Temple University
Environmental Health and Radiation Safety

TEMPLE UNIVERISTY

CHEMICAL WASTE MINIMIZATION MANUAL

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I. INTRODUCTION

OVERVIEW

Temple University (TU) generates large quantities of regulated chemical waste and is required to operate a chemical waste minimization and pollution prevention program. At TU, regulated chemical waste are generated in laboratories, maintenance shops, garages, machine shops, are studios and other academic, research and operation support location. Waste minimization is the reduction in the amount of toxicity or waste produced by the university, and includes source reduction, re-use, recycling, and applicable treatment options.

APPLICABILITY

The chemical waste minimization techniques identified in this manual apply to all students, faculty, staff, and visitors who use chemicals while working at Temple University (TU).

ROLE OF ENVIRONMENTAL HEALTH AND RADIATION SAFETY (EHRS)

The principal role of EHRS is to serve as the primary universal resource for all matters pertaining to biological safety, chemical safety, radiation safety, occupational safety, and emergency response support within Temple University (TU). EHRS provides technical guidance, compliance assistance, remediation oversight and training to the TU community.

For the chemical waste minimization, the main role of EHRS is to provide chemical waste minimization services in conjunction with technical assistance, training, and support resources so that all TU personnel are aware of their individual responsibilities in helping the University meet the following goals:

- Ensure all chemical wastes are managed in a way that protects the health and safety of all students, faculty, staff, and visitors to the University.
- Use the most responsible and environmentally sound management and disposal methods as are practical, and that prevents release into the environment.
- Reduce the quantity and/or toxicity of chemical waste generated by the University to the lowest level possible.
- Comply with all local, state, and federal regulations regarding waste management and disposal; and

This manual will be revised and updated as necessary to reflect changing regulations and circumstances. The most current copy of this manual is available on the EHRS website. Copies of the written manual and related information may be obtained from Environmental Health & Radiation Safety (EHRS)

Environmental Health & Radiation Safety (EHRS)
Pharmacy-Allied Health Building
3307 N. Broad Street, Room B-49
Philadelphia, PA 19140
Phone: 215-707-2520
Email: ehrs@temple.edu
Web: www.temple.edu/ehrs

YOUR RESPONSIBILITY

The Temple University chemical waste minimization and pollution prevention program is fully dependent on the willing and active participation of the whole University community. All faculty, staff and students should make waste minimization an ongoing component of their overall chemical waste management strategy. Waste prevention and minimization has positive environmental, human health and safety, and economic impacts. Implementing "less is better" concept provides better protection for human health and safety by reducing exposures, generating less demand for disposal on the environment, and lower disposal costs.

REGULATORY OVERVIEW

As required by both the Environmental Protection Agency (EPA) and the Pennsylvania Department of Environmental Protection (PADEP), EHRS has developed the Chemical Waste Minimization & Pollution Prevention Program that establishes the framework and procedures necessary to minimize the volume and/or toxicity of chemical waste generated at the University, and to manage any chemical waste that must be generated in the most responsible way possible.

II. METHODS FOR WASTE MINIMIZATION

SOURCE REDUCTION

Reduce the scale of chemical processes/experiments.

The use of microscale techniques and specially designed lab glassware in chemistry promotes waste minimization and pollution prevention. This allows chemical processes to use small quantities of chemicals without compromising the quality and standard of chemical application in education and research. Other benefits include promoting shorter experiment times and storage space savings. It is also recommended to consider pre-weighed or pre-measured reagent packets where waste generation is high.

Use computer modeling.

Another option is the use of computer modeling instead of experimentation to eliminate the creation of chemical waste, especially in teaching situations.

Reduce chemical purchases.

Every year, the University disposes of thousands of unused, unwanted, or expired chemical containers through routine requests or laboratory cleanouts. When disposal costs are considered, it is more economical to purchase only the quantities of chemicals that will be used. Purchasing chemicals in larger containers at an initial lower cost, rather than in smaller containers, appears to be a good way to save money. However, there are other costs to consider when purchasing chemicals in larger quantities. In a laboratory that has not adequately implemented waste minimization programs, unused chemicals typically constitute 40% or more of the chemical waste stream generated. Costs incurred as a result of these unneeded chemicals include analysis, storage, packaging, transport, and disposal. When labels are missing or unclear, the cost of having even a small amount of an unknown chemicals analyzed prior to disposal will far exceed the purchase price of an entire container of the chemical. Furthermore, the long-term storage of expired or reactive unused chemical containers increases the risk of accidents. In addition to this, if small bottles do break, there is less spillage, making clean-up safer, easier, and less expensive.

