# REGULATED WASTE MANUAL

University of Houston Department of Environmental Health & Life Safety

Revised 2017-12-21

# Contents

# Emergency (and non-emergency) contacts

## In case of emergencies

In emergencies, University of Houston Police Dispatch will notify both emergency responders from outside the University as well as EHLS. If an emergency warrants or could warrant evacuation of a building or area for safety purposes, first activate the fire alarm, then proceed to a safe area if possible, and call UHPD at 713-743-3333.

## Non-emergency contacts

### Environmental Health & Life Safety

EHLS office hours are 8:00 AM through 5:00 PM Monday through Friday with closures for University Holidays. After hours, EHLS maintains a 24-hour on call rotation facilitated by University of Houston Police.

For questions and routine business regarding hazardous waste, laboratory safety, general safety, and fire marshal issues, contact EHLS via

> Email: ehs@uh.edu or fire@uh.edu
> Phone: 713-743-5858

Alternatively, to contact a specific staff member or office, please visit http://www.uh.edu/ehls/about/staff/ and select the appropriate group from the menu.

Hazardous waste pickup requests are submitted online at http://www.uh.edu/ehls/waste/pickup/.

### University of Houston Police

University of Houston Police play an integral role to responding to every emergency on campus. They facilitate a 24-hour on call rotation of EHLS staff, and coordinate emergency response with other agencies such as the City of Houston.

> Phone: 713-743-3333

### University of Houston Facilities Services

University of Houston Facilities Services provides numerous services to the University community and plays an integral role in responding to issues with infrastructure and equipment at the University. Contact is provided through the Facilities Services Call Center. More information on appropriate contact methods is located at http://www.uh.edu/facilities-services/services/fix-it/.

> Phone: 713-743-4948

### University of Houston Health Center

The University Health Center provides routine medical care and limited first aid in the event of an accident or incident. If emergency care is required, utilize emergency transportation such as an ambulance or if it is safe to do so, ask a colleague for assistance in transport to the nearest emergency room. More information on appropriate contact methods is located at http://www.uh.edu/healthcenter/about_us/contact_us.html.

> Phone: 713-743-5151

## University of Houston College of Optometry

The College of Optometry can provide guidance and limited care for injuries relating to the eyes, but lacks facilities for other emergency care. In case of an ocular emergency the Ocular Diagnostic and Medical Eye Service.

Phone: 713-743-2010

## University of Houston Risk Management

The Office of Risk Management manages the Workers Compensation Program for University personnel. Contact this office for any injuries involving employees. More information on filing of workers compensation claims is available at http://www.uh.edu/af/riskmanagement/workerscomp.htm.

Phone: 713-743-0414

## Getting started

In a strictly technical sense, everything that the University or its employees discard is regulated. As a result of the hard work and dedication of the University's Recycling and Solid Waste team, disposal of refuse is taken for granted as a service provided to the university community. The purpose of this manual is to provide guidelines for the generation, accumulation, and disposal of material that is regulated beyond what is provided by the university in this capacity.

Waste in this case is regulated primarily by its physical and chemical qualities and identity, the processes that generated the waste, and the university business (activity) that generated the waste. These regulations seek to protect human health and the environment by preventing the adverse effects that would result from disposal of these further-regulated materials as normal refuse.

This manual lists prohibited actions, the responsibilities of individuals and groups at the University, general procedures for emergencies, information for the identification and management of wastes that cannot be handled as refuse, guidelines for the management of these wastes, and procedures for the safe, ethical, and compliant disposal of such materials.

In order to best understand the manual, an understanding of prohibited acts as well as responsibilities will help users in determining the scope of their practices and the requirements for compliance commiserate with their activities. From these sections, the referenced requirements further in the manual can be reached. Listings of materials that are regulated under this manual may provide further context as to the requirements for users and can be found throughout the appropriate sections.

## Refuse

Whether you accept this fact or not, even the materials that you place into a trash can every day are regulated in some sense- it would be illegal and unethical to dump them in your street for instance. Refuse is a term that refers to both wet and dry things that are wastes. It does not refer to construction debris (rubble). Generally, this means that if you'd normally put it in a trash can and allow it to be put into a dumpster, and eventually sent to a landfill then it is refuse.

When you're managing waste from laboratories, shops, workplaces, and even food service locations most of the waste is regulated only as refuse- it would be illegal to dump it in the street or in a park, it should not be allowed to generate odors that impact nearby right-of-ways or private property.

When something cannot be managed as refuse, then it requires special handling to dispose of. This could mean that an object is simply too big to be sent to the landfill that the University would normally send its refuse to, or it could mean that it is a reactive waste that would cause a fire if it is exposed to air. Many everyday items cannot be managed as refuse such as cell phone batteries, used motor oil, or hot ashes from a charcoal grill.

EHLS can help you with many of these items that are not regulated only as refuse.

## Prohibited acts

### Unsafe or unlawful acts

Generating, storing, and accumulating waste all fall under various other regulations (and manuals) that govern these actions. The requirements of these documents apply equally to wastes as to other chemicals and processes covered. Specifically, it is prohibited to use, handle, or store materials covered by this manual in a way that is prohibited or would be prohibited for other materials sharing the same characteristics were it not a waste.

Several examples of this principle include:

> Generally, it is prohibited to store flammable liquids outside of a listed flammable storage cabinet in the workplace. It would be similarly prohibited to store flammable liquids that are a waste outside of a listed flammable storage cabinet as well.
>
> Exposure of workers to hazardous substances beyond acceptable limits, or in a way that is likely to cause death or serious harm to employees is prohibited. It would similarly be prohibited to conduct business in a similar manner if the hazardous substance is also a waste.
>
> Storage of strong acids in unlined steel drums is prohibited. Similarly it would be prohibited to store (or accumulate) wastes with corrosive properties in an unlined steel drum.

As a general guideline, if you could not do something with a product or material due to safety or legal concerns, you could not do the same thing with the waste material. Conversely, just because something is allowable with an unused product does not necessarily allow it once a material becomes a waste.

### Unpermitted treatment

Actions taken to reduce or eliminate the hazard of a material after it has already become a waste may be unlawful. This is because specific performance requirements and limitations are required to be met by treatment processes in order to ensure that they are protective of human health and the environment. In many cases, traditional processes such as bench-top neutralization of corrosive waste may be allowable. In order to reduce the regulatory burden on the university community, EHLS will issue broad permits through this manual and its appendices or through user-specific standard operating procedures to ensure that any treatment is lawful, compliant, and protective of human health and the environment.

## Emergency response

Spills and releases happen, and in many cases, they are handled in ways the result in treatment that would be considered “unpermitted” under existing regulation. Treatment that is required to protect human health and the environment as part of response to an emergency or a spill is expressly permitted and will not result in adverse administrative action.

If you need to use some sodium metabisulfite to your piranha solution spill, just do so as safely as possible within the scope of your training. If you haven’t received training on how to handle a spill, then you should not be handling a spill. If you’ve received training on using hypochlorite bleach to mitigate the odorous effects of a spill of 1-butanethiol all that we ask is that you wear appropriate personal protective equipment and use engineering controls if available.

If you’re wondering what personal protective equipment and engineering controls are, check out our general laboratory safety course online to learn more.

Several examples of this principle include:

> Hydrochloric acid solutions diluted until their pH is acceptable for drain disposal (according to City of Houston standards) never really had the hazard treated, just hidden by a larger volume of another material.
>
> Unused containers of flammable solvents past their expiration date left open and allowed to evaporate never really had their hazard treated, just shifted to another medium (air).
>
> Lead-contaminated sand blasting grit rinsed with nitric acid to remove the lead from the grit shifted the lead to a different (and arguably more hazardous) material and now both the grit and the acid may require regulated disposal.

Generally, if it is not in this manual, in another EHLS manual, on the EHLS website's list of permitted processes and standard operating procedures, or in an SOP approved for your lab or shop, then you should not be doing it if the purpose is to eliminate or minimize a hazard in your waste. This may sound counterintuitive, but there is a process included in this manual for labs, shops, departments, and individuals to request a review and approval of these procedures.

### Unpermitted disposal

Disposal of wastes is not simply limited to depositing material into a dumpster. It also includes treating materials in a way that indicates they are no longer wanted or valued (such as storing containers piled in a box), abandoned (such as left in a lab or shop that is no longer being occupied), used in a way that constitutes disposal (taking a container of spent acetone on a camping trip to use for lighting camp fires), or several other conditions. Approved disposal methods are included in this manual, and other procedures for disposal may be included in future updates to this manual, on the EHLS website's list of permitted processes and standard operating procedures, or in an SOP approved for your lab or shop. Examples of unpermitted disposal include:

> Venting toxic gas cylinders into a fume hood to allow them to reach atmospheric pressure.
>
> Applying pesticides in excess of manufacturer recommendation to empty the whole container instead of leaving residue.
>
> Pouring excess solvent into absorbent material in order to empty the container for disposal.

## Disposal

Generally, if what you're doing results in "getting rid of" a material that would be considered a regulated waste if you didn't "get rid of it", and what you're doing to "get rid of" the material isn't in line with how one would normally use the material, then you probably shouldn't be doing it. There are some situations where these actions could be allowable, but in order to reduce the regulatory burden on the university community EHLS utilizes a permit system to control and regulate these actions.

## Regulatory burden

Generators of hazardous waste are responsible for the proper characterization of their wastes. That means everyone from the postdoc chemist to the machine shop worker must know and understand their waste sufficiently to determine whether it is a hazardous waste (by regulation), to know why it is regulated such as specific chemicals or processes that caused it to be, and any exceptions they're using to ease this burden. If that seems like a lot for an undergraduate chemistry student, or a research lab then we're on the same page. EHLS works to reduce the regulatory burden to generators of regulated wastes at the University. Laboratories managed under this new regulatory program can handle all of their wastes as hazardous and not be held responsible for the improper characterization later- EHLS can handle the characterization for them.

## Recoupment

University entities that do pay for the cost of disposal and violations are not prohibited from seeking to recoup excess costs incurred through violations of this manual by generators.

Leaving containers of material (that would qualify for regulation by this manual) next to or inside a container that is normally picked up for disposal as refuse.

# Responsibilities

## Dean, director, and head of academic and administrative unit responsibilities

Deans, directors, and heads of academic and administrative units have the primary responsibility for the health and safety of their staff and students. They directly and indirectly provide funding for the activities of their employees and bear supervisory and managerial responsibility for those employees as well as the workplaces, shops, and laboratories in which they conduct such business. Each college and department within the University must assure that personnel who generate regulated wastes have received the required training for the scope of their work and are complying with University policy regarding waste management. Special sessions can be arranged for specific departments if requested. When graduate students, faculty, or staff members complete their work and prepare to leave the University, arrangements for the proper disposal of any remaining waste must be made prior to his/her departure. Colleges and departments can be held responsible for the increased cost of handling and disposal of unknown and time-sensitive chemicals that require additional testing, research, or precautions in handling and transportation where the cost cannot be recouped from the principal investigator.

## Principal investigator, safety designee, and supervisor responsibilities

Principal investigators, safety designees, and supervisors are in charge of supervising laboratories, shops, and workplaces and have direct supervisory or managerial responsibility for their employees, the work that their employees perform, and the laboratories, shops, and workplaces that they utilize to accomplish this work. The work performed by employees of these individuals is considered to have implicit approval based on the assumption that individuals in these roles perform their duties with due diligence. It is also generally held true that they occupy a role as mentor for their employees and in this role bear responsibility for upholding safety standards and regulatory compliance in their own action. Adhering to best practices and general standards of conduct insure not only a better safety culture, but also that workers and students as they grown in role and responsibility will reflect favorably on their past employment and work for those individuals and for the University. Principal investigators will be held responsible for the increased cost of handling and disposal of unknown and time-sensitive chemicals that require additional testing, research, or precautions in handling and transportation.

## Worker and student responsibilities

Workers and students that generate regulated waste at the University bear primary responsibility for understanding the processes that generate such wastes and properly conducting these processes so as to generate, accumulate, and request removal of those wastes in a safe and compliant manner. Reading and understanding the physical and chemical properties of the materials that they will be using and the wastes that will be created, documenting this knowledge and testing, and imparting this information on labels and in records is a requirement of these individuals. Reporting unsafe acts, near misses, incidents, spills, releases, and accidents are also responsibilities at this level. Every individual using hazardous material is responsible for becoming familiar with emergency response procedures for their workplace and for the hazardous materials that they will be working with.

## Escalation policy

The most current escalation policy regarding regulated waste and safety issues is available on the EHLS website.

# Emergencies and near-misses

## Spills and releases

It is the responsibility of each individual using hazardous material to become familiar with the emergency response procedures, if any, which govern his or her facility.

The following general rules should be followed in the event of a major (i.e. greater than 5 gallons of a typical solvent; much less for more toxic materials) hazardous materials spill or other emergency.

1. Activate the fire alarm if necessary, for the building

   Be familiar with how to initiate emergency evacuation of a building. If the incident could threaten the health of individuals in the building, activate the alarm.

2. Call for help, and call UH Police at 3-3333 or 911 for outside emergency services if necessary

   UH Police are available at all times and serve as the on-call function for EHLS personnel trained to respond to spills. They are also able to coordinate emergency response with outside agencies. Get as much information as can safely be obtained about the chemical. If possible, locate a safety data sheet. Convey this information as accurately as possible to UH Police including the nature and location of the spill, the approximate volume and source of the spill (if known), any other possible hazards from the spill, and whether there are injuries requiring medical assistance. Stay on the line if possible or leave contact information.

3. Attend to life-threatening injuries

   Once in a safe place, address any injuries that can be safely addressed. The primary concern in the event of an emergency is the protection of life and health.

4. Prevent access to the area

   Barricades, signage, or other means of preventing inadvertent access to the area and possible exposure must be emplaced if it is safe to do so. In many cases UH Police are able to provide access control if they are contacted regarding the spill.

5. Contain the spill to prevent release to the environment

   If the spill can be safely contained, or the source of the spill isolated, prevent release to the sanitary sewer system, to the storm sewer, and to the ground. Do not jeopardize personal safety to accomplish this.

6. Initiate material-specific clean-up procedures

Environmental Health and Life Safety can assist in spill cleanup that is beyond the capabilities of laboratory personnel. Responsibility for spills and their remediation still belong to the individual and their department.

7. Report the spill to EHLS if it has not already been reported

   Spills and releases of regulated material (even if it is not a waste before the spill or release) must be reported immediately to EHLS, even if the spill is addressed by the laboratory or department.

### Near misses, incidents, and accidents

Reporting of near misses, incidents, and accidents is required in all cases, even if the event is handled only by the laboratory, shop, or department. Failure to report near misses, incident, and accidents to EHLS is a violation of UH Policy.

## Identifying regulated wastes and activities

### Chemical wastes

The handling and identification of chemical wastes as either "unwanted materials", "hazardous waste", or "regulated waste" determines the regulatory requirements for the generator and depends on where the waste was generated as well as certain characteristics. Laboratories are able to handle their waste under a different regulatory status to better reflect their operations. Waste generated anywhere other than a laboratory may be "hazardous waste" or another regulated waste, both with their own sections of this manual.

### Laboratory activities

The University's Main Campus must manage chemical wastes from laboratories as "unwanted materials" in order to facilitate the conduct of teaching and research laboratories in a compliant manner. Effective January 1, 2018 the University will manage waste from laboratories under a new set of regulatory rules. Activities in accordance with these provisions for laboratories must begin on January 1, 2018. All activities determined to be laboratories must manage their chemical waste as "unwanted materials" and may not manage their chemical waste as "hazardous waste" after June 30, 2018. Laboratories for the purposes of managing waste and unwanted materials include:

- Teaching and instructional laboratories
- Research laboratories
- Diagnostic laboratories (in healthcare teaching settings)
- Photography laboratories (for teaching)
- Art studios (for teaching)
- Shops such as machine shops where the purpose of the shop is teaching
- Chemical stockrooms and preparatory laboratories (solely and directly supporting teaching or research)
- Field laboratories

Some activities would specifically exclude an activity from managing waste as unwanted material and would need to manage their chemical waste as Hazardous waste, examples of this are:

- Laboratories, pilot plants, and shops serving a commercial function
- Diagnostic laboratories not associated with the teaching of healthcare functions
- Art studios not used for the purpose of teaching or researching art
- Photographic laboratories not used for teaching photographic techniques and not used in direct support of teaching or researching activities
- Stockrooms, storerooms, and other facilities for managing chemicals and chemical products that are used (even in part) for purposes other than supplying research or teaching activities

All waste materials from laboratories that are not listed on the EHLS website's list of approved disposal methods are considered "Unwanted Materials" and must be managed according to the provisions of this manual until EHLS is able to perform a regulatory determination on the material. EHLS will continue to expand the list of approved disposal methods to include substances commonly disposed of by laboratories that can be disposed of as refuse, or through other processes more convenient to laboratories.

Unwanted materials that meet the requirements for identification of biological wastes, radioactive wastes, or any of the other regulated wastes identified in this section ("Identifying regulated wastes and activities") are managed as required by those identifiers. Some of these identifiers may require parallel management under multiple regulations. Some examples of this circumstance include:

> Ethidium bromide gels that contain synthetic nucleic acids are managed as biological waste and as unwanted materials in the laboratory.
>
> Ethidium bromide gels that contain synthetic nucleic acids with radioactive phosphorus used as a tracer are managed as radioactive waste, biological waste, and as unwanted material.

In most cases, it is possible to follow all of these regulations in parallel while maintaining the most stringent requirements of each; however, in some cases they may conflict. Activities that generate waste falling into multiple management categories will benefit from contacting EHLS for clarification in the case that conflict between the requirements exists.

## Is my workplace a laboratory?

These categories are defined by regulation and may not be all-encompassing. Assistance is available from EHLS in determining whether an activity must manage their waste as "unwanted materials" or as "hazardous waste".

There is no choice available for the clearly defined categories of laboratories included in the regulation- every laboratory at UH Main Campus is included in this plan.

## Are there any exclusions?

Energy Research Park, the Coastal Conservation Center, and other campuses are not included in this plan and must continue to manage their laboratory chemical wastes as Hazardous Waste until notified otherwise.

## Hazardous wastes (chemical waste from non-laboratory activities)

Waste materials that aren't generated in laboratory activities (further specified in the previous section) are subject to regulation as hazardous waste. Generally, it is acceptable to treat any waste chemical as hazardous waste so long as limits and accumulation requirements are met; however, it is not always economical. EHLS provides on its website a list of approved disposal practices that allow employees to find the best option for their materials. If there is not an approved disposal practice, the material you need to dispose of may be a hazardous waste, or it may fall under the list of other regulated wastes. To determine if a waste is a hazardous waste and it is not listed under the disposal practices website you'll need to see if it matches any of the following criteria:

- Ignitability
- Corrosivity
- Reactivity
- Toxicity
- Listing

More information on each of the criteria above area is available in subsequent sections.

### If it isn't a hazardous waste, then what do I do?

Hazardous waste characteristics cover a very narrow set of chemicals, and is not all-encompassing. Many chemicals that are not regulated as hazardous wastes could harm workers or the environment if disposed of improperly.

Check the section for other chemical wastes in this manual, the EHLS website, manufacturer literature, and if all else fails contact EHLS for further guidance on the proper disposal of your wastes.

### *Ignitability characteristic*

Ignitable wastes can create fires under some conditions, are spontaneously combustible, or have a flash point less than 60 °C (140 °F). Any of the following circumstances would make a waste ignitable:

- Liquids with a flash point less than 60 °C (140 °F)
- Non-liquids capable at standard temperature and pressure of causing a fire through friction, absorption of moisture, or spontaneous chemical changes
- Compressed gases classified as a DOT hazard of 2.1. This is normally indicated on the SDS.
- Oxidizers (readily contribute oxygen to stimulate the combustion of organic matter).
- Organic peroxides (organic compounds containing the bivalent O-O structure which may be considered a derivative of hydrogen peroxide where one or more of the hydrogen atoms has been replaced by organic radicles.

### *Corrosivity characteristic*

For the purposes of classification as a hazardous waste, only liquids are considered. The University requires regulated disposal under other requirements for other liquids, solids, and gases. Any of the following circumstances would make a waste corrosive:

- Aqueous liquids with a pH less than or equal to 2, or greater than or equal to 12.5
- Any liquid that corrodes steel (at a rate greater than 6.35mm/year under test conditions)

### *Reactivity characteristic*

Reactivity characteristics are more subjective than many other criteria for characterizing hazardous waste. Generally, if the material matches or approaches any of the following characteristics it should be treated as a reactive waste:

- It is normally instable and readily undergoes violent change without detonating
- It reacts violently with water
- It forms potentially explosive mixtures with water
- When mixed with water it generates toxic gases, vapors, or fumes
- It is a cyanide or sulfide bearing waste
- It is capable of detonation or explosive reaction if subjected to a strong initiating source or heated under confinement
- It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure

### *Toxicity characteristic*

The toxicity characteristic applies to wastes that may leach any of the following contaminants above the listed levels under specific test conditions. Generally, this testing is beyond the means of generators, and so for ease of compliance it is acceptable to estimate whether this characteristic applies based on the maximum amount that could leach from a substance.

| Contaminant | Regulatory Level (mg/L) |
|---|---|
| Arsenic | 5.0 |
| Barium | 100.0 |
| Benzene | 0.5 |
| Cadmium | 1.0 |
| Carbon tetrachloride | 0.5 |
| Chlordane | 0.03 |
| Chlorobenzene | 100.0 |
| Chloroform | 6.0 |
| Chromium | 5.0 |
| o-Cresol | 200.0 |
| m-Cresol | 200.0 |
| p-Cresol | 200.0 |
| Cresol | 200.0 |
| 2,4-D | 10.0 |
| 1,4-Dichlorobenzene | 7.5 |
| 1,2-Dichloroethane | 0.5 |
| 1,1-Dichloroethylene | 0.7 |
| 2,4-Dinitrotoluene | 0.13 |
| Endrin | 0.02 |
| Heptachlor (and its epoxide) | 0.008 |
| Hexachlorobenzene | 0.13 |

| Contaminant | Regulatory Level (mg/L) |
|---|---|
| Hexachlorobutadiene | 0.5 |
| Hexachloroethane | 3.0 |
| Lead | 5.0 |
| Lindane | 0.4 |
| Mercury | 0.2 |
| Methoxychlor | 10.0 |
| Methyl ethyl ketone | 200.0 |
| Nitrobenzene | 2.0 |
| Pentachlorophenol | 100.0 |
| Pyridine | 5.0 |
| Selenium | 1.0 |
| Silver | 5.0 |
| Tetrachloroethylene | 0.7 |
| Toxaphene | 0.5 |
| Trichloroethylene | 0.5 |
| 2,4,5-Trichlorophenol | 400.0 |
| 2,4,6-Trichlorophenol | 2.0 |
| 2,4,5-TP (Silvex) | 1.0 |
| Vinyl chloride | 0.2 |

A basic procedure for estimating the leaching potential of a waste is to imagine the highest concentration that could be present in 50g of the material. If the maximum mass of contaminant present in the 50g sample is greater than the regulatory limit, then it should be treated as a toxicity characteristic hazardous waste unless other testing is available to refute this estimate. Any testing must be submitted to EHLS for approval prior to disposal.

### *Listed hazardous wastes*

Several lists of materials that are regulated as a hazardous waste also exist and are included in the appendix of this document. Also included is the regulatory reference in order to determine if the list is the most current available as they are changed periodically as a result of regulatory action.

| List name | Regulatory Reference | Appendix | Applicability |
|---|---|---|---|
| F-list | 40 CFR 261.31 | Appendix J | This list is specific to the listed process, such as degreasing however, it is acceptable to consider a waste a hazardous material for the purposes of accumulation solely based on the inclusion of a chemical constituent of the waste in this list. |
| K-list | 40 CFR 261.32 | Appendix K | Generally, this is not applicable to the University; however, the industries listed may at some point be involved. It is applicable for materials generated by the listed industries and accepted by the University such as wastes from inorganic pigment production accepted by the University for testing or analysis. |
| P-list | 40 CFR 261.33(e) | Appendix L | Specific to unused chemical products, however due to the complicated nature of "used" and "unused" in this context, it is required that all wastes bearing any of these components are managed as hazardous wastes. Inclusion of any chemical component in this list also qualifies the waste for management as an "acutely hazardous waste", which carries additional regulatory requirements. |
| U-list | 40 CFR 261.33(f) | Appendix M | Specific to unused chemical products, however due to the complicated nature of "used" and "unused" in this context, it is required that all wastes bearing any of these components are managed as hazardous wastes. |

## Other chemical wastes

Non-laboratory activities may generate wastes that are not specifically included as hazardous wastes but due to other regulations or concerns about workplace safety and legal liability must be managed as regulated wastes. These are addressed in the section “Other regulated wastes and their management”.

