties: MW: 121.2 BP: 415-439°F Sol: Slight Fl.P: 206°F (2,3-) IP: 7.65 eV (2,4-) 7.30 eV (2,6-) Sp.Gr: 0.98 VP: <1 mmHg FRZ: -33°F UEL: ? LEL: 1.0% (o-isomer) Class IIIB Combustible Liquid (2,3-)	Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash Quick drench	Respirator Recommendations (see Tables 3 and 4): NIOSH 20 ppm: CcrOv/Sa 50 ppm: Sa:Cf/CcrFOv/GmFOv/ PaprOv/ScbaF/SaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers, hypochlorite salts

Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Abs, Ing, Con SY: Anoxia, cyan, methemo; lung, liver, kidney damage TO: Resp sys, blood, liver, kidneys, CVS	First Aid (see Table 6): Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

Yttrium

Formula:	CAS#:	RTECS#:	IDLH:
Y	7440-65-5	ZG2980000	500 mg/m^3 (as Y)

Conversion:

DOT:

Synonyms/Trade Names: Yttrium metal

Exposure Limits:
NIOSH REL*: TWA 1 mg/m^3
OSHA PEL*: TWA 1 mg/m^3
[*Note: The REL and PEL also apply to other yttrium compounds (as Y).]

Measurement Methods (see Table 1):
NIOSH 7300, 7301, 7303, 9102
OSHA ID121

Physical Description: Dark-gray to black, odorless solid.

Chemical & Physical Properties:
MW: 88.9
BP: 5301°F
Sol: Soluble in hot H_2O
Fl.P: NA
IP: NA
Sp.Gr: 4.47
VP: 0 mmHg (approx)
MLT: 2732°F
UEL: NA
LEL: NA
Noncombustible Solid in bulk form.

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
5 mg/m^3: Qm
10 mg/m^3: 95XQ/Sa
25 mg/m^3: Sa:Cf/PaprHie
50 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF
500 mg/m^3: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes; in animals: pulm irrit; eye inj; possible liver damage
TO: Eyes, resp sys, liver

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Zinc chloride fume

Formula:	CAS#:	RTECS#:	IDLH:
$ZnCl_2$	7646-85-7	ZH1400000	50 mg/m^3

Conversion:

DOT: 2331 154

Synonyms/Trade Names: Zinc dichloride fume

Exposure Limits:
NIOSH REL: TWA 1 mg/m^3
ST 2 mg/m^3
OSHA PEL†: TWA 1 mg/m^3

Measurement Methods (see Table 1):
OSHA ID121

Physical Description: White particulate dispersed in air.

Chemical & Physical Properties:
MW: 136.3
BP: 1350°F
Sol(70°F): 435%
Fl.P: NA
IP: NA
Sp.Gr(77°F): 2.91
VP: 0 mmHg (approx)
MLT: 554°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
10 mg/m^3: 95XQ*/Sa*
25 mg/m^3: Sa:Cf*/PaprHie*
50 mg/m^3: 100F/PaprTHie*/ScbaF/SaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Potassium

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Irrit eyes, skin, nose, throat; conj; cough, copious sputum; dysp, chest pain, pulm edema, pneu; pulm fib, cor pulmonale; fever; cyan; tachypnea; skin burns
TO: Eyes, skin, resp sys, CVS

First Aid (see Table 6):
Breath: Resp support

Zinc oxide

Formula:	CAS#:	RTECS#:	IDLH:
ZnO	1314-13-2	ZH4810000	500 mg/m^3

Conversion: DOT: 1516 143

Synonyms/Trade Names: Zinc peroxide

Exposure Limits:
NIOSH REL: Dust: TWA 5 mg/m^3
C 15 mg/m^3
Fume: TWA 5 mg/m^3
ST 10 mg/m^3
OSHA PEL†: TWA 5 mg/m^3 (fume)
TWA 15 mg/m^3 (total dust)
TWA 5 mg/m^3 (resp dust)

Measurement Methods (see Table 1):
NIOSH 7303, 7502
OSHA ID121, ID143

Physical Description: White, odorless solid.

Chemical & Physical Properties:
MW: 81.4
BP: ?
Sol(64°F): 0.0004%
Fl.P: NA
IP: NA
Sp.Gr: 5.61
VP: 0 mmHg (approx)
MLT: 3587°F
UEL: NA
LEL: NA
Noncombustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
50 mg/m^3: 95XQ/Sa
125 mg/m^3: Sa:Cf/PaprHie
250 mg/m^3: 100F/SaT:Cf/PaprTHie/ScbaF/SaF
500 mg/m^3: Sa:Pd,Pp
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: 100F/ScbaE

Incompatibilities and Reactivities: Chlorinated rubber (at 419°F), water
[Note: Slowly decomposed by water.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh
SY: Metal fume fever: chills, musc ache, nau, fever, dry throat, cough; lass; metallic taste; head; blurred vision; low back pain; vomit; mal; chest tight; dysp, rales, decr pulm func
TO: Resp sys

First Aid (see Table 6):
Breath: Resp support

Zinc stearate

Formula:	CAS#:	RTECS#:	IDLH:
$Zn(C_{18}H_{35}O_2)_2$	557-05-1	ZH5200000	N.D.

Conversion: DOT:

Synonyms/Trade Names: Dibasic zinc stearate, Zinc salt of stearic acid, Zinc distearate

Exposure Limits:
NIOSH REL: TWA 10 mg/m^3 (total)
TWA 5 mg/m^3 (resp)
OSHA PEL†: TWA 15 mg/m^3 (total)
TWA 5 mg/m^3 (resp)

Measurement Methods (see Table 1):
NIOSH 0500, 0600

Physical Description: Soft, white powder with a slight, characteristic odor.

Chemical & Physical Properties:
MW: 632.4
BP: ?
Sol: Insoluble
Fl.P(oc): 530°F
IP: NA
Sp.Gr: 1.10
VP: 0 mmHg (approx)
MLT: 266°F
UEL: ?
LEL: ?
MEC: 20 g/m^3
Combustible Solid

Personal Protection/Sanitation (see Table 2):
Skin: N.R.
Eyes: N.R.
Wash skin: N.R.
Remove: N.R.
Change: N.R.

Respirator Recommendations (see Tables 3 and 4):
Not available.

Incompatibilities and Reactivities: Oxidizers, dilute acids
[Note: Hydrophobic (i.e., repels water).]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Con
SY: Irrit eyes, skin, upper resp sys; cough
TO: Eyes, skin, resp sys

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash
Breath: Fresh air
Swallow: Medical attention immed

Zirconium compounds (as Zr)	Formula: Zr (metal)	CAS#: 7440-67-7 (metal)	RTECS#: ZH7070000 (metal)	IDLH: 50 mg/m^3 (as Zr)
Conversion:	DOT: 1358 170 (powder, wet); 1932 135 (scrap); 2008 135 (powder, dry)			

Synonyms/Trade Names: Zirconium metal: Zirconium
Synonyms of other zirconium compounds vary depending upon the specific compound.

Exposure Limits:	Measurement Methods (see Table 1):
NIOSH REL*: TWA 5 mg/m^3 ST 10 mg/m^3 [*Note: The REL applies to all zirconium compounds (as Zr) except Zirconium tetrachloride.] OSHA PEL†: TWA 5 mg/m^3	NIOSH 7300, 7301, 9102 OSHA ID121

Physical Description: Metal: Soft, malleable, ductile, solid or gray to gold, amorphous powder.

Chemical & Physical Properties:	Personal Protection/Sanitation (see Table 2):	Respirator Recommendations (see Tables 3 and 4):
MW: 91.2 BP: 6471°F Sol: Insoluble Fl.P: NA IP: NA Sp.Gr: 6.51 (Metal) VP: 0 mmHg (approx) MLT: 3375°F UEL: NA LEL: NA Metal: Combustible, but solid form is difficult to ignite; however, powder form may ignite SPONTANEOUSLY and can continue burning under water.	Recommendations regarding personal protective clothing vary depending upon the specific compound.	NIOSH/OSHA 25 mg/m^3: Qm 50 mg/m^3: 95XQ/PaprHie/100F/Sa/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: 100F/ScbaE

Incompatibilities and Reactivities: Potassium nitrate, oxidizers
[Note: Fine powder may be stored completely immersed in water.]

Exposure Routes, Symptoms, Target Organs (see Table 5):	First Aid (see Table 6):
ER: Inh, Con SY: Skin, lung granulomas; in animals: irrit skin, muc memb; X-ray evidence of retention in lungs TO: Skin, resp sys	Eye: Irr immed Skin: Soap wash Breath: Resp support Swallow: Medical attention immed

APPENDICES

Appendix A
NIOSH POTENTIAL OCCUPATIONAL CARCINOGENS

New Policy (Adopted September 1995)

For the past 20 plus years, NIOSH has subscribed to a carcinogen policy that was published in 1976 by Edward J. Fairchild, II, Associate Director for Cincinnati Operations, which called for "no detectable exposure levels for proven carcinogenic substances" (Annals of the New York Academy of Sciences, 271:200-207, 1976). This was in response to a generic OSHA rulemaking on carcinogens. Because of advances in science and in approaches to risk assessment and risk management, NIOSH has adopted a more inclusive policy. NIOSH recommended exposure limits (RELs) will be based on risk evaluations using human or animal health effects data, and on an assessment of what levels can be feasibly achieved by engineering controls and measured by analytical techniques. To the extent feasible, NIOSH will project not only a no effect exposure, but also exposure levels at which there may be residual risks. This policy applies to all workplace hazards, including carcinogens, and is responsive to Section 20(a)(3) of the Occupational Safety and Health Act of 1970, which charges NIOSH to ". . .describe exposure levels that are safe for various periods of employment, including but not limited to the exposure levels at which no employee will suffer impaired health or functional capacities or diminished life expectancy as a result of his work experience."

The effect of this new policy will be the development, whenever possible, of quantitative RELs that are based on human and/or animal data, as well as on the consideration of technological feasibility for controlling workplace exposures to the REL. Under the old policy, RELs for most carcinogens were non-quantitative values labeled "lowest feasible concentration (LFC)." [Note: There are a few exceptions to LFC RELs for carcinogens (e.g., RELs for asbestos, formaldehyde, benzene, and ethylene oxide are quantitative values based primarily on analytical limits of detection or technological feasibility). Also, in 1989, NIOSH adopted several quantitative RELs for carcinogens from OSHA's permissible exposure limit (PEL) update.]

Under the new policy, NIOSH will also recommend the complete range of respirators (as determined by the NIOSH Respirator Decision Logic) for carcinogens with quantitative RELs. In this way, respirators will be consistently recommended regardless of whether a substance is a carcinogen or a non-carcinogen.

Appendix A (Continued)
NIOSH POTENTIAL OCCUPATIONAL CARCINOGENS

Old Policy

In the past, NIOSH identified numerous substances that should be treated as potential occupational carcinogens even though OSHA might not have identified them as such. In determining their carcinogenicity, NIOSH used the OSHA classification outlined in 29 CFR 1990.103, which states in part:

> Potential occupational carcinogen means any substance, or combination or mixture of substances, which causes an increased incidence of benign and/or malignant neoplasms, or a substantial decrease in the latency period between exposure and onset of neoplasms in humans or in one or more experimental mammalian species as the result of any oral, respiratory or dermal exposure, or any other exposure which results in the induction of tumors at a site other than the site of administration. This definition also includes any substance which is metabolized into one or more potential occupational carcinogens by mammals.