NOTE: *Before you contact EHRS for the removal of an unwanted but stable chemical, please check to see whether other labs in your building can use the material. Be sure to update your chemical inventory and have the recipient do the same for their chemical inventory.*

Substitute with a less hazardous chemical.

A less hazardous material can often be used in place of more hazardous chemicals.

Examples of less toxic alternatives:

- Use non-mercury thermometers instead of mercury thermometers.

- Use water or calibrated oils instead of mercury manometers. Or switch to pressure transducers or electronic gauges.
- Use enzymatic cleaners, detergents, or elbow grease when cleaning glassware instead of chromium-based cleaners.
- Use quaternary amine detergents instead of isopropyl alcohol when sterilizing equipment.
- Replace thermal distillation apparatus with dry solvent purification systems for purifying or drying solvents. This minimizes the use of energy, water, and solvents. Also, it has the bonus of reducing your fire risk.
- Use alcohol as a fixative instead of formaldehyde.
- Use SYBR Safe DNA Gel Stain instead of Ethidium Bromide (a known mutagen).
- Use non-halogenated rather than halogenated solvents when applicable.
- Use digital photography or a digital X-ray machine.

Better management of chemical inventory.

It is important for each TU laboratory or area that stores chemicals to maintain an updated inventory of chemicals in the University's Chemical Environmental Management System (CEMS).

III. ENVIRONMETALLY SOUND RECYCLING (ESR)

EPA in the content of the Resource Conservation and Recovery Act (RCRA), includes materials that are used, reused, or reclaimed. A material is reclaimed if it is processed to recover a usable product, or if it is regenerated. Certain conditions/restrictions may apply. Contact EHRS at 215-707-2520 for technical assistance.

Examples of ESR processes that can be used within your area include:

- Treating photographic waste with silver recovery units*
- Redistilling used solvents*
- Purchasing gas cylinders, including lecture bottles, from manufacturers who will accept the return of the partially used or empty cylinders.

* Only with EHRS approval and monitoring.

TREATMENT

The last technique for waste minimization is treatment of waste generated during use. As part of the experiment, neutralization, precipitation, oxidation/reduction, and distillation are examples of treatment techniques that may be applied to reduce chemical waste quantities. These processes are commonly used in laboratories.

CAUTION: If treatment is not part of the end step, and is done separately from the experiment, it is considered hazardous waste treatment, which cannot be done with a treatment permit from the State.

Waste that re neutralized or detoxified and managed at the source can reduce environmental risks that might occur during transportation and handling. These steps either decrease or eliminate toxicity or help reduce the volume of waste. All chemical waste must be processed through EHRS.

IV. MANAGING WASTE EFFICIENTLTY

The following sections are meant to give waste generators some information on how to minimize waste volumes and disposal costs of some of the more common waste streams generated at Temple University. In some situations, these suggestions may be difficult or impractical to implement. In such cases, consult with EHRS to determine the best method for collection and disposal.

FLAMMABLE LIQUIDS AND SOLIDS

Examples: acetone, ethanol, methanol, toluene, hexane, acetonitrile, camphor, sulfur, and naphthalene.

Flammable liquid disposal is easy and relatively inexpensive than many other waste streams since they can be burned as a fuel or simply incinerated independently. Solvents contaminated with materials not permitted for incineration will require alternative, costly treatment methods.

Some suggestions for waste minimization include:

- Use the solvent distillation process to produce or a recycled product that can be reused. If considering this waste minimization procedure, please contact EHRS before beginning the process.
- Keep water content as low as possible in these wastes; increases in water increases disposal costs-minimize dilutions.
- Do not allow heavy metals, pesticides, corrosives, or acutely hazardous chemicals to mix with the flammable liquids.
- Replace solvent-based inks in printing operation with soy-based inks. Soybean inks are non-toxic, recyclable, and low in volatile organic compounds.
- Use Paraclear instead of Xylene.
- Use Toluene or alcohols instead of Benzene
- Use detergent and hot water to clean items instead of solvents.

HALOGENATED SOLVENTS

Examples: chloroform, carbon tetrachloride, methylene chloride and trichloroethane.