## Biological wastes

Biological wastes pose a hazard through the transmission of disease by the disease-causing agent itself (bacteria, virus, prion, amoeba, etc.), through the risk of augmentation of the pathogenic potential of disease-causing agents (such as by the transmission of recombinant or synthetic nucleic acid molecules), or by creating conditions amenable to such consequences. These wastes are addressed through several regulations and institutional rules and may be generally addressed as “biological waste”, “biohazardous waste”, or “red bag waste”. Biological waste can be identified by the following descriptors:

### In vivo or ex vivo recombinant or synthetic nucleic acid molecules

Recombinant or synthetic nucleic acid molecules require special disposal practices. This requirement extends to organisms or disease-causing agents bearing these molecules. This serves to prevent release of these nucleic acids. Work with these materials requires review by the Institutional Biosafety Committee, and such work will be identified. Materials originating from such work that meet the definition of waste are biological wastes.

### Microbiological waste

Microbiological waste consists of material that is discarded, abandoned, unwanted, or no longer usable for its purpose, specifically:

- Cultures and stocks of infectious agents (or agents with recombinant or synthetic nucleic acid molecules)
- Cultures of specimens from medical, pathological, pharmaceutical, research, clinical, and other laboratories
- Live and attenuated vaccines (excluding empty containers)
- Used culture dishes (excluding those that will be reused)
- Used transfer, inoculation, or mixing devices (excluding those that will be reused)

### Pathological waste, blood, and other potentially infectious material

Pathological waste refers to the following materials when originating from humans, including but is not limited to:

- Body parts
- Tissues or fetuses
- Organs
- Bulk blood and body fluids (over 100 mL aggregated over all containers)
- Laboratory specimens of blood and tissue after completion of laboratory examination
- Remains of human bodies donated for the purposes of teaching or research after the completion of such activities

Blood with regard to this classification refers to the following materials in any volume from humans or where the source cannot be identified:

- Blood
- Blood components
- Products made from blood

Other potentially infectious material refers to material from humans, experimental animals, or where the source cannot be identified, and includes:

- Semen
- Vaginal secretions
- Cerebrospinal fluid
- Synovial fluid
- Pleural fluid
- Pericardial fluid
- Peritoneal fluid
- Amniotic fluid
- Saliva (in dental procedures)
- Any bodily fluid visibly contaminated with blood
- All bodily fluids in situations where it is difficult or impossible to differentiate between body fluids
- Any unfixed tissue or organ other than intact skin
- HIV-containing cell or tissue culture, organ cultures
- HIV- or HBV-containing culture media or other solutions

### Animal waste

Animal waste refers to the following materials from animals that have intentionally been exposed to pathogens or disease-causing agents:

- Carcasses (not including chemically fixed carcasses that are managed as unwanted materials)
- Body parts
- Blood
- Blood components
- Products made from blood
- Bedding (including feces and urine not directly deposited into bedding)

### Other healthcare-related biological waste

Materials that come into contact with bodily fluids not specifically covered in other classifications as well as the bodily fluids themselves that are removed from the point of collection and leave the possession of the person giving the sample also require regulated disposal. Some existing examples include:

> Urine sample cups that are removed from the bathroom in which they are collected for analysis in a laboratory down the hall
>
> Saliva swabs that are removed from the location in which the sample is taken and analyzed at the University

This would not include

> Urine sample cups that are collected and hand-carried by the person giving the sample to a location for colorimetric results to be read prior to returning to the same bathroom to flush the sample and place the empty container in the trash

Saliva swabs that are sent to an off-site laboratory for analysis (because they would not be waste until they are analyzed by the off-site lab)

## Sharps

Sharps, when contaminated are considered biological waste and must be disposed of in sharps containers. Even unused sharps may require additional disposal precautions detailed in the section "Other regulated wastes and their management". A detailed list of items considered to be sharps and other attributes that could regulate an item as such is available in the same section of this manual.

## Biologicals

Biologicals are compounds isolated from organisms. Generally, they are regulated as unwanted material or hazardous waste unless they have not been isolated from the organism that they were extracted from. Commercially purchased biologicals are managed as unwanted material or other types of chemical waste (such as hazardous waste).

## Biological waste minimization

Biological waste is one of the largest regulated waste streams at the University. Many items are disposed of as biological waste that can easily be disposed of as refuse. These items include empty containers of culture media and stock solutions that were not in contact with pathogens or infectious agents, packing materials from the shipping, receiving, or commercial sale of materials used in the laboratory, and unused nutrient broths, gels, and other media.

## Radioactive wastes

Radioactive materials possessed under sublicense, naturally occurring radioactive material, technologically enhanced radioactive material, and uranium and thorium salts are regulated for possession and disposal at the University. Uncertainties about whether a material is regulated for disposal can be addressed by contacting EHLS.

## Other regulated wastes and their management

### Empty containers

Empty containers must be rinsed in a way that removes the hazard of their residue prior to disposal, uncapped or otherwise left permanently open, and the labels of the container must be defaced in a way that would indicate to landfill operators, recycling personnel, and law enforcement officials that the hazard has been removed. If the container never held substances that pose a hazard to human health or the environment, the empty containers may be disposed of as refuse. The specific requirements of this provision are:

#### *Rinsing of empty containers*

Containers of material that poses a hazard must be rinsed in a way that removes the hazard of the material that was inside as well as that of any residue or vapors prior to disposal as refuse. This may require the use of appropriate solvents if the material is difficult to remove or quenching procedures if the material reacts to air or water. In addition to this general provision, the following additional steps must be taken for containers of some materials or types:

- Containers that held any of the listed materials (as a waste, unused product, or otherwise) in Appendix J, L, or M must have the rinse collected and sent for disposal through EHLS.
- Containers rinsed with solvents that present a hazard (ignitable or flammable, corrosive, or reactive) must have the rinse collected and sent for disposal through EHLS.
- Containers that held any of the listed materials (as a waste, unused product, or otherwise) in Appendix L must be sent for EHLS for disposal without rinsing. Any rinse of the container (up to the first three rinses) must also be collected and sent to EHLS for disposal if the container is rinsed for the purpose of reuse.
- Containers that held material determined to require quenching prior to disposal must have the wastes from the quenching process collected and sent for disposal through EHLS.

#### *Defacing labels of empty containers*

Containers, once rinsed, must have their labels defaced in a way that indicates to landfill operators, recycling personnel, and law enforcement officials that the contents of the container are no longer hazardous. The two methods most preferable involve the

## What is empty?

Empty is defined differently in several regulations that concern regulated waste. If you're keeping a container of regulated waste in your laboratory, shop, or workplace and want to be sure that it is empty and won't get you in trouble, then you'll just want to be sure that all residue that can be removed using customary means (tipping it upside down for most containers, pumping it out for larger ones) has been removed, and that there isn't a label indicating that it contains a regulated waste. If it is an acutely hazardous waste as defined in this manual, then it won't be empty until you've triple rinsed it and collected the rinse for EHLS to remove.

If you have a container of any chemical that can present a hazard even when empty due to the accumulation of vapors, or due to other concerns such as being toxic even in small quantities, then it will need to be rinsed or purged in such a way as to remove this hazard.

If you're disposing of a container as refuse, then it needs to meet the definition of empty for wastes above, and then it needs to also be purged or rinsed in a way that removes the hazard posed by any residue- it must be clean. Of course, that rinse must go to EHLS unless a standard operating procedure for sanitary sewer disposal has been approved by EHLS for the chemical.

## Do I have to?

Some materials and wastes pose such a hazard that it is not economically feasible for labs to rinse them to make them empty. Dioxins, Furans, PCBs, and mercury are some examples. Some acutely hazardous wastes may also fall into this category. Contact EHLS for information if you're using these materials so that we can establish a procedure for the safe and economical disposal of these materials.

removal of the label or covering of the label. These methods render the label completely unreadable and suffice as a means of indicating that the labels are not indicative of the container's content. Other means that may be acceptable are cross-hatching of information on the label such as the chemical name and indicated hazards (including graphical indicators), covering of these elements of the label with tape or other "empty" labels, or the complete destruction of the container rendering the labels unreadable (such as with a glass crushing machine). It is a violation of UH policy to deface the label of a container that is not empty without providing and affixing a label indicative of the contents of the container.

### *Rendering empty containers permanently open*

For many containers, the simple removal of caps or other closures is sufficient to render the container open. For containers over 20L in volume, additional steps such as puncturing the bottom of the container (or sending it for recycling of the container's material) are required. For containers that cannot easily have closures removed such as compressed gas cylinders, EHLS must be consulted prior to disposal as refuse in order to verify the acceptability of the container for landfilling. Many compressed gas cylinders must be shipped for disposal through a vendor due to landfill refusal; disposing of a compressed gas cylinder as refuse without EHLS permission is a violation of UH policy and may result in the recapture of expenditures to remove the cylinder from the waste stream.

## Broken glass

Disposal of broken glass depends on whether there is any contamination that would require that the glass be treated as a regulated material. Generally, the preferred means of disposal for uncontaminated (or decontaminated) broken glass is placement in a purpose-built broken glass box and placement in the dumpster. Custodial crews are instructed not to pick up broken glass boxes; they must be placed directly into the dumpster by personnel from the area that generated the broken glass.

### *Rinsing broken glass*

Broken glass must be rinsed to remove any hazards associated with the materials it was in contact with. Upon request, EHLS may evaluate broken glass for the feasibility and safety of rinsing in cases where rinsing would require the use of exothermic chemical reactions or manual abrasion and on a case-by-case basis allow for disposal of broken glass through EHLS removal and treatment. Broken glass contaminated with any of the chemicals listed in Appendix XXX will receive automatic approval for EHLS removal due to the difficulty of the required removal operations for these materials.

### *Biologically contaminated broken glass*

Broken glass contaminated with material regulated as biological waste, or where the material contaminating the glass is covered under an appropriate regulatory document as mentioned in the section of this manual covering biological waste may be disposed of in a sharps container or in a broken glass box. Broken glass contaminated with any material requiring deactivation, sterilization, or disinfection prior to disposal must similarly be deactivated, sterilized, or disinfected according a method approved in the covered regulatory document. Additional methods of deactivation, sterilization, or disinfection may be approved on a case-by-case basis by EHLS. Any biologically contaminated broken glass must be so deactivated, sterilized, or disinfected prior to placement in a broken glass box.

### *Broken glass contaminated by radioactive material*

Broken glass contaminated by radioactive material must be disposed of in a sharps tube provided by EHLS.

### *Broken glass boxes*

Broken glass boxes must be assembled according to manufacturer instructions and for the safety of personnel transporting such containers should be limited in size or in the quantity of material placed inside so as to be comfortably picked up by hand. Broken glass boxes (and other receptacles) used to accumulate broken glass in workplaces must have at a minimum the name of the PI or supervisor of the area and the building name and room number written or affixed to the container. Prior to disposal glass boxes must have their inner liner securely closed (overhand knot or goose-necked with tape), their receptacle closed (typically a cardboard tab), and their top piece secured to the body by heavy-duty tape. Other vessels for broken glass may be approved by EHLS on request. Broken glass boxes must contain only uncontaminated (or decontaminated) broken glass and are routinely audited to verify compliance. No liquid in containers, solid materials other than broken glass, or sharps may be present.

### *Sharps containers and sharps tubes*

Sharps containers and sharps tubes must be disposed of through EHLS. No mail-in sharps containers are permitted on the UH main campus. No sharps containers or sharps tubes may be disposed of as refuse.

## Spill cleanup materials

Materials from the cleanup of a spill must be disposed of through EHLS. Even if the remains of a spill are no longer dangerous (dried paint, neutralized acids, etc.) they must still be evaluated by EHLS prior to disposal as in many cases they are still regulated. Spill cleanup materials must be kept in a container that is compatible with the materials of the spill and any additional materials used in the cleanup (such as solvents used for rinsing). The spill must be reported immediately to EHLS even if it is addressed by laboratory or shop personnel. This reporting requirement is in place to facilitate the prompt removal of spill cleanup materials as they may present additional hazards that an accumulation area is not prepared to handle and may also count toward accumulation limits. EHLS may also use this information to evaluate additional hazards (such as exposure of building components to the spill) and for statistical use in safety planning. A means of containing these materials safely is part of the required spill kits for work areas that use chemicals. Failure to report spills within 24 hours to EHLS is a violation of UH policy.

## Soiled or contaminated PPE

Most PPE can be safely disposed of as refuse. PPE that is soiled or that can freely release material once removed (such as gloves that are dripping or have a coating of liquid) must be collected and disposed of through EHLS unless the material contaminating the PPE is determined to not require regulated disposal. PPE that is (or may be) contaminated with any of the chemicals in Appendix XXX must also be collected and disposed of through EHLS if it is known or suspected that they may have come in contact with such chemicals. Additional institutional controls may require the regulated disposal of other PPE and will be covered in such institutional documents (MUAs, protocols, and SOPs for instance).

## Batteries

Batteries are managed based on their chemistry and characteristics. Batteries that are created at the University as part of research or instruction must be disposed of through EHLS, as there will be insufficient information to make a regulatory determination in most cases. Requests for disposal of

these batteries as refuse will be evaluated by EHLS. Damaged batteries must also be disposed of through EHLS. Batteries must be accumulated with secondary containment if there is any evidence of leakage from the batteries. Incompatible battery chemistries must be segregated. Either the batteries themselves or the secondary containment for the batteries must be labeled according to the provisions of this manual using EHLS-provided downloadable labels. Generally, the following table covers most batteries in use at the University:

| **Chemistry** | **Management** | **Third-party options** | **Additional info** |
|---|---|---|---|
| Alkaline* | Not required | Recycle | See Alkaline Batteries below |
| NiMH | EHLS disposal | Recycle | |
| NiCd Dry-cell | EHLS disposal | Recycle | |
| NiCd Wet-cell | EHLS disposal | Recycle | |
| ZnAir | Not required | Recycle* | See Zinc Air Batteries below |
| Li Primary | EHLS disposal | Recycle | |
| LiPoly | EHLS disposal | Recycle | |
| LiIon | EHLS disposal | Recycle | |
| Sealed lead-acid | EHLS disposal | Recycle | |
| Lead acid (VRLA or other non-sealed) | EHLS disposal | Recycle | |
| Button-cells* | | | See Button-cell Batteries below |
| Others | | | Contact EHLS |

### *Alkaline batteries*

Alkaline batteries may contain mercury. Batteries manufactured in the US and EU after 2000 are generally safe for landfill disposal, however prior to this time some batteries being sold as alkaline incorporated added mercury or had sources of materials very high in mercury. In the US, the Mercury and Rechargeable Battery Act of 1996 and the EU's Battery Directives have curbed this significantly. The elimination of added mercury has greatly reduced the negative environmental effects of disposal; however, it is not without consequence.

Alkaline batteries still contain corrosive chemicals as well as metals that can negatively disrupt carefully controlled landfill chemistries. EHLS recommends recycling of alkaline batteries through reputable vendors, or the selection of recyclable rechargeable batteries whenever practicable. Currently, in Texas, wastes are classified on their condition at disposal and batteries (as an article) have a protective coating on them that contains the metals and solution that would by themselves pose more of a hazard. In tests,

many brands of batteries are able to withstand the test of time in a simulated landfill environment, but these do not account for any damage or rough handling that could occur on the way to the landfill.

### *Zinc-Air batteries*

Zinc air batteries can contain mercury, and those that do must be disposed of properly. Zinc air button cells are commonly manufactured in mercury-free designs and can be purchased in such configurations by consumers. Many industrial applications may or may not contain mercury depending on the application. Button cells are the most common consumer variant, but they come in virtually unlimited shapes and sizes for industrial and transportation applications.

Specific to marine applications including navigation and emergency beacons, users may be required to recycle or use specific disposal options. See Coast Guard Commandant Instruction 16478.10 for more information when operating watercraft or performing operations in US waters.

### *Button-cell batteries*

| **Chemistry** | **Management** | **Third-party options** |
|---|---|---|
| Alkaline | See alkaline above | Recycle |
| Silver | EHLS determination | Recycle |
| Zinc-air | See zinc-air above | Recycle |
| Lithium | EHLS determination | Recycle |
| Carbon monofluoride | See lithium primary above | Recycle |
| Copper oxide | See lithium primary above | Recycle |
| Mercuric oxide | EHLS-disposal | Recycle |

### *Refuse disposal of batteries*

Batteries undergo regulatory determination by EHLS and as evaluated will be added to the EHLS website's collection of permitted disposal options in the case that disposal as refuse is to be permitted.

## MOU glassware and laboratory apparatus

Pursuant to Texas Health and Safety Code, Section 481.0621(b), the Texas Department of Public Safety (DPS) and the Texas Higher Education Coordinating Board (THECB) have developed a memorandum of understanding (MOU) regarding the sale, transfer, and disposal of certain laboratory apparatus. Laboratory apparatus covered under this MOU (listed in the table below) cannot be sent to property management for sale to the public, given to persons or entities outside the University, or disposed of in a way that it remains usable. The laboratory apparatus included in this MOU are:

| | | |
|---|---|---|
| Condensers | Distilling apparatus | Vacuum dryers |
| Three-necked flasks | Distilling flasks | Tableting machines |
| Encapsulating machines | Filter funnels | Buchner funnels |
| Separatory Funnels | Erlenmyer flasks | Two-necked flasks |
| Single neck flasks | Thermometer flasks | Round-bottom flasks |
| Florence flasks | Filtering flasks | Soxhlet extractors |
| Transformers | Flask heaters | Heating mantles |

| | | |
|---|---|---|
| Adapter tubes | | |

Glassware from this table can be transferred to other users at the University for use or storage, or it can be disposed of as broken glass following the procedures for broken glass disposal in this manual.

## Sharps

Sharps are materials or instruments that in use or disposal could puncture non-resistant containers or human skin. They must be disposed of in a purpose-built sharps container purchased by the laboratory or shop generating the contaminated sharps, or a container provided by EHLS if permitted. When contaminated with a material covered in an appropriate regulatory document as 0.mentioned in the section of this manual covering biological waste, they include:

| | | |
|---|---|---|
| Hypodermic needles | Disposable scissors (used in medical procedures) | Blood culture bottles |
| Hypodermic syringes with attached needles | Intravenous stylets and rigid introducers | Microscope slides |
| Scalpel blades | Glass pasteur pipettes | Tattoo needles |
| Razor blades | Glass pipettes | Acupuncture needles |
| Disposable razors | Specimen tubes | Electrolysis needles |

When uncontaminated, hypodermic needles and hypodermic syringes must still be disposed of through EHLS in a sharps container. Special circumstances such as the disposal of bulk unused hypodermic syringes with attached needles or bulk unused hypodermic needles in manufacturer packaging can be addressed by contacting EHLS. Any material that has the ability to puncture human skin under normal disposal conditions requires disposal in a way that prevents human harm. Generally, this requires a sharps container; however, other containers for uncontaminated sharps may be permitted by EHLS upon request.

## Gas cylinders

Gas cylinders must be returned to their manufacturer or distributor. Cylinders that cannot be returned by the generator must be disposed of through EHLS. Disposal of empty or full cylinders is significantly more expensive than return to the manufacturer, and as such, EHLS requires proof of attempts to contact the manufacturer and distributor of the cylinder or documentation from an appropriate party that the cylinder cannot be returned prior to acceptance of these materials. Attempts to return the cylinder must take place prior to any removal deadlines from the laboratory or shop, as failure to follow this rule does not alleviate requirements for appropriate storage or timely removal of unwanted materials or hazardous wastes from accumulation areas.

## Controlled substances

Possession and use of controlled substances is limited to those legally allowed to do so either as end-users, researchers, or dispensers of the substances to end users. Many controlled substances for human and animal use have expiration dates that must be adhered to for compliance with other rules and regulations. As a consequence of this, some controlled substances must be disposed of. Disposal of

controlled substances is not provided by EHLS and must be coordinated by the entity licensed, registered, or prescribed the substance.

Disposal of controlled substances at the University may take place through reverse distribution to the manufacturer if the manufacturer accepts these transactions or disposal through a third-party reverse distributor paid for by the registrant. Some controlled substances such as chloral hydrate are also regulated as hazardous wastes and may only be disposed of through registered reverse distributors that are also permitted hazardous waste disposal vendors. EHLS must be notified prior to disposal of any controlled substances that are also regulated as hazardous wastes.

Drug take-back events are limited only to prescribed end users and are coordinated though UHPD.

The DEA permits destruction of controlled substances by registrants and in some cases, EHLS may have appropriate materials to facilitate the chemical destruction of such substances. EHLS can dispose of the waste remaining after destruction. For more information on material availability, please contact EHLS. For more information on drug destruction, please contact the DEA Special Agent in charge of your registration or the entity in charge of your license.

## Laboratory equipment

Laboratory equipment such as freezers, refrigerators, rotary evaporators, and centrifuges as well as other laboratory equipment that may have some contamination with regulated substances must receive EHLS clearance prior to disposal. More information on the laboratory equipment clearance form is available on the EHLS website.

## Fats, oils, and grease

Fats, oils, and grease may be difficult to dispose of. Fats and solid grease from cooking operations can be disposed of as refuse, however liquid oils, fats, and grease require regulated disposal. In quantities of 55 gallons or more the liquids also require notification to EHLS and incorporation into regulated storage under the University's Spill Prevention Countermeasure and Control plan.

### *Used oil*

Used oil is any oil that has been refined from crude oil or any synthetic oil that has been used and as a result of such use is contaminated by physical or chemical impurities. It qualifies in some cases for management standards that many generators find to be more amenable to working conditions than hazardous waste. Laboratories must classify their used oil as unwanted material.

### *Cooking oil*

Cooking oil generated by the University can be disposed of in rendering bins (used cooking oil bins) located at dining establishments at the University that require them. Other disposal options are available through EHLS. Cooking oil whether used or unused may not be dumped directly into the sanitary sewer or into the plumbing of kitchens even if a grease interceptor is present on the line.

### *Brown grease*

Brown grease is cooking grease that has been washed into the sanitary sewer and is removed by an interceptor to prevent it from fouling or blocking sewage lines, disrupting water treatment works, or contaminating waterways. Activities that may generate fats, oils, or grease that could be washed down the sanitary sewer are required to install and maintain a grease interceptor and to register it with EHLS. Waste may only be removed by permitted disposal companies through EHLS.

### *Unused oils, fats, and greases*

Unused oils, fats, and greases except for cooking oils shall be managed as unwanted materials, hazardous wastes, or other regulated wastes as appropriate to the location of their generation and the hazards of the material.

## Aerosol cans

Aerosol cans are used for a variety of applications. They are typically used for applying a liquid product as very fine droplets in air (an aerosol) and may contain materials posing a hazard in several forms. The propellant itself may be regulated for disposal, as could the solvent used for the liquid product inside. The product itself may also be regulated for disposal. Aerosol cans containing paint may be managed as paint and paint-related waste when not in a laboratory. All other aerosol cans must be managed according to the hazards presented by the contents of the container as explained.

## Paint and paint-related waste

Paint and paint-related waste refers to paint that could be classified as a hazardous waste. Water-based paint for instance without any additional hazard may be disposed of through other means. EHLS can provide more information on water-based paint disposal on request. Specifically eligible for management as paint and paint-related waste are paint whether used or unused, and paint mixed with thinners or other materials routinely applied during the process of painting. Spill cloths, roller trays, aerosol paint cans, and other materials contaminated with paint may also be managed as paint and paint-related waste. Paint that has spilled onto the ground not as a result of painting is ineligible for management under this rule and must be managed as hazardous waste. These materials must be stored in secondary containment and may be accumulated for up to 1 year from the date that it is decided they were no longer wanted or needed. All containers must be labeled according to the provisions of this manual using EHLS-provided downloadable labels.

## Pesticides

Pesticides that would otherwise be regulated for disposal as hazardous waste may be managed as universal waste pesticides provided they are not used as part of laboratory activities. These pesticides must be kept in a container in good condition without leaks and may be accumulated for up to one year. All containers must be labeled according to the provisions of this manual using EHLS-provided downloadable labels.

## Mercury-containing equipment

Mercury containing equipment that would normally be regulated as a hazardous waste for disposal may be managed as universal waste mercury containing equipment provided that steps are taken to contain mercury and prevent its release to the environment. Management as mercury-containing equipment is not applicable to mercury-containing lamps or to mercury-containing batteries as they can be managed as universal waste lamps and universal waste batteries.

Steps required to prevent release are to place into a container (air-tight) any equipment with uncontained mercury or showing evidence of leakage, to perform any work removing mercury or pieces of equipment containing mercury over secondary containment, ensure that a mercury-clean up system is available at or near the point that work will be undertaken, handle and store any parts or pieces of equipment in such a way to prevent breakage and release of the elemental mercury inside.

Mercury-containing equipment managed in this way can be accumulated for up to 1 year prior to disposal. All containers must be labeled according to the provisions of this manual using EHLS-provided downloadable labels.

### Lamps and bulbs

Lamps and bulbs that would normally be regulated as hazardous waste for disposal due to the presence of mercury vapor or halogen vapor (sodium for instance) may be managed as universal waste lamps. Lamps and bulbs managed in this way must be accumulated in containers adequate to prevent breakage (such as cardboard boxes designed for holding them). Spills or leaks must be cleaned up immediately and the debris cleaned up and stored in an airtight container. All containers must be labeled according to the provisions of this manual using EHLS-provided downloadable labels.