When thresholds for carcinogens that would protect 100% of the population had not been identified, NIOSH usually recommended that occupational exposures to carcinogens be limited to the lowest feasible concentration. To ensure maximum protection from carcinogens through the use of respiratory protection, NIOSH also recommended that only the most reliable and protective respirators be used. These respirators include (1) a self-contained breathing apparatus (SCBA) that has a full facepiece and is operated in a positive pressure mode, or (2) a supplied air respirator that has a full facepiece and is operated in a pressure demand or other positive pressure mode in combination with an auxiliary SCBA operated in a pressure demand or other positive pressure mode.

Recommendations to be Revised

The RELs and respirator recommendations for carcinogens listed in this edition of the Pocket Guide still reflect the old policy. Changes in the RELs and respirator recommendations that reflect the new policy will be included in future editions.

Appendix B
THIRTEEN OSHA-REGULATED CARCINOGENS

Without establishing PELs, OSHA promulgated standards in 1974 to regulate the industrial use of the following 13 chemicals identified as potential occupational carcinogens:

- 2-Acetylaminofluorene
- 4-Aminodiphenyl
- Benzidine
- bis-Chloromethyl ether
- 3,3'-Dichlorobenzidine
- 4-Dimethylaminoazobenzene
- Ethyleneimine
- Methyl chloromethyl ether
- α-Naphthylamine
- β-Naphthylamine
- 4-Nitrobiphenyl
- N-Nitrosodimethylamine
- β-Propiolactone

Exposures of workers to these 13 chemicals must be controlled through the required use of engineering controls, work practices, and personal protective equipment, including respirators. Specific OSHA respirator requirements for these chemicals are provided in Appendix E (page 351). See 29 CFR 1910.1003 - 1910.1016 for more specific details of these requirements.

Appendix C
SUPPLEMENTARY EXPOSURE LIMITS

Aldehydes (Low-Molecular-Weight)

Exposure to acetaldehyde has produced nasal tumors in rats and laryngeal tumors in hamsters, and exposure to malonaldehyde has caused thyroid gland and pancreatic islet cell tumors in rats. NIOSH therefore recommends that acetaldehyde and malonaldehyde be considered potential occupational carcinogens in accordance with the OSHA carcinogen policy. Testing has not been completed to determine the carcinogenicity of the following nine related low-molecular-weight aldehydes:

- Acrolein (CAS# 107-02-8)
- Butyraldehyde (CAS# 123-72-8)
- Crotonaldehyde (CAS# 4170-30-3)
- Glutaraldehyde (CAS# 111-30-8)
- Glyoxal (CAS# 107-22-2)
- Paraformaldehyde (CAS# 30525-89-4)
- Propiolaldehyde (CAS# 624-67-9)
- Propionaldehyde (CAS# 123-38-6)
- n-Valeraldehyde (CAS# 110-62-3)

However, the limited studies to date indicate that these substances have chemical reactivity and mutagenicity similar to acetaldehyde and malonaldehyde. Therefore, NIOSH recommends that careful consideration should be given to reducing exposures to these nine related aldehydes. Further information can be found in NIOSH Current Intelligence Bulletin 55: Carcinogenicity of Acetaldehyde and Malonaldehyde, and Mutagenicity of Related Low-Molecular-Weight Aldehydes [DHHS (NIOSH) Publication No. 91-112]. This document is available on the NIOSH Web site (http://www.cdc.gov/niosh/91112_55.html).

Asbestos

NIOSH considers asbestos to be a potential occupational carcinogen and recommends that exposures be reduced to the lowest feasible concentration. For asbestos fibers >5 micrometers in length, NIOSH recommends a REL of 100,000 fibers per cubic meter of air (100,000 fibers/m^3), which is equal to 0.1 fiber per cubic centimeter of air (0.1 fiber/cm^3), as determined by a 400-liter air sample collected over 100 minutes in accordance with NIOSH Analytical Method #7400. Airborne asbestos fibers are defined as those particles having (1) an aspect ratio of 3 to 1 or greater and (2) the mineralogic characteristics (that is, the crystal structure and elemental composition) of the asbestos minerals and their nonasbestiform analogs. The asbestos minerals are defined as chrysotile, crocidolite, amosite (cummingtonite-grunerite), anthophyllite, tremolite, and actinolite. In addition, airborne cleavage fragments from the nonasbestiform habits of the serpentine minerals antigorite and lizardite, and the amphibole minerals contained in the series cummingtonite-grunerite, tremolite-actinolite, and glaucophane-riebeckite should also be counted as fibers provided they meet the criteria for a fiber when viewed microscopically.

As found in 29 CFR 1910.1001, the OSHA PEL for asbestos fibers (i.e., actinolite asbestos, amosite, anthophyllite asbestos, chrysotile, crocidolite, and tremolite asbestos) is an 8-hour TWA airborne concentration of 0.1 fiber (longer than 5 micrometers and having a length to diameter ratio of at least 3 to 1) per cubic centimeter of air (0.1 fiber/cm^3), as determined by the membrane filter method at approximately 400X magnification with phase contrast illumination. No worker should be exposed in excess of 1 fiber/cm^3 (excursion limit) as averaged over a sampling period of 30 minutes.

Asphalt Fumes

The recommendations provided below are from Health Effects of Occupational Exposure to Asphalt [DHHS (NIOSH) Publication No. 2001-110] (http://www.cdc.gov/niosh/01-110pd.html).

Occupational exposure to asphalt fumes shall be controlled so that employees are not exposed to the airborne particulates at a concentration greater than 5 mg/m^3, determined during any 15-minute period.

Data regarding the potential carcinogenicity of paving asphalt fumes in humans are limited, and no animal studies have examined the carcinogenic potential of either field- or laboratory-generated samples of paving asphalt fume condensates. NIOSH concludes that the collective data currently available from studies on paving asphalt provide insufficient evidence for an association between lung cancer and exposure to asphalt during paving.

The results from epidemiologic studies indicate that roofers are at an increased risk of lung cancer, but it is uncertain whether this increase can be attributed to asphalt and/or to other exposures such as coal tar or asbestos. Data from experimental studies in animals and cultured mammalian cells indicate that laboratory-generated roofing asphalt fume condensates are genotoxic and cause skin tumors in mice when applied dermally. Furthermore, a known carcinogen (Benzo(a)pyrene) was detected in field-generated roofing fumes. The collective health and exposure data provide sufficient evidence for NIOSH to conclude that roofing asphalt fumes are a potential occupational carcinogen.

The available data indicate that although all asphalt-based paint formulations may exert genotoxicity, some are genotoxic and carcinogenic in animals. No published data examine the carcinogenic potential of asphalt-based paints in humans, but NIOSH concludes that asphalt-based paints are potential occupational carcinogens.

Benzidine-, o-Tolidine-, and o-Dianisidine-based Dyes

In December 1980, OSHA and NIOSH jointly published the Health Hazard Alert: Benzidine-, o-Tolidine-, and o-Dianisidine-based Dyes [DHHS (NIOSH) Publication No. 81-106] (http://www.cdc.gov/niosh/81-106.html). In this Alert, OSHA and NIOSH concluded that benzidine and benzidine-based dyes were potential occupational carcinogens and recommended that worker exposure be reduced to the lowest feasible level. OSHA and NIOSH further concluded that o-tolidine and o-dianisidine (and dyes based on them) may present a cancer risk to workers and should be handled with caution and exposure minimized.

Carbon Black

NIOSH considers “Carbon Black” to be the material consisting of more than 80% elemental carbon, in the form of near-spherical colloidal particles and coalesced particle aggregates of colloidal size, that is obtained by the partial combustion or thermal decomposition of hydrocarbons. The NIOSH REL (10-hour TWA) for carbon black is 3.5 mg/m^3. Polycyclic aromatic hydrocarbons (PAHs), particulate polycyclic organic matter (PPOM), and polynuclear aromatic hydrocarbons (PNAs) are terms frequently used to describe various petroleum-based substances that NIOSH considers to be potential occupational carcinogens. Since some of these aromatic hydrocarbons may be formed during the manufacture of carbon black (and become adsorbed on the carbon black), the NIOSH REL (10-hour TWA) for carbon black in the presence

of PAHs is 0.1 mg PAHs/m^3 (measured as the cyclohexane-extractable fraction). The OSHA PEL (8-hour TWA) for carbon black is 3.5 mg/m^3.

Chloroethanes

NIOSH considers the following four chemicals to be potential occupational carcinogens:

- Ethylene dichloride
- Hexachloroethane
- 1,1,2,2-Tetrachloroethane
- 1,1,2-Trichloroethane

Additionally, NIOSH recommends that the following five other chloroethane compounds be treated in the workplace with caution because of their structural similarity to the four chloroethanes shown to be carcinogenic in animals:

- 1,1-Dichloroethane
- Ethyl chloride
- Methyl chloroform
- Pentachloroethane
- 1,1,1,2-Tetrachloroethane

Chromic Acid and Chromates (as CrO_3), Chromium(II) and Chromium(III) Compounds (as Cr), and Chromium Metal (as Cr)

The NIOSH REL (10-hour TWA) is 0.001 mg Cr(VI)/m^3 for all hexavalent chromium [Cr(VI)] compounds. NIOSH considers all Cr(VI) compounds (including chromic acid, tert-butyl chromate, zinc chromate, and chromyl chloride) to be potential occupational carcinogens. The NIOSH REL (8-hour TWA) is 0.5 mg Cr/m^3 for chromium metal and chromium(II) and chromium(III) compounds.

The OSHA PEL is 0.005 mg CrO_3/m^3 (8-hour TWA) for chromic acid and chromates (including tert-butyl chromate with a "skin" designation and zinc chromate); 0.5 mg Cr/m^3 (8-hour TWA) for chromium(II) and chromium(III) compounds; and 1 mg Cr/m^3 (8-hour TWA) for chromium metal and insoluble salts.

Coal Dust and Coal Mine Dust

The NIOSH REL (10-hour TWA) for respirable coal mine dust is 1 mg/m^3 measured using a coal mine personal sampler unit (CPSU) as defined in 30 CFR 74.2. The REL is equivalent to 0.9 mg/m^3 measured according to the ISO/CEN/ACGIH (International Standards Organization/Comité Européen de Normalisation/American Conference of Governmental Industrial Hygienists) definition of respirable dust. The REL applies to respirable coal mine dust and respirable coal dust in occupations other than mining. NIOSH recommends a separate REL for crystalline silica. See NIOSH publication 95-106 (Criteria for a Recommended Standard - Occupational Exposure to Respirable Coal Mine Dust) for more detailed information.

Coal Tar Pitch Volatiles

NIOSH considers coal tar products (i.e., coal tar, coal tar pitch, or creosote) to be potential occupational carcinogens; the NIOSH REL (10-hour TWA) for coal tar products is 0.1 mg/m^3 (cyclohexane-extractable fraction).

The OSHA PEL (8-hour TWA) for coal tar pitch volatiles is 0.2 mg/m^3 (benzene-soluble fraction). OSHA defines "coal tar pitch volatiles" in 29 CFR 1910.1002 as the fused polycyclic hydrocarbons that volatilize from the distillation residues of coal, petroleum (excluding asphalt),

wood, and other organic matter and includes tarsubstances such as anthracene, benzo(a)pyrene (BaP), phenanthrene, acridine, chrysene, pyrene, etc.