Many halogenated solvents are carcinogenic, difficulty to dispose of, and can cost three times more to dispose of as compared to non-halogenated solvents. Making an effort to keep halogenated and non-halogenated solvents separate can reduce disposal costs.

Some suggestions for waste minimization include:

- Hydrocarbon solvents may serve in the place of their halogenated counterparts.
- Investigate the use of alternative non-halogenated solvents.
- Keep separate from acidic or alkaline waste streams.
- Minimize unnecessary dilution.
- If possible, keep separate from waste that contain heavy metals, pesticides, cyanides, or acutely toxic “P-listed: waste. These wastes tend to increase the costs of disposal due to the need for more complex waste treatment.
- Recycle or re-distill solvents (EHRS approval and monitoring required).

SOLVENT CONTAMINATED TOWELS AND RAGS

Solvent contaminated towels and rags can be sent to an approved laundering service for cleaning and reuse, rather than disposing of them as waste. The service will reuse the towels or rags until their useful life is reached or until they are contaminated beyond the vendor's ability to clean them, in which case they are typically incinerated. By using a shop towel service, the number of contaminated towels that need to be shipped as waste can be greatly reduced.

As of January 31, 2014, the EPA modified the hazardous waste management regulations under RCRA to conditionally exclude solvent-contaminated wipes from hazardous waste regulations provided that businesses clean or dispose of them properly. In order to be excluded from hazardous waste regulations, solvent-contaminated rags in these areas must be managed according to specific-management standards. Contact EHRS 215-707-2520 for technical guidance and assistance on the requirements.

PAINT-RELATED WASTES

Waste oil-based paints and solvents are hazardous waste due to their flammable and/or toxic properties.

Some suggestions for waste minimization include:

- When possible, substitute water-based paints.
- Minimize volume by reducing any unnecessary dilution.
- Use paints with less or non-toxic pigments.
- Do not contaminate the paint by mixing latex paints with non-latex paints or any other hazardous materials. Always reseal the containers to allow for recycling.
- Minimize inventory of paints and solvents by ordering based on immediate need.
- Use heat guns to remove paint rather than chemical solvents.
- Consolidate latex paint prior to submitting to EHRS for removal. Excess latex paint that has been completely dried can be disposed of in the regular trash.

UNKNOWN CHEMICALS

The generation of unknown chemicals results in an expensive waste disposal challenge. The disposal of unknown chemical can substantially increase the costs of disposal. Original chemical container labels should be kept on the containers until the chemicals are completely used and the containers no longer have any hazards related to its contents. When a chemical is transferred into secondary container, these containers should be labeled at a minimum with the chemical name and appropriate hazard warnings such as words, symbols, pictures, or a combination thereof, which provide at least general information regarding the chemical and physical hazards.

Some suggestions for waste minimization include:

- Keep all chemical containers labeled, including sample vials.
- Clean out stockpiles of old chemicals and products before they become "unknowns".
- Transfer chemicals to another individual or request proper disposal prior to an individual's departure.

P-LISTED CHEMICALS

Examples: Sodium Azide, Cyanide, Osmium Textroxide.

P-listed waste are chemicals that can be acutely toxic to humans and animals in very small amounts. Both the waste and the chemical bottle must be disposed of which becomes very costly. A listed of P-listed waste can be found in Appendix B- Acutely Toxic Chemical List.

Some suggestions for waste minimization include:

- Substitute P-listed chemicals with less toxic and more environmentally friendly chemicals
- Use Phenoxyethanol as a substitute for sodium azide.
- Sodium cyanide can be treated to yield sodium cyanate.
- Do not mix P-listed wastes with other waste as the whole then becomes P-listed.

HEAVY METALS

Examples: Cadmium, Barium, Chromium, Lead, Silver.

Some suggestions for waste minimization include:

- Eliminate the use of pigments containing heavy metals in art projects.
- Eliminate silver from waste streams in photography labs through EHRS approved and monitored silver recovery units.
- Eliminate experiments using heavy metals in teaching labs. Replace with iron, cobalt, sopper, etc.
- Avoid reagents or paints containing heavy metals.

MERCURY

Mercury can be found in elemental, organic, or inorganic forms. Most laboratory and hospital encounters with mercury are in thermometers, manometers, and mercury reagents. The EPA strongly encourages waste minimization techniques be applied to mercury because it is hazardous and extremely costly to dispose. The ideal management method is to recover mercury and ship for reclamation.