### Equipment, infrastructure, and building materials

Some equipment, infrastructure, and building materials may contain or themselves be regulated for disposal. Examples of this include mercury-containing flooring, lead paint, asbestos heater mantles and mastic. The management of these materials may vary based on numerous factors. For more information on the management requirements for a particular situation please contact EHLS prior to the start of work.

### Time-limited materials

Time limited materials are those identified as having a limited time for storage due to increasing hazard according to manufacturer literature or published research, including but not limited to peroxide forming chemicals, multi-nitro aromatics and other chemicals that must be wetted for safety, alkali metals and other materials required to be stored under volatile solvents or inert gases for safety purposes, corrosive and reactive compressed gases, and materials that may degrade and release hazardous gases or accumulate sufficient pressure under normal storage conditions as to pose a hazard. Examples of these materials are listed in Appendix G.

Time limited materials are managed as unwanted materials or hazardous waste according to the regulatory requirements of the activity generating them. Efforts to recoup additional costs of handling, transportation, and disposal by the entity paying these costs, of time limited materials that have not been disposed of before they present a sufficient hazard as to require additional costs for handling, transportation, or disposal are not prohibited.

## Universal waste

Universal waste such as pesticides, lamps, bulbs, mercury-containing equipment, paint and paint-related waste, and batteries provides less stringent standards for the management of some items that would be considered hazardous wastes when intended for disposal. This relief is provided because these wastes are so ubiquitous that managing them under satellite rules or the rules for central accumulation areas (the ones that EHLS has to follow) would be overly burdensome.

The compliant management of these wastes is a condition of this relief- if they aren't managed properly as universal wastes then the fines and penalties are based on hazardous waste violations. This is an issue for many violators because the relaxed management standards mean that a systemic violation would be cited for each individual item or container and under universal waste rules, more of them can be accumulated.

To avoid this situation, manage universal wastes properly and contact EHLS with any questions regarding their management.

## Unknowns

Unknown materials are presumed to be acutely hazardous waste or acutely reactive unwanted material. They are quantity-limited similarly to these materials and are assumed to be incompatible even with other unknowns. Unknowns must be reported to EHLS immediately upon discovery by employees and must be labeled according to the provisions of this manual. They are prioritized for immediate removal from laboratories and workplaces by EHLS.

Efforts to recoup monetary expenditures by the university entity paying for the increased disposal cost are permitted as a means to properly allocate this cost to the labs, shops, and workplaces responsible for these costs. Unknowns are treated as incidents for the purpose of EHLS investigation and reporting.

## Other potentially-regulated material

It is the responsibility of every employee and their supervisors to thoroughly understand all of the regulations, rules, and laws covering their operations and the materials that they use. EHLS is available for assistance regarding other potentially regulated materials.


# Unknowns


EHLS requires the prompt cooperation of all entities involved in the discovery and generation of unknowns in order to safely and compliantly remove the materials from the lab, shop, or workplace and send the material for proper disposal. The proper identification of unknowns is paramount to achieving this goal and helps achieve the most cost-efficient disposal by avoiding additional expenses associated with presumptive or misleading identification of unknown materials in attempting to avoid the cost of having an unknown. It is also important to know that intentional misidentification of these materials may result in civil and criminal penalties.

EHLS may conduct analytical testing on wastes removed from laboratories and shops, and contracted hazardous waste disposal companies routinely conduct this testing. Containers that are unknown should not be identified without a high degree of certainty that this identification is correct, as the costs of off-specification waste are much higher than the cost of unknowns and may include fines and penalties.

# Managing regulated wastes

## Laboratory waste management

### Accumulating waste

Unwanted materials in a laboratory can be accumulated in the same room that they are generated. They are not allowed to be moved to a different room (through a doorway) without an approved standard operating procedure from EHLS. All areas where unwanted materials are accumulated must be registered with EHLS prior to the start of the work that will generate the unwanted materials. Unwanted materials can be removed from accumulation areas only by EHLS staff, or the personnel listed on an EHLS-approved SOP.

Accumulation areas must be appropriate for the storage of the chemical components of the unwanted material. Fume hoods cannot be used for the accumulation of unwanted materials outside of EHLS-approved standard operating procedures. This means that unwanted materials that would require a flammable cabinet for storage if they weren't a waste will still require a flammable cabinet for storage once they become unwanted materials. Accumulation areas must separate incompatible materials (even if some materials are not unwanted materials) sufficiently to prevent a reaction between the materials as well. This means that oxidizers must be sufficiently separated from organics; even if that means that different storage appliances must be used.

An accumulation area must be under the control of a single PI. While many workers within a PI's group may place their unwanted materials in the accumulation area, a separate accumulation area must be established for each PI even if they are in the same room. This can be accomplished even by dividing a storage appliance such as a flammable storage cabinet into sections with sections designated for each PI. For more information on options to accomplish this, please contact EHLS.

### Storage appliances

OBJECTS SUCH AS FLAMMABLE STORAGE CABINETS, TOXIC GAS CABINETS, OR SHELVING UNITS CONSTRUCTED SPECIFICALLY FOR THE STORAGE OF MATERIALS. SOME STORAGE APPLIANCES MAY OFFER ACCREDITED LISTING BY A TESTING AGENCY INDICATING THAT IT MEETS REQUIRED CODES OR STANDARDS.

## Laboratory waste program implementation

Laboratories may begin managing their wastes as unwanted materials any time after 11:59 PM on December 31, 2017. All laboratories must achieve full compliance with these rules before 5:00PM on June 30, 2018.

**Labels:** Hazardous waste labels may continue to be used until June 30, 2018, but no new labels should be purchased after January 1, 2018.

**Notification:** EHLS will proactively reach out to known waste-generating laboratories prior to June 30, 2018, but to get to the front of the line for accommodations and requests laboratories may contact EHLS to begin the process beginning on January 1, 2018.

**Standard operating procedures:** Standard operating procedures for processes already in place will be prioritized for completion prior to June 30, 2018. To get to the front of the line, contact EHLS.

**EHLS-provided containers:** metal solvent cans can continue to be used until June 30, 2018 but will not be picked up for removal after that time. Laboratories can request these containers and others by contacting EHLS beginning on January 1, 2018.

## Containers

Unwanted materials must be accumulated in containers that are compatible with the materials that they'll be accumulating. That means that the materials inside the container cannot cause the container to degrade over the time that the container will be used. The container must be of sufficient volume to allow for 20% of the container's volume to be used for headspace, although more headspace may be required based on approved standard operating procedures. Containers must be closable in a way that if they were tipped over would prevent the release of liquid.

Container volume is limited to a maximum of 20L in laboratories without an EHLS-approved standard operating procedure.

EHLS provides containers for some waste streams for laboratories. For more information, see Appendix B.

## Secondary containment

Accumulation of unwanted materials must take place in secondary containment that is also compatible with the materials inside of the containers. Secondary containment must also segregate any incompatible materials. In some cases, separate storage appliances may not be required to adequately separate incompatible materials, but in no case can two incompatible materials occupy the same secondary containment vessel. This protection extends to containers as well, so a container of a material that is incompatible with the container of another material cannot be stored in the same secondary containment.

Secondary containment must provide adequate volume to contain the greatest of 10% of the aggregate volume of all containers or 50% of the volume of the largest container. Provided volume must account for the displacement of any containers if they intrude into the area where a spill or release would be contained.

### Secondary containment, secondary container, primary container

**Secondary containment** is a means of containing the release of the contents of a container.

**Secondary container** is a container other than the container provided by the manufacturer, distributor, or packager that does not have affixed or attached the information required by the hazard communication standard.

**Primary container** is a container that is provided by the manufacturer, distributor, or packager of a chemical that contains all of the information required by the hazard communication standard.

## Labeling

All containers of unwanted materials require an "unwanted materials" label approved by EHLS. The label must be affixed or attached to the container before the first drop, grain, or other increment of unwanted material is added to the container. Approved labels are provided for download from the EHLS website. As part of the SOP approval process, pre-filled labels can also be provided. EHLS is available for assistance in hazard estimation and to answer questions regarding labeling. More information on which label to select and how to properly fill it out is available in the section of this manual entitled "Labeling waste".

Container labels that are not pertinent to the hazards of the material in the container (such as leftover DOT hazard labels when using an empty container) must be defaced prior to using the container.

### Dating labels

All containers of unwanted material must be dated with the date that unwanted material first entered the container. If containers are reused, it must be re-dated every time that it is emptied.

### Container closure

Containers of unwanted material must be closed except when adding unwanted material to the container or removing unwanted material from the container. Generally, this means that if there is not a person standing in front of the container with a second container of unwanted material in-hand that the container of unwanted material must be closed.

### Working containers

Working containers are a type of secondary container (a container that isn't supplied by the manufacturer with all of the required labeling) that allow laboratory workers to accumulate waste in a container that does not have to be immediately closed at all times. Working containers are limited to 250mL and must be labeled with the name of the employee using the container. Working containers are only permitted in the immediate vicinity of the employee using the container and must be emptied if the employee is not present. That means even if an employee steps out of the lab for a minute, the working container must be emptied into an appropriate unwanted material container or a violation of UH Policy has occurred.

### Containers attached in-line to equipment

Containers attached to equipment in-line are permitted in laboratories. Containers attached to equipment in-line are required to have secondary containment and appropriate labeling. Containers attached to equipment in-line may either be secured against tipping over by their placement in the equipment or must have a means of preventing the release of unwanted material from the system if they were tipped over. In-line collection equipment must be registered as part of the accumulation area. An example of this would be:

> A bottle hooked up to an HPLC machine for in-line collection of waste can allow waste to return up the line to the machine, but cannot release the waste from the system of bottle and chromatography machine. This can be accomplished with purpose-designed caps or laboratory-modified caps.
>
> A bottle hooked up to an HPLC machine for in-line collection of waste where the top is covered with aluminum foil would not prevent the release of waste from the system of bottle and chromatography machine and would not be allowed.

Containers attached to in-line equipment may be required to prevent the release of harmful vapors or gas as necessary to protect the health and safety of workers.

## Used or unused

Unused typically applies to materials that have not been used for their intended purpose, which can lead to some counterintuitive classifications.

Spilled material is classified as unused if it was spilled prior to use and will not be used because of the spill. Concurrently off-specification products and expired products are also considered unused.

Even the portion of a material left in a mostly-empty container, its residue, is considered unused even if it is emptied from the container for disposal.

Used means that the material has at least once been employed for its intended purpose.

## Which date?

When wastes are consolidated, even if it is just the unused residue from mostly-empty containers, the entire container takes on the oldest accumulation start date.

### Venting of containers

Containers in laboratories may be allowed to vent under certain circumstances provided that conditions can be met to protect the health and safety of workers. This practice requires an EHLS-approved standard operating procedure.

### Time limits

Accumulation of unwanted materials in laboratories is limited to 180 days from the date on the label (the date that the container first received unwanted material). EHLS will routinely reach out to laboratories requesting them to check their accumulation areas to verify that no containers that will reach 180 days in the next quarter, and if there are to arrange for their removal. Laboratories are encouraged to routinely request removal of unwanted materials well before approaching the 180-day limit. Containers in most cases can be returned with proper planning and coordination. Any containers with accumulation start dates older than 180 days are in violation of UH Policy.

### Quantity limits

Each laboratory (not each laboratory accumulation area) is limited at a maximum to 55 gallons of unwanted material. Laboratories are physically separated from one-another. This applies exclusively to unwanted materials and not to materials managed under other provisions of this manual such as biological waste. Further limitations include space available inside of appropriate storage appliances, or by fire code restrictions on the amount of flammable liquids that may be stored in a given area. More information on the limits for individual laboratories are available during the registration process.

A select subset of unwanted materials are further limited in quantity due to their unique hazards. These chemicals may be referred to as acutely reactive unwanted materials. No more than 1kg (solids) or 1L (liquids) of these materials in aggregate may be accumulated prior to requesting removal. Those materials are:

Any laboratory with more than 55 gallons of unwanted material (or 1kg of acutely reactive unwanted solids, or 1L of acutely reactive unwanted liquids) without a completed removal request is in violation of UH Policy.

## Pushing the limit

It is advised that accumulation limits are not approached as a matter of common practice. Removal requests can be submitted even for single containers of unwanted materials.

Upon reaching the storage limit, all containers in an accumulation area (that are both in the same laboratory room and under the control of the same PI) must be removed. All containers in the accumulation area must have the date that the limit was reached marked in the “ready for pickup” box on their label.

## Laboratory cleanouts

Laboratory cleanouts often involve larger quantities of unused chemical products. These have a distinct difference from other unwanted materials in that they may find use through the University’s ChemSwap program. Provided that these unwanted materials are still properly stored and managed as valuable chemical products (store them just like they would be stored if they were going to be used- such as in a storage appliance) and attach or affix an appropriate unwanted materials label (there is one for chemical products in their primary container). This allows EHLS time to coordinate the manpower and space to facilitate their removal and to find potential users.

## Chemical waste management

### Accumulating waste

Hazardous waste and other chemical waste can be accumulated at or near the point of generation. Generally, this means that if one must open a door (even if the door would normally be left open), that this would be going too far and a new satellite accumulation area should be created for work performed in this area. There may be situations where this would be unfeasible, and variances from this guideline may be requested from EHLS. All areas where hazardous waste and other chemical waste are accumulated must be registered with EHLS prior to the start of the work that would generate this waste.

**Storage Appliances**

OBJECTS SUCH AS FLAMMABLE STORAGE CABINETS, TOXIC GAS CABINETS, OR SHELVING UNITS CONSTRUCTED SPECIFICALLY FOR THE STORAGE OF MATERIALS. SOME STORAGE APPLIANCES MAY OFFER ACCREDITED LISTING BY A TESTING AGENCY INDICATING THAT IT MEETS REQUIRED CODES OR STANDARDS.

Accumulation areas must be appropriate for the hazards presented by the waste. This means that wastes that would require a flammable cabinet for storage before becoming a waste will still require storage in a flammable cabinet as wastes. These are often called storage appliances when referred to without specifying a particular hazard. Accumulation areas must separate incompatible materials (even if some of the incompatible materials are not wastes).

A single shop or workplace may contain multiple accumulation areas, and accumulation areas may be shared between different shops or workplaces provided that they are still at or near the point of generation as required. No hazardous waste may be moved between accumulation areas outside of a single shop or workplace except by EHLS staff.

**Point of Generation**

THE END-POINT OF THE PROCESS THAT SIGNIFIES WHEN THE MATERIAL WAS NO LONGER WANTED OR USEFUL. THE LOCATION WHERE THE WORK TOOK PLACE THAT GENERATED THE WASTE

### Containers

Hazardous wastes and other chemical wastes must be accumulated in containers that are compatible with the materials that they will be accumulating. This means that the materials inside the container

## Used or unused

Unused typically applies to materials that have not been used for their intended purpose, which can lead to some counterintuitive classifications.

Spilled material is classified as unused if it was spilled prior to use and will not be used because of the spill. Concurrently off-specification products and expired products are also considered unused.

Even the portion of a material left in a mostly-empty container, its residue, is considered unused even if it is emptied from the container for disposal.

Used means that the material has at least once been employed for its intended purpose.

cannot cause the container to degrade over the time that the container will be used. The container must be of sufficient volume to allow for 10% of the container's volume to be used as headspace, although more headspace may be required for certain wastes based on guidance from EHLS and the materials' SDSs. Container volume is limited to a maximum of 20L without an EHLS-approved drum accumulation permit.

Containers must be capable of being closed in a way that would prevent the release of material from the interior of the container if it were tipped over. Accumulation of hazardous or other chemical waste in containers that are found open when a worker is not present and adding or removing material are a violation of UH Policy.

### Secondary containment

Accumulation of hazardous and other chemical wastes must take place in secondary containment that is also compatible with the materials inside of the containers. Secondary containment may be used to segregate incompatible materials if the use of different storage appliances is not feasible provided that the secondary containment is capable of preventing an adverse reaction in the case of the failure of both containers. In no case can two incompatible materials (even if one is not a hazardous or other chemical waste) occupy the same secondary containment.

### Labeling

All containers of hazardous waste and other chemical wastes require an appropriate label. Hazardous waste require the hazardous waste label provided on the EHLS website. Other chemical wastes also have appropriate labels provided on the website that must be used. Additional labels are permitted as required for the purposes of the shop or workplace as well as compliance with other regulations. Container labels that are not pertinent to the hazards of the material in the container (such as leftover DOT hazard labels when using an empty container) must be defaced prior to using the container. More information on which label to select and how to properly fill it out is available in the section of this manual entitled "Labeling waste".

### Dating labels

All containers hazardous and other chemical wastes must be dated with the date that waste first entered the container if the EHLS-provided label has a field for a date. If containers are reused, it must be re-dated every time that it is emptied.

For containers of unused chemical products, the date must reflect the date the decision to dispose of the waste was made. Containers with labels without a date are a violation of UH Policy if there is any material inside the container, or if the empty container may still pose a hazard. Regulatory inspectors and auditors typically presume that an undated label signifies that a container has been stored for longer than would be permitted, as documentary evidence contrary to this presumption is absent.

For assistance in determining the appropriate hazards of a waste, EHLS can be contacted. EHLS may also provide pre-filled labels in a digital format to assist shops and workplaces in complying with these regulations upon request.

## Container closure

Containers of hazardous and other chemical wastes must be closed unless a worker is present and actively adding waste to the container or removing waste from the container. Containers that are open when a worker is not present and adding or removing waste are a violation of UH Policy.

## Quantity limits

Each shop or workplace is limited to 55 gallons of hazardous waste in aggregate across all of the accumulation areas. If an accumulation area is separated by a doorway or otherwise determined by EHLS to be adequately separated, the waste in this accumulation area may be counted independently and have its own limit.

Acutely hazardous wastes have lower quantity limits due to their unique hazards. Chemical wastes (even unused chemical products to be discarded) with a chemical component listed in Appendix L are considered acutely hazardous wastes. Chemical wastes bearing codes F020, F021, F022, F023, F026, and F027 from Appendix J are also included as acutely hazardous wastes. No more than 1 qt of liquid waste or 2.2 lbs of solid acutely hazardous wastes may be accumulated in any workplace or shop.

Upon reaching these quantity limits, a shop or workplace must have the wastes removed within 3 calendar days by EHLS staff. It is the responsibility of the shop or workplace to request removal before these limits are reached as this response time may not be achievable without advanced notice to facilitate staffing by EHLS.

Other chemical wastes may have unique quantity limits; however, quantities of other chemical wastes that present a danger to the health and safety of the University community, to workers, or the environment are unacceptable. Quantities of other chemical wastes that exceed the capacity of available storage appliances if they require storage in such an appliance are also considered to be unacceptable. Quantities that impede egress or safe occupancy of a shop or workplace are also prohibited.

## Time limits

Once storage limits are exceeded, only 3 calendar days are allowed for the wastes to be removed. Failure to request removal with adequate notice to facilitate this is a violation of UH Policy. Workplaces and shops that have accumulated more hazardous waste or other chemical wastes beyond their allowable quantity and have not submitted a request for removal are in violation of UH Policy.

# Biological waste management

## Housekeeping

Biological waste is one of the largest regulated waste streams produced by the University. Areas where materials that can become biological waste are used should be cleaned on a regular basis by trained laboratory personnel with appropriate disinfectants. This cleaning should address incidental contamination as well as minimize unnecessary materials that could be contaminated by the materials.

All equipment and working surfaces should be cleaned and decontaminated upon completion of procedures, after spills, or after other contact with such materials. Fluids should be absorbed prior to disinfection with the contaminated absorbent material accumulated as biological waste. Other potentially-contaminated material should be cleaned off of equipment and working surfaces and accumulated as biological waste prior to application of a disinfectant appropriate for the agents or materials of concern to the equipment and surfaces. Protective coverings such as absorbent paper and plastic-backed absorbent mats should be removed and replaced when overtly contaminated or upon completion of procedures. Contaminated absorbent should be removed when work is not being performed.

Receptacles and containers intended for reuse such as bins, pails, or cans that could become contaminated should be inspected and decontaminated on a regular basis. Parts of reusable bins where waste is collected for disposal should be inspected and decontaminated on a regular basis. Broken glassware and other debris should be cleaned up using mechanical means (brush, broom, dust pans, tongs, etc.) and placed into an appropriate container for later pickup. If the debris is contaminated, the cleaning instruments should be cleaned and disinfected prior to storage or reuse.

## Accumulation

Biological waste must be accumulated in containers. Secondary containment must be provided for biological waste. This can be accomplished using a bag-in-container set up, or a tray to contain liquids. Containers must be closed when waste is not being added or removed. This can be accomplished using a closable top for solid waste, or a bottle or jug with a liquid-tight seal for liquids. Containers of biological waste left open without a worker present adding or removing waste from the container are a violation of UH Policy.

Accumulation of biological waste in smaller container such as bench-top containers, or free-standing container is permitted provided that the containers are closable and provide adequate secondary containment to hold the contents of the inner container should it fail. The containers must also bear labeling either from the manufacturer or affixed to the container by the user indicating the contents of the container (“biohazard”, “medical waste”, or other phrases approved by EHLS). The contents of these containers should be lined with a bag capable of holding the material while it is accumulated. The bags and their contents can then be moved to a larger container with an appropriately labeled bag from many workstations.

## Treatment

Treatment of biological waste can serve many purposes. Chiefly housekeeping and equipment maintenance, prevention of contamination or release, and treatment for the purpose of disposal are accomplished through varying means of treatment.

### *Sterilization*

Sterilization is the complete removal of all viable microorganisms or disease-causing agents from a material or object. Sterilization is not strictly required for the purposes of accumulating waste unless it is required by other regulations or institutional rules.

### *Disinfection*

Disinfection for the purpose of biological waste requires a 99.99% reduction in the viable microorganisms or disease-causing agents from a material or object. Inactivation is a type of disinfection often referenced in other regulations that also applies to biological waste in some cases. The two primary means of disinfection permitted at the University are steam disinfection (autoclaving) and chemical disinfection. Disinfection of biological waste for the purpose of disposal as refuse or through the sanitary sewer system require the establishment of an EHLS-approved standard operating procedure for the disinfection and disposal practice as well as documentation of all waste disposed of by this method. Activities at the University that will generate liquid biological waste must obtain a standard operating procedure for the disposal of their liquid waste or seek alternative arrangements for its disposal through EHLS.

### *Cleaning*

Cleaning is the removal of visible soiling or debris through wiping, abrasion, or other mechanical means as well as the absorption of liquids. Untreated debris and absorbents from cleaning require accumulation and disposal as biological waste.

## Managing waste for off-site disposal

Off-site treatment and disposal is available for most biological wastes generated at the University. Biological waste managed for off-site treatment and disposal is picked up on request by EHLS. Accumulation of biological wastes for off-site treatment and disposal take place in EHLS-provided hard-shell containers. Prior to removal, all bags of biological material must be tied with a single overhand knot and the lids of provided containers must be secured. For more information on the specific requirements for EHLS-provided containers, see Appendix B.

## Biological wastes ineligible for off-site disposal

Liquid biological wastes, animal carcasses, and recognizable human bodies, body parts, and tissues are ineligible for off-site disposal. Liquid biological wastes require on-site disinfection, or may be absorbed and sent for off-site treatment and disposal provided that there is no remaining free liquid. Animal carcasses are incinerated on-site through Animal Care Operations, and recognizable human bodies, body parts, and tissues require special coordination with EHLS for disposal.

## Animal carcasses and wastes presenting chemical or radiological hazards

Animal carcasses that present a chemical hazard due to elements of the research performed such as the use of cytotoxic drugs with potentially harmful metabolites require special disposal procedures described in Appendix N. Radiologically-contaminated animal carcass disposal is detailed in the Radiation Safety Manual.

## Radioactive waste management

Radioactive waste requires the same safety and security measures similar to radioactive materials. The PI is responsible for the safe, secure, and proper storage of radioactive wastes generated until removed by the EHLS department. The University's Radiation Safety Manual establishes guidelines to ensure compliance with the required procedures for collection, packaging, labeling, transport and disposal of radioactive wastes generated under licensed activities conducted at UH.