Coke Oven Emissions

The production of coke by the carbonization of bituminous coal leads to the release of chemically-complex emissions from coke ovens that include both gases and particulate matter of varying chemical composition. The emissions include coal tar pitch volatiles (e.g., particulate polycyclic organic matter [PPOM], polycyclic aromatic hydrocarbons [PAHs], and polynuclear aromatic hydrocarbons [PNAs]), aromatic compounds (e.g., benzene and 2-naphthylamine), trace metals (e.g., arsenic, beryllium, cadmium, chromium, lead, and nickel), and gases (e.g., nitric oxides and sulfur dioxide).

Cotton Dust (raw)

NIOSH recommends reducing exposures to cotton dust to the lowest feasible concentration to reduce the prevalence and severity of byssinosis; the REL is <0.200 mg/m^3 (as lint free cotton dust).

As found in OSHA Table Z-1 (29 CFR 1910.1000), the PEL for cotton dust (raw) is 1 mg/m^3 for the cotton waste processing operations of waste recycling (sorting, blending, cleaning, and willowing) and garnetting. PELs for other sectors (as found in 29 CFR 1910.1043) are 0.200 mg/m^3 for yarn manufacturing and cotton washing operations, 0.500 mg/m^3 for textile mill waste house operations or for dust from "lower grade washed cotton" used during yarn manufacturing, and 0.750 mg/m^3 for textile slashing and weaving operations. The OSHA standard 29 CFR 1910.1043 does not apply to cotton harvesting, ginning, or the handling and processing of woven or knitted materials and waste cotton. All PELs for cotton dust are mean concentrations of lint-free, respirable cotton dust collected by a vertical elutriator or an equivalent method and averaged over an 8-hour period.

Lead

NIOSH considers "Lead" to mean metallic lead, all lead oxides, and lead salts (including organic salts such as lead soaps but excluding lead arsenate). The NIOSH REL for lead (8-hour TWA) is 0.050 mg/m^3; air concentrations should be maintained so that worker blood lead remains less than 0.060 mg Pb/100 g of whole blood.

OSHA considers "Lead" to mean metallic lead, all inorganic lead compounds (lead oxides and lead salts), and a class of organic compounds called soaps; all other lead compounds are excluded from this definition. The OSHA PEL (8-hour TWA) is 0.050 mg/m^3; other OSHA requirements can be found in 29 CFR 1910.1025. The OSHA PEL (8 hour-TWA) for lead in "non-ferrous foundries with less than 20 employees" is 0.075 mg/m^3.

Mineral Dusts

The OSHA PELS for "mineral dusts" listed below are from Table Z-3 of 29 CFR 1910.1000. The OSHA PEL (8-hour TWA) for crystalline silica (as respirable quartz) is either 250 mppcf divided by the value "%SiO_2+ 5" or 10 mg/m^3 divided by the value

"%SiO_2 + 2." The OSHA PEL (8-hour TWA) for crystalline silica (as total quartz) is 30 mg/m^3 divided by the value "%SiO_2 + 2." The OSHA PELs (8-hour TWAs) for cristobalite and tridymite are ½ the values calculated above using the count or mass formulae for quartz.

The OSHA PEL (8-hour TWA) for amorphous silica (including diatomaceous earth) is either 80 mg/m^3 divided by the value "%SiO_2" or 20 mppcf.

The OSHA PELs (8-hour TWAs) for talc (not containing asbestos), mica, and soapstone are 20 mppcf. The OSHA PEL (8-hour TWA) for portland cement is 50 mppcf. The OSHA PEL (8-hour TWA) for graphite (natural) is 15 mppcf. The PELs for talc (not containing asbestos), mica, soapstone, and portland cement are applicable if the material contains less than 1% crystalline silica.

The OSHA PEL (8-hour TWA) for coal dust (as the respirable fraction) containing less than 5% SiO_2 is 2.4 mg/m^3 divided by the value "%SiO_2 + 2." The OSHA PEL (8-hour TWA) for coal dust (as the respirable fraction) containing greater than or equal to 5% SiO_2 is 10 mg/m^3 divided by the value "%SiO_2 + 2."

NIAX® Catalyst ESN

In May 1978, OSHA and NIOSH jointly published Current Intelligence Bulletin (CIB) 26: NIAX® Catalyst ESN. In this CIB, OSHA and NIOSH recommended that occupational exposure to NIAX® Catalyst ESN, its components, dimethylaminopropionitrile and bis(2-(dimethylamino)ethyl)ether, as well as formulations containing either component, be minimized. Exposures should be limited to as few workers as possible, while minimizing workplace exposure concentrations with effective work practices and engineering controls. Exposed workers should be carefully monitored for potential disorders of the nervous and genitourinary system. Although substitution is a possible control measure, alternatives to NIAX® Catalyst ESN or its components should be carefully evaluated with regard to possible adverse health effects.

Trichloroethylene

NIOSH considers trichloroethylene (TCE) to be a potential occupational carcinogen and recommends a REL of 2 ppm (as a 60-minute ceiling) during the use of TCE as an anesthetic agent, and 25 ppm (as a 10-hour TWA) during all other exposures.

Tungsten Carbide (Cemented)

"Cemented tungsten carbide" or "hard metal" refers to a mixture of tungsten carbide, cobalt, and sometimes metal oxides or carbides and other metals (including nickel). When the cobalt (Co) content exceeds 2%, its contribution to the potential hazard is judged to exceed that of tungsten carbide. Therefore, the NIOSH REL (10-hour TWA) for cemented tungsten carbide containing >2% Co is 0.05 mg Co/m^3; the applicable OSHA PEL is 0.1 mg Co/m^3 (8-hour TWA). Nickel (Ni) may sometimes be used as a binder rather than cobalt. NIOSH considers cemented tungsten carbide containing nickel to be a potential occupational carcinogen and recommends a REL of 0.015 mg Ni/m^3 (10-hour TWA). The OSHA PEL for Insoluble Nickel (i.e., a 1 mg Ni/m^3 8-hour TWA) applies to mixtures of tungsten carbide and nickel.

Appendix D
SUBSTANCES WITH NO ESTABLISHED RELs

After reviewing available published literature, NIOSH provided comments to OSHA on August 1, 1988, regarding the "Proposed Rule on Air Contaminants" (29 CFR 1910, Docket No. H-020). In these comments, NIOSH questioned whether the PELs proposed (and listed below) for the following substances included in the Pocket Guide were adequate to protect workers from recognized health hazards. The current PEL for each of these compounds is listed on the chemical page for each substance in the Pocket Guide. See pages xi-xii for a discussion of the vacated PELs.

- Acetylene tetrabromide [TWA 1 ppm]
- Chlorobenzene [TWA 75 ppm]
- Ethyl bromide [TWA 200 ppm, STEL 250 ppm]
- Ethylene glycol [C 50 ppm]
- Ethyl ether [TWA 400 ppm, STEL 500 ppm]
- Fenthion [TWA 0.2 mg/m^3 (skin)]
- Furfural [TWA 2 ppm (skin)]
- 2-Isopropoxyethanol [TWA 25 ppm]
- Isopropyl acetate [TWA 250 ppm, STEL 310 ppm]
- Isopropylamine [TWA 5 ppm, STEL 10 ppm]
- Manganese tetroxide (as Mn) [TWA 1 mg/m^3]
- Molybdenum (soluble compounds as Mo) [TWA 5 mg/m^3]
- Nitromethane [TWA 100 ppm]
- m-Toluidine [TWA 2 ppm (skin)]
- Triethylamine [TWA 10 ppm, STEL 15 ppm]

At that time, NIOSH also conducted a limited evaluation of the literature and concluded that the documentation cited by OSHA was inadequate to support the proposed PEL (as an 8-hour TWA) of 10 mg/m^3 for the compounds listed below. The current PEL for magnesium oxide fume is 15 mg/m^3 (8-hour TWA, total particulate), and the current PEL for molybdenum (insoluble compounds as Mo) is 15 mg/m^3 (8-hour TWA, total dust). For the other compounds listed below the current PEL is 15 mg/m^3 (8-hour TWA, total dust) and 5 mg/m^3 (8-hour TWA, respirable dust).

- α-Alumina
- Benomyl
- Emery
- Glycerine (mist)
- Graphite (synthetic)
- Magnesium oxide fume
- Molybdenum (insoluble compounds as Mo)
- Particulates not otherwise regulated
- Picloram
- Rouge

Appendix E
OSHA Respirator Requirements for Selected Chemicals

Revisions to the OSHA Respiratory Protection Standard (29 CFR 1910.134) became effective on April 8, 1998. Incorporated within the preamble of this ruling were changes to OSHA regulations for several chemicals or substances, which are listed as subheadings in blue text throughout this appendix. These subheadings, which are also the titles of the affected standards within 29 CFR 1910 and 29 CFR 1926, are followed by the standard number(s) in parentheses and the OSHA respirator requirements. Fit testing is required by OSHA for all tight-fitting air-purifying respirators. Please consult 29 CFR 1910.134 for the full content of the changes that apply. For all of the chemicals listed in this appendix, any respirators that are permitted at higher environmental concentrations can be used at lower concentrations.

13 Carcinogens (4-Nitrobiphenyl, etc.) (1910.1003)

Employees engaged in handling operations involving the carcinogens listed below must be provided with, and required to wear and use, a half-mask filter-type respirator for dusts, mists, and fumes. A respirator affording higher levels of protection than this respirator may be substituted.

- 2-Acetylaminofluorene
- 4-Aminodiphenyl
- Benzidine
- bis-Chloromethyl ether
- 3,3'-Dichlorobenzidine (and its salts)
- 4-Dimethylaminoazobenezene
- Ethyleneimine
- Methyl chloromethyl ether
- α-Naphthylamine
- β-Naphthylamine
- 4-Nitrobiphenyl
- N-Nitrosodimethylamine
- β-Propiolactone

Acrylonitrile (1910.1045)

Airborne Concentration or Condition of Use	Respirator Type
≤ 20 ppm (parts per million)	(1) Chemical cartridge respirator with organic vapor cartridge(s) and half-mask facepiece; or (2) Supplied-air respirator with half-mask facepiece.
≤ 100 ppm or maximum use concentration of cartridges or canisters, whichever is lower	(1) Full-facepiece respirator with (A) organic vapor cartridges, (B) organic vapor gas mask, chin-style, or (C) organic vapor gas mask canister, front- or back-mounted; (2) Supplied-air respirator with full facepiece; or (3) Self-contained breathing apparatus with full facepiece.
≤ 4,000 ppm	Supplied-air respirator operated in positive-pressure mode with full facepiece, helmet, suit, or hood.
> 4,000 ppm or unknown concentration	(1) Supplied-air and auxiliary self-contained breathing apparatus with full facepiece in positive-pressure mode; or (2) Self-contained breathing apparatus with full facepiece in positive-pressure mode.
Firefighting	Self-contained breathing apparatus with full facepiece in positive-pressure mode.
Escape	(1) Any organic vapor respirator; or (2) Any self-contained breathing apparatus.

Arsenic, inorganic (1910.1018)

Requirements for Respiratory Protection for Inorganic Arsenic Particulate
Except for Those With Significant Vapor Pressure

Airborne Concentration (as As) or Condition of Use	Required Respirator
≤ 100 µg/m³ (micrograms per cubic meter)	(1) Half-mask air-purifying respirator equipped with high-efficiency filter*; or (2) Any half-mask supplied air respirator.
≤ 500 µg/m³	(1) Full facepiece air-purifying respirator equipped with high-efficiency filter*; (2) Any full-facepiece supplied-air respirator; or (3) Any full-facepiece self-contained breathing apparatus.
≤ 10,000 µg/m³	(1) Powered air-purifying respirators in all inlet face coverings with high-efficiency filters*; or (2) Half-mask supplied-air respirators operated in positive-pressure mode.
≤ 20,000 µg/m³	Supplied-air respirator with full facepiece, hood, or helmet or suit, operated in positive-pressure mode.
> 20,000 µg/m³, unknown concentrations, or firefighting	Any full-facepiece self-contained breathing apparatus operated in positive-pressure mode.