Some suggestions for waste minimization include:

- Survey your area for potential sources of mercury.
- Use water or calibrated oils instead of mercury for differential manometers.
- Replace mercury thermometers with non-mercury alternatives, such as alcohol or digital. If you must use mercury thermometers, purchase those with a Teflon coating.
- Use metal-oven thermometers instead of mercury thermometers in ovens.
- Use mercury-free compound alternatives in laboratories.
- Use mercury-free catalyst or simply let the reaction run longer.
- Do not use mercury thermometers as stirring rods.
- Use secondary containment under mercury containing devices.
- Keep mercury wastes separate from all other waste streams.

REACTIVE CHEMICALS

Examples: Tributyllithium, trichloromethylene.

Reactive chemicals are more expensive to dispose of since many times these chemicals have special storage requirements or become tool dangerous to handle. On some occasions an outside contractor may be called to remove the chemical. Reactive chemicals waste can be minimized through thorough planning of chemicals needed and proper estimation of chemical consumption rate.

CAUTION: It is important to check with EHRS before purchasing reactives or any extremely dangerous chemicals to see if they are capable of responding to an incident or managing any chemical waste.

Some suggestions for waste minimization include:

- Store chemicals in appropriate packaging, especially for reactive chemicals with short shelf life or peroxide forming chemicals.
- Use oldest stock first and prior to its expiration.
- Label chemicals with the date received, date opened, and date of expiration.

FORMALIN AND FORMALDEHYDE

Formaldehyde is a suspected human carcinogen, which is toxic, very irritating to the eyes, throat and breathing passages and can lead to dermatitis. Formaldehyde is also a sensitizer, so the more a person is exposed to it, the smaller a dose takes to have an effect on that person.

Some suggestions for waste minimization include:

- Minimize the volume of formaldehyde/formalin waste generated by eliminating any unnecessary dilution.
- Do not mix with other waste streams.
- Substitute ethanol, or commercial fixatives like CarosafeR or FormalternateR in place of formaldehyde/formalin for the storage of biological specimens.

V. REFERENCES

- US EPA Resource Conservation and Recovery Act (RCRA) Regulations 40 CFR 239-282.
- US EPA Pollution Prevention Act of 1990
- Pennsylvania Code Title Chapters 260-270 Hazardous Waste Management Regulations
- Temple University Chemical Waste Minimization and Pollution Prevention Program Document

APPENDIX A: Glossary

Best Management Practices: Methods or techniques found to be the most effective and practical means in achieving an objective (such as preventing or minimizing pollution) while making the optimum use of their resources.

Central Accumulation Area (CAA): Site designated by EHRS to be used for the accumulation of chemical waste prior to shipment to permitted disposal facilities.

CFR: Code of Federal Regulations

DEA: Drug Enforcement Agency

Electronic Waste: Includes electrical or battery operated devices, or appliances such as computers or lab equipment that require recycling or special disposal due to the presence of toxic metals or other contaminants.

EPA: Environmental Protection Agency

Hazardous Material: Any substance regulated by the Department of Transportation because the material poses an unreasonable rick to health, safety, and property during transport.

Hazardous Waste: listed or characteristic waste regulated for handling and disposal as defined by the EPA Resource Conservation & Recovery Act.

Non-Hazardous Waste: Waste that does not meet the definition of a RCRA hazardous waste; but may still be regulated as a hazardous material under Department of Transportation Regulation during transportation.

Non-Regulated Waste: Waste that does not meet the definition of a RCRA hazardous waste, and does not meet the definition of a Department of Transportation hazardous materials during transportation

PADEP: Pennsylvania Department of Environmental Protection

Polychlorinated Biphenyls (PCB) Waste: Waste contaminated with polychlorinated biphenyls more than 50 parts per million.

RCRA: Resource Conservation and Recovery Act

Satellite Accumulation Area (SAA): Satellite Accumulation Area (SAA) is the name given to the location where chemical waste are generated and stored prior to transport to a campus Central Accumulation Area (CAA) or to a permitted off-site destination.

TSCA: Toxic Substance Control Act

Universal Waste: Certain waste that meet the definition of a hazardous waste but have modified regulatory requirements that encourage recycling. Includes batteries, fluorescent light bulbs, mercury containing equipment and certain pesticides.