# Labeling waste

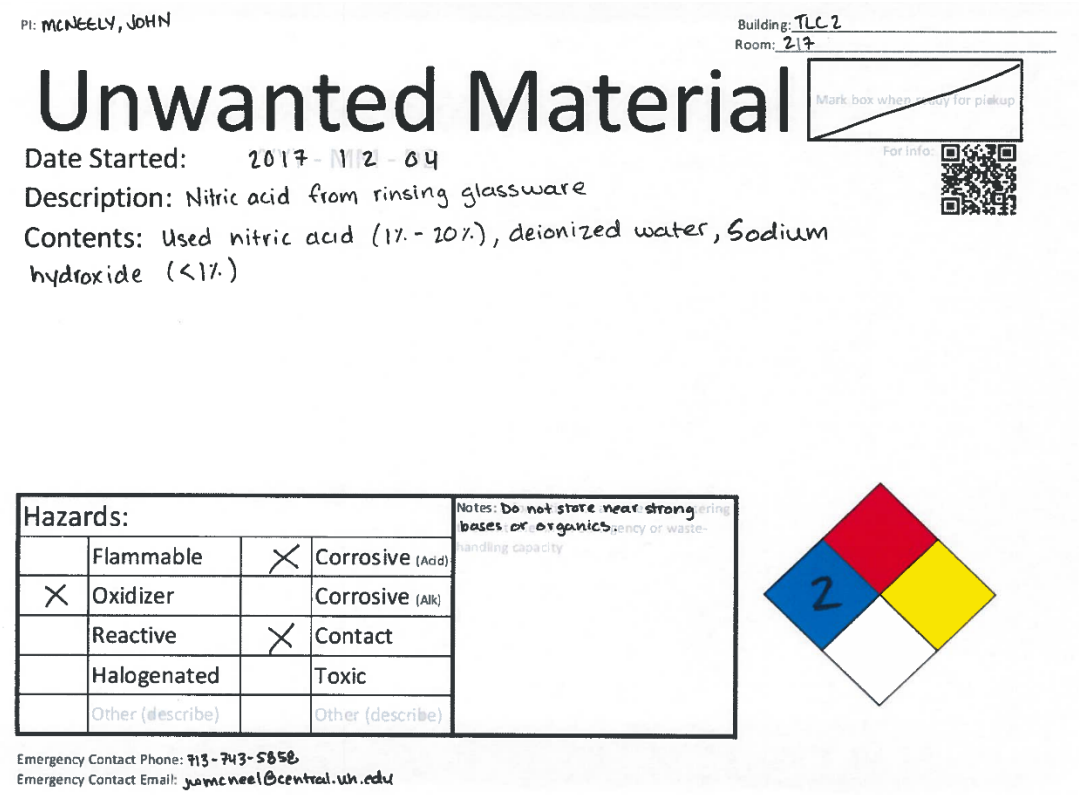
## Labels for labs

### *Chemical wastes*

For laboratories, all wastes except for biological and radioactive waste must use unwanted materials labels. This includes universal wastes such as batteries, paint, and mercury-containing equipment as well as used oil.

#### Standard unwanted materials label

This is the label supplied for all unwanted material unless a separate label is required.



PI: MCNEELY, JOHN

Building: TLC 2
Room: 217

Unwanted Material

Mark box when ready for pickup

Date Started: 2017 - 12 - 04

Description: Nitric acid from rinsing glassware

Contents: Used nitric acid (1% - 20%), deionized water, Sodium hydroxide (<1%)

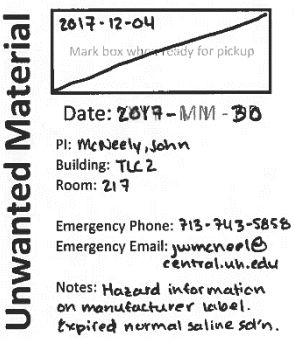
| Hazards: | | | | Notes: Do not store near strong bases or organics. |
|---|---|---|---|---|
| | Flammable | X | Corrosive (Acid) | |
| X | Oxidizer | | Corrosive (Alk) | |
| | Reactive | X | Contact | |
| | Halogenated | | Toxic | |
| | Other (describe) | | Other (describe) | |




Emergency Contact Phone: 713-743-5858
Emergency Contact Email: jwmcneel@central.uh.edu

#### Unwanted materials label for commercial chemical products

This label can be used only when the manufacturer's label contains all of the required hazard and chemical identification information that would be required of a label for unwanted material.



Unwanted Material

2017-12-04
Mark box when ready for pickup

Date: 2017-MM-DD

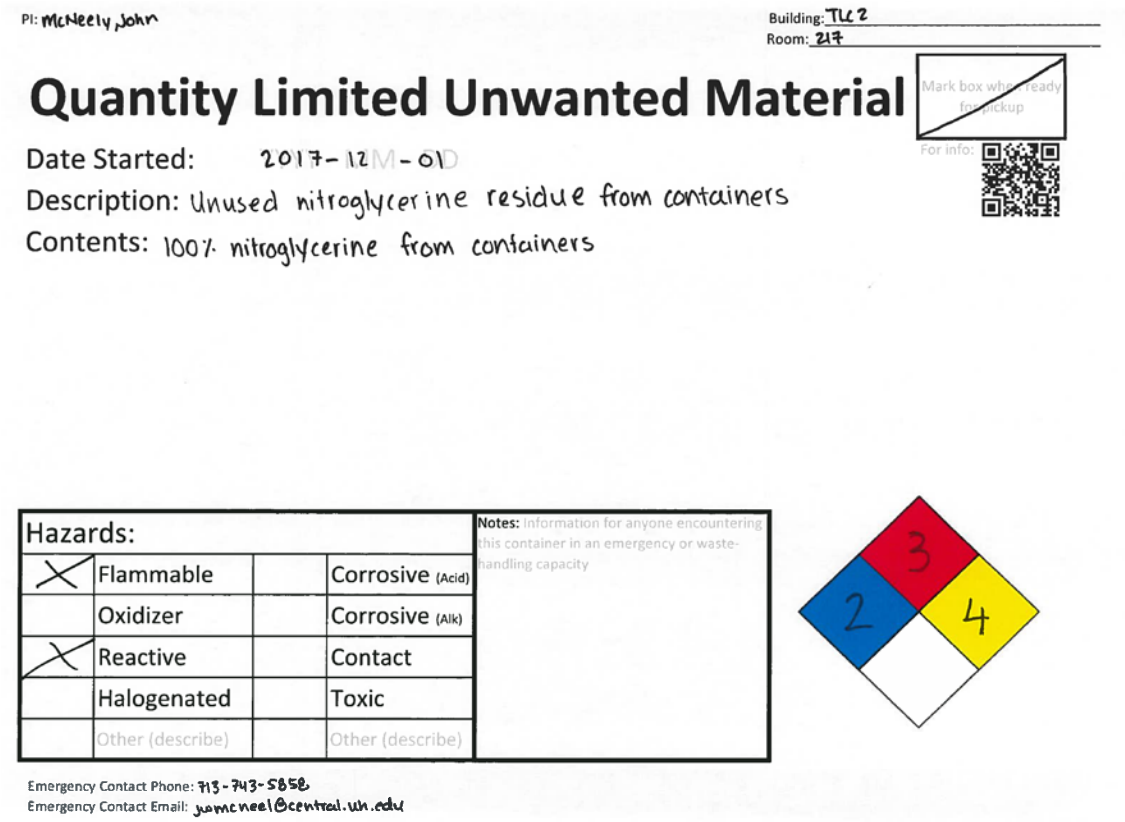
PI: McNeely, John
Building: TLC 2
Room: 217

Emergency Phone: 713-743-5858
Emergency Email: jwmcneel@central.uh.edu

Notes: Hazard information on manufacturer label. Expired normal saline sol'n.

## Quantity limited unwanted material label

This label is to be used to identify unwanted material that has limits less than the 55-gallon laboratory accumulation area limit such as acutely reactive unwanted material, quantity-limited biologicals, and other materials as limited by UH Policy and approved standard operating procedures.



PI: McNeely, John

Building: TLC 2
Room: 217

# Quantity Limited Unwanted Material

Mark box when ready for pickup

For info:

Date Started: 2017-12-01

Description: Unused nitroglycerine residue from containers

Contents: 100% nitroglycerine from containers

| Hazards: | | | |
|---|---|---|---|
| X | Flammable | | Corrosive (Acid) |
| | Oxidizer | | Corrosive (Alk) |
| X | Reactive | | Contact |
| | Halogenated | | Toxic |
| | Other (describe) | | Other (describe) |

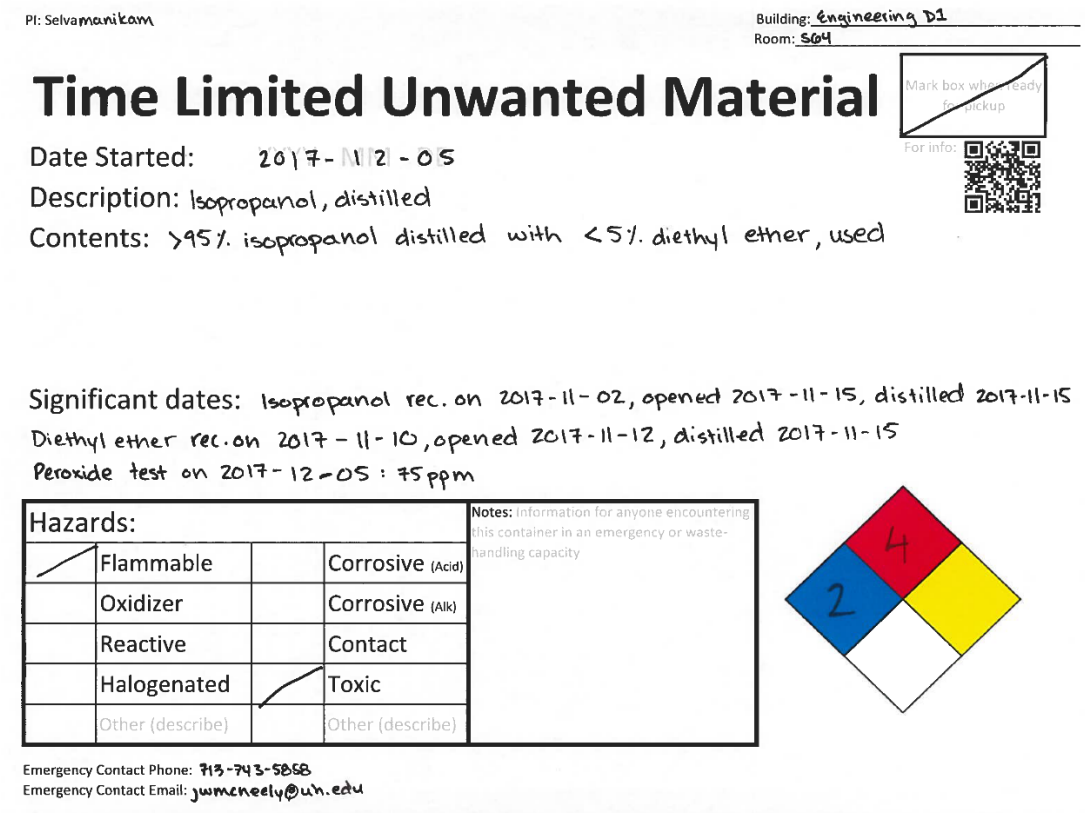
**Notes:** Information for anyone encountering this container in an emergency or waste-handling capacity




Emergency Contact Phone: 713-743-5858
Emergency Contact Email: jwmcneel@central.uh.edu

## Time limited unwanted material label

This label is to be used when an unwanted material has a risk of increased hazard over time and the original manufacturer's label would not fulfill the requirements of an unwanted materials label or where there are more than one chemical constituent in the container.



PI: Selvamanikam

Building: Engineering D1
Room: 504

# Time Limited Unwanted Material

Mark box when ready for pickup

For info:

Date Started: 2017-11-05

Description: Isopropanol, distilled

Contents: >95% isopropanol distilled with <5% diethyl ether, used

Significant dates: Isopropanol rec. on 2017-11-02, opened 2017-11-15, distilled 2017-11-15
Diethyl ether rec. on 2017-11-10, opened 2017-11-12, distilled 2017-11-15
Peroxide test on 2017-12-05 : 75ppm

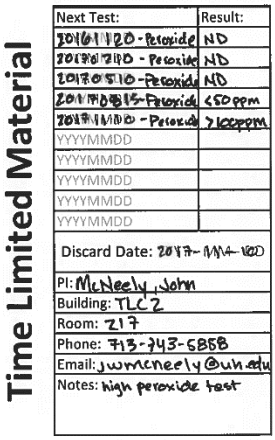
| Hazards: | | | | Notes: Information for anyone encountering this container in an emergency or waste-handling capacity |
|---|---|---|---|---|
| ✓ | Flammable | | Corrosive (Acid) | |
| | Oxidizer | | Corrosive (Alk) | |
| | Reactive | | Contact | |
| | Halogenated | ✓ | Toxic | |
| | Other (describe) | | Other (describe) | |




Emergency Contact Phone: 713-743-5858
Emergency Contact Email: jwmcneely@uh.edu

## Time limited material label

This label can be used to indicate testing data or observational data about materials that may pose increased hazard over time but are not yet unwanted materials in order to facilitate access to information on the part of EHLS staff when conducting waste determination of commercial chemical products.



Time Limited Material

| Next Test: | Result: |
|---|---|
| 20161120-Peroxide | ND |
| 20170210-Peroxide | ND |
| 20170510-Peroxide | ND |
| 20170815-Peroxide | <50ppm |
| 20171000-Peroxide | >100ppm |
| YYYYMMDD | |
| YYYYMMDD | |
| YYYYMMDD | |
| YYYYMMDD | |
| YYYYMMDD | |

Discard Date: 2017-11-14 1000

PI: McNeely, John
Building: TLC 2
Room: 217
Phone: 713-743-5858
Email: jwmcneely@uh.edu
Notes: high peroxide test

### *Biological wastes*

Biological wastes generated by laboratories may be accumulated in containers marked as biohazardous or containing medical waste as appropriate. EHLS-supplied containers have all of the required labeling already.

Liquid biological wastes may be accumulated in containers marked “unwanted materials” with the EHLS-supplied labels where the description includes the infectious agents or other regulated material and any treatment that has been performed.

### *Radioactive wastes*

Radioactive waste labeling information is available in the Radioactive Material Manual.

### *Laboratory equipment*

Laboratory equipment for disposal requires a laboratory equipment clearance form. This form is available on the EHLS website.

### *Broken glass containers*

Broken glass boxes and other containers for broken glass must use the EHLS-supplied broken glass label.

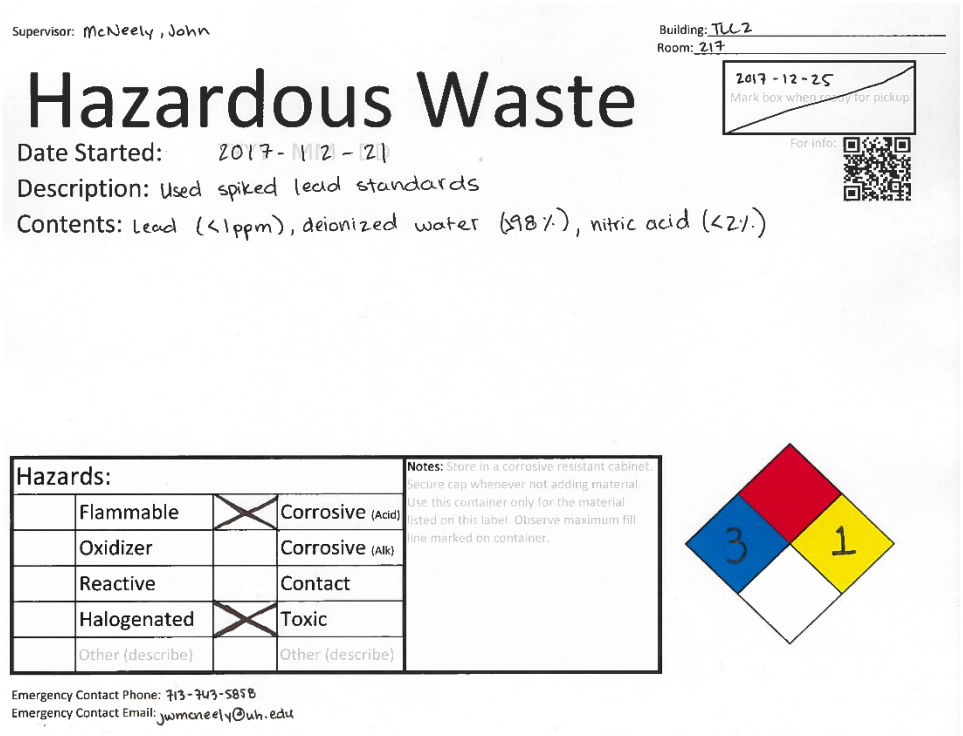
## Labels for non-laboratories

### *Hazardous waste*

For non-laboratory activities, hazardous waste labels are to be used for any chemical wastes determined by an appropriate supervisor or EHLS to be hazardous wastes according to this manual. Wastes considered to fall outside of the scope of hazardous waste used in this manual would have other labels.

### Standard hazardous waste label

This is the label supplied for all hazardous waste unless a separate label is required.

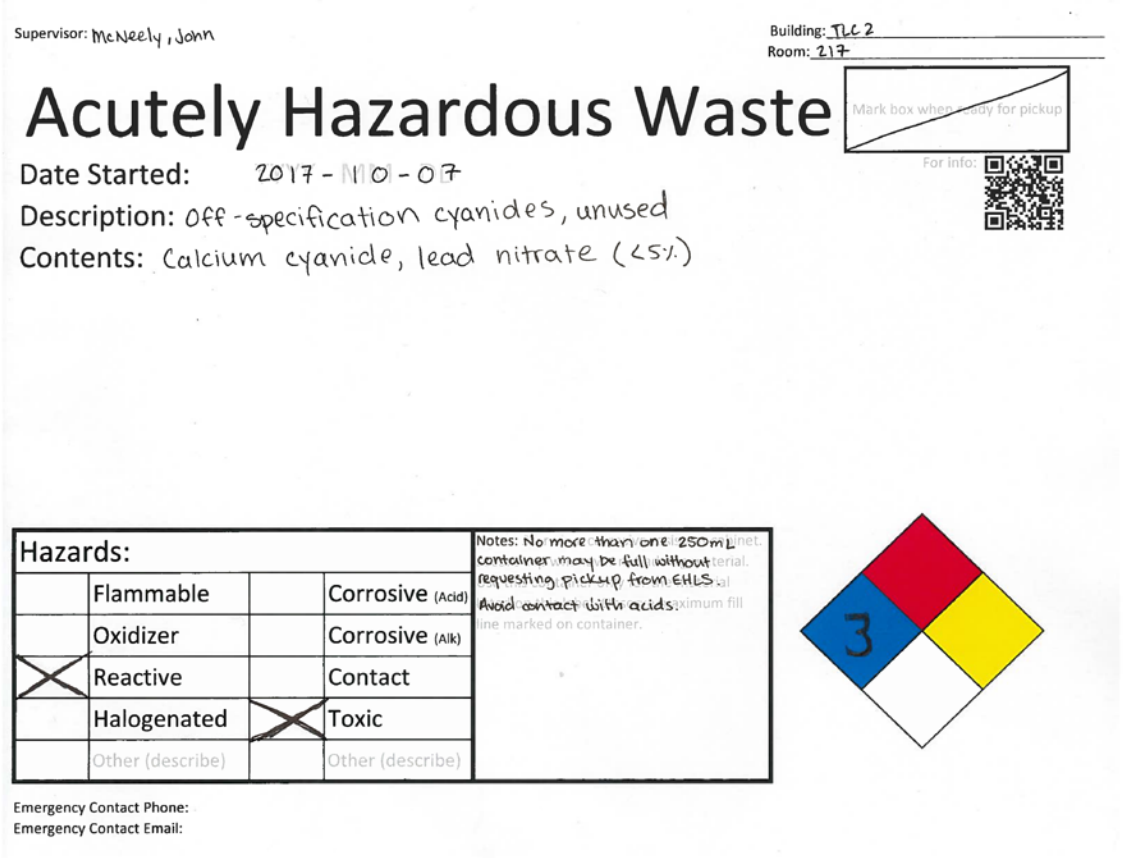


## Hazardous waste label for commercial chemical products

This label can be used only when the manufacturer's label contains all of the required hazard and chemical identification information that would be required of a label for a hazardous waste.

## Acutely hazardous waste label

This label is to be used to identify acutely hazardous waste and facilitates easier determination of aggregate limits less than the 55-gallon satellite accumulation area limit.



Supervisor: McNeely, John

Building: TLC 2
Room: 217

# Acutely Hazardous Waste

Mark box when ready for pickup

For info:

Date Started: 2017-10-07

Description: Off-specification cyanides, unused

Contents: Calcium cyanide, lead nitrate (<5%)

| Hazards: | | | |
|---|---|---|---|
| | Flammable | | Corrosive (Acid) |
| | Oxidizer | | Corrosive (Alk) |
| X | Reactive | | Contact |
| | Halogenated | X | Toxic |
| | Other (describe) | | Other (describe) |

Notes: No more than one 250mL container may be full without requesting pickup from EHLS. Avoid contact with acids.



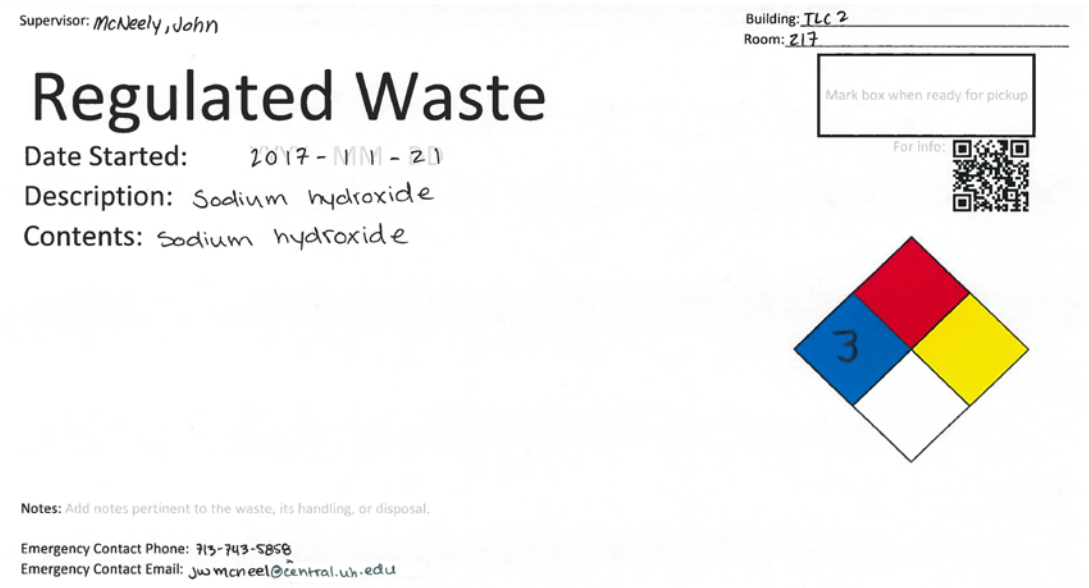
Emergency Contact Phone:
Emergency Contact Email:

### *Regulated waste*

Regulated waste labels are required for chemical wastes that do not meet the definition of hazardous waste for the purpose of this manual, but still require regulated disposal.

#### Standard regulated waste label

This label is to be used for chemical wastes that are outside of the scope of hazardous waste as described by this manual.




#### Regulated waste label for commercial chemical products

This label can be used only when the manufacturer's label contains all of the required hazard and chemical identification information that would be required of a label for the purposes of regulatory identification and emergency response.

### *Biological waste*

Biological waste generated outside of laboratories is expected to accumulate in EHLS-provided containers for off-site disposal. These containers bear all required labeling for accumulation of biological waste in the workplace.

### *Radioactive waste*

Labeling of radioactive waste generated outside of laboratories is covered in the Radioactive Materials Manual.

### *Batteries*

Batteries that cannot be disposed of as refuse according to this manual will utilize a universal waste batteries label affixed to either the battery or to a secondary container holding multiple batteries.

### *Used oil*

Used oil must bear the EHLS-supplied used oil label.

### *Aerosol cans*

Aerosol cans containing paint must use the universal waste paint and paint-related waste label provided by EHLS. Aerosol cans containing materials other than paint must use a hazardous waste label or regulated waste label as appropriate for the hazards of the product.

### *Paint and paint-related waste*

Paint and paint-related waste must use the universal waste paint and paint-related waste label provided by EHLS. It can be affixed or attached to the containers themselves or to secondary containment.

### *Pesticides*

Pesticides must use the universal waste pesticide label provided by EHLS. The regulated pesticide label must also be present on all containers or on the secondary containment.

### *Mercury-containing equipment*

Mercury-containing equipment must use the universal waste mercury containing equipment label provided by EHLS. The label must be affixed or attached to the container in which the mercury-containing pieces are stored or to the piece of equipment if they have not been removed.

### *Lamps and bulbs*

Lamps and bulbs must use the universal waste lamp label provided by EHLS. The label must be affixed or attached to the outer container designed to prevent breakage of the lamps. These are generally removed as facilities personnel perform work when they are a part of buildings or infrastructure, however employees that remove these on their own must still provide adequate labeling and storage until they can be removed. Lamps and bulbs that are not removed by facilities personnel as part of a work order can be removed by EHLS by requesting removal.

### *Construction and demolition debris*

Construction and demolition debris may present unique hazards and labeling requirements may vary based on the quantity of waste generated as well as the processes generating such waste. Please contact EHLS to determine appropriate labeling to meet regulatory requirements.