* A high-efficiency filter means a filter that is at least 99.97% efficient against mono-disperesed particles of 0.3 µm (micrometers) in diameter or higher.

Requirements for Respiratory Protection for
Inorganic Arsenicals ***With Significant Vapor Pressure***

Airborne Concentration (as As) or Condition of Use	Required Respirator
≤ 100 µg/m³ (micrograms per cubic meter)	(1) Half-mask* air-purifying respirator equipped with high-efficiency filter** and acid gas cartridge; or (2) Any half-mask* supplied-air respirator.
≤ 500 µg/m³	(1) Front- or back-mounted gas mask equipped with high-efficiency filter** and acid gas canister; or (2) Any full-facepiece supplied-air respirator; or (3) Any full-facepiece self-contained breathing apparatus.
≤ 10,000 µg/m³	Half-mask* supplied-air respirator operated in positive-pressure mode.
≤ 20,000 µg/m³	Supplied-air respirator with full facepiece, hood, or helmet or suit, operated in positive-pressure mode.
> 20,000 µg/m³, unknown concentrations, or firefighting	Any full-facepiece self-contained breathing apparatus operated in positive-pressure mode.

* Half-mask respirators shall not be used for protection against arsenic trichloride, as it is rapidly absorbed through the skin.
** A high-efficiency filter means a filter that is at least 99.97% efficient against mono-disperesed particles of 0.3 µm (micrometers) in diameter or higher.

OSHA Respirator Requirements for Selected Chemicals

Asbestos (1910.1001 & 1926.1101)

Airborne Concentration or Condition of Use	Required Respirator
≤ 1 f/cm³ (fibers per cubic centimeter) (10 X PEL)	Half-mask air-purifying respirator other than a disposable respirator, equipped with high-efficiency filters*.
≤ 5 f/cm³ (50 X PEL)	Full-facepiece air-purifying respirator equipped with high-efficiency filters*.
≤ 10 f/cm³ (100 X PEL)	Any powered air-purifying respirator equipped with high-efficiency filters* or any supplied-air respirator operated in continuous-flow mode.
≤ 100 f/cm³ (1,000 X PEL)	Full-facepiece supplied air respirator operated in pressure-demand mode.
> 100 f/cm³ (1,000 X PEL), or unknown concentrations	Full-facepiece supplied-air respirator operated in pressure-demand mode, equipped with an auxiliary positive-pressure self-contained breathing apparatus.

* A high-efficiency filter means a filter that is at least 99.97% efficient against mono-dispersed particles of 0.3 μm (micrometers) in diameter or higher.

Benzene (1910.1028)

Airborne Concentration or Condition of Use	Required Respirator
≤ 10 ppm (parts per million)	Half-mask air-purifying respirator with organic vapor cartridge.
≤ 50 ppm	(1) Full-facepiece respirator with organic vapor cartridges; or (2) Full-facepiece gas mask with chin-style canisters*
≤ 100 ppm	Full-facepiece powered air-purifying respirator with organic vapor canister*.
≤ 1,000 ppm	Supplied-air respirator with full facepiece in positive-pressure mode.
> 1,000 ppm or unknown concentration	(1) Self-contained breathing apparatus with full facepiece in positive-pressure mode; (2) Full-facepiece positive-pressure supplied-air respirator with auxiliary self-contained air supply.
Escape	(1) Any organic vapor gas mask; (2) Any self-contained breathing apparatus with full facepiece.
Firefighting	Full-facepiece self-contained breathing apparatus in positive-pressure mode.

* Canisters must have a minimum service life of four (4) hours when tested at 150 ppm benzene, at a flow rate of 64 liters per minute (LPM), 25°C, and 85% relative humidity for non-powered air-purifying respirators. The flow rate shall be 115 LPM and 170 LPM, respectively, for tight-fitting and loose-fitting powered air-purifying respirators.

1,3-Butadiene (1910.1051)

Airborne Concentration or Condition of Use	Required Respirator
≤ 5 ppm (parts per million)	Air-purifying half-mask or full-facepiece respirator equipped with approved butadiene or organic vapor cartridges or canisters. Cartridges or canisters shall be replaced every 4 hours.
≤ 10 ppm	Air-purifying half-mask or full-facepiece respirator equipped with approved butadiene or organic vapor cartridges or canisters. Cartridges or canisters shall be replaced every 3 hours.
≤ 25 ppm	(1) Air-purifying half-mask or full-facepiece respirator equipped with approved butadiene or organic vapor cartridges or canisters. Cartridges or canisters shall be replaced every 2 hours; (2) Any powered air-purifying respirator equipped with approved butadiene or organic vapor cartridges or canisters. Cartridges or canisters shall be replaced every [1] hour; or (3) Continuous-flow supplied-air respirator equipped with a hood or helmet.
≤ 50 ppm	(1) Air-purifying full-facepiece respirator equipped with approved butadiene or organic vapor cartridges or canisters. Cartridges or canisters shall be replaced every [1] hour; or (2) Powered air-purifying respirator (PAPR) equipped with a tight-fitting facepiece and approved butadiene or organic vapor cartridges. PAPR cartridges shall be replaced every [1] hour.
≤ 1,000 ppm	Supplied-air respirator equipped with a half-mask or full facepiece and operated in a pressure-demand or other positive-pressure mode.
> 1,000 ppm, unknown concentration, or firefighting	(1) Self-contained breathing apparatus equipped with a full facepiece and operated in a pressure-demand or other positive-pressure mode; or (2) Any supplied-air respirator equipped with a full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
Escape from IDLH conditions (IDLH is 2,000 ppm)	(1) Any positive-pressure self-contained breathing apparatus with an appropriate service life; or (2) Any air-purifying full-facepiece respirator equipped with a front- or back-mounted butadiene or organic vapor canister.

OSHA Respirator Requirements for Selected Chemicals

Cadmium (1910.1027 & 1926.1127)

Airborne Concentration or Condition of Use	Required Respirator
≤ 50 µg/m³ (micrograms per cubic meter)	Half-mask, air-purifying respirator equipped with a high-efficiency filter*
≤ 125 µg/m³	(1) Powered air-purifying respirator with a loose-fiting hood or helmet equipped with a high-efficiency filter*; or (2) Supplied-air respirator with a loose-fitting hood or helmet facepiece operated in continuous-flow mode.
≤ 250 µg/m³	(1) Full-facepiece air-purifying respirator equipped with a high-efficiency filter*; (2) Powered air-purifying respirator with a tight-fitting half-mask equipped with a high-efficiency filter*; or (3) Supplied-air respirator with a tight-fitting half-mask operated in continuous-flow mode.
≤ 1,250 µg/m³	(1) Powered air-purifying respirator with a tight-fitting full facepiece equipped with a high-efficiency filter*; or (2) Supplied-air respirator with a tight-fitting full facepiece operated in continuous-flow mode.
≤ 5,000 µg/m³	Supplied-air respirator with half-mask or full facepiece operated in pressure-demand or other positive-pressure mode.
> 5,000µg/m³ or unknown concentration	(1) Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive-pressure mode; or (2) Supplied-air respirator with a full facepiece operated in pressure-demand or other positive-pressure mode and equipped with an auxiliary escape-type self-contained breathing apparatus operated in pressure-demand mode.
Firefighting	Self-contained breathing apparatus with full facepiece operated in pressure-demand or other positive-pressure mode.

Note: Quantitative fit testing is required for all tight-fitting air-purifying respirators where airborne concentration of cadmium exceeds 10 times the TWA PEL (10 x 5 µg/m³ = 50 µg/m³). A full-facepiece respirator is required when eye irritation is expected.

* A high-efficiency filter means a filter that is at least 99.97% efficient against mono-dispersed particles of 0.3 µm (micrometers) in diameter or higher.

Coke oven emissions (1910.1029)

Airborne Concentration	Required Respirator
≤ 1500 µg/m³ (micrograms per cubic meter)	(1) Any particulate filter respirator for dust and mist except single-use respirator; or (2) Any particulate filter respirator or combination chemical cartridge and particulate filter respirator for coke oven emissions.
Any concentrations	(1) Type C supplied-air respirator [see page 360] operated in pressure-demand or continuous-flow mode; (2) Powered air-purifying particulate filter respirator for dust and mist; (3) Powered air-purifying particulate filter respirator or combination chemical cartridge and particulate filter respirator for coke oven emissions.

Cotton dust (1910.1043)

Airborne Concentration	Required Respirator
≤ 5 X PEL	Disposable respirator* with a particulate filter.
≤ 10 X PEL	Quarter- or half-mask respirator, other than a disposable respirator, equipped with particulate filters.
≤ 100 X PEL	Full-facepiece respirator equipped with high-efficiency particulate filters**.
> 100 X PEL	Powered air-purifying respirator equipped with high-efficiency particulate filters.

* A disposable respirator means the filter element is an inseparable part of the respirator.
** A high-efficiency filter means a filter that is at least 99.97% efficient against mono-dispersed particles of 0.3 µm (micrometers) in diameter or higher.

Notes:
Self-contained breathing apparatus are not required but are permitted respirators.

Supplied-air respirators are not required but are permitted under the following conditions: Cotton dust concentration not greater than 10X the PEL: Any supplied air respirator; not greater than 100X the PEL: Any supplied-air respirator with a full facepiece, helmet, or hood; greater than 100X the PEL: Supplied-air respirator operated in positive-pressure mode.

APPENDIX E

1,2-Dibromo-3-chloropropane (1910.1044)

Airborne Concentration or Condition of Use	Required Respirator
≤ 10 ppb (parts per billion)	(1) Any supplied-air respirator; or (2) any self-contained breathing apparatus.
≤ 50 ppb	(1) Any supplied-air respirator with a full facepiece, helmet, or hood; or (2) any self-contained breathing apparatus with full facepiece.
≤ 1,000 ppb	Type C supplied-air respirator [see page 360] operated in pressure-demand or other positive-pressure mode or continuous-flow mode.
≤ 2,000 ppb	Type C supplied-air respirator [see page 360] with full facepiece operated in pressure-demand or other positive-pressure mode, or with full facepiece, helmet, or hood operated in continuous-flow mode.
> 2,000 ppb or entry and escape from unknown concentrations	(1) A combination respirator which includes a Type C supplied-air respirator [see page 360] with a full facepiece operated in pressure-demand or other positive pressure mode or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or positive-pressure mode; or (2) Self-contained breathing apparatus with full facepiece operated in pressure-demand or other positive-pressure mode.
Firefighting	Self-contained breathing apparatus with full facepiece operated in pressure-demand or other positive-pressure mode.

Ethylene oxide (1910.1047)

Airborne Concentration or Condition of Use	Required Respirator
≤ 50 ppm (parts per million)	Full-facepiece respirator with ethylene oxide approved canister, front- or back-mounted.
≤ 2,000 ppm	(1) Positive-pressure supplied-air respirator equipped with full facepiece, hood, or helmet; or (2) Continuous-flow supplied-air respirator (positive-pressure) equipped with hood, helmet, or suit.
> 2,000 ppm or unknown concentrations	(1) Positive-pressure self-contained breathing apparatus equipped with full facepiece; or (2) Positive-pressure full-facepiece supplied-air respirator equipped with an auxiliary positive-pressure self-contained breathing apparatus.
Firefighting	Positive-pressure self-contained breathing apparatus equipped with full facepiece.
Escape	Any respirator described above.