Universal Waste lamps: are lamps that due to the presence of toxic heavy metals such as mercury or lead, must comply with EPA and PADEP when disposed. These include, but are not limited to, fluorescent, high-intensity discharge (HID), neon, mercury vapor, high pressure sodium, and metal halide lamps. Note: incandescent bulbs, including halogen bulbs, do not container any of these heavy metals of concern and therefore not included in this definition.

Waste Chemical: Any expired, spent, or unwanted chemical or chemical mixture, including hazardous and non-hazardous wastes.

Waste Minimization: Procedures to minimize the volume and/or toxicity of hazardous waste produced at the University.

Waste Generators: Students, faculty, staff, visitors, and contractors working on behalf of Temple University that participate in any activity that generates chemical waste.

APPENDIX B: Acutely Toxic Chemical List

United States Environmental Protection Agency (EPA) Acutely Toxic Chemical Name	EPA Waste Code	CAS #
Acetaldehyde, chloro-	P023	107-20-0
Acetamide, N-(aminothioxomethyl)-	P002	591-08-2
Acetamide, 2-fluoro-	P057	640-19-7
Acetic acid, fluoro-, sodium salt	P058	62-74-8
1-Acetyl-2-thiourea	P002	591-08-2
Acrolein	P003	107-02-8
Aldicarb	P070	116-06-3
Aldicarb sulfone.	P203	1646-88-4
Aldrin	P004	309-00-2
Allyl alcohol	P005	107-18-6
Aluminum phosphide (R,T)	P006	20859-73-8
5-(Aminomethyl)-3-isoxazolol	P007	2763-96-4
4-Aminopyridine	P008	504-24-5
Ammonium picrate (R)	P009	131-74-8
Ammonium vanadate	P119	7803-55-6
Argentate(1-), bis(cyano-C)-, potassium	P099	506-61-6
Arsenic acid H_3AsO_4	P010	7778-39-4
Arsenic oxide As_2O_3	P012	1327-53-3
Arsenic oxide As_2O_5	P011	1303-28-2
Arsenic pentoxide	P011	1303-28-2
Arsenic trioxide	P012	1327-53-3
Arsine, diethyl-	P038	692-42-2
Arsonous dichloride, phenyl-	P036	696-28-6
Aziridine	P054	151-56-4
Aziridine, 2-methyl-	P067	75-55-8
Barium cyanide	P013	542-62-1
Benzenamine, 4-chloro-	P024	106-47-8
Benzenamine, 4-nitro-	P077	100-01-6
Benzene, (chloromethyl)-	P028	100-44-7
1,2-Benzenediol, 4-[1-hydroxy-2-(methylamino)ethyl]-, (R)-	P042	51-43-4
Benzeneethanamine, alpha, alpha-dimethyl-	P046	122-09-8
Benzenethiol	P014	108-98-5
7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-, methylcarbamate.	P127	1563-66-2
Benzoic acid, 2-hydroxy-, compd. W (3aS-cis)-1,2,3a,8,8a-hexahydro-1,3a,8-trimethylpyrrolo[2,3-b]indol-5-yl methylcarbamate ester (1:1)	P188	57-64-7
2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl)-, & salts, when present at concentrations greater than 0.3%	P001	81-81-2
Benzyl chloride	P028	100-44-7
Beryllium Powder	P015	7440-41-7