## Labels used both in and out of laboratories

### *Empty containers*

Empty containers do not require their own label, but must instead have all of the identifying information such as chemical name and hazard information defaced in a way that conveys to EHLS staff, landfill or recycling workers, and law enforcement that the hazards of the container's contents are no longer present. It is a violation of UH Policy to do this prior to the removal of such hazards.

### *Sharps containers*

Commercially available sharps containers have all of the required labeling requirements already present.

### *Gas cylinders*

Gas cylinder labeling follows the requirements for other chemical labeling; however, it is imperative that applied labels do not cover manufacturer-provided labels.

### *Controlled substances*

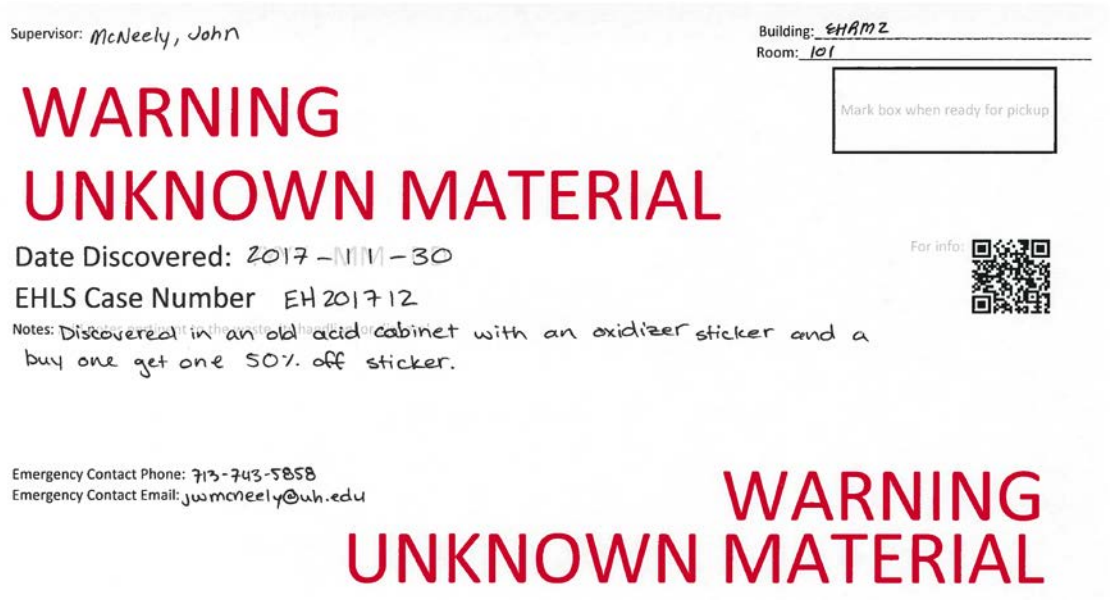
Controlled substances that are no longer wanted may not be labeled as unwanted materials or hazardous wastes until permission for off-site disposal through a reverse distributor is obtained. Controlled substances that will be managed through registrant destruction within the limits of a license or registration may only be labeled unwanted materials after the destruction has taken place. The labels must omit the controlled substance's name and instead specify the products of the reaction used to destroy the drugs.

### *Material permitted for disposal as refuse*

If through available EHLS-approved methods a waste is determined to be appropriate for disposal through refuse collection, labeling requirements will be specified in the appropriate disposal procedure provided.

### *Unknown materials and materials pending analysis or classification*

Unknown materials or materials that are pending analysis by EHLS prior to classification must be labeled with the EHLS-provided unknown material label.



## Required elements of labels

### *PI or supervisor*

Indicate the last name and first name separated by a comma of the person responsible for the activity that generated this waste. Additional information such as middle names may be included if necessary to adequately identify the source of the material.

### *Building and room*

Indicate the building name (and number if known) and the room number where the waste is accumulated. This should provide sufficient information to find the point of generation of the waste. If it would not typically be enough information, more information can be included in the notes section of a label or attached as a continuation sheet.

### *Date started*

For all wastes on this manual, the date started is the date that regulated material first entered the container since the last time that the container was made empty. This is the date against which accumulation times are compared and is one of the leading sources of violations for colleges and universities when left blank.

### *Description*

Description on all EHLS-provided labels is for use by workers accumulating waste in the container to provide them with an understanding of the process that generated the waste and information comprehensible to them regarding the wastes from their activities that can go in. An example would be “Used solvent waste from HPLC”.

### *Contents*

The contents section on all EHLS-provided labels is a place where all of the contents of a container must be listed. Whenever feasible, percentages may be used to indicate upper and lower boundaries (this can significantly reduce the cost of waste disposal and increase worker safety). For all contents, the description must list either used, unused, or both in a way that is comprehensible to EHLS.

### *Hazards*

The hazards section on EHLS-provided labels is necessary to provide information for the proper disposal and treatment methods for the waste as well as for any emergency responders that may encounter the container. It is a mandatory field and includes spaces for “other” hazards as well as a notes section to include additional information. The NFPA 704 area (diamond or square on point) is to be used in order to indicate pertinent information to emergency responders. More

## NFPA 704

NFPA 704: Standard System for the Identification of the Hazards of Materials for Emergency Response is a standard maintained by the National Fire Protection Association. The presence of this labeling element is intended to satisfy the requirement that information on labels is adequate for emergency responders.

The symbol is a square on point. The left-most square on point is colored blue and signifies health risk. The uppermost square on point symbolizes flammability and is colored red. The right-most square on point signifies instability and reactivity and is colored yellow. The lowest square on point is colored white and symbolizes special hazards.

Health, flammability, and instability may be blank or have a number 0 through 4 indicating an increasing hazard. Information on assessing these factors can be found on the EHLS website. The area for special hazards may be either “OX” for oxidizer, a “W” struck through the middle horizontally for water reactive, or “SA” for simple asphyxiant. Only two symbols may be present in the special area, with the second lower than the midline and to the right of the square on point.

information on hazard estimation is available on the EHLS website, and EHLS offers assistance in determining this information through the SOP approval process.

### *Emergency contact phone and email*

This information is required on all labels that bear fields for emergency contact information. It must be a person that is knowledgeable about the waste inside the labeled container and the processes that generated the waste. It will be used in case of emergencies to determine any additional information required for response.

### *Ready for pickup box*

This box when included on the label may be marked to indicate to EHLS that the container is ready for removal from the accumulation area. It can also serve to indicate to other workers that the container is full and no more waste should be added. In the case that accumulation quantity limits are reached, it must also contain the date that the accumulation limit is reached. Marking the box to indicate it is ready for removal can simply be a line through the box or other writing as needed.

### *Significant dates*

Significant dates indicate times when materials that may become more hazardous over time or less useful over time have been tested, treated, or other operations that may increase or decrease the risk associated with their use and storage took place. Examples include peroxide tests, receipt, opening, distillation, and other substance-specific operations.

## Special requirements and provisions for labels

### *One or more small container*

In situations in which many smaller containers of similar properties are accumulated together, it is acceptable to label the secondary containment with a label that addresses all of the smaller containers within it. In this case, the secondary container (such as a metal can or plastic tray) will be taken with the containers as part of the pickup. If this is not acceptable, providing additional labels that can be affixed to EHLS-supplied containers is an acceptable alternative provided that the containers are requested and labels affixed or attached prior to the request for removal.

### *Continuation pages*

Continuation pages can be attached or affixed to a container and must contain at a minimum a means of correlating the continuation page with the container should they become separated (a unique number, a date and PI name, etc.)

### *Printing EHLS-supplied labels*

Labels provided in a downloadable format by EHLS may be scaled appropriately to fit different containers provided that the information on the label is still legible. It may be printed onto paper and affixed or attached to containers, or to other more-durable materials if necessary and can be laminated provided that any information added to the label will not be destroyed or wiped off during transportation. The labels may be printed onto commercially available adhesive-backed pages as well for ease of application to containers. Color printing is not required for any EHLS-provided labels.

# Disposing of waste

## Preferred methods

### Transfer to other users

Many materials are used in similar roles at different laboratories, shops, and workplaces throughout the University. The most beneficial use of material that is no longer wanted or required by a single laboratory, shop, or workplace is to offer it to other laboratories, shops, or workplaces that use the material in a similar manner. Not only does this offer cost savings to the recipient, but the University avoids the cost of shipping and disposal as well. Transfers of some materials that are not routinely used may require establishment of standard operating procedures or regulatory paperwork to satisfy accountability requirements such as for controlled substances, radioactive materials, or particularly hazardous substances. For more information on user transfer of regulated materials, please contact EHLS.

### Vendor return

Some regulated wastes such as controlled substances for human use, compressed gas cylinders, and even chemical products can be returned to the vendor for credit, return of deposit, or other benefit to the user. This method is preferable as it best utilizes the already-processed materials and requires the least input of raw materials. In many cases, the reclaimed, reconditioned, or reprocessed materials are of similar quality to virgin materials. To account for waste generation, it is important that returns of regulated wastes to vendors be reported to EHLS.

### Reuse and recycling

Many regulated materials can be reused or recycled on-site. Reuse is permitted if no additional chemical manipulation of the material is required prior to reuse, until the material no longer serves its intended purpose. Reuse that requires chemical manipulation of the material may also be permitted, but must be coordinated with EHLS prior to commencing operation. Recycling may require additional regulation and should be coordinated through EHLS prior to the beginning of recycling if performed on-site. In either case, the opportunity to realize cost savings is a significant incentive for many laboratories, shops, and workplaces. In some cases, reuse may be accomplished in conjunction with transferring materials to a different user. For instance, solvents no longer good for rinsing slides may still be good for degreasing the parts of a vacuum pump. This must be coordinated with EHLS to provide for the safe transfer of materials and to ensure that no unpermitted treatment takes place.

### Regulated only as refuse (non-hazardous)

Waste materials that do not have other uses at the University may sometimes be disposed of as refuse. Disposal of material that is only regulated as refuse is regulated differently between laboratories and non-laboratory activities. Laboratories may dispose of material that EHLS indicates are only regulated as refuse through their normal waste stream through their normal procedures for discarding refuse. Shops and workplaces may dispose of material that is only regulated as refuse based on existing determinations, but are cautioned to request EHLS evaluation of any substances about which they may be unsure or have not received official verification.

EHLS will publish to the EHLS website information on disposal procedures for laboratory (and non-laboratory) wastes based on demand and availability of staff to perform waste determinations. If there are wastes that are not listed, contact EHLS to request evaluation.

## Request removal

Wastes at the University that require regulated disposal through EHLS may be removed from accumulation areas only by EHLS staff, EHLS-approved vendors, and University employees working under an EHLS-approved standard operating procedure that addresses removal. Removal requests are processed through the EHLS website's online hazardous waste pickup form for both laboratories and non-laboratory activities. The form can be accessed at http://uh.edu/ehls/waste/pickup/ by following the instructions. Updated instructions are posted there for software upgrades and other changes to the request system.

Generally, EHLS requires two-day notice to remove waste from accumulation areas; however, emergency removal may be warranted in the case of accidents and incidents. Waste generators should factor in this time when planning for accumulation and removal requests based on time limits.

## On-site treatment

### Neutralization

EHLS allows neutralization as a treatment in limited circumstances where a standard operating procedure describing the process has been approved by EHLS. An approved standard operating procedure is only required where on-site treatment is used as treatment prior to disposal of wastes as normal refuse or through the sanitary sewer. Laboratories may still incorporate activities such as benchtop neutralization of chemicals as part of their procedures provided that it is not used as a means of disposal.

### Disinfection

EHLS allows disinfection as a treatment in limited circumstances where a standard operating procedure describing the process has been approved by EHLS. An approved standard operating procedure is only required where on-site treatment is used as a treatment to facilitate disposal of wastes as normal refuse or through the sanitary sewer. Laboratories may still incorporate activities such as autoclaving or chlorine bleach disinfection as part of their procedures provided that it is not used as a means of disposal.

# Appendices

## A. Container selection

In order for a container to function properly, it must be compatible with its contents. Under normal conditions, it is optimal to use a container that held material during shipping to hold the same material as waste. Often, the material that was shipped has undergone changes during its use that may necessitate a different container to be used when accumulating or storing waste. Whenever possible, and especially for unused chemicals, utilizing the original container is the best course of action. In order to determine chemical compatibility of a waste stream, it is important to determine the potential hazards and characteristics of a waste stream. Utilize principles of hazard estimation from this manual, the Chemical Hygiene Plan, and other reputable sources to determine the hazards and incompatibility of the waste stream as a starting point.

Container and material manufacturers can be a valuable resource in determining chemical compatibility. This information can be found in chemical compatibility databases, chemical resistance charts, and even in direct communication with the manufacturer. Utilizing the results of your hazard estimation, consult a chart for the desired container material. While there is not a standard to compare for chemical compatibility of a container, it is important to look at the work that the container will be doing in order to determine appropriateness. Some factors that should be considered are:

- How long will the material be stored?
    - Generally containers used for waste material can be expected to be in contact with a material for at least a few days, if not much longer.
    - Some containers may, as a matter of their role in a process, be single-use or only in contact with a material for minutes prior to transfer.
- Will the container be re-used or single-use?
    - Many containers can be expensive, this can create a preference for the use or reusable containers, if a material causes an effect such as softening or loss of strength in a container it may not meet this requirement.
    - Containers may become impregnated with material from a previous use that could create a hazard.
    - Containers are sometimes not returned to the generator in cases where they are used as a container during shipping, or where the container itself may be a regulated waste.
- What temperature will the material be that is deposited into the container?
    - Chemical compatibility can be heavily influenced by the temperature of the material inside, containers used for cooling or allowing a reaction to complete may degrade faster than containers used with ambient temperature material.
    - Freezing and cooling can cause containers constructed with more than one material or features that require a tight tolerance to underperform. This can be especially critical when dealing with air- or water-reactives or when trying to contain vapors or gasses.
    - Temperature variations can also cause materials inside containers to expand and contract, stratify, or separate. This can cause container deformation, failure, or require containers with purpose-designed geometries.
- Can pressure (from reactions within the container or the response of the material to the environment such as temperature) be expected to be exerted on the container?

    - In addition to the pressure changes caused by cooling and warming, chemical reactions can cause pressure to build in a container.
    - Requirements for venting do not supersede requirements for container closure when controls are available.
    - Pressure on the container from the weight of a material, especially when dealing with very dense materials, may be a design consideration when selecting a container.
- Will the container be used to transport material?
    - If the container is designed to transport materials, either from the accumulation area, or when leaving the generation site, it may be required to meet requirements that are more stringent.
    - Whether the material user is shipping the container, or if EHLS will ship it as part of a regulated waste shipment, these requirements can be addressed by contacting EHLS.
- What environmental stressors will the container and material within encounter?
    - Will the container be stored outdoors or in an area with dissimilar climate controls to where it was filled?
    - Is the material inside sensitive to sunlight or repeated cycles of heating and cooling?

These general considerations are important to address for all wastes. They are not a substitute for consulting the safety data sheet of materials for further storage information. Safety data sheets (SDS) include not only information to prevent a reaction or degradation, some suggestions may also be included in order to prolong a material's useful life or preserve certain properties important to a specific application of the material. When in doubt, please contact EHLS for guidance on the applicability of storage provisions on the SDS.

Non-material-specific guidelines can be determined from established academic and industry literature on materials when information is insufficient. It is important to note that when dealing with information not supplied by the manufacturer that there may be important differences between product lines even between batches of the same product. While this is often not the case, preference shall be given to the manufacturer-supplied information. For suggested sources of information outside of the supply chain for materials, please contact EHLS for assistance.

EHLS does provide reusable containers for some waste streams that EHLS manages by waste consolidation. These are designed to provide a safer and more reliable replacement for currently used 5-gallon metal cans. Other containers may be available such as used 1-gallon amber glass jugs and 2.5L plastic lined acid bottles based on availability for reuse. More information on EHLS-provided containers is available in this manual and by contacting EHLS.

## B. EHLS-provided containers

EHLS provides containers for some waste streams in order to ensure the safe and compliant accumulation of wastes. These are available by contacting EHLS and for most waste streams may be returned to the generator after consolidation of waste at EHLS facilities. Some typical offerings are listed in this appendix.

### Unwanted materials organic solvents

Previously solvent waste at the University has been managed in 5-gallon metal cans that were used to ship the solvent. These cans have demonstrated reduced resistance to waste products due to the chemical changes inherent in the processes that produced the wastes. For this reason, EHLS has available 1-gallon amber glass jugs and 2.5-gallon carboys for the accumulation of these waste streams. Other waste streams may be acceptable for accumulation in either of these containers based on material compatibility and EHLS practices regarding waste consolidation. Contact EHLS to request an evaluation for these containers before June 30, 2018 when metal cans will no longer be accepted for removal of wastes other than the materials that were shipped in them.

### Biological waste bins

EHLS provides through its vendors hard-shelled containers for the accumulation of biological waste. They come in various sizes and have closable lids for compliance purposes. Bags are provided in limited number based on the size of the container- typically one bag per container. More information is available by contacting EHLS.

### Pails and drums

Pails for small volumes of solid waste are provided for laboratory accumulation of solid regulated wastes. Some of this waste such as silica from chromatography has been accumulated in 5-gallon metal cans in the past, which are being phased out and will no longer be accepted for removal after June 30, 2018. Pails are available upon request.

Drums for larger volumes of waste are limited to non-laboratory activities and require the permission of EHLS for accumulation of waste. Drums may be permitted for equipment maintenance or other episodic operations in both labs and shops with advance planning through EHLS. These may not be kept on-hand and so early notification is key to facilitating this. No containers larger than 5 gallons may be used to accumulate regulated wastes without EHLS approval. In some cases, EHLS may compel laboratories, shops, and workplaces in possession of waste in containers larger than 5 gallons to transfer the waste manually to smaller containers if permission is not obtained in a timely manner. Contact EHLS for more information on obtaining larger waste containers and drums.

## C. Incompatible materials and segregation

While it is generally inadvisable to store materials (such as wastes) in ways where the interaction of chemicals stored together could cause a significant hazard such as a fire, explosion, or release of toxic gas and may be prohibited in many circumstances, such actions carry civil (and possibly criminal) penalties when regulated wastes are involved. These penalties can be enforced solely on observed storage of incompatible chemicals together even if no reaction ever occurs.

Various material storage schemes are available such as the Stanford Storage groups (available on the Stanford University EHS website) and those mentioned in the University's Chemical Hygiene Plan are available and can provide a significant help in broadly classifying incompatible materials and means of segregating them. They are unable to achieve the breadth and depth that can be achieved by investigating the interactions of chemicals that may be stored in your lab, shop, or workplace- use of a chemical storage scheme does not alleviate the requirement to verify the individual compatibility of your materials with those that are not segregated from it. This compatibility extends to the container materials and secondary containment materials used for storing chemicals. Inspect safety data sheets and published literature regarding your chemicals to have the best understanding of what is and is not permissible.

Generally, if the interaction of two chemicals would cause any of the following results, it is not permissible:

- Weakening or degrading a container
- Exothermic reactions when the released energy would be adequate to harm other chemicals or cause a reaction of chemicals present
- Explosion or formation of explosive compounds
- Release of toxic gas
- Violent polymerization
- Creation of additional hazards (formation of a new chemical with distinct hazards from the two or more chemicals in aggregate, or imparting a new hazard to one of the materials that did not have it before such as flammable solvent contaminating biological waste)
- Cause a fire or create conditions amenable to the ignition of a fire

For more information or with specific questions about compatibility of wastes for storage, please contact EHLS.

## D. Hazard assessment

Hazard assessment for the purposes of labeling or determining management requirements for wastes must be based on documentable evidence of hazards or a lack thereof. Safety data sheets, related compounds, and published literature can all be used to determine the hazards of chemicals and mixtures of chemicals. Approaches to estimating the hazards of mixtures of found in most waste streams can take two primary approaches- to aggregate the hazards of all compounds and select the highest category of hazard for each criteria, or to estimate the products of reactions that have taken place in the processes that generate the waste and to examine the expected hazards of these products and of related compounds to achieve reasonable estimates of the hazards of the waste materials.

### Aggregate estimation

Aggregate estimation is essentially taking the worst-case scenario of a mixture of chemicals that reacts and using that as the baseline estimate. An example of this would be to look at the combination of concentrated hydrochloric acid and a concentrated solution of sodium hydroxide. In this case, all of the hazards of hydrochloric acid would be indicated on the label and used in determining storage requirements, as would all of the hazards of the sodium hydroxide. After this, any literature documenting the products of this combination could be consulted to add any synergistic effects, or to rule out hazards that were present. In this approach the quantities and concentrations matter if for instance on is in excess, it would not totally be neutralized by the reaction. All of this must be documentable, and this documentation must be maintained for as long as the waste is generated.

### Predicted products estimation

If the products of the reaction are known, this information can use used so long as impurities and possible intermediate compounds are also accounted for. In doing this, literature searches are important in order to understand other possible outcomes of the reaction and their products. Related compounds may also lend some information on intermediary compounds and additional reaction products. In this case, estimation must also be based on documentable knowledge and must be maintained for as long as the waste is generated.

### Analytical data

Representative samples of wastes can be sent for analysis if proper sampling procedures are followed and the destination laboratory uses approved testing procedures. Depending on the materials being analyzed, additional accreditations may be required of the lab for this analytical evidence to rule out the presence of a hazard. This is generally beyond the means of most generators at the University but may be employed for large volume wastes such as tanks. Some waste may be sampled from materials removed from laboratories, shops, and workplaces to insure compliance with regulation and policy by EHLS. Disposal vendors also perform additional sampling and analysis. Recoupment of costs related to misrepresented or poorly classified wastes are not prohibited from recoupment by the university entity paying for the increased cost of disposal.

### Combining these practices

These methods of estimating the hazards of mixtures using documentable evidence or knowledge are often combined in order to form the most complete picture of the hazards that must be treated or mitigated. The most important aspects of hazard estimation are understanding when there is insufficient evidence, conservative reasoning erring on the side of a hazard, and documentation of this

information. EHLS may request this documentation at any time as part of routine operations or in response to regulatory inspection or action.

## E. Chemical substitution

Chemical substitution is the principle that less-hazardous alternatives to some chemical products exist and are usable. Chemical substitution involves a chance to a process or workflow and requires that controls are reevaluated, container compatibility verified, and that there is a net benefit. EHLS is available for assistance in matters regarding substitution of chemicals in processes, especially when promised outcomes are “green” or disposable without regulation. Commonly accepted substitutions adopted with good results at the University may be posted to the EHLS website to inform other users of similar chemicals and processes.

## F. Commonly consolidated waste streams

Waste stream consolidation is common in laboratories and must be undertaken in a way that does not present an additional hazard by means of adverse reaction, cause unpermitted treatment for the purposes of disposal, or shift pollutants to another medium. This means that careful evaluation of the compatibility of all of the wastes that may enter a container is required before wastes from multiple processes or workers are consolidated. EHLS will publish to the EHLS website records of common consolidation schemes as these practices are evaluated in order to allow more efficient management of unwanted materials, hazardous wastes, and other regulated wastes.

## G. Time sensitive materials

The University has, or reasonably expects to have at any time many time-sensitive materials. Generally, these are divided between the following general classes:

- Peroxide formers
- Multi-nitro aromatics
- Corrosive compressed gases
- Alkali metals
- Metal fulminate and heavy metal acetylide formers

### Peroxide formers

Peroxide formers are typically divided into four classes based on their risk of forming peroxides.