Formaldehyde (1910.1048)

Airborne Concentration or Condition of Use	Required Respirator
≤ 7.5 ppm (parts per million) (10 X PEL)	Full-facepiece respirator with cartridges or canisters specifically approved for protection against formaldehyde.*
≤ 75 ppm (100 X PEL)	(1) Full-face mask respirator with chin-style or chest- or back-mounted type with industrial size canister specifically approved for protection against formaldehyde; or (2) Type C supplied-air respirator [see page 360], demand type or continuous flow type, with full facepiece, hood, or helmet.
> 75 ppm (100 X PEL) or unknown concentrations (emergencies)	(1) Self-contained breathing apparatus with positive-pressure full-facepiece; or (2) Combination supplied-air, full-facepiece positive-pressure respirator with auxiliary self-contained air supply.
Firefighting	Self-contained breathing apparatus with positive-pressure in full facepiece.
Escape	(1) Self-contained breathing apparatus in demand or pressure-demand mode; or (2) Full-face mask respirator with chin-style or front- or back-mounted type industrial size canister specifically approved for protection against formaldehyde.

* A half-mask respirator with cartridges specifically approved for protection against formaldehyde can be substituted for the full-facepiece respirator providing that effective gas-proof goggles are provided and used in combination with the half-mask respirator.

Lead (1910.1025 & 1926.62)

Respirator Requirements of 1910.1025 (General Industry Lead Standard)

Airborne Concentration or Condition of Use	Required Respirator
≤ 0.5 mg/m³ (milligrams per cubic meter) (10 X PEL)	Half-mask* air-purifying respirator equipped with high-efficiency filters**
≤ 2.5 mg/m³ (50 X PEL)	Full-facepiece air-purifying respirator with high-efficiency filters**.
≤ 50 mg/m³ (1000 X PEL)	(1) Any powered air-purifying respirator with high-efficiency filters**; or (2) Half-mask* supplied-air respirator operated in positive-pressure mode.
≤ 100 mg/m³ (2000 X PEL)	Supplied-air respirators with full facepiece, hood, helmet, or suit, operated in positive-pressure mode.
> 100 mg/m³, unknown concentration, or firefighting	Full-facepiece, self-contained breathing apparatus operated in positive-pressure mode.

* Full facepiece is required if the lead aerosols cause eye or skin irritation at the use concentrations.

** A high-efficiency filter means a filter that is at least 99.97% efficient against mono-dispersed particles of 0.3 μm (micrometers) in diameter or higher.

APPENDIX E

Respirator Requirements of 1926.62 (Construction Lead Standard)

Airborne Concentration or Condition of Use	Required Respirator
≤ 0.5 mg/m³ (milligrams per cubic meter)	(1) Half-mask* air-purifying respirator with high-efficiency filters**; or (2) Half-mask* supplied-air respirator operated in demand (negative pressure) mode.
≤ 1.25 mg/m³	(1) Loose-fitting hood or helmet powered air-purifying respirator with high-efficiency filters** ; or (2) Hood or helmet supplied-air respirator operated in a continuous-flow mode (e.g., Type CE abrasive blasting respirators [see page 360] operated in a continuous-flow mode).
≤ 2.5 mg/m³	(1) Full-facepiece air-purifying respirator with high-efficiency filters**; (2) Tight-fitting powered air-purifying respirator with high-efficiency filters** ; (3) Full-facepiece supplied-air respirator operated in demand mode; (4) Half-mask* or full-facepiece supplied-air respirator operated in a continuous-flow mode; or (5) Full-facepiece self-contained breathing apparatus operated in demand mode.
≤ 50 mg/m³	Half-mask* supplied-air respirator operated in pressure-demand or other positive-pressure mode.
≤ 100 mg/m³	Full-facepiece supplied-air respirator operated in pressure-demand or other positive-pressure mode (e.g., Type CE abrasive blasting respirators [see page 360] operated in a continuous-flow mode).
> 100 mg/m³, unknown concentration, or firefighting	Full-facepiece self-contained breathing apparatus in pressure-demand or other positive-pressure mode.

* Full facepiece is required if the lead aerosols cause eye or skin irritation at the use concentrations.

** A high-efficiency filter means a filter that is at least 99.97% efficient against mono-dispersed particles of 0.3 μm (micrometers) in diameter or higher.

OSHA Respirator Requirements for Selected Chemicals

Methylene chloride (1910.1052)

Airborne Concentration or Condition of Use	Required Respirator
≤ 625 ppm (parts per million) (25 X PEL)	Continuous-flow supplied-air respirator, hood or helmet.
≤ 1250 ppm (50 X PEL)	(1) Full-facepiece supplied-air respirator operated in negative-pressure (demand) mode; or (2) Full-facepiece self-contained breathing apparatus operated in negative-pressure (demand) mode.
≤ 5,000 ppm (200 X PEL)	(1) Continuous-flow supplied-air respirator, full-facepiece; or (2) Pressure-demand supplied-air respirator, full-facepiece; or (3) Positive-pressure full-facepiece self-contained breathing apparatus.
> 5,000 ppm or unknown concentration	(1) Positive-pressure full-facepiece self-contained breathing apparatus; or (2) Full-facepiece pressure-demand supplied-air respirator with an auxiliary self-contained air supply.
Firefighting	Positive-pressure full-facepiece self-contained breathing apparatus.
Emergency escape	(1) Any continuous-flow or pressure-demand self-contained breathing apparatus; or (2) Gas mask with organic vapor canister.

4,4'-Methylenedianiline (1910.1050 & 1926.60)

Airborne Concentration or Condition of Use	Required Respirator
≤ 10 X PEL	Half-mask respirator with high-efficiency* cartridge**.
≤ 50 X PEL	Full-facepiece respirator with high-efficiency* cartridge or canister**.
≤ 1,000 X PEL	Full-facepiece powered air-purifying respirator with high-efficiency* cartridge**.
> 1,000 X PEL or unknown concentration	(1) Self-contained breathing apparatus with full facepiece in positive-pressure mode; or (2) Full-facepiece positive-pressure demand supplied-air respirator with auxiliary self-contained air supply.
Escape	(1) Any full-facepiece air-purifying respirator with high-efficiency* cartridges**; or (2) Any positive-pressure continuous-flow self-contained breathing apparatus with full facepiece or hood.
Firefighting	Full-facepiece self-contained breathing apparatus in positive-pressure demand mode.

* A high-efficiency filter means a filter that is at least 99.97% efficient against mono-dispersed particles of 0.3 μm (micrometers) in diameter or higher.
** Combination High-Efficiency/Organic Vapor Cartridges shall be used wherever Methylenedianiline is in liquid form or a process requiring heat is used.

Vinyl Chloride (1910.1017)

Airborne Concentration or Condition of Use	Required Respirator
≤ 10 ppm (parts per million)	(1) Combination Type C supplied-air respirator [see below], demand type, with half facepiece, and auxiliary self-contained air supply; or (2) Type C supplied-air respirator [see below], demand type, with half facepiece; or (3) Any chemical cartridge respirator with an organic vapor cartridge which provides a service life of at least 1 hour for concentrations of vinyl chloride up to 10 ppm.
≤ 25 ppm	(1) Powered air-purifying respirator with hood, helmet, full or half facepiece, and a canister which provides a service life of at least 4 hours for concentrations of vinyl chloride up to 25 ppm; or (2) Gas mask with front- or back-mounted canister which provides a service life of at least 4 hours for concentrations of vinyl chloride up to 25 ppm.
≤ 100 ppm	(1) Combination Type C supplied-air respirator [see below], demand type, with full facepiece, and auxiliary self-contained air supply; or (2) Open-circuit self-contained breathing apparatus with full facepiece, in demand mode; or (3) Type C supplied-air respirator [see below], demand type, with full facepiece.
≤ 1,000 ppm	Type C supplied-air respirator [see below], continuous-flow type, with full or half facepiece, helmet, or hood.
≤ 3,600 ppm	(1) Combination Type C supplied-air respirator [see below], pressure demand type, with full or half facepiece, and auxiliary self-contained air supply; or (2) Combination type continuous-flow supplied-air respirator with full or half facepiece and auxiliary self-contained air supply.
> 3,600 ppm or unknown concentration	Open-circuit self-contained breathing apparatus, pressure-demand type, with full facepiece.

Definitions for Type C and Type CE Respirators

The definitions below were obtained from the NIOSH Certified Equipment List, which is available on the NIOSH Web site (http://www.cdc.gov/niosh/npptl/topics/respirators/cel).

Type C Respirator: An airline respirator, for entry into and escape from atmospheres not immediately dangerous to life or health, which consists of a source of respirable breathing air, a hose, a detachable coupling, a control valve, orifice, a demand valve or pressure demand valve, and arrangement for attaching the hose to the wearer and a facepiece, hood, or helmet.

Type CE Respirator: A Type C supplied-air respirator equipped with additional devices designed to protect the wearer's head and neck against impact and abrasion from rebounding abrasive material, and with shielding material such as plastic, glass, or wire, sheet metal, or other suitable material to protect the window(s) of facepieces, hoods, and helmets which do not unduly interfere with the wearer's vision and permit easy access to the exterior surface of such window(s) for cleaning.

Appendix F
MISCELLANEOUS NOTES

Benzene

The final OSHA Benzene standard in 1910.1028 applies to all occupational exposures to benzene except some subsegments of industry where exposures are consistently under the actio level (i.e., distribution and sales of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply (i.e., an 8-hour TWA of 10 ppm, an acceptable ceiling of 25 ppm, and 50 ppm for a maximum duration of 10 minutes as an acceptable maximum peak above the acceptable ceiling).

Octachloronaphthalene
Pentachloronaphthalene
Tetrachloronaphthalene
Trichloronaphthalene

IDLH values for these four chloronaphthalene compounds are unknown. The Documentation for Immediately Dangerous to Life or Health Concentrations (NTIS Publication Number PB-94-195047) identified "Effective" IDLH values, based on analogy with other chloronaphthalenes and the then-effective NIOSH Respirator Decision Logic (DHHS [NIOSH] Publication No. 87-108; http://www.cdc.gov/niosh/docs/87-108). These values for respirator recommendations were determined by multiplying the NIOSH REL or OSHA PEL by an assigned protection factor of 10. This assigned protection factor was used during the Standards Completion Program for deciding when the "most protective" respirators should be used for these four chemicals. Listed below are the "Effective" IDLH values that were determined using 10 times the REL or PEL for each chemical. For more information please consult the IDLH Documentation on the NIOSH Web site (http://www.cdc.gov/niosh/idlh/idlhintro.html).

Chemical	NIOSH REL/OSHA PEL	"Effective" IDLH (10 X REL/PEL)
Octachloronaphthalene	TWA 0.1 mg/m^3*	1 mg/m^3
Pentachloronaphthalene	TWA 0.5 mg/m^3	5 mg/m^3
Tetrachloronaphthalene	TWA 5 mg/m^3	50 mg/m^3
Trichloronaphthalene	TWA 2 mg/m^3	20 mg/m^3

* NIOSH also recommends a STEL of 0.3 mg/m^3 for octachloronaphthalene; the TWA of 0.1 mg/m^3 was used to calculate the "Effective" IDLH of 1 mg/m^3

Appendix G
VACATED 1989 OSHA PELs

(See pages xi and xii for an explanation of the vacated 1989 OSHA PELs.)