United States Environmental Protection Agency (EPA) Acutely Toxic Chemical Name	EPA Waste Code	CAS #
Bromoacetone	P017	598-31-2
Brucine	P018	357-57-3
2-Butanone, 3,3-dimethyl- 1-(methylthio)-,O-[(methylamino)carbonyl] oxime	P045	39196-18-4
Calcium cyanide	P021	592-01-8
Calcium cyanide $Ca(CN)_2$	P021	592-01-8
Carbamic acid, [(dibutylamino)-thio]methyl-, 2,3-dihydro-2,2-dimethyl-7-benzofuranyl ester	P189	55285-14-8
Carbamic acid, dimethyl-, 1-[(dimethyl-amino)carbonyl]-5-methyl-1H- pyrazol-3-yl ester.	P191	644-64-4
Carbamic acid, dimethyl-, 3-methyl-1(1-methylethyl)-1H-pyrazol-5-yl ester.	P192	119-38-0
Carbamic acid, methyl-, 3-methylphenyl ester.	P190	1129-41-5
Carbofuran.	P127	1563-66-2
Carbon disulfide	P022	75-15-0
Carbonic dichloride	P095	75-44-5
Carbosulfan	P189	55285-14-8
Chloroacetaldehyde	P023	107-20-0
p-Chloroaniline	P024	106-47-8
1-(o-Chlorophenyl)thiourea	P026	5344-82-1
3-Chloropropionitrile	P027	542-76-7
Copper cyanide	P029	544-92-3
Copper cyanide Cu(CN)	P029	544-92-3
m-Cumenyl methylcarbamate	P202	64-00-6
Cyanides (soluble cyanide salts), not otherwise specified	P030	
Cyanogen	P031	460-19-5
Cyanogen chloride	P033	506-77-4
Cyanogen chloride (CN)Cl	P033	506-77-4
2-Cyclohexyl-4,6-dinitrophenol	P034	131-89-5
Dichloromethyl ether	P016	542-88-1
Dichlorophenylarsine	P036	696-28-6
Dieldrin	P037	60-57-1
Diethylarsine	P038	692-42-2
Diethyl-p-nitrophenyl phosphate	P041	311-45-5
O,O-Diethyl O-pyrazinyl phosphorothioate	P040	297-97-2
Diisopropylfluorophosphate (DFP)	P043	55-91-4
1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexa-chloro-1,4,4a,5,8,8a,-hexahydro-,(1alpha, 4alpha,4abeta,5alpha,8alpha,8abeta)-	P004	309-00-2
1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexa- chloro-1,4,4a,5,8,8a-hexahydro-, (1alpha,4alpha, 4abeta,5beta,8beta,8abeta)-	P060	465-73-6

United States Environmental Protection Agency (EPA) Acutely Toxic Chemical Name	EPA Waste Code	CAS #
2,7:3,6-Dimethanonaphth[2,3-b]oxirene 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1 a alpha,2beta,2aalpha, 3beta,6beta, 6aalpha,7beta, 7aalpha)-	P037	60-57-1
2,7:3,6-Dimethanonaphth [2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aalpha,2beta,2abeta,3alpha, 6alpha,6abeta,7beta, 7aalpha)-, & metabolites	P051	72-20-8
Dimethoate	P044	60-51-5
alpha,alpha-Dimethylphenethylamine	P046	122-09-8
Dimetilan.	P191	644-64-4
4,6-Dinitro-o-cresol, & salts	P047	534-52-1
2,4-Dinitrophenol	P048	51-28-5
Dinoseb	P020	88-85-7
Diphosphoramide, octamethyl-	P085	152-16-9
Diphosphoric acid, tetraethyl ester	P111	107-49-3
Disulfoton	P039	298-04-4
Dithiobiuret	P049	541-53-7
1,3-Dithiolane-2-carboxaldehyde, 2,4-dimethyl-, O-[(methylamino)-carbonyl]oxime.	P185	26419-73-8
Endosulfan	P050	115-29-7
Endothall	P088	145-73-3
Endrin	P051	72-20-8
Endrin, & metabolites	P051	72-20-8
Epinephrine	P042	51-43-4
Ethanedinitrile	P031	460-19-5
Ethanimidothioc acid,2-(dimethylamino)-N-[[(methylamino) carbonyl]oxy]-2-oxo-, methyl ester.	P194	23135-22-0
Ethanimidothioic acid, N-[[(methylamino) carbonyl]oxy]-, methyl ester	P066	16752-77-5
Ethyl cyanide	P101	107-12-0
Ethyleneimine	P054	151-56-4
Famphur	P097	52-85-7
Fluorine	P056	7782-41-4
Fluoroacetamide	P057	640-19-7
Fluoroacetic acid, sodium salt	P058	62-74-8
Formetanate hydrochloride.	P198	23422-53-9
Formparanate.	P197	17702-57-7
Fulminic acid, mercury(2+) salt (R,T)	P065	628-86-4
Heptachlor	P059	76-44-8
Hexaethyl tetraphosphate	P062	757-58-4
Hydrazinecarbothioamide	P116	79-19-6
Hydrazine, methyl-	P068	60-34-4
Hydrocyanic acid	P063	74-90-8
Hydrogen cyanide	P063	74-90-8