*Class A peroxide formers form peroxides without concentration (by distillation or evaporation).*

| Class A | | |
|---|---|---|
| Butadiene | Chloroprene | Divinylacetylene |
| Isopropyl ether | Tetrafluoroethylene | Vinylidene chloride |

*Class B peroxide formers form explosive levels of peroxides on concentration (by distillation or evaporation).*

| Class B | | |
|---|---|---|
| Acetal | Acetaldehyde | Benzyl alcohol |
| 2-Butanol | Cumene | Cyclohexanol |
| 2-Cyclohexen-1-ol | Cyclohexene | Decahydronaphthalene |
| Diacetylene | Dicyclopentadiene | Diethyl ether |
| Diglyme | Dioxanes | Glyme |
| 4-Hepitanol | 2-Hexanol | Methyl acetylene |
| 3-Methyl-1-butanol | Methylcyclopentane | Methy isobutyl ketone |
| 4-methyl-2-pentanol | 2-Pentanol | 4-Pentene-1-ol |
| 1-Phenylethanol | 2-Phenylethanol | 2-Propanol |
| Tetrahydrofuran | Tetrahydronaphthalene | Vinyl ethers |
| Other secondary alcohols | | |

*Class C peroxide formers can autopolymerize due to peroxide formation*

| Class C | | |
|---|---|---|
| Acrylic acid | Acrylonitrile | Butadiene |
| Chloroprene | Chlorotrifluoroethylene | Methyl methacrylate |
| Styrene | Tetrafluoroethylene | Vinyl acetate |
| Vinylacetylene | Vinyl chloride | Vinyl pyridine |
| Vinyladiene chloride | | |

*Class D peroxide formers do not fall into other categories, but require special handling.*

| Class D | | |
|---|---|---|
| Acrolein | p-Chlorophenetole | 4,5-Hexadien-2-yn-1-ol |
| Allyl ether | Cyclooctene | n-Hexyl ether |
| Allyl ethyl ether | Cyclopropyl methyl ether | o.p-Iodophenetole |
| Allyl phenyl ether | Diallyl ether | Isoamyl benzyl ether |
| p-(n-Amyloxy)benzoyl chloride | p-Di-n-butoxybenzene | Isoamyl ether |
| n-Amyl ether | 1,2-Dibenzyloxyethane | Isobutyl vinyl ether |
| Benzyl n-butyl ether | p-Dibenzyloxybenzene | Isophorone |
| Benzyl ether | 1,2-Dichloroethyl ethyl ether | b-Isopropoxypropionitrile |
| Benzyl ethyl ether | 2,4-Dichlorophenetole | Isopropyl-2,4,5-trichlorophenoxy acetate |
| Benzyl methyl ether | Diethoxymethane | n-Methylphenetole |
| Benzyl-1-napthyl ether | 2,2-Diethoxypropane | 2-Methyltetrahydrofuran |
| 1,2-Bis(2-chloroethoxyl)ethane | Diethyl ethoxymethylenemalonate | 3-Methoxy-1-butyl acetate |
| Bis(2-ethoxyethyl)ether | Diethyl fumarate | 2-Methoxyethanol |
| Bis(2-(methoxyethoxy)ethyl) ether | Diethyl acetal | 3-Methoxyethyl acetate |
| Bis(2-chloroethyl) ether | Diethylketene | 2-Methoxyethyl vinyl ether |
| Bis(2-ethoxyethyl) adipate | Diethoxybenzene (m-,o-,p-) | Methoxy-1,3,5,7-cyclooctatetraene |
| Bis(2-methoxyethyl) carbonate | 1,2-Diethoxyethane | b-Methoxypropionitrile |
| Bis(2-methoxyethyl) ether | Dimethoxymethane | m-Nitrophenetole |
| Bis(2-methoxyethyl) phthalate | 1,1-Dimethoxyethane | 1-Octene |
| Bis(2-methoxymethyl) adipate | Di(1-propynl) ether | Oxybis(2-ethyl acetate) |
| Bis(2-n-butoxyethyl) phthalate | Di(2-propynl) ether | Oxybis(2-ethyl benzoate) |
| Bis(2-phenoxyethyl) ether | Di-n-propoxymethane | b,b-Oxydipropionitrile |
| Bis(4-chlorobutyl) ether | 1,2-Epoxy-3-isopropoxypropane | 1-Pentene |
| Bis(chloromethyl) ether | 1,2-Epoxy-3-phenoxypropane | Phenoxyacetyl chloride |
| 2-Bromomethyl ethyl ether | p-Ethoxyacetophenone | a-Phenoxypropionyl chloride |
| beta-Bromophenetole | 1-(2-Ethoxyethoxy)ethyl acetate | Phenyl-o-propyl ether |
| o-Bromophenetole | 2-Ethoxyethyl acetate | p-Phenylphenetone |
| p-Bromophenetole | (2-Ethoxyethyl)-a-benzoyl benzoate | n-Propyl ether |
| 3-Bromopropyl phenyl ether | 1-Ethoxynaphthalene | n-Propyl isopropyl ether |
| tert-Butyl methyl ether | o,p-Ethoxyphenyl isocyanate | Sodium 8-11-14-eicosatetraenoate |
| n-Butyl phenyl ether | 1-Ethoxy-2-propyne | Sodium ethoxyacetylide |
| n-Butyl vinyl ether | 3-Ethoxypropionitrile | Tetrahydropyran |
| Chloroacetaldehyde diethylacetal | 2-Ethylacrylaldehyde oxime | Triethylene glycol diacetate |
| 2-Chlorobutadiene | 2-Ethylbutanol | Triethylene glycol dipropionate |
| 1-(2-Chloroethoxy)-2-phenoxyethane | Ethyl-b-ethoxypropionate | 1,3,3-Trimethoxypropene |
| Chloroethylene | Ethylene glycol monomethyl ether | 1,1,2,3-Tetrachloro-1,3-butadiene |
| Chloromethyl methyl ether | 2-Ethylhexanal | 4-Vinyl cyclohexene |
| beta-Chlorophenetole | Ethyl vinyl ether | Vinylene carbonate |

| | | |
|---|---|---|
| o-Chorophenol | 2,5-Hexadiyn-1-ol | |

## Multi-nitro compounds

Multi-nitro aromatics are generally packaged in appropriate material isolating them from materials that may increase their hazard, and may be stabilized with water or other liquids. Over time and use conditions these conditions may change. Periodic checks are needed to insure adequate stabilization and proper storage conditions.

| Multi-nitro | | |
|---|---|---|
| Nitroguanadine | Nitrocellulose | Picric acid |
| Tetranitroaniline | Trinitroaniline | Trinitroanisole |

## Corrosive compressed gases

While in a regulatory sense it is difficult to define a compressed gas as corrosive, some do exhibit properties that make them prone to a reaction between the gas, atmospheric contaminants such as water, and the material of the cylinder in which they are contained that over time can result in releases due to pressure relief devices or lacking these a catastrophic failure of the container. (Reactive compressed gases mentioned in other sections and manuals are addressed in the peroxide formers section.)

| Corrosive Compressed Gases | | |
|---|---|---|
| Hydrogen fluoride | Hydrogen bromide | Hydrogen sulfide |
| Hydrogen cyanide | Hydrogen chloride | |

## Alkali metals

Alkali metals (those in the first period of the periodic table such as lithium, sodium, potassium, rubidium, and cesium) must generally be stored under mineral oil although other solvents are common. Use in and out of glove boxes can potentially expose the metals to gases that can cause reactions such as dissolved oxygen in mineral oil or nitrogen when working with lithium that can create nitrides, oxides, and superoxides that increase the hazard of these materials.

## Metal fulminate and heavy metal acetylide generating conditions

Tollens reagent is known to be unstable over time, and other materials with similar properties may cause such conditions. Improperly stored materials such as calcium carbide that may react with atmospheric moisture may cause heavy metal acetylides if stored improperly.

## H. Unused chemical products

Unused commercial chemical products are not considered waste or unwanted material until the decision has been made that they are no longer wanted, no longer needed, or unable to serve their intended purpose. Unused chemical products in primary containers may bear information on their manufacturing date and lot information that make them significantly more useful as reagents and chemical products to other users at the University. Primary containers may also have warning and hazard information included as well as safety and product lifespan features such as opaque material, vented caps, and stabilizing materials. Unused commercial chemical products must be maintained as valuable chemical products to avoid becoming subject to violations due to handling as a waste material. Unused commercial chemical products in primary containers can have more simple labels as their manufacturer-provided label may provide adequate information for waste classification and emergency responders. If users for an unused commercial chemical product are difficult to find, please contact EHLS to see if the product(s) can be introduced into the University's ChemSwap program.

## I. Laboratory cleanouts

Laboratory cleanouts are removals of unwanted materials from laboratories where twenty or more containers are present, or where the personnel that generated the waste are unavailable (no longer employed by the University, deceased, etc.) or unwilling to assist in removing the unwanted materials. Prompt laboratory cleanouts where multiple containers of unwanted material are present, or where the disposition of chemicals is unknown increase the safety and security of laboratories by providing for prompt disposal of time-sensitive, unknown, or orphaned chemicals. Chemicals that are left in place for significant periods are not only capable of increasing in hazard in some circumstances; they also have increased exposure to laboratory personnel and activities increasing the chance of accidents and incidents. Cleanouts can be requested by contacting EHLS.

## J. EPA F-list

| Number | Hazardous waste | Hazard code |
|---|---|---|
| F001 | The following spent halogenated solvents used in degreasing: Tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride, and chlorinated fluorocarbons; all spent solvent mixtures/blends used in degreasing containing, before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures | (T) |
| F002 | The following spent halogenated solvents: Tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, ortho-dichlorobenzene, trichlorofluoromethane, and 1,1,2-trichloroethane; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents or those listed in F001, F004, or F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures | (T) |
| F003 | The following spent non-halogenated solvents: Xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol; all spent solvent mixtures/blends containing, before use, only the above spent non-halogenated solvents; and all spent solvent mixtures/blends containing, before use, one or more of the above non-halogenated solvents, and, a total of ten percent or more (by volume) of one or more of those solvents listed in F001, F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures | (I)* |
| F004 | The following spent non-halogenated solvents: Cresols and cresylic acid, and nitrobenzene; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures | (T) |

| Number | Hazardous waste | Hazard code |
|---|---|---|
| F005 | The following spent non-halogenated solvents: Toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, and 2-nitropropane; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, or F004; and still bottoms from the recovery of these spent solvents and spent solvent mixtures | (I,T) |
| F006 | Wastewater treatment sludges from electroplating operations except from the following processes: (1) Sulfuric acid anodizing of aluminum; (2) tin plating on carbon steel; (3) zinc plating (segregated basis) on carbon steel; (4) aluminum or zinc-aluminum plating on carbon steel; (5) cleaning/stripping associated with tin, zinc and aluminum plating on carbon steel; and (6) chemical etching and milling of aluminum | (T) |
| F007 | Spent cyanide plating bath solutions from electroplating operations | (R, T) |
| F008 | Plating bath residues from the bottom of plating baths from electroplating operations where cyanides are used in the process | (R, T) |
| F009 | Spent stripping and cleaning bath solutions from electroplating operations where cyanides are used in the process | (R, T) |
| F010 | Quenching bath residues from oil baths from metal heat treating operations where cyanides are used in the process | (R, T) |
| F011 | Spent cyanide solutions from salt bath pot cleaning from metal heat treating operations | (R, T) |
| F012 | Quenching waste water treatment sludges from metal heat treating operations where cyanides are used in the process | (T) |
| F019 | Wastewater treatment sludges from the chemical conversion coating of aluminum except from zirconium phosphating in aluminum can washing when such phosphating is an exclusive conversion coating process. Wastewater treatment sludges from the manufacturing of motor vehicles using a zinc phosphating process will not be subject to this listing at the point of generation if the wastes are not placed outside on the land prior to shipment to a landfill for disposal and are either: disposed in a Subtitle D municipal or industrial landfill unit that is equipped with a single clay liner and is permitted, licensed or otherwise authorized by the state; or disposed in a landfill unit subject to, or otherwise meeting, the landfill requirements in §258.40, §264.301 or §265.301. For the purposes of this listing, motor vehicle manufacturing is defined in paragraph (b)(4)(i) of this section and (b)(4)(ii) of this section describes the recordkeeping requirements for motor vehicle manufacturing facilities | (T) |

| Number | Hazardous waste | Hazard code |
|---|---|---|
| F020 | Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- or tetrachlorophenol, or of intermediates used to produce their pesticide derivatives. (This listing does not include wastes from the production of Hexachlorophene from highly purified 2,4,5-trichlorophenol.) | (H) |
| F021 | Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of pentachlorophenol, or of intermediates used to produce its derivatives | (H) |
| F022 | Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzenes under alkaline conditions | (H) |
| F023 | Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- and tetrachlorophenols. (This listing does not include wastes from equipment used only for the production or use of Hexachlorophene from highly purified 2,4,5-trichlorophenol.) | (H) |
| F024 | Process wastes, including but not limited to, distillation residues, heavy ends, tars, and reactor clean-out wastes, from the production of certain chlorinated aliphatic hydrocarbons by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution. (This listing does not include wastewaters, wastewater treatment sludges, spent catalysts, and wastes listed in §261.31 or §261.32.) | (T) |
| F025 | Condensed light ends, spent filters and filter aids, and spent desiccant wastes from the production of certain chlorinated aliphatic hydrocarbons, by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution | (T) |

| Number | Hazardous waste | Hazard code |
|---|---|---|
| F026 | Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzene under alkaline conditions | (H) |
| F027 | Discarded unused formulations containing tri-, tetra-, or pentachlorophenol or discarded unused formulations containing compounds derived from these chlorophenols. (This listing does not include formulations containing Hexachlorophene sythesized from prepurified 2,4,5-trichlorophenol as the sole component.) | (H) |
| F028 | Residues resulting from the incineration or thermal treatment of soil contaminated with EPA Hazardous Waste Nos. F020, F021, F022, F023, F026, and F027 | (T) |
| F032 | Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that currently use or have previously used chlorophenolic formulations (except potentially cross-contaminated wastes that have had the F032 waste code deleted in accordance with §261.35 of this chapter or potentially cross-contaminated wastes that are otherwise currently regulated as hazardous wastes (i.e., F034 or F035), and where the generator does not resume or initiate use of chlorophenolic formulations). This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol | (T) |
| F034 | Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use creosote formulations. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol | (T) |
| F035 | Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use inorganic preservatives containing arsenic or chromium. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol | (T) |

| Number | Hazardous waste | Hazard code |
|---|---|---|
| F037 | Petroleum refinery primary oil/water/solids separation sludge—Any sludge generated from the gravitational separation of oil/water/solids during the storage or treatment of process wastewaters and oily cooling wastewaters from petroleum refineries. Such sludges include, but are not limited to, those generated in oil/water/solids separators; tanks and impoundments; ditches and other conveyances; sumps; and stormwater units receiving dry weather flow. Sludge generated in stormwater units that do not receive dry weather flow, sludges generated from non-contact once-through cooling waters segregated for treatment from other process or oily cooling waters, sludges generated in aggressive biological treatment units as defined in §261.31(b)(2) (including sludges generated in one or more additional units after wastewaters have been treated in aggressive biological treatment units) and K051 wastes are not included in this listing. This listing does include residuals generated from processing or recycling oil-bearing hazardous secondary materials excluded under §261.4(a)(12)(i), if those residuals are to be disposed of | (T) |
| F038 | Petroleum refinery secondary (emulsified) oil/water/solids separation sludge—Any sludge and/or float generated from the physical and/or chemical separation of oil/water/solids in process wastewaters and oily cooling wastewaters from petroleum refineries. Such wastes include, but are not limited to, all sludges and floats generated in: induced air flotation (IAF) units, tanks and impoundments, and all sludges generated in DAF units. Sludges generated in stormwater units that do not receive dry weather flow, sludges generated from non-contact once-through cooling waters segregated for treatment from other process or oily cooling waters, sludges and floats generated in aggressive biological treatment units as defined in §261.31(b)(2) (including sludges and floats generated in one or more additional units after wastewaters have been treated in aggressive biological treatment units) and F037, K048, and K051 wastes are not included in this listing | (T) |
| F039 | Leachate (liquids that have percolated through land disposed wastes) resulting from the disposal of more than one restricted waste classified as hazardous under subpart D of this part. (Leachate resulting from the disposal of one or more of the following EPA Hazardous Wastes and no other Hazardous Wastes retains its EPA Hazardous Waste Number(s): F020, F021, F022, F026, F027, and/or F028.) | (T) |

## K. EPA K-list

| Industry and Number | Hazardous waste | Hazard code |
|---|---|---|
| Wood preservation: K001 | Bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol | (T) |
| Inorganic pigments: | | |
| K002 | Wastewater treatment sludge from the production of chrome yellow and orange pigments | (T) |
| K003 | Wastewater treatment sludge from the production of molybdate orange pigments | (T) |
| K004 | Wastewater treatment sludge from the production of zinc yellow pigments | (T) |
| K005 | Wastewater treatment sludge from the production of chrome green pigments | (T) |
| K006 | Wastewater treatment sludge from the production of chrome oxide green pigments (anhydrous and hydrated) | (T) |
| K007 | Wastewater treatment sludge from the production of iron blue pigments | (T) |
| K008 | Oven residue from the production of chrome oxide green pigments | (T) |
| Organic chemicals: | | |
| K009 | Distillation bottoms from the production of acetaldehyde from ethylene | (T) |
| K010 | Distillation side cuts from the production of acetaldehyde from ethylene | (T) |
| K011 | Bottom stream from the wastewater stripper in the production of acrylonitrile | (R, T) |
| K013 | Bottom stream from the acetonitrile column in the production of acrylonitrile | (R, T) |
| K014 | Bottoms from the acetonitrile purification column in the production of acrylonitrile | (T) |
| K015 | Still bottoms from the distillation of benzyl chloride | (T) |
| K016 | Heavy ends or distillation residues from the production of carbon tetrachloride | (T) |
| K017 | Heavy ends (still bottoms) from the purification column in the production of epichlorohydrin | (T) |
| K018 | Heavy ends from the fractionation column in ethyl chloride production | (T) |

| Industry and Number | Hazardous waste | Hazard code |
|---|---|---|
| K019 | Heavy ends from the distillation of ethylene dichloride in ethylene dichloride production | (T) |
| K020 | Heavy ends from the distillation of vinyl chloride in vinyl chloride monomer production | (T) |
| K021 | Aqueous spent antimony catalyst waste from fluoromethanes production | (T) |
| K022 | Distillation bottom tars from the production of phenol/acetone from cumene | (T) |
| K023 | Distillation light ends from the production of phthalic anhydride from naphthalene | (T) |
| K024 | Distillation bottoms from the production of phthalic anhydride from naphthalene | (T) |
| K025 | Distillation bottoms from the production of nitrobenzene by the nitration of benzene | (T) |
| K026 | Stripping still tails from the production of methy ethyl pyridines | (T) |
| K027 | Centrifuge and distillation residues from toluene diisocyanate production | (R, T) |
| K028 | Spent catalyst from the hydrochlorinator reactor in the production of 1,1,1-trichloroethane | (T) |
| K029 | Waste from the product steam stripper in the production of 1,1,1-trichloroethane | (T) |
| K030 | Column bottoms or heavy ends from the combined production of trichloroethylene and perchloroethylene | (T) |
| K083 | Distillation bottoms from aniline production | (T) |
| K085 | Distillation or fractionation column bottoms from the production of chlorobenzenes | (T) |
| K093 | Distillation light ends from the production of phthalic anhydride from ortho-xylene | (T) |
| K094 | Distillation bottoms from the production of phthalic anhydride from ortho-xylene | (T) |
| K095 | Distillation bottoms from the production of 1,1,1-trichloroethane | (T) |
| K096 | Heavy ends from the heavy ends column from the production of 1,1,1-trichloroethane | (T) |

| Industry and Number | Hazardous waste | Hazard code |
|---|---|---|
| K103 | Process residues from aniline extraction from the production of aniline | (T) |
| K104 | Combined wastewater streams generated from nitrobenzene/aniline production | (T) |
| K105 | Separated aqueous stream from the reactor product washing step in the production of chlorobenzenes | (T) |
| K107 | Column bottoms from product separation from the production of 1,1-dimethylhydrazine (UDMH) from carboxylic acid hydrazides | (C,T) |
| K108 | Condensed column overheads from product separation and condensed reactor vent gases from the production of 1,1-dimethylhydrazine (UDMH) from carboxylic acid hydrazides | (I,T) |
| K109 | Spent filter cartridges from product purification from the production of 1,1-dimethylhydrazine (UDMH) from carboxylic acid hydrazides | (T) |
| K110 | Condensed column overheads from intermediate separation from the production of 1,1-dimethylhydrazine (UDMH) from carboxylic acid hydrazides | (T) |
| K111 | Product washwaters from the production of dinitrotoluene via nitration of toluene | (C,T) |
| K112 | Reaction by-product water from the drying column in the production of toluenediamine via hydrogenation of dinitrotoluene | (T) |
| K113 | Condensed liquid light ends from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitrotoluene | (T) |
| K114 | Vicinals from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitrotoluene | (T) |
| K115 | Heavy ends from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitrotoluene | (T) |
| K116 | Organic condensate from the solvent recovery column in the production of toluene diisocyanate via phosgenation of toluenediamine | (T) |

| Industry and Number | Hazardous waste | Hazard code |
|---|---|---|
| K117 | Wastewater from the reactor vent gas scrubber in the production of ethylene dibromide via bromination of ethene | (T) |
| K118 | Spent adsorbent solids from purification of ethylene dibromide in the production of ethylene dibromide via bromination of ethene | (T) |
| K136 | Still bottoms from the purification of ethylene dibromide in the production of ethylene dibromide via bromination of ethene | (T) |
| K149 | Distillation bottoms from the production of alpha- (or methyl-) chlorinated toluenes, ring-chlorinated toluenes, benzoyl chlorides, and compounds with mixtures of these functional groups, (This waste does not include still bottoms from the distillation of benzyl chloride.) | (T) |
| K150 | Organic residuals, excluding spent carbon adsorbent, from the spent chlorine gas and hydrochloric acid recovery processes associated with the production of alpha- (or methyl-) chlorinated toluenes, ring-chlorinated toluenes, benzoyl chlorides, and compounds with mixtures of these functional groups | (T) |
| K151 | Wastewater treatment sludges, excluding neutralization and biological sludges, generated during the treatment of wastewaters from the production of alpha- (or methyl-) chlorinated toluenes, ring-chlorinated toluenes, benzoyl chlorides, and compounds with mixtures of these functional groups | (T) |
| K156 | Organic waste (including heavy ends, still bottoms, light ends, spent solvents, filtrates, and decantates) from the production of carbamates and carbamoyl oximes. (This listing does not apply to wastes generated from the manufacture of 3-iodo-2-propynyl n-butylcarbamate.) | (T) |

| Industry and Number | Hazardous waste | Hazard code |
|---|---|---|
| K157 | Wastewaters (including scrubber waters, condenser waters, washwaters, and separation waters) from the production of carbamates and carbamoyl oximes. (This listing does not apply to wastes generated from the manufacture of 3-iodo-2-propynyl n-butylcarbamate.) | (T) |
| K158 | Bag house dusts and filter/separation solids from the production of carbamates and carbamoyl oximes. (This listing does not apply to wastes generated from the manufacture of 3-iodo-2-propynyl n-butylcarbamate.) | (T) |
| K159 | Organics from the treatment of thiocarbamate wastes | (T) |
| K161 | Purification solids (including filtration, evaporation, and centrifugation solids), bag house dust and floor sweepings from the production of dithiocarbamate acids and their salts. (This listing does not include K125 or K126.) | (R,T) |
| K174 | Wastewater treatment sludges from the production of ethylene dichloride or vinyl chloride monomer (including sludges that result from commingled ethylene dichloride or vinyl chloride monomer wastewater and other wastewater), unless the sludges meet the following conditions: (i) they are disposed of in a subtitle C or non-hazardous landfill licensed or permitted by the state or federal government; (ii) they are not otherwise placed on the land prior to final disposal; and (iii) the generator maintains documentation demonstrating that the waste was either disposed of in an on-site landfill or consigned to a transporter or disposal facility that provided a written commitment to dispose of the waste in an off-site landfill. Respondents in any action brought to enforce the requirements of subtitle C must, upon a showing by the government that the respondent managed wastewater treatment sludges from the production of vinyl chloride monomer or ethylene dichloride, demonstrate that they meet the terms of the exclusion set forth above. In doing so, they must provide appropriate documentation (e.g., contracts between the generator and the landfill owner/operator, invoices documenting delivery of waste to landfill, etc.) that the terms of the exclusion were met | (T) |

| Industry and Number | Hazardous waste | Hazard code |
|---|---|---|
| K175 | Wastewater treatment sludges from the production of vinyl chloride monomer using mercuric chloride catalyst in an acetylene-based process | (T) |
| K181 | Nonwastewaters from the production of dyes and/or pigments (including nonwastewaters commingled at the point of generation with nonwastewaters from other processes) that, at the point of generation, contain mass loadings of any of the constituents identified in paragraph (c) of this section that are equal to or greater than the corresponding paragraph (c) levels, as determined on a calendar year basis. These wastes will not be hazardous if the nonwastewaters are: (i) disposed in a Subtitle D landfill unit subject to the design criteria in §258.40, (ii) disposed in a Subtitle C landfill unit subject to either §264.301 or §265.301, (iii) disposed in other Subtitle D landfill units that meet the design criteria in §258.40, §264.301, or §265.301, or (iv) treated in a combustion unit that is permitted under Subtitle C, or an onsite combustion unit that is permitted under the Clean Air Act. For the purposes of this listing, dyes and/or pigments production is defined in paragraph (b)(1) of this section. Paragraph (d) of this section describes the process for demonstrating that a facility's nonwastewaters are not K181. This listing does not apply to wastes that are otherwise identified as hazardous under §§261.21-261.24 and 261.31-261.33 at the point of generation. Also, the listing does not apply to wastes generated before any annual mass loading limit is met | (T) |
| Inorganic chemicals: | | |
| K071 | Brine purification muds from the mercury cell process in chlorine production, where separately prepurified brine is not used | (T) |
| K073 | Chlorinated hydrocarbon waste from the purification step of the diaphragm cell process using graphite anodes in chlorine production | (T) |
| K106 | Wastewater treatment sludge from the mercury cell process in chlorine production | (T) |