Chemical	Vacated 1989 OSHA PEL
Acetaldehyde	TWA 100 ppm (180 mg/m^3), ST 150 ppm (270 mg/m^3)
Acetic anhydride	C 5 ppm (20 mg/m^3)
Acetone	TWA 750 ppm (1800 mg/m^3), ST 1000 ppm (2400 mg/m^3)
Acetonitrile	TWA 40 ppm (70 mg/m^3), ST 60 ppm (105 mg/m^3)
Acetylsalicyclic acid	TWA 5 mg/m^3
Acrolein	TWA 0.1 ppm (0.25 mg/m^3), ST 0.3 ppm (0.8 mg/m^3)
Acrylamide	TWA 0.03 mg/m^3 [skin]
Acrylic acid	TWA 10 ppm (30 mg/m^3) [skin]
Allyl alcohol	TWA 2 ppm (5 mg/m^3), ST 4 ppm (10 mg/m^3) [skin]
Allyl chloride	TWA 1 ppm (3 mg/m^3), ST 2 ppm (6 mg/m^3)
Allyl glycidyl ether	TWA 5 ppm (22 mg/m^3), ST 10 ppm (44 mg/m^3)
Allyl propyl disulfide	TWA 2 ppm (12 mg/m^3), ST 3 ppm (18 mg/m^3)
α-Alumina	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
Aluminum (pyro powders & welding fumes, as Al)	TWA 5 mg/m^3
Aluminum (soluble salts & alkyls, as Al)	TWA 2 mg/m^3
Amitrole	TWA 0.2 mg/m^3
Ammonia	ST 35 ppm (27 mg/m^3)
Ammonium chloride fume	TWA 10 mg/m^3, ST 20 mg/m^3
Ammonium sulfamate	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
Aniline (and homologs)	TWA 2 ppm (8 mg/m^3) [skin]
Atrazine	TWA 5 mg/m^3
Barium sulfate	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
Benomyl	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
Benzenethiol	TWA 0.5 ppm (2 mg/m^3)
Bismuth telluride (doped with selenium sulfide, as Bi_2Te_3)	TWA 5 mg/m^3
Borates, tetra, sodium salts (Anhydrous)	TWA 10 mg/m^3
Borates, tetra, sodium salts (Decahydrate)	TWA 10 mg/m^3
Borates, tetra, sodium salts (Pentahydrate)	TWA 10 mg/m^3
Boron oxide	TWA 10 mg/m^3
Boron tribromide	C 1 ppm (10 mg/m^3)
Bromacil	TWA 1 ppm (10 mg/m^3)
Bromine	TWA 0.1 ppm (0.7 mg/m^3), ST 0.3 ppm (2 mg/m^3)

VACATED 1989 OSHA PELs

(See pages xi and xii for an explanation of the vacated 1989 OSHA PELs.)

Chemical	Vacated 1989 OSHA PEL
Bromine pentafluoride	TWA 0.1 ppm (0.7 mg/m^3)
n-Butane	TWA 800 ppm (1900 mg/m^3)
2-Butanone	TWA 200 ppm (590 mg/m^3), ST 300 ppm (885 mg/m^3)
2-Butoxyethanol	TWA 25 ppm (120 mg/m^3) [skin]
n-Butyl acetate	TWA 150 ppm (710 mg/m^3), ST 200 ppm (950 mg/m^3)
Butyl acrylate	TWA 10 ppm (55 mg/m^3)
n-Butyl alcohol	C 50 ppm (150 mg/m^3) [skin]
sec-Butyl alcohol	TWA 100 ppm (305 mg/m^3)
tert-Butyl alcohol	TWA 100 ppm (300 mg/m^3), ST 150 ppm (450 mg/m^3)
n-Butyl glycidyl ether	TWA 25 ppm (135 mg/m^3)
n-Butyl lactate	TWA 5 ppm (25 mg/m^3)
n-Butyl mercaptan	TWA 0.5 ppm (1.5 mg/m^3)
o-sec-Butylphenol	TWA 5 ppm (30 mg/m^3) [skin]
p-tert-Butyltoluene	TWA 10 ppm (60 mg/m^3), ST 20 ppm (120 mg/m^3)
Calcium cyanamide	TWA 0.5 mg/m^3
Caprolactam	Dust: TWA 1 mg/m^3, ST 3 mg/m^3 Vapor: TWA 5 ppm (20 mg/m^3), ST 10 ppm (40 mg/m^3)
Captafol	TWA 0.1 mg/m^3
Captan	TWA 5 mg/m^3
Carbofuran	TWA 0.1 mg/m^3
Carbon dioxide	TWA 10,000 ppm (18,000 mg/m^3) ST 30,000 ppm (54,000 mg/m^3)
Carbon disulfide	TWA 4 ppm (12 mg/m^3), ST 12 ppm (36 mg/m^3) [skin]
Carbon monoxide	TWA 35 ppm (40 mg/m^3), C 200 ppm (229 mg/m^3)
Carbon tetrabromide	TWA 0.1 ppm (1.4 mg/m^3), ST 0.3 ppm (4 mg/m^3)
Carbon tetrachloride	TWA 2 ppm (12.6 mg/m^3)
Carbonyl fluoride	TWA 2 ppm (5 mg/m^3), ST 5 ppm (15 mg/m^3)
Catechol	TWA 5 ppm (20 mg/m^3) [skin]
Cesium hydroxide	TWA 2 mg/m^3
Chlorinated camphene	TWA 0.5 mg/m^3, ST 1 mg/m^3 [skin]
Chlorine	TWA 0.5 ppm (1.5 mg/m^3), ST 1 ppm (3 mg/m^3)
Chlorine dioxide	TWA 0.1 ppm (0.3 mg/m^3), ST 0.3 ppm (0.9 mg/m^3)
Chloroacetyl chloride	TWA 0.05 ppm (0.2 mg/m^3)
o-Chlorobenzylidene malononitrile	C 0.05 ppm (0.4 mg/m^3) [skin]
Chlorodifluoromethane	TWA 1000 ppm (3500 mg/m^3)
Chloroform	TWA 2 ppm (9.78 mg/m^3)

VACATED 1989 OSHA PELs

(See pages xi and xii for an explanation of the vacated 1989 OSHA PELs.)

Chemical	Vacated 1989 OSHA PEL
1-Chloro-1-nitropropane	TWA 2 ppm (10 mg/m^3)
Chloropentafluoroethane	TWA 1000 ppm (6320 mg/m^3)
β-Chloroprene	TWA 10 ppm (35 mg/m^3) [skin]
o-Chlorostyrene	TWA 50 ppm (285 mg/m^3), ST 75 ppm (428 mg/m^3)
o-Chlorotoluene	TWA 50 ppm (250 mg/m^3)
Chlorpyrifos	TWA 0.2 mg/m^3 [skin]
Coal dust	TWA 2 mg/m^3 (<5% SiO_2) (resp dust) TWA 0.1 mg/m^3 (≥ 5% SiO_2) (resp quartz)
Cobalt metal dust & fume (as Co)	TWA 0.05 mg/m^3
Cobalt carbonyl (as Co)	TWA 0.1 mg/m^3
Cobalt hydrocarbonyl (as Co)	TWA 0.1 mg/m^3
Crag® herbicide	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
Crufomate	TWA 5 mg/m^3
Cyanamide	TWA 2 mg/m^3
Cyanogen	TWA 10 ppm (20 mg/m^3)
Cyanogen chloride	C 0.3 ppm (0.6 mg/m^3)
Cyclohexanol	TWA 50 ppm (200 mg/m^3) [skin]
Cyclohexanone	TWA 25 ppm (100 mg/m^3) [skin]
Cyclohexylamine	TWA 10 ppm (40 mg/m^3)
Cyclonite	TWA 1.5 mg/m^3 [skin]
Cyclopentane	TWA 600 ppm (1720 mg/m^3)
Cyhexatin	TWA 5 mg/m^3
Decaborane	TWA 0.3 mg/m^3 (0.05 ppm), ST 0.9 mg/m^3 (0.15 ppm) [skin]
Diazinon®	TWA 0.1 mg/m^3 [skin]
2-N-Dibutylaminoethanol	TWA 2 ppm (14 mg/m^3)
Dibutyl phosphate	TWA 1 ppm (5 mg/m^3), ST 2 ppm (10 mg/m^3)
Dichloroacetylene	C 0.1 ppm (0.4 mg/m^3)
p-Dichlorobenzene	TWA 75 ppm (450 mg/m^3), ST 110 ppm (675 mg/m^3)
1,3-Dichloro-5,5-dimethylhydantoin	TWA 0.2 mg/m^3, ST 0.4 mg/m^3
Dichloroethyl ether	TWA 5 ppm (30 mg/m^3), ST 10 ppm (60 mg/m^3) [skin]
Dichloromonofluoromethane	TWA 10 ppm (40 mg/m^3)
1,1-Dichloro-1-nitroethane	TWA 2 ppm (10 mg/m^3)
1,3-Dichloropropene	TWA 1 ppm (5 mg/m^3) [skin]
2,2-Dichloropropionic acid	TWA 1 ppm (6 mg/m^3)
Dicrotophos	TWA 0.25 mg/m^3 [skin]

Chemical	Vacated 1989 OSHA PEL
Dicyclopentadiene	TWA 5 ppm (30 mg/m^3)
Dicyclopentadienyl iron	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
Diethanolamine	TWA 3 ppm (15 mg/m^3)
Diethylamine	TWA 10 ppm (30 mg/m^3), ST 25 ppm (75 mg/m^3)
Diethylenetriamine	TWA 1 ppm (4 mg/m^3)
Diethyl ketone	TWA 200 ppm (705 mg/m^3)
Diethyl phthalate	TWA 5 mg/m^3
Diglycidyl ether	TWA 0.1 ppm (0.5 mg/m^3)
Diisobutyl ketone	TWA 25 ppm (150 mg/m^3)
N,N-Dimethylaniline	TWA 5 ppm (25 mg/m^3), ST 10 ppm (50 mg/m^3) [skin]
Dimethyl-1,2-dibromo-2,2-dichlorethyl phosphate	TWA 3 mg/m^3 [skin]
Dimethyl sulfate	TWA 0.1 ppm (0.5 mg/m^3) [skin]
Dinitolmide	TWA 5 mg/m^3
Di-sec octyl phthalate	TWA 5 mg/m^3, ST 10 mg/m^3
Dioxane	TWA 25 ppm (90 mg/m^3) [skin]
Dioxathion	TWA 0.2 mg/m^3 [skin]
Diphenylamine	TWA 10 mg/m^3
Dipropylene glycol methyl ether	TWA 100 ppm (600 mg/m^3) ST 150 ppm (900 mg/m^3) [skin]
Dipropyl ketone	TWA 50 ppm (235 mg/m^3)
Diquat (Diquat dibromide)	TWA 0.5 mg/m^3
Disulfiram	TWA 2 mg/m^3
Disulfoton	TWA 0.1 mg/m^3 [skin]
2,6-Di-tert-butyl-p-cresol	TWA 10 mg/m^3
Diuron	TWA 10 mg/m^3
Divinyl benzene	TWA 10 ppm (50 mg/m^3)
Emery	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
Endosulfan	TWA 0.1 mg/m^3 [skin]
Epichlorohydrin	TWA 2 ppm (8 mg/m^3) [skin]
Ethanolamine	TWA 3 ppm (8 mg/m^3), ST 6 ppm (15 mg/m^3)
Ethion	TWA 0.4 mg/m^3 [skin]
Ethyl acrylate	TWA 5 ppm (20 mg/m^3), ST 25 ppm (100 mg/m^3) [skin]
Ethyl benzene	TWA 100 ppm (435 mg/m^3), ST 125 ppm (545 mg/m^3)
Ethyl bromide	TWA 200 ppm (890 mg/m^3), ST 250 ppm (1110 mg/m^3)
Ethylene chlorohydrin	C 1 ppm (3 mg/m^3) [skin]
Ethylene dichloride	TWA 1 ppm (4 mg/m^3), ST 2 ppm (8 mg/m^3)

VACATED 1989 OSHA PELs

(See pages xi and xii for an explanation of the vacated 1989 OSHA PELs.)