United States Environmental Protection Agency (EPA) Acutely Toxic Chemical Name	EPA Waste Code	CAS #
Hydrogen phosphide	P096	7803-51-2
Isodrin	P060	465-73-6
Isolan.	P192	119-38-0
3-Isopropylphenyl N-methylcarbamate.	P202	64-00-6
3(2H)-Isoxazolone, 5-(aminomethyl)-	P007	2763-96-4
Manganese, bis(dimethylcarbamodithioato-S,S')-,	P196	15339-36-3
Manganese dimethyldithiocarbamate.	P196	15339-36-3
Mercury, (acetato-O)phenyl-	P092	62-38-4
Mercury fulminate (R,T)	P065	628-86-4
Methanimidamide, N,N-dimethyl-N'-[3-[[(methylamino)-carbonyl]oxy]phenyl]-, monohydrochloride	P198	23422-53-9
Methanimidamide,N,N-dimethyl-N'-[2-methyl-4-(methylamino) carbonyl]oxy]phenyl]-	P197	17702-57-7
Methanamine, N-methyl-N-nitroso-	P082	62-75-9
Methane, isocyanato-	P064	624-83-9
Methane, oxybis[chloro-	P016	542-88-1
Methane, tetranitro- (R)	P112	509-14-8
Methanethiol, trichloro-	P118	75-70-7
6,9-Methano-2,4, 3-benzodioxathiepin,6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide	P050	115-29-7
4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-	P059	76-44-8
Methiocarb.	P199	2032-65-7
Methomyl	P066	16752-77-5
Methyl hydrazine	P068	60-34-4
Methyl isocyanate	P064	624-83-9
2-Methyllactonitrile	P069	75-86-5
Methyl parathion	P071	298-00-0
Metolcarb.	P190	1129-41-5
Mexacarbate.	P128	315-18-4
alpha-Naphthylthiourea	P072	86-88-4
Nickel carbonyl	P073	13463-39-3
Nickel carbonyl Ni(CO)4, (T-4)-	P073	13463-39-3
Nickel cyanide	P074	557-19-7
Nickel cyanide Ni(CN)2	P074	557-19-7
Nicotine, & salts	P075	54-11-5
Nitric oxide	P076	10102-43-9
p-Nitroaniline	P077	100-01-6
Nitrogen dioxide	P078	10102-44-0
Nitrogen oxide NO	P076	10102-43-9
Nitrogen oxide NO_2	P078	10102-44-0
Nitroglycerine (R)	P081	55-63-0
N-Nitrosodimethylamine	P082	62-75-9
N-Nitrosomethylvinylamine	P084	4549-40-0

United States Environmental Protection Agency (EPA) Acutely Toxic Chemical Name	EPA Waste Code	CAS #
Octamethylpyrophosphoramide	P085	152-16-9
Osmium oxide OsO_4, (T-4)-	P087	20816-12-0
Osmium tetroxide	P087	20816-12-0
7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid	P088	145-73-3
Oxamyl.	P194	23135-22-0
Parathion	P089	56-38-2
Phenol, 2-cyclohexyl-4,6-dinitro-	P034	131-89-5
Phenol, 4-(dimethylamino)-3,5-dimethyl-, methylcarbamate (ester).	P128	315-18-4
Phenol, (3,5-dimethyl-4-(methylthio)-, methylcarbamate	P199	2032-65-7
Phenol, 3-(1-methylethyl)-, methyl carbamate.	P202	64-00-6
Phenol, 3-methyl-5-(1-methylethyl)-, methyl carbamate.	P201	2631-37-0
Phenol, 2,4-dinitro-	P048	51-28-5
Phenol, 2-methyl-4,6-dinitro-, & salts	P047	1534-52-1
Phenol, 2-(1-methylpropyl)-4,6-dinitro-	P020	88-85-7
Phenol, 2,4,6-trinitro-, ammonium salt (R)	P009	131-74-8
Phenylmercury acetate	P092	62-38-4
Phenylthiourea	P093	103-85-5
Phorate	P094	298-02-2
Phosgene	P095	75-44-5
Phosphine	P096	7803-51-2
Phosphoric acid, diethyl 4-nitrophenyl ester	P041	311-45-5
Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl] ester	P039	298-04-4
Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester	P094	298-02-2
Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl] ester	P044	60-51-5
Phosphorofluoridic acid, bis(1-methylethyl) ester	P043	55-91-4
Phosphorothioic acid, O,O-diethyl O-(4-nitrophenyl) ester	P089	56-38-2
Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester	P040	297-97-2
Phosphorothioic acid, O-[4-[(dimethylamino) sulfonyl]phenyl] O,O-dimethyl ester	P097	52-85-7
Phosphorothioic acid, O,O,-dimethyl O-(4-nitrophenyl) ester	P071	298-00-0
Physostigmine.	P204	57-47-6
Physostigmine salicylate.	P188	57-64-7
Plumbane, tetraethyl-	P110	78-00-2
Potassium cyanide	P098	151-50-8
Potassium cyanide K(CN)	P098	151-50-8
Potassium silver cyanide	P099	506-61-6
Promecarb	P201	2631-37-0
Propanal, 2-methyl-2- (methylthio)-, O-[(methylamino)carbonyl]oxime	P070	116-06-3
Propanal, 2-methyl-2-(methyl-sulfonyl)-, O-[(methylamino)carbonyl] oxime	P203	1646-88-4