| Industry and Number | Hazardous waste | Hazard code |
|---|---|---|
| K176 | Baghouse filters from the production of antimony oxide, including filters from the production of intermediates (e.g., antimony metal or crude antimony oxide) | (E) |
| K177 | Slag from the production of antimony oxide that is speculatively accumulated or disposed, including slag from the production of intermediates (e.g., antimony metal or crude antimony oxide) | (T) |
| K178 | Residues from manufacturing and manufacturing-site storage of ferric chloride from acids formed during the production of titanium dioxide using the chloride-ilmenite process | (T) |
| Pesticides: | | |
| K031 | By-product salts generated in the production of MSMA and cacodylic acid | (T) |
| K032 | Wastewater treatment sludge from the production of chlordane | (T) |
| K033 | Wastewater and scrub water from the chlorination of cyclopentadiene in the production of chlordane | (T) |
| K034 | Filter solids from the filtration of hexachlorocyclopentadiene in the production of chlordane | (T) |
| K035 | Wastewater treatment sludges generated in the production of creosote | (T) |
| K036 | Still bottoms from toluene reclamation distillation in the production of disulfoton | (T) |
| K037 | Wastewater treatment sludges from the production of disulfoton | (T) |
| K038 | Wastewater from the washing and stripping of phorate production | (T) |
| K039 | Filter cake from the filtration of diethylphosphorodithioic acid in the production of phorate | (T) |
| K040 | Wastewater treatment sludge from the production of phorate | (T) |
| K041 | Wastewater treatment sludge from the production of toxaphene | (T) |

| Industry and Number | Hazardous waste | Hazard code |
|---|---|---|
| K042 | Heavy ends or distillation residues from the distillation of tetrachlorobenzene in the production of 2,4,5-T | (T) |
| K043 | 2,6-Dichlorophenol waste from the production of 2,4-D | (T) |
| K097 | Vacuum stripper discharge from the chlordane chlorinator in the production of chlordane | (T) |
| K098 | Untreated process wastewater from the production of toxaphene | (T) |
| K099 | Untreated wastewater from the production of 2,4-D | (T) |
| K123 | Process wastewater (including supernates, filtrates, and washwaters) from the production of ethylenebisdithiocarbamic acid and its salt | (T) |
| K124 | Reactor vent scrubber water from the production of ethylenebisdithiocarbamic acid and its salts | (C, T) |
| K125 | Filtration, evaporation, and centrifugation solids from the production of ethylenebisdithiocarbamic acid and its salts | (T) |
| K126 | Baghouse dust and floor sweepings in milling and packaging operations from the production or formulation of ethylenebisdithiocarbamic acid and its salts | (T) |
| K131 | Wastewater from the reactor and spent sulfuric acid from the acid dryer from the production of methyl bromide | (C, T) |
| K132 | Spent absorbent and wastewater separator solids from the production of methyl bromide | (T) |
| Explosives: | | |
| K044 | Wastewater treatment sludges from the manufacturing and processing of explosives | (R) |
| K045 | Spent carbon from the treatment of wastewater containing explosives | (R) |
| K046 | Wastewater treatment sludges from the manufacturing, formulation and loading of lead-based initiating compounds | (T) |
| K047 | Pink/red water from TNT operations | (R) |

| Industry and Number | Hazardous waste | Hazard code |
|---|---|---|
| Petroleum refining: | | |
| K048 | Dissolved air flotation (DAF) float from the petroleum refining industry | (T) |
| K049 | Slop oil emulsion solids from the petroleum refining industry | (T) |
| K050 | Heat exchanger bundle cleaning sludge from the petroleum refining industry | (T) |
| K051 | API separator sludge from the petroleum refining industry | (T) |
| K052 | Tank bottoms (leaded) from the petroleum refining industry | (T) |
| K169 | Crude oil storage tank sediment from petroleum refining operations | (T) |
| K170 | Clarified slurry oil tank sediment and/or in-line filter/separation solids from petroleum refining operations | (T) |
| K171 | Spent Hydrotreating catalyst from petroleum refining operations, including guard beds used to desulfurize feeds to other catalytic reactors (this listing does not include inert support media) | (I,T) |
| K172 | Spent Hydrorefining catalyst from petroleum refining operations, including guard beds used to desulfurize feeds to other catalytic reactors (this listing does not include inert support media) | (I,T) |
| Iron and steel: | | |
| K061 | Emission control dust/sludge from the primary production of steel in electric furnaces | (T) |
| K062 | Spent pickle liquor generated by steel finishing operations of facilities within the iron and steel industry (SIC Codes 331 and 332) | (C,T) |
| Primary aluminum: | | |
| K088 | Spent potliners from primary aluminum reduction | (T) |
| Secondary lead: | | |
| K069 | Emission control dust/sludge from secondary lead smelting. (Note: This listing is stayed administratively for sludge generated from secondary acid scrubber systems. The stay will remain in effect until further administrative action is taken. If EPA takes further action effecting this stay, EPA will publish a notice of the action in the Federal Register) | (T) |
| K100 | Waste leaching solution from acid leaching of emission control dust/sludge from secondary lead smelting | (T) |

| Industry and Number | Hazardous waste | Hazard code |
|---|---|---|
| Veterinary pharmaceuticals: | | |
| K084 | Wastewater treatment sludges generated during the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds | (T) |
| K101 | Distillation tar residues from the distillation of aniline-based compounds in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds | (T) |
| K102 | Residue from the use of activated carbon for decolorization in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds | (T) |
| Ink formulation: | | |
| K086 | Solvent washes and sludges, caustic washes and sludges, or water washes and sludges from cleaning tubs and equipment used in the formulation of ink from pigments, driers, soaps, and stabilizers containing chromium and lead | (T) |
| Coking: | | |
| K060 | Ammonia still lime sludge from coking operations | (T) |
| K087 | Decanter tank tar sludge from coking operations | (T) |
| K141 | Process residues from the recovery of coal tar, including, but not limited to, collecting sump residues from the production of coke from coal or the recovery of coke by-products produced from coal. This listing does not include K087 (decanter tank tar sludges from coking operations) | (T) |
| K142 | Tar storage tank residues from the production of coke from coal or from the recovery of coke by-products produced from coal | (T) |
| K143 | Process residues from the recovery of light oil, including, but not limited to, those generated in stills, decanters, and wash oil recovery units from the recovery of coke by-products produced from coal | (T) |
| K144 | Wastewater sump residues from light oil refining, including, but not limited to, intercepting or contamination sump sludges from the recovery of coke by-products produced from coal | (T) |
| K145 | Residues from naphthalene collection and recovery operations from the recovery of coke by-products produced from coal | (T) |
| K147 | Tar storage tank residues from coal tar refining | (T) |
| K148 | Residues from coal tar distillation, including but not limited to, still bottoms | (T) |

## L. EPA P-list

| Number | C.A.S. | Substance |
|---|---|---|
| P001 | [1]81-81-2 | 2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl)-, & salts, when present at concentrations greater than 0.3% |
| P001 | [1]81-81-2 | Warfarin, & salts, when present at concentrations greater than 0.3% |
| P002 | 591-08-2 | Acetamide, -(aminothioxomethyl)- |
| P002 | 591-08-2 | 1-Acetyl-2-thiourea |
| P003 | 107-02-8 | Acrolein |
| P003 | 107-02-8 | 2-Propenal |
| P004 | 309-00-2 | Aldrin |
| 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,5alpha,8alpha,8abeta)- |
| P005 | 107-18-6 | Allyl alcohol |
| P005 | 107-18-6 | 2-Propen-1-ol |
| P006 | 20859-73-8 | Aluminum phosphide (R,T) |
| P007 | 2763-96-4 | 5-(Aminomethyl)-3-isoxazolol |
| P007 | 2763-96-4 | 3(2H)-Isoxazolone, 5-(aminomethyl)- |
| P008 | 504-24-5 | 4-Aminopyridine |
| P008 | 504-24-5 | 4-Pyridinamine |
| P009 | 131-74-8 | Ammonium picrate (R) |
| P009 | 131-74-8 | Phenol, 2,4,6-trinitro-, ammonium salt (R) |
| P010 | 7778-39-4 | Arsenic acid $H_3$ $AsO_4$ |
| P011 | 1303-28-2 | Arsenic oxide $As_2$ $O_5$ |
| P011 | 1303-28-2 | Arsenic pentoxide |
| P012 | 1327-53-3 | Arsenic oxide $As_2$ $O_3$ |
| P012 | 1327-53-3 | Arsenic trioxide |
| P013 | 542-62-1 | Barium cyanide |
| P014 | 108-98-5 | Benzenethiol |
| P014 | 108-98-5 | Thiophenol |
| P015 | 7440-41-7 | Beryllium powder |
| P016 | 542-88-1 | Dichloromethyl ether |
| P016 | 542-88-1 | Methane, oxybis[chloro- |

| Number | C.A.S. | Substance |
|---|---|---|
| P017 | 598-31-2 | Bromoacetone |
| P017 | 598-31-2 | 2-Propanone, 1-bromo- |
| P018 | 357-57-3 | Brucine |
| P018 | 357-57-3 | Strychnidin-10-one, 2,3-dimethoxy- |
| P020 | 88-85-7 | Dinoseb |
| P020 | 88-85-7 | Phenol, 2-(1-methylpropyl)-4,6-dinitro- |
| P021 | 592-01-8 | Calcium cyanide |
| P021 | 592-01-8 | Calcium cyanide $Ca(CN)_2$ |
| P022 | 75-15-0 | Carbon disulfide |
| P023 | 107-20-0 | Acetaldehyde, chloro- |
| P023 | 107-20-0 | Chloroacetaldehyde |
| P024 | 106-47-8 | Benzenamine, 4-chloro- |
| P024 | 106-47-8 | p-Chloroaniline |
| P026 | 5344-82-1 | 1-(o-Chlorophenyl)thiourea |
| P026 | 5344-82-1 | Thiourea, (2-chlorophenyl)- |
| P027 | 542-76-7 | 3-Chloropropionitrile |
| P027 | 542-76-7 | Propanenitrile, 3-chloro- |
| P028 | 100-44-7 | Benzene, (chloromethyl)- |
| P028 | 100-44-7 | Benzyl chloride |
| P029 | 544-92-3 | Copper cyanide |
| P029 | 544-92-3 | Copper cyanide Cu(CN) |
| P030 | | Cyanides (soluble cyanide salts), not otherwise specified |
| P031 | 460-19-5 | Cyanogen |
| P031 | 460-19-5 | Ethanedinitrile |
| P033 | 506-77-4 | Cyanogen chloride |
| P033 | 506-77-4 | Cyanogen chloride (CN)Cl |
| P034 | 131-89-5 | 2-Cyclohexyl-4,6-dinitrophenol |
| P034 | 131-89-5 | Phenol, 2-cyclohexyl-4,6-dinitro- |
| P036 | 696-28-6 | Arsonous dichloride, phenyl- |
| P036 | 696-28-6 | Dichlorophenylarsine |
| P037 | 60-57-1 | Dieldrin |
| 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,2aalpha,3beta,6beta,6aalpha,7beta, 7aalpha)- |
| P038 | 692-42-2 | Arsine, diethyl- |
| P038 | 692-42-2 | Diethylarsine |
| P039 | 298-04-4 | Disulfoton |
| P039 | 298-04-4 | Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl] ester |

| Number | C.A.S. | Substance |
|---|---|---|
| P040 | 297-97-2 | O,O-Diethyl O-pyrazinyl phosphorothioate |
| P040 | 297-97-2 | Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester |
| P041 | 311-45-5 | Diethyl-p-nitrophenyl phosphate |
| P041 | 311-45-5 | Phosphoric acid, diethyl 4-nitrophenyl ester |
| P042 | 51-43-4 | 1,2-Benzenediol, 4-[1-hydroxy-2-(methylamino)ethyl]-, (R)- |
| P042 | 51-43-4 | Epinephrine |
| P043 | 55-91-4 | Diisopropylfluorophosphate (DFP) |
| P043 | 55-91-4 | Phosphorofluoridic acid, bis(1-methylethyl) ester |
| P044 | 60-51-5 | Dimethoate |
| P044 | 60-51-5 | Phosphorodithioic acid, O,O-dimethyl S-[2-(methyl amino)-2-oxoethyl] ester |
| P045 | 39196-18-4 | 2-Butanone, 3,3-dimethyl-1-(methylthio)-, O-[(methylamino)carbonyl] oxime |
| P045 | 39196-18-4 | Thiofanox |
| P046 | 122-09-8 | Benzeneethanamine, alpha,alpha-dimethyl- |
| P046 | 122-09-8 | alpha,alpha-Dimethylphenethylamine |
| P047 | [1]534-52-1 | 4,6-Dinitro-o-cresol, & salts |
| P047 | [1]534-52-1 | Phenol, 2-methyl-4,6-dinitro-, & salts |
| P048 | 51-28-5 | 2,4-Dinitrophenol |
| P048 | 51-28-5 | Phenol, 2,4-dinitro- |
| P049 | 541-53-7 | Dithiobiuret |
| P049 | 541-53-7 | Thioimidodicarbonic diamide $[(H_2 N)C(S)]_2 NH$ |
| P050 | 115-29-7 | Endosulfan |
| P050 | 115-29-7 | 6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide |
| P051 | [1]72-20-8 | 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 | Endrin |
| P051 | 72-20-8 | Endrin, & metabolites |
| P054 | 151-56-4 | Aziridine |
| P054 | 151-56-4 | Ethyleneimine |
| P056 | 7782-41-4 | Fluorine |
| P057 | 640-19-7 | Acetamide, 2-fluoro- |
| P057 | 640-19-7 | Fluoroacetamide |
| P058 | 62-74-8 | Acetic acid, fluoro-, sodium salt |
| P058 | 62-74-8 | Fluoroacetic acid, sodium salt |

| Number | C.A.S. | Substance |
|---|---|---|
| P059 | 76-44-8 | Heptachlor |
| P059 | 76-44-8 | 4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro- |
| P060 | 465-73-6 | 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 | Isodrin |
| P062 | 757-58-4 | Hexaethyl tetraphosphate |
| P062 | 757-58-4 | Tetraphosphoric acid, hexaethyl ester |
| P063 | 74-90-8 | Hydrocyanic acid |
| P063 | 74-90-8 | Hydrogen cyanide |
| P064 | 624-83-9 | Methane, isocyanato- |
| P064 | 624-83-9 | Methyl isocyanate |
| P065 | 628-86-4 | Fulminic acid, mercury(2 + ) salt (R,T) |
| P065 | 628-86-4 | Mercury fulminate (R,T) |
| P066 | 16752-77-5 | Ethanimidothioic acid, N-[[(methylamino)carbonyl]oxy]-, methyl ester |
| P066 | 16752-77-5 | Methomyl |
| P067 | 75-55-8 | Aziridine, 2-methyl- |
| P067 | 75-55-8 | 1,2-Propylenimine |
| P068 | 60-34-4 | Hydrazine, methyl- |
| P068 | 60-34-4 | Methyl hydrazine |
| P069 | 75-86-5 | 2-Methyllactonitrile |
| P069 | 75-86-5 | Propanenitrile, 2-hydroxy-2-methyl- |
| P070 | 116-06-3 | Aldicarb |
| P070 | 116-06-3 | Propanal, 2-methyl-2-(methylthio)-, O-[(methylamino)carbonyl]oxime |
| P071 | 298-00-0 | Methyl parathion |
| P071 | 298-00-0 | Phosphorothioic acid, O,O,-dimethyl O-(4-nitrophenyl) ester |
| P072 | 86-88-4 | alpha-Naphthylthiourea |
| P072 | 86-88-4 | Thiourea, 1-naphthalenyl- |
| P073 | 13463-39-3 | Nickel carbonyl |
| P073 | 13463-39-3 | Nickel carbonyl $Ni(CO)_4$, (T-4)- |
| P074 | 557-19-7 | Nickel cyanide |
| P074 | 557-19-7 | Nickel cyanide $Ni(CN)_2$ |
| P075 | [1]54-11-5 | Nicotine, & salts |
| P075 | [1]54-11-5 | Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-, & salts |

| Number | C.A.S. | Substance |
|---|---|---|
| P076 | 10102-43-9 | Nitric oxide |
| P076 | 10102-43-9 | Nitrogen oxide NO |
| P077 | 100-01-6 | Benzenamine, 4-nitro- |
| P077 | 100-01-6 | p-Nitroaniline |
| P078 | 10102-44-0 | Nitrogen dioxide |
| P078 | 10102-44-0 | Nitrogen oxide $NO_2$ |
| P081 | 55-63-0 | Nitroglycerine (R) |
| P081 | 55-63-0 | 1,2,3-Propanetriol, trinitrate (R) |
| P082 | 62-75-9 | Methanamine, -methyl-N-nitroso- |
| P082 | 62-75-9 | N-Nitrosodimethylamine |
| P084 | 4549-40-0 | N-Nitrosomethylvinylamine |
| P084 | 4549-40-0 | Vinylamine, -methyl-N-nitroso- |
| P085 | 152-16-9 | Diphosphoramide, octamethyl- |
| P085 | 152-16-9 | Octamethylpyrophosphoramide |
| P087 | 20816-12-0 | Osmium oxide $OsO_4$, (T-4)- |
| P087 | 20816-12-0 | Osmium tetroxide |
| P088 | 145-73-3 | Endothall |
| P088 | 145-73-3 | 7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid |
| P089 | 56-38-2 | Parathion |
| P089 | 56-38-2 | Phosphorothioic acid, O,O-diethyl O-(4-nitrophenyl) ester |
| P092 | 62-38-4 | Mercury, (acetato-O)phenyl- |
| P092 | 62-38-4 | Phenylmercury acetate |
| P093 | 103-85-5 | Phenylthiourea |
| P093 | 103-85-5 | Thiourea, phenyl- |
| P094 | 298-02-2 | Phorate |
| P094 | 298-02-2 | Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester |
| P095 | 75-44-5 | Carbonic dichloride |
| P095 | 75-44-5 | Phosgene |
| P096 | 7803-51-2 | Hydrogen phosphide |
| P096 | 7803-51-2 | Phosphine |
| P097 | 52-85-7 | Famphur |

| Number | C.A.S. | Substance |
|---|---|---|
| P097 | 52-85-7 | Phosphorothioic acid, O-[4-[(dimethylamino)sulfonyl]phenyl] O,O-dimethyl ester |
| P098 | 151-50-8 | Potassium cyanide |
| P098 | 151-50-8 | Potassium cyanide K(CN) |
| P099 | 506-61-6 | Argentate(1-), bis(cyano-C)-, potassium |
| P099 | 506-61-6 | Potassium silver cyanide |
| P101 | 107-12-0 | Ethyl cyanide |
| P101 | 107-12-0 | Propanenitrile |
| P102 | 107-19-7 | Propargyl alcohol |
| P102 | 107-19-7 | 2-Propyn-1-ol |
| P103 | 630-10-4 | Selenourea |
| P104 | 506-64-9 | Silver cyanide |
| P104 | 506-64-9 | Silver cyanide Ag(CN) |
| P105 | 26628-22-8 | Sodium azide |
| P106 | 143-33-9 | Sodium cyanide |
| P106 | 143-33-9 | Sodium cyanide Na(CN) |
| P108 | [1]157-24-9 | Strychnidin-10-one, & salts |
| P108 | [1]157-24-9 | Strychnine, & salts |
| P109 | 3689-24-5 | Tetraethyldithiopyrophosphate |
| P109 | 3689-24-5 | Thiodiphosphoric acid, tetraethyl ester |
| P110 | 78-00-2 | Plumbane, tetraethyl- |
| P110 | 78-00-2 | Tetraethyl lead |
| P111 | 107-49-3 | Diphosphoric acid, tetraethyl ester |
| P111 | 107-49-3 | Tetraethyl pyrophosphate |
| P112 | 509-14-8 | Methane, tetranitro-(R) |
| P112 | 509-14-8 | Tetranitromethane (R) |
| P113 | 1314-32-5 | Thallic oxide |
| P113 | 1314-32-5 | Thallium oxide $Tl_2 O_3$ |
| P114 | 12039-52-0 | Selenious acid, dithallium(1 + ) salt |
| P114 | 12039-52-0 | Tetraethyldithiopyrophosphate |
| P115 | 7446-18-6 | Thiodiphosphoric acid, tetraethyl ester |
| P115 | 7446-18-6 | Plumbane, tetraethyl- |

| Number | C.A.S. | Substance |
|---|---|---|
| P116 | 79-19-6 | Tetraethyl lead |
| P116 | 79-19-6 | Thiosemicarbazide |
| P118 | 75-70-7 | Methanethiol, trichloro- |
| P118 | 75-70-7 | Trichloromethanethiol |
| P119 | 7803-55-6 | Ammonium vanadate |
| P119 | 7803-55-6 | Vanadic acid, ammonium salt |
| P120 | 1314-62-1 | Vanadium oxide $V_2O_5$ |
| P120 | 1314-62-1 | Vanadium pentoxide |
| P121 | 557-21-1 | Zinc cyanide |
| P121 | 557-21-1 | Zinc cyanide $Zn(CN)_2$ |
| P122 | 1314-84-7 | Zinc phosphide $Zn_3 P_2$, when present at concentrations greater than 10% (R,T) |
| P123 | 8001-35-2 | Toxaphene |
| P127 | 1563-66-2 | 7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-, methylcarbamate. |
| P127 | 1563-66-2 | Carbofuran |
| P128 | 315-8-4 | Mexacarbate |
| P128 | 315-18-4 | Phenol, 4-(dimethylamino)-3,5-dimethyl-, methylcarbamate (ester) |
| P185 | 26419-73-8 | 1,3-Dithiolane-2-carboxaldehyde, 2,4-dimethyl-, O-[(methylamino)-carbonyl]oxime. |
| P185 | 26419-73-8 | Tirpate |
| P188 | 57-64-7 | Benzoic acid, 2-hydroxy-, compd. with (3aS-cis)-1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethylpyrrolo[2,3-b]indol-5-yl methylcarbamate ester (1:1) |
| P188 | 57-64-7 | Physostigmine salicylate |
| P189 | 55285-14-8 | Carbamic acid, [(dibutylamino)-thio]methyl-, 2,3-dihydro-2,2-dimethyl-7-benzofuranyl ester |
| P189 | 55285-14-8 | Carbosulfan |
| P190 | 1129-41-5 | Carbamic acid, methyl-, 3-methylphenyl ester |
| P190 | 1129-41-5 | Metolcarb |

| Number | C.A.S. | Substance |
|---|---|---|
| P191 | 644-64-4 | Carbamic acid, dimethyl-, 1-[(dimethyl-amino)carbonyl]-5-methyl-1H-pyrazol-3-yl ester |
| P191 | 644-64-4 | Dimetilan |
| P192 | 119-38-0 | Carbamic acid, dimethyl-, 3-methyl-1-(1-methylethyl)-1H-pyrazol-5-yl ester |
| P192 | 119-38-0 | Isolan |
| P194 | 23135-22-0 | Ethanimidthioic acid, 2-(dimethylamino)-N-[[(methylamino) carbonyl]oxy]-2-oxo-, methyl ester |
| P194 | 23135-22-0 | Oxamyl |
| P196 | 15339-36-3 | Manganese, bis(dimethylcarbamodithioato-S,S')-, |
| P196 | 15339-36-3 | Manganese dimethyldithiocarbamate |
| P197 | 17702-57-7 | Formparanate |
| P197 | 17702-57-7 | Methanimidamide, N,N-dimethyl-N'-[2-methyl-4-[[(methylamino)carbonyl]oxy]phenyl]- |
| P198 | 23422-53-9 | Formetanate hydrochloride |
| P198 | 23422-53-9 | Methanimidamide, N,N-dimethyl-N'-[3-[[(methylamino)-carbonyl]oxy]phenyl]-monohydrochloride |
| P199 | 2032-65-7 | Methiocarb |
| P199 | 2032-65-7 | Phenol, (3,5-dimethyl-4-(methylthio)-, methylcarbamate |
| P201 | 2631-37-0 | Phenol, 3-methyl-5-(1-methylethyl)-, methyl carbamate |
| P201 | 2631-37-0 | Promecarb |
| P202 | 64-00-6 | m-Cumenyl methylcarbamate |
| P202 | 64-00-6 | 3-Isopropylphenyl N-methylcarbamate |
| P202 | 64-00-6 | Phenol, 3-(1-methylethyl)-, methyl carbamate |
| P203 | 1646-88-4 | Aldicarb sulfone |
| P203 | 1646-88-4 | Propanal, 2-methyl-2-(methyl-sulfonyl)-, O-[(methylamino)carbonyl] oxime |
| P204 | 57-47-6 | Physostigmine |
| P204 | 57-47-6 | Pyrrolo[2,3-b]indol-5-ol, 1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethyl-, methylcarbamate (ester), (3aS-cis)- |
| P205 | 137-30-4 | Zinc, bis(dimethylcarbamodithioato-S,S')-, |
| P205 | 137-30-4 | Ziram |