Chemical	Vacated 1989 OSHA PEL
Ethylene glycol	C 50 ppm (125 mg/m^3)
Ethylene glycol dinitrate	ST 0.1 mg/m^3 [skin]
Ethyl ether	TWA 400 ppm (1200 mg/m^3), ST 500 ppm (1500 mg/m^3)
Ethylidene norbornene	C 5 ppm (25 mg/m^3)
Ethyl mercaptan	TWA 0.5 ppm (1 mg/m^3)
N-Ethylmorpholine	TWA 5 ppm (23 mg/m^3) [skin]
Ethyl silicate	TWA 10 ppm (85 mg/m^3)
Fenamiphos	TWA 0.1 mg/m^3 [skin]
Fensulfothion	TWA 0.1 mg/m^3
Fenthion	TWA 0.2 mg/m^3 [skin]
Ferbam	TWA 10 mg/m^3
Ferrovanadium dust	TWA 1 mg/m^3, ST 3 mg/m^3
Fluorotrichloromethane	C 1000 ppm (5600 mg/m^3)
Fonofos	TWA 0.1 mg/m^3 [skin]
Formamide	TWA 20 ppm (30 mg/m^3), ST 30 ppm (45 mg/m^3)
Furfural	TWA 2 ppm (8 mg/m^3) [skin]
Furfuryl alcohol	TWA 10 ppm (40 mg/m^3), ST 15 ppm (60 mg/m^3) [skin]
Gasoline	TWA 300 ppm (900 mg/m^3), ST 500 ppm (1500 mg/m^3)
Germanium tetrahydride	TWA 0.2 ppm (0.6 mg/m^3)
Glutaraldehyde	C 0.2 ppm (0.8 mg/m^3)
Glycerin (mist)	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
Glycidol	TWA 25 ppm (75 mg/m^3)
Graphite (natural)	TWA 2.5 mg/m^3 (resp)
Graphite (synthetic)	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
n-Heptane	TWA 400 ppm (1600 mg/m^3), ST 500 ppm (2000 mg/m^3)
Hexachlorobutadiene	TWA 0.02 ppm (0.24 mg/m^3)
Hexachlorocyclopentadiene	TWA 0.01 ppm (0.1 mg/m^3)
Hexafluoroacetone	TWA 0.1 ppm (0.7 mg/m^3) [skin]
n-Hexane	TWA 50 ppm (180 mg/m^3)
Hexane isomers (except n-Hexane)	TWA 500 ppm (1800 mg/m^3), ST 1000 ppm (3600 mg/m^3)
2-Hexanone	TWA 5 ppm (20 mg/m^3)
Hexone	TWA 50 ppm (205 mg/m^3), ST 75 ppm (300 mg/m^3)
Hexylene glycol	C 25 ppm (125 mg/m^3)
Hydrazine	TWA 0.1 ppm (0.1 mg/m^3) [skin]
Hydrogenated terphenyls	TWA 0.5 ppm (5 mg/m^3)
Hydrogen bromide	C 3 ppm (10 mg/m^3)

Chemical	Vacated 1989 OSHA PEL
Hydrogen cyanide	ST 4.7 ppm (5 mg/m^3) [skin]
Hydrogen fluoride (as F)	TWA 3 ppm, ST 6 ppm
Hydrogen sulfide	TWA 10 ppm (14 mg/m^3), ST 15 ppm (21 mg/m^3)
2-Hydroxypropyl acrylate	TWA 0.5 ppm (3 mg/m^3) [skin]
Indene	TWA 10 ppm (45 mg/m^3)
Indium	TWA 0.1 mg/m^3
Iodoform	TWA 0.6 ppm (10 mg/m^3)
Iron pentacarbonyl (as Fe)	TWA 0.1 ppm (0.8 mg/m^3), ST 0.2 ppm (1.6 mg/m^3)
Iron salts (soluble, as Fe)	TWA 1 mg/m^3
Isoamyl alcohol (primary & secondary)	TWA 100 ppm (360 mg/m^3), ST 125 ppm (450 mg/m^3)
Isobutane	TWA 800 ppm (1900 mg/m^3)
Isobutyl alcohol	TWA 50 ppm (150 mg/m^3)
Isooctyl alcohol	TWA 50 ppm (270 mg/m^3) [skin]
Isophorone	TWA 4 ppm (23 mg/m^3)
Isophorone diisocyanate	TWA 0.005 ppm, ST 0.02 ppm [skin]
2-Isopropoxyethanol	TWA 25 ppm (105 mg/m^3)
Isopropyl acetate	TWA 250 ppm (950 mg/m^3), ST 310 ppm (1185 mg/m^3)
Isopropyl alcohol	TWA 400 ppm (980 mg/m^3), ST 500 ppm (1225 mg/m^3)
Isopropylamine	TWA 5 ppm (12 mg/m^3), ST 10 ppm (24 mg/m^3)
N-Isopropylaniline	TWA 2 ppm (10 mg/m^3) [skin]
Isopropyl glycidyl ether	TWA 50 ppm (240 mg/m^3), ST 75 ppm (360 mg/m^3)
Kaolin	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
Ketene	TWA 0.5 ppm (0.9 mg/m^3), ST 1.5 ppm (3 mg/m^3)
Magnesium oxide fume	TWA 10 mg/m^3
Malathion	TWA 10 mg/m^3 [skin]
Manganese compounds and fume (as Mn)	Compounds: C 5 mg/m^3 Fume: TWA 1 mg/m^3, ST 3 mg/m^3
Manganese cyclopentadienyl tricarbonyl (as Mn)	TWA 0.1 mg/m^3 [skin]
Manganese tetroxide (as Mn)	TWA 1 mg/m^3
Mercury compounds, as Hg [except (organo) alkyls]	Hg Vapor: TWA 0.05 mg/m^3 [skin] Non-alkyl compounds: C 0.1 mg/m^3 [skin]
Mercury (organo) alkyl compounds (as Hg)	TWA 0.01 mg/m^3, ST 0.03 mg/m^3 [skin]
Mesityl oxide	TWA 15 ppm (60 mg/m^3), ST 25 ppm (100 mg/m^3)
Methacrylic acid	TWA 20 ppm (70 mg/m^3) [skin]
Methomyl	TWA 2.5 mg/m^3

VACATED 1989 OSHA PELs

(See pages xi and xii for an explanation of the vacated 1989 OSHA PELs.)

Chemical	Vacated 1989 OSHA PEL
Methoxychlor	TWA 10 mg/m^3
4-Methoxyphenol	TWA 5 mg/m^3
Methyl acetate	TWA 200 ppm (610 mg/m^3), ST 250 ppm (760 mg/m^3)
Methyl acetylene-propadiene mixture	TWA 1000 ppm (1800 mg/m^3), ST 1250 ppm (2250 mg/m^3)
Methylacrylonitrile	TWA 1 ppm (3 mg/m^3) [skin]
Methyl alcohol	TWA 200 ppm (260 mg/m^3), ST 250 ppm (325 mg/m^3) [skin]
Methyl bromide	TWA 5 ppm (20 mg/m^3) [skin]
Methyl chloride	TWA 50 ppm (105 mg/m^3), ST 100 ppm (210 mg/m^3)
Methyl chloroform	TWA 350 ppm (1900 mg/m^3), ST 450 ppm (2450 mg/m^3)
Methyl-2-cyanoacrylate	TWA 2 ppm (8 mg/m^3), ST 4 ppm (16 mg/m^3)
Methylcyclohexane	TWA 400 ppm (1600 mg/m^3)
Methylcyclohexanol	TWA 50 ppm (235 mg/m^3)
o-Methylcyclohexanone	TWA 50 ppm (230 mg/m^3), ST 75 ppm (345 mg/m^3) [skin]
Methyl cyclopentadienyl manganese tricarbonyl (as Mn)	TWA 0.2 mg/m^3 [skin]
Methyl demeton	TWA 0.5 mg/m^3 [skin]
4,4'-Methylenebis(2-chloro-aniline)	TWA 0.02 ppm (0.22 mg/m^3) [skin]
Methylene bis (4-cyclo-hexylisocyanate)	C 0.01 ppm (0.11 mg/m^3) [skin]
Methyl ethyl ketone peroxide	C 0.7 ppm (5 mg/m^3)
Methyl formate	TWA 100 ppm (250 mg/m^3), ST 150 ppm (375 mg/m^3)
Methyl iodide	TWA 2 ppm (10 mg/m^3) [skin]
Methyl isoamyl ketone	TWA 50 ppm (240 mg/m^3)
Methyl isobutyl carbinol	TWA 25 ppm (100 mg/m^3), ST 40 ppm (165 mg/m^3) [skin]
Methyl isopropyl ketone	TWA 200 ppm (705 mg/m^3)
Methyl mercaptan	TWA 0.5 ppm (1 mg/m^3)
Methyl parathion	TWA 0.2 mg/m^3 [skin]
Methyl silicate	TWA 1 ppm (6 mg/m^3)
α-Methyl styrene	TWA 50 ppm (240 mg/m^3), ST 100 ppm (485 mg/m^3)
Metribuzin	TWA 5 mg/m^3
Mica	TWA 3 mg/m^3 (resp)
Molybdenum (insoluble compounds, as Mo)	TWA 10 mg/m^3
Monocrotophos	TWA 0.25 mg/m^3
Monomethyl aniline	TWA 0.5 ppm (2 mg/m^3) [skin]
Morpholine	TWA 20 ppm (70 mg/m^3), ST 30 ppm (105 mg/m^3) [skin]