United States Environmental Protection Agency (EPA) Acutely Toxic Chemical Name	EPA Waste Code	CAS #
Propanenitrile	P101	107-12-0
Propanenitrile, 3-chloro-	P027	542-76-7
Propanenitrile, 2-hydroxy-2-methyl-	P069	75-86-5
1,2,3-Propanetriol, trinitrate (R)	P081	55-63-0
2-Propanone, 1-bromo-	P017	598-31-2
Propargyl alcohol	P102	107-19-7
2-Propenal	P003	107-02-8
2-Propen-1-ol	P005	107-18-6
1,2-Propylenimine	P067	75-55-8
2-Propyn-1-ol	P102	107-19-7
4-Pyridinamine	P008	504-24-5
Pyridine, 3-(1-methyl- 2-pyrrolidinyl)-, (S)-, & salts	P075	54-11-5
Pyrrolo[2,3-b]indol-5-ol, 1,2,3,3a,8,8a-hexahydro-1,3a, 8-trimethyl-, methylcarbamate (ester), (3aS-cis)-.	P204	57-47-6
Selenious acid, dithallium(1+) salt	P114	12039-52-0
Selenourea	P103	630-10-4
Silver cyanide	P104	506-64-9
Silver cyanide Ag(CN)	P104	506-64-9
Sodium azide	P105	26628-22-8
Sodium cyanide	P106	143-33-9
Sodium cyanide Na(CN)	P106	143-33-9
Strychnidin-10-one, & salts	P108	157-24-9
Strychnidin-10-one, 2,3-dimethoxy-	P018	357-57-3
Strychnine, & salts	P108	157-24-9
Sulfuric acid, dithallium(1+) salt	P115	7446-18-6
Tetraethyldithio pyrophosphate	P109	3689-24-5
Tetraethyl lead	P110	78-00-2
Tetraethyl pyrophosphate	P111	107-49-3
Tetranitromethane (R)	P112	509-14-8
Tetraphosphoric acid, hexaethyl ester	P062	757-58-4
Thallic oxide	P113	1314-32-5
Thallium oxide Tl_2O_3	P113	1314-32-5
Thallium(I) selenite	P114	2039-52-0
Thallium(I) sulfate	P115	7446-18-6
Thiodiphosphoric acid, tetraethyl ester	P109	3689-24-5
Thiofanox	P045	39196-18-4
Thioimidodicarbonic diamide $[(H_2N)C(S)]_2$ NH	P049	541-53-7
Thiophenol	P014	108-98-5
Thiosemicarbazide	P116	79-19-6
Thiourea, (2-chlorophenyl)-	P026	5344-82-1
Thiourea, 1-naphthalenyl-	P072	86-88-4
Thiourea, phenyl-	P093	103-85-5
Tirpate	P185	26419-73-8

United States Environmental Protection Agency (EPA) Acutely Toxic Chemical Name	EPA Waste Code	CAS #
Toxaphene	P123	8001-35-2
Trichloromethanethiol	P118	75-70-7
Vanadic acid, ammonium salt	P119	7803-55-6
Vanadium oxide V_2O_5	P120	314-62-1
Vanadium pentoxide	P120	1314-62-1
Vinylamine, N-methyl-N-nitroso-	P084	4549-40-0
Warfarin, & salts, when present at concentrations greater than 0.3%	P001	81-81-2
Zinc cyanide	P121	557-21-1
Zinc cyanide $Zn(CN)_2$	P121	557-21-1
Zinc, bis(dimethylcarbamodithioato-S,S')-,	P205	137-30-4
Zinc phosphide Zn_3P_2, when present at concentrations greater than 10% (R,T)	P122	1314-84-7
Ziram	P205	137-30-4