Chemical	Vacated 1989 OSHA PEL
Naphthalene	TWA 10 ppm (50 mg/m^3), ST 15 ppm (75 mg/m^3)
Nickel metal & other compounds (as Ni)	Metal & insoluble compounds: TWA 1 mg/m^3 Soluble compounds: TWA 0.1 mg/m^3
Nitric acid	TWA 2 ppm (5 mg/m^3), ST 4 ppm (10 mg/m^3)
p-Nitroaniline	TWA 3 mg/m^3 [skin]
Nitrogen dioxide	ST 1 ppm (1.8 mg/m^3)
Nitroglycerine	ST 0.1 mg/m^3 [skin]
2-Nitropropane	TWA 10 ppm (35 mg/m^3)
Nitrotoluene (o-, m-, p-isomers)	TWA 2 ppm (11 mg/m^3) [skin]
Nonane	TWA 200 ppm (1050 mg/m^3)
Octachloronaphthalene	TWA 0.1 mg/m^3, ST 0.3 mg/m^3 [skin]
Octane	TWA 300 ppm (1450 mg/m^3), ST 375 ppm (1800 mg/m^3)
Osmium tetroxide (as Os)	TWA 0.002 mg/m^3 (0.0002 ppm), ST 0.006 mg/m^3 (0.0006 ppm)
Oxalic acid	TWA 1 mg/m^3, ST 2 mg/m^3
Oxygen difluoride	C 0.05 ppm (0.1 mg/m^3)
Ozone	TWA 0.1 ppm (0.2 mg/m^3), ST 0.3 ppm (0.6 mg/m^3)
Paraffin wax fume	TWA 2 mg/m^3
Paraquat	TWA 0.1 mg/m^3 (resp) [skin]
Pentaborane	TWA 0.005 ppm (0.01 mg/m^3), ST 0.015 ppm (0.03 mg/m^3)
Pentaerythritol	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
n-Pentane	TWA 600 ppm (1800 mg/m^3), ST 750 ppm (2250 mg/m^3)
2-Pentanone	TWA 200 ppm (700 mg/m^3), ST 250 ppm (875 mg/m^3)
Perchloryl fluoride	TWA 3 ppm (14 mg/m^3), ST 6 ppm (28 mg/m^3)
Petroleum distillates (naphtha)	TWA 400 ppm (1600 mg/m^3)
Phenothiazine	TWA 5 mg/m^3 [skin]
Phenyl glycidyl ether	TWA 1 ppm (6 mg/m^3)
Phenylhydrazine	TWA 5 ppm (20 mg/m^3), ST 10 ppm (45 mg/m^3) [skin]
Phenylphosphine	C 0.05 ppm (0.25 mg/m^3)
Phorate	TWA 0.05 mg/m^3, ST 0.2 mg/m^3 [skin]
Phosdrin	TWA 0.01 ppm (0.1 mg/m^3), ST 0.03 ppm (0.3 mg/m^3) [skin]
Phosphine	TWA 0.3 ppm (0.4 mg/m^3), ST 1 ppm (1 mg/m^3)
Phosphoric acid	TWA 1 mg/m^3, ST 3 mg/m^3
Phosphorus oxychloride	TWA 0.1 ppm (0.6 mg/m^3)
Phosphorus pentasulfide	TWA 1 mg/m^3, ST 3 mg/m^3
Phosphorus trichloride	TWA 0.2 ppm (1.5 mg/m^3), ST 0.5 ppm (3 mg/m^3)
Phthalic anhydride	TWA 6 mg/m^3 (1 ppm)
m-Phthalodinitrile	TWA 5 mg/m^3

VACATED 1989 OSHA PELs

(See pages xi and xii for an explanation of the vacated 1989 OSHA PELs.)

Chemical	Vacated 1989 OSHA PEL
Picloram	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
Piperazine dihydrochloride	TWA 5 mg/m^3
Platinum metal (as Pt)	TWA 1 mg/m^3
Portland cement	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
Potassium hydroxide	TWA 2 mg/m^3
Propargyl alcohol	TWA 1 ppm (2 mg/m^3) [skin]
Propionic acid	TWA 10 ppm (30 mg/m^3)
Propoxur	TWA 0.5 mg/m^3
n-Propyl acetate	TWA 200 ppm (840 mg/m^3), ST 250 ppm (1050 mg/m^3)
n-Propyl alcohol	TWA 200 ppm (500 mg/m^3), ST 250 ppm (625 mg/m^3)
Propylene dichloride	TWA 75 ppm (350 mg/m^3), ST 110 ppm (510 mg/m^3)
Propylene glycol dinitrate	TWA 0.05 ppm (0.3 mg/m^3)
Propylene glycol monomethyl ether	TWA 100 ppm (360 mg/m^3), ST 150 ppm (540 mg/m^3)
Propylene oxide	TWA 20 ppm (50 mg/m^3)
n-Propyl nitrate	TWA 25 ppm (105 mg/m^3), ST 40 ppm (170 mg/m^3)
Resorcinol	TWA 10 ppm (45 mg/m^3), ST 20 ppm (90 mg/m^3)
Ronnel	TWA 10 mg/m^3
Rosin core solder, pyrolysis products (as formaldehyde)	TWA 0.1 mg/m^3
Rouge	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
Silica, amorphous	TWA 6 mg/m^3, TWA 0.1 mg/m^3 (fused)
Silica, crystalline (as respirable dust)	TWA 0.05 mg/m^3 (cristobalite), TWA 0.05 mg/m^3 (tridymite), TWA 0.1 mg/m^3 (quartz), TWA 0.1 mg/m^3 (tripoli)
Silicon	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
Silicon carbide	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
Silicon tetrahydride	TWA 5 ppm (7 mg/m^3)
Soapstone	TWA 6 mg/m^3 (total), TWA 3 mg/m^3 (resp)
Sodium azide	C 0.1 ppm (as HN_3) [skin], C 0.3 mg/m^3 (as NaN_3) [skin]
Sodium bisulfite	TWA 5 mg/m^3
Sodium fluoroacetate	TWA 0.05 mg/m^3, ST 0.15 mg/m^3 [skin]
Sodium hydroxide	C 2 mg/m^3
Sodium metabisulfite	TWA 5 mg/m^3
Stoddard solvent	TWA 525 mg/m^3 (100 ppm)
Styrene	TWA 50 ppm (215 mg/m^3), ST 100 ppm (425 mg/m^3)
Subtilisins	ST 0.00006 mg/m^3 [60-minute]
Sulfur dioxide	TWA 2 ppm (5 mg/m^3), ST 5 ppm (13 mg/m^3)

VACATED 1989 OSHA PELs

(See pages xi and xii for an explanation of the vacated 1989 OSHA PELs.)

Chemical	Vacated 1989 OSHA PEL
Sulfur monochloride	C 1 ppm (6 mg/m^3)
Sulfur tetrafluoride	C 0.1 ppm (0.4 mg/m^3)
Sulfuryl fluoride	TWA 5 ppm (20 mg/m^3), ST 10 ppm (40 mg/m^3)
Sulprofos	TWA 1 mg/m^3
Talc	TWA 2 mg/m^3 (resp)
Temephos	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
Terphenyl (o-, m-, p-isomers)	C 5 mg/m^3 (0.5 ppm)
1,1,2,2-Tetrachloroethane	TWA 1 ppm (7 mg/m^3) [skin]
Tetrachloroethylene	TWA 25 ppm (170 mg/m^3)
Tetrahydrofuran	TWA 200 ppm (590 mg/m^3), ST 250 ppm (735 mg/m^3)
Tetrasodium pyrophosphate	TWA 5 mg/m^3
4,4'-Thiobis(6-tert-butyl-m-cresol)	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
Thioglycolic acid	TWA 1 ppm (4 mg/m^3) [skin]
Thionyl chloride	C 1 ppm (5 mg/m^3)
Tin (organic compounds, as Sn)	TWA 0.1 mg/m^3 [skin]
Tin(II) oxide (as Sn)	TWA 2 mg/m^3
Tin(IV) oxide (as Sn)	TWA 2 mg/m^3
Titanium dioxide	TWA 10 mg/m^3
Toluene	TWA 100 ppm (375 mg/m^3), ST 150 ppm (560 mg/m^3)
Toluene-2,4-diisocyanate	TWA 0.005 ppm (0.04 mg/m^3), ST 0.02 ppm (0.15 mg/m^3)
m-Toluidine	TWA 2 ppm (9 mg/m^3) [skin]
p-Toluidine	TWA 2 ppm (9 mg/m^3) [skin]
Tributyl phosphate	TWA 0.2 ppm (2.5 mg/m^3)
Trichloroacetic acid	TWA 1 ppm (7 mg/m^3)
1,2,4-Trichlorobenzene	C 5 ppm (40 mg/m^3)
Trichloroethylene	TWA 50 ppm (270 mg/m^3), ST 200 ppm (1080 mg/m^3)
1,2,3-Trichloropropane	TWA 10 ppm (60 mg/m^3)
1,1,2-Trichloro-1,2,2-trifluoroethane	TWA 1000 ppm (7600 mg/m^3) ST 1250 ppm (9500 mg/m^3)
Triethylamine	TWA 10 ppm (40 mg/m^3), ST 15 ppm (60 mg/m^3)
Trimellitic anhydride	TWA 0.005 ppm (0.04 mg/m^3)
Trimethylamine	TWA 10 ppm (24 mg/m^3), ST 15 ppm (36 mg/m^3)
1,2,3-Trimethylbenzene	TWA 25 ppm (125 mg/m^3)
1,2,4-Trimethylbenzene	TWA 25 ppm (125 mg/m^3)
1,3,5-Trimethylbenzene	TWA 25 ppm (125 mg/m^3)

Appendix G (Continued)
VACATED 1989 OSHA PELs

(See pages xi and xii for an explanation of the vacated 1989 OSHA PELs.)

Chemical	Vacated 1989 OSHA PEL
Trimethyl phosphite	TWA 2 ppm (10 mg/m^3)
2,4,6-Trinitrotoluene	TWA 0.5 mg/m^3 [skin]
Triorthocresyl phosphate	TWA 0.1 mg/m^3 [skin]
Triphenylamine	TWA 5 mg/m^3
Tungsten (insoluble compounds, as W)	TWA 5 mg/m^3, ST 10 mg/m^3
Tungsten (soluble compounds, as W)	TWA 1 mg/m^3, ST 3 mg/m^3
Tungsten carbide (cemented)	TWA 5 mg/m^3 (as W), ST 10 mg/m^3 (as W), TWA 0.05 mg/m^3 (as Co), TWA 1 mg/m^3 (as Ni)
Uranium (insoluble compounds, as U)	TWA 0.2 mg/m^3, ST 0.6 mg/m^3
n-Valeraldehyde	TWA 50 ppm (175 mg/m^3)
Vanadium dust	TWA 0.05 mg V_2O_5/m^3 (resp)
Vanadium fume	C 0.05 mg V_2O_5/m^3
Vinyl acetate	TWA 10 ppm (30 mg/m^3), ST 20 ppm (60 mg/m^3)
Vinyl bromide	TWA 5 ppm (20 mg/m^3)
Vinyl cyclohexene dioxide	TWA 10 ppm (60 mg/m^3) [skin]
Vinylidene chloride	TWA 1 ppm (4 mg/m^3)
VM & P Naphtha	TWA 1350 mg/m^3 (300 ppm), ST 1800 mg/m^3 (400 ppm)
Welding fumes	TWA 5 mg/m^3
Wood dust (all wood dusts except Western red cedar)	TWA 5 mg/m^3, ST 10 mg/m^3
Wood dust (Western red cedar)	TWA 2.5 mg/m^3
Xylene (o-, m-, p-isomers)	TWA 100 ppm (435 mg/m^3), ST 150 ppm (655 mg/m^3)
m-Xylene α,α'-diamine	C 0.1 mg/m^3 [skin]
Xylidine	TWA 2 ppm (10 mg/m^3) [skin]
Zinc chloride fume	TWA 1 mg/m^3, ST 2 mg/m^3
Zinc oxide	TWA 5 mg/m^3 (fume), ST 10 mg/m^3 (fume), TWA 10 mg/m^3 (total dust), TWA 5 mg/m^3 (resp dust)
Zinc stearate	TWA 10 mg/m^3 (total), TWA 5 mg/m^3 (resp)
Zirconium compounds (as Zr)	TWA 5 mg/m^3, ST 10 mg/m^3

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