## M. EPA U-list

| Number | C.A.S. | Substance |
|---|---|---|
| U001 | 75-07-0 | Acetaldehyde (I) |
| U001 | 75-07-0 | Ethanal (I) |
| U002 | 67-64-1 | Acetone (I) |
| U002 | 67-64-1 | 2-Propanone (I) |
| U003 | 75-05-8 | Acetonitrile (I,T) |
| U004 | 98-86-2 | Acetophenone |
| U004 | 98-86-2 | Ethanone, 1-phenyl- |
| U005 | 53-96-3 | Acetamide, -9H-fluoren-2-yl- |
| U005 | 53-96-3 | 2-Acetylaminofluorene |
| U006 | 75-36-5 | Acetyl chloride (C,R,T) |
| U007 | 79-06-1 | Acrylamide |
| U007 | 79-06-1 | 2-Propenamide |
| U008 | 79-10-7 | Acrylic acid (I) |
| U008 | 79-10-7 | 2-Propenoic acid (I) |
| U009 | 107-13-1 | Acrylonitrile |
| U009 | 107-13-1 | 2-Propenenitrile |
| U010 | 50-07-7 | Azirino[2',3':3,4]pyrrolo[1,2-a]indole-4,7-dione, 6-amino-8-[[(aminocarbonyl)oxy]methyl]-1,1a,2,8,8a,8b-hexahydro-8a-methoxy-5-methyl-, [1aS-(1aalpha, 8beta,8aalpha,8balpha)]- |
| U010 | 50-07-7 | Mitomycin C |
| U011 | 61-82-5 | Amitrole |
| U011 | 61-82-5 | 1H-1,2,4-Triazol-3-amine |
| U012 | 62-53-3 | Aniline (I,T) |
| U012 | 62-53-3 | Benzenamine (I,T) |
| U014 | 492-80-8 | Auramine |
| U014 | 492-80-8 | Benzenamine, 4,4'-carbonimidoylbis[N,N-dimethyl- |
| U015 | 115-02-6 | Azaserine |
| U015 | 115-02-6 | L-Serine, diazoacetate (ester) |
| U016 | 225-51-4 | Benz[c]acridine |
| U017 | 98-87-3 | Benzal chloride |
| U017 | 98-87-3 | Benzene, (dichloromethyl)- |
| U018 | 56-55-3 | Benz[a]anthracene |
| U019 | 71-43-2 | Benzene (I,T) |
| U020 | 98-09-9 | Benzenesulfonic acid chloride (C,R) |
| U020 | 98-09-9 | Benzenesulfonyl chloride (C,R) |
| U021 | 92-87-5 | Benzidine |
| U021 | 92-87-5 | [1,1'-Biphenyl]-4,4'-diamine |
| U022 | 50-32-8 | Benzo[a]pyrene |

| Number | C.A.S. | Substance |
|---|---|---|
| U023 | 98-07-7 | Benzene, (trichloromethyl)- |
| U023 | 98-07-7 | Benzotrichloride (C,R,T) |
| U024 | 111-91-1 | Dichloromethoxy ethane |
| U024 | 111-91-1 | Ethane, 1,1'-[methylenebis(oxy)]bis[2-chloro- |
| U025 | 111-44-4 | Dichloroethyl ether |
| U025 | 111-44-4 | Ethane, 1,1'-oxybis[2-chloro- |
| U026 | 494-03-1 | Chlornaphazin |
| U026 | 494-03-1 | Naphthalenamine, N,N'-bis(2-chloroethyl)- |
| U027 | 108-60-1 | Dichloroisopropyl ether |
| U027 | 108-60-1 | Propane, 2,2'-oxybis[2-chloro- |
| U028 | 117-81-7 | 1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester |
| U028 | 117-81-7 | Diethylhexyl phthalate |
| U029 | 74-83-9 | Methane, bromo- |
| U029 | 74-83-9 | Methyl bromide |
| U030 | 101-55-3 | Benzene, 1-bromo-4-phenoxy- |
| U030 | 101-55-3 | 4-Bromophenyl phenyl ether |
| U031 | 71-36-3 | 1-Butanol (I) |
| U031 | 71-36-3 | n-Butyl alcohol (I) |
| U032 | 13765-19-0 | Calcium chromate |
| U032 | 13765-19-0 | Chromic acid $H_2CrO_4$, calcium salt |
| U033 | 353-50-4 | Carbonic difluoride |
| U033 | 353-50-4 | Carbon oxyfluoride (R,T) |
| U034 | 75-87-6 | Acetaldehyde, trichloro- |
| U034 | 75-87-6 | Chloral |
| U035 | 305-03-3 | Benzenebutanoic acid, 4-[bis(2-chloroethyl)amino]- |
| U035 | 305-03-3 | Chlorambucil |
| U036 | 57-74-9 | Chlordane, alpha & gamma isomers |
| U036 | 57-74-9 | 4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro- |
| U037 | 108-90-7 | Benzene, chloro- |
| U037 | 108-90-7 | Chlorobenzene |
| U038 | 510-15-6 | Benzeneacetic acid, 4-chloro-alpha-(4-chlorophenyl)-alpha-hydroxy-, ethyl ester |
| U038 | 510-15-6 | Chlorobenzilate |
| U039 | 59-50-7 | p-Chloro-m-cresol |
| U039 | 59-50-7 | Phenol, 4-chloro-3-methyl- |
| U041 | 106-89-8 | Epichlorohydrin |
| U041 | 106-89-8 | Oxirane, (chloromethyl)- |

| Number | C.A.S. | Substance |
|---|---|---|
| U042 | 110-75-8 | 2-Chloroethyl vinyl ether |
| U042 | 110-75-8 | Ethene, (2-chloroethoxy)- |
| U043 | 75-01-4 | Ethene, chloro- |
| U043 | 75-01-4 | Vinyl chloride |
| U044 | 67-66-3 | Chloroform |
| U044 | 67-66-3 | Methane, trichloro- |
| U045 | 74-87-3 | Methane, chloro- (I,T) |
| U045 | 74-87-3 | Methyl chloride (I,T) |
| U046 | 107-30-2 | Chloromethyl methyl ether |
| U046 | 107-30-2 | Methane, chloromethoxy- |
| U047 | 91-58-7 | beta-Chloronaphthalene |
| U047 | 91-58-7 | Naphthalene, 2-chloro- |
| U048 | 95-57-8 | o-Chlorophenol |
| U048 | 95-57-8 | Phenol, 2-chloro- |
| U049 | 3165-93-3 | Benzenamine, 4-chloro-2-methyl-, hydrochloride |
| U049 | 3165-93-3 | 4-Chloro-o-toluidine, hydrochloride |
| U050 | 218-01-9 | Chrysene |
| U051 | | Creosote |
| U052 | 1319-77-3 | Cresol (Cresylic acid) |
| U052 | 1319-77-3 | Phenol, methyl- |
| U053 | 4170-30-3 | 2-Butenal |
| U053 | 4170-30-3 | Crotonaldehyde |
| U055 | 98-82-8 | Benzene, (1-methylethyl)-(I) |
| U055 | 98-82-8 | Cumene (I) |
| U056 | 110-82-7 | Benzene, hexahydro-(I) |
| U056 | 110-82-7 | Cyclohexane (I) |
| U057 | 108-94-1 | Cyclohexanone (I) |
| U058 | 50-18-0 | Cyclophosphamide |
| U058 | 50-18-0 | 2H-1,3,2-Oxazaphosphorin-2-amine, N,N-bis(2-chloroethyl)tetrahydro-, 2-oxide |
| U059 | 20830-81-3 | Daunomycin |
| U059 | 20830-81-3 | 5,12-Naphthacenedione, 8-acetyl-10-[(3-amino-2,3,6-trideoxy)-alpha-L-lyxo-hexopyranosyl)oxy]-7,8,9,10-tetrahydro-6,8,11-trihydroxy-1-methoxy-, (8S-cis)- |

| Number | C.A.S. | Substance |
|---|---|---|
| U060 | 72-54-8 | Benzene, 1,1'-(2,2-dichloroethylidene)bis[4-chloro- |
| U060 | 72-54-8 | DDD |
| U061 | 50-29-3 | Benzene, 1,1'-(2,2,2-trichloroethylidene)bis[4-chloro- |
| U061 | 50-29-3 | DDT |
| U062 | 2303-16-4 | Carbamothioic acid, bis(1-methylethyl)-, S-(2,3-di chloro-2-propenyl) ester |
| U062 | 2303-16-4 | Diallate |
| U063 | 53-70-3 | Dibenz[a,h]anthracene |
| U064 | 189-55-9 | Benzo[rst]pentaphene |
| U064 | 189-55-9 | Dibenzo[a,i]pyrene |
| U066 | 96-12-8 | 1,2-Dibromo-3-chloropropane |
| U066 | 96-12-8 | Propane, 1,2-dibromo-3-chloro- |
| U067 | 106-93-4 | Ethane, 1,2-dibromo- |
| U067 | 106-93-4 | Ethylene dibromide |
| U068 | 74-95-3 | Methane, dibromo- |
| U068 | 74-95-3 | Methylene bromide |
| U069 | 84-74-2 | 1,2-Benzenedicarboxylic acid, dibutyl ester |
| U069 | 84-74-2 | Dibutyl phthalate |
| U070 | 95-50-1 | Benzene, 1,2-dichloro- |
| U070 | 95-50-1 | o-Dichlorobenzene |
| U071 | 541-73-1 | Benzene, 1,3-dichloro- |
| U071 | 541-73-1 | m-Dichlorobenzene |
| U072 | 106-46-7 | Benzene, 1,4-dichloro- |
| U072 | 106-46-7 | p-Dichlorobenzene |
| U073 | 91-94-1 | [1,1'-Biphenyl]-4,4'-diamine, 3,3'-dichloro- |
| U073 | 91-94-1 | 3,3'-Dichlorobenzidine |
| U074 | 764-41-0 | 2-Butene, 1,4-dichloro-(I,T) |
| U074 | 764-41-0 | 1,4-Dichloro-2-butene (I,T) |
| U075 | 75-71-8 | Dichlorodifluoromethane |
| U075 | 75-71-8 | Methane, dichlorodifluoro- |
| U076 | 75-34-3 | Ethane, 1,1-dichloro- |
| U076 | 75-34-3 | Ethylidene dichloride |
| U077 | 107-06-2 | Ethane, 1,2-dichloro- |
| U077 | 107-06-2 | Ethylene dichloride |
| U078 | 75-35-4 | 1,1-Dichloroethylene |
| U078 | 75-35-4 | Ethene, 1,1-dichloro- |
| U079 | 156-60-5 | 1,2-Dichloroethylene |
| U079 | 156-60-5 | Ethene, 1,2-dichloro-, (E)- |
| U080 | 75-09-2 | Methane, dichloro- |

| Number | C.A.S. | Substance |
|---|---|---|
| U080 | 75-09-2 | Methylene chloride |
| U081 | 120-83-2 | 2,4-Dichlorophenol |
| U081 | 120-83-2 | Phenol, 2,4-dichloro- |
| U082 | 87-65-0 | 2,6-Dichlorophenol |
| U082 | 87-65-0 | Phenol, 2,6-dichloro- |
| U083 | 78-87-5 | Propane, 1,2-dichloro- |
| U083 | 78-87-5 | Propylene dichloride |
| U084 | 542-75-6 | 1,3-Dichloropropene |
| U084 | 542-75-6 | 1-Propene, 1,3-dichloro- |
| U085 | 1464-53-5 | 2,2'-Bioxirane |
| U085 | 1464-53-5 | 1,2:3,4-Diepoxybutane (I,T) |
| U086 | 1615-80-1 | N,N'-Diethylhydrazine |
| U086 | 1615-80-1 | Hydrazine, 1,2-diethyl- |
| U087 | 3288-58-2 | O,O-Diethyl S-methyl dithiophosphate |
| U087 | 3288-58-2 | Phosphorodithioic acid, O,O-diethyl S-methyl ester |
| U088 | 84-66-2 | 1,2-Benzenedicarboxylic acid, diethyl ester |
| U088 | 84-66-2 | Diethyl phthalate |
| U089 | 56-53-1 | Diethylstilbesterol |
| U089 | 56-53-1 | Phenol, 4,4'-(1,2-diethyl-1,2-ethenediyl)bis-, (E)- |
| U090 | 94-58-6 | 1,3-Benzodioxole, 5-propyl- |
| U090 | 94-58-6 | Dihydrosafrole |
| U091 | 119-90-4 | [1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethoxy- |
| U091 | 119-90-4 | 3,3'-Dimethoxybenzidine |
| U092 | 124-40-3 | Dimethylamine (I) |
| U092 | 124-40-3 | Methanamine, -methyl-(I) |
| U093 | 60-11-7 | Benzenamine, N,N-dimethyl-4-(phenylazo)- |
| U093 | 60-11-7 | p-Dimethylaminoazobenzene |
| U094 | 57-97-6 | Benz[a]anthracene, 7,12-dimethyl- |
| U094 | 57-97-6 | 7,12-Dimethylbenz[a]anthracene |
| U095 | 119-93-7 | [1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethyl- |
| U095 | 119-93-7 | 3,3'-Dimethylbenzidine |
| U096 | 80-15-9 | alpha,alpha-Dimethylbenzylhydroperoxide (R) |
| U096 | 80-15-9 | Hydroperoxide, 1-methyl-1-phenylethyl-(R) |
| U097 | 79-44-7 | Carbamic chloride, dimethyl- |
| U097 | 79-44-7 | Dimethylcarbamoyl chloride |

| Number | C.A.S. | Substance |
|---|---|---|
| U098 | 57-14-7 | 1,1-Dimethylhydrazine |
| U098 | 57-14-7 | Hydrazine, 1,1-dimethyl- |
| U099 | 540-73-8 | 1,2-Dimethylhydrazine |
| U099 | 540-73-8 | Hydrazine, 1,2-dimethyl- |
| U101 | 105-67-9 | 2,4-Dimethylphenol |
| U101 | 105-67-9 | Phenol, 2,4-dimethyl- |
| U102 | 131-11-3 | 1,2-Benzenedicarboxylic acid, dimethyl ester |
| U102 | 131-11-3 | Dimethyl phthalate |
| U103 | 77-78-1 | Dimethyl sulfate |
| U103 | 77-78-1 | Sulfuric acid, dimethyl ester |
| U105 | 121-14-2 | Benzene, 1-methyl-2,4-dinitro- |
| U105 | 121-14-2 | 2,4-Dinitrotoluene |
| U106 | 606-20-2 | Benzene, 2-methyl-1,3-dinitro- |
| U106 | 606-20-2 | 2,6-Dinitrotoluene |
| U107 | 117-84-0 | 1,2-Benzenedicarboxylic acid, dioctyl ester |
| U107 | 117-84-0 | Di-n-octyl phthalate |
| U108 | 123-91-1 | 1,4-Diethyleneoxide |
| U108 | 123-91-1 | 1,4-Dioxane |
| U109 | 122-66-7 | 1,2-Diphenylhydrazine |
| U109 | 122-66-7 | Hydrazine, 1,2-diphenyl- |
| U110 | 142-84-7 | Dipropylamine (I) |
| U110 | 142-84-7 | 1-Propanamine, N-propyl-(I) |
| U111 | 621-64-7 | Di-n-propylnitrosamine |
| U111 | 621-64-7 | 1-Propanamine, N-nitroso-N-propyl- |
| U112 | 141-78-6 | Acetic acid ethyl ester (I) |
| U112 | 141-78-6 | Ethyl acetate (I) |
| U113 | 140-88-5 | Ethyl acrylate (I) |
| U113 | 140-88-5 | 2-Propenoic acid, ethyl ester (I) |
| U114 | [1]111-54-6 | Carbamodithioic acid, 1,2-ethanediylbis-, salts & esters |
| U114 | [1]111-54-6 | Ethylenebisdithiocarbamic acid, salts & esters |
| U115 | 75-21-8 | Ethylene oxide (I,T) |
| U115 | 75-21-8 | Oxirane (I,T) |
| U116 | 96-45-7 | Ethylenethiourea |
| U116 | 96-45-7 | 2-Imidazolidinethione |
| U117 | 60-29-7 | Ethane, 1,1'-oxybis-(I) |
| U117 | 60-29-7 | Ethyl ether (I) |
| U118 | 97-63-2 | Ethyl methacrylate |
| U118 | 97-63-2 | 2-Propenoic acid, 2-methyl-, ethyl ester |
| U119 | 62-50-0 | Ethyl methanesulfonate |

| Number | C.A.S. | Substance |
|---|---|---|
| U119 | 62-50-0 | Methanesulfonic acid, ethyl ester |
| U120 | 206-44-0 | Fluoranthene |
| U121 | 75-69-4 | Methane, trichlorofluoro- |
| U121 | 75-69-4 | Trichloromonofluoromethane |
| U122 | 50-00-0 | Formaldehyde |
| U123 | 64-18-6 | Formic acid (C,T) |
| U124 | 110-00-9 | Furan (I) |
| U124 | 110-00-9 | Furfuran (I) |
| U125 | 98-01-1 | 2-Furancarboxaldehyde (I) |
| U125 | 98-01-1 | Furfural (I) |
| U126 | 765-34-4 | Glycidylaldehyde |
| U126 | 765-34-4 | Oxiranecarboxyaldehyde |
| U127 | 118-74-1 | Benzene, hexachloro- |
| U127 | 118-74-1 | Hexachlorobenzene |
| U128 | 87-68-3 | 1,3-Butadiene, 1,1,2,3,4,4-hexachloro- |
| U128 | 87-68-3 | Hexachlorobutadiene |
| U129 | 58-89-9 | Cyclohexane, 1,2,3,4,5,6-hexachloro-, (1alpha,2alpha,3beta,4alpha,5alpha,6beta)- |
| U129 | 58-89-9 | Lindane |
| U130 | 77-47-4 | 1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro- |
| U130 | 77-47-4 | Hexachlorocyclopentadiene |
| U131 | 67-72-1 | Ethane, hexachloro- |
| U131 | 67-72-1 | Hexachloroethane |
| U132 | 70-30-4 | Hexachlorophene |
| U132 | 70-30-4 | Phenol, 2,2’-methylenebis[3,4,6-trichloro- |
| U133 | 302-01-2 | Hydrazine (R,T) |
| U134 | 7664-39-3 | Hydrofluoric acid (C,T) |
| U134 | 7664-39-3 | Hydrogen fluoride (C,T) |
| U135 | 6/4/7783 | Hydrogen sulfide |
| U135 | 6/4/7783 | Hydrogen sulfide $H_2S$ |
| U136 | 75-60-5 | Arsinic acid, dimethyl- |
| U136 | 75-60-5 | Cacodylic acid |
| U137 | 193-39-5 | Indeno[1,2,3-cd]pyrene |
| U138 | 74-88-4 | Methane, iodo- |
| U138 | 74-88-4 | Methyl iodide |
| U140 | 78-83-1 | Isobutyl alcohol (I,T) |
| U140 | 78-83-1 | 1-Propanol, 2-methyl- (I,T) |
| U141 | 120-58-1 | 1,3-Benzodioxole, 5-(1-propenyl)- |

| Number | C.A.S. | Substance |
|---|---|---|
| U141 | 120-58-1 | Isosafrole |
| U142 | 143-50-0 | Kepone |
| U142 | 143-50-0 | 1,3,4-Metheno-2H-cyclobuta[cd]pentalen-2-one, 1,1a,3,3a,4,5,5,5a,5b,6-decachlorooctahydro- |
| U143 | 303-34-4 | 2-Butenoic acid, 2-methyl-, 7-[[2,3-dihydroxy-2-(1-methoxyethyl)-3-methyl-1-oxobutoxy]methyl]-2,3,5,7a-tetrahydro-1H-pyrrolizin-1-yl ester, [1S-[1alpha(Z),7(2S*,3R*),7aalpha]]- |
| U143 | 303-34-4 | Lasiocarpine |
| U144 | 301-04-2 | Acetic acid, lead(2 + ) salt |
| U144 | 301-04-2 | Lead acetate |
| U145 | 7446-27-7 | Lead phosphate |
| U145 | 7446-27-7 | Phosphoric acid, lead(2 + ) salt (2:3) |
| U146 | 1335-32-6 | Lead, bis(acetato-O)tetrahydroxytri- |
| U146 | 1335-32-6 | Lead subacetate |
| U147 | 108-31-6 | 2,5-Furandione |
| U147 | 108-31-6 | Maleic anhydride |
| U148 | 123-33-1 | Maleic hydrazide |
| U148 | 123-33-1 | 3,6-Pyridazinedione, 1,2-dihydro- |
| U149 | 109-77-3 | Malononitrile |
| U149 | 109-77-3 | Propanedinitrile |
| U150 | 148-82-3 | Melphalan |
| U150 | 148-82-3 | L-Phenylalanine, 4-[bis(2-chloroethyl)amino]- |
| U151 | 7439-97-6 | Mercury |
| U152 | 126-98-7 | Methacrylonitrile (I,T) |
| U152 | 126-98-7 | 2-Propenenitrile, 2-methyl- (I,T) |
| U153 | 74-93-1 | Methanethiol (I,T) |
| U153 | 74-93-1 | Thiomethanol (I,T) |
| U154 | 67-56-1 | Methanol (I) |
| U154 | 67-56-1 | Methyl alcohol (I) |
| U155 | 91-80-5 | 1,2-Ethanediamine, N,N-dimethyl-N’-2-pyridinyl-N’-(2-thienylmethyl)- |
| U155 | 91-80-5 | Methapyrilene |
| U156 | 79-22-1 | Carbonochloridic acid, methyl ester (I,T) |
| U156 | 79-22-1 | Methyl chlorocarbonate (I,T) |
| U157 | 56-49-5 | Benz[j]aceanthrylene, 1,2-dihydro-3-methyl- |
| U157 | 56-49-5 | 3-Methylcholanthrene |

| Number | C.A.S. | Substance |
|---|---|---|
| U158 | 101-14-4 | Benzenamine, 4,4’-methylenebis[2-chloro- |
| U158 | 101-14-4 | 4,4’-Methylenebis(2-chloroaniline) |
| U159 | 78-93-3 | 2-Butanone (I,T) |
| U159 | 78-93-3 | Methyl ethyl ketone (MEK) (I,T) |
| U160 | 1338-23-4 | 2-Butanone, peroxide (R,T) |
| U160 | 1338-23-4 | Methyl ethyl ketone peroxide (R,T) |
| U161 | 108-10-1 | Methyl isobutyl ketone (I) |
| U161 | 108-10-1 | 4-Methyl-2-pentanone (I) |
| U161 | 108-10-1 | Pentanol, 4-methyl- |
| U162 | 80-62-6 | Methyl methacrylate (I,T) |
| U162 | 80-62-6 | 2-Propenoic acid, 2-methyl-, methyl ester (I,T) |
| U163 | 70-25-7 | Guanidine, -methyl-N'-nitro-N-nitroso- |
| U163 | 70-25-7 | MNNG |
| U164 | 56-04-2 | Methylthiouracil |
| U164 | 56-04-2 | 4(1H)-Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo- |
| U165 | 91-20-3 | Naphthalene |
| U166 | 130-15-4 | 1,4-Naphthalenedione |
| U166 | 130-15-4 | 1,4-Naphthoquinone |
| U167 | 134-32-7 | 1-Naphthalenamine |
| U167 | 134-32-7 | alpha-Naphthylamine |
| U168 | 91-59-8 | 2-Naphthalenamine |
| U168 | 91-59-8 | beta-Naphthylamine |
| U169 | 98-95-3 | Benzene, nitro- |
| U169 | 98-95-3 | Nitrobenzene (I,T) |
| U170 | 100-02-7 | p-Nitrophenol |
| U170 | 100-02-7 | Phenol, 4-nitro- |
| U171 | 79-46-9 | 2-Nitropropane (I,T) |
| U171 | 79-46-9 | Propane, 2-nitro- (I,T) |
| U172 | 924-16-3 | 1-Butanamine, N-butyl-N-nitroso- |
| U172 | 924-16-3 | N-Nitrosodi-n-butylamine |
| U173 | 1116-54-7 | Ethanol, 2,2’-(nitrosoimino)bis- |
| U173 | 1116-54-7 | N-Nitrosodiethanolamine |
| U174 | 55-18-5 | Ethanamine, -ethyl-N-nitroso- |
| U174 | 55-18-5 | N-Nitrosodiethylamine |
| U176 | 759-73-9 | N-Nitroso-N-ethylurea |
| U176 | 759-73-9 | Urea, N-ethyl-N-nitroso- |

| Number | C.A.S. | Substance |
|---|---|---|
| U177 | 684-93-5 | N-Nitroso-N-methylurea |
| U177 | 684-93-5 | Urea, N-methyl-N-nitroso- |
| U178 | 615-53-2 | Carbamic acid, methylnitroso-, ethyl ester |
| U178 | 615-53-2 | N-Nitroso-N-methylurethane |
| U179 | 100-75-4 | N-Nitrosopiperidine |
| U179 | 100-75-4 | Piperidine, 1-nitroso- |
| U180 | 930-55-2 | N-Nitrosopyrrolidine |
| U180 | 930-55-2 | Pyrrolidine, 1-nitroso- |
| U181 | 99-55-8 | Benzenamine, 2-methyl-5-nitro- |
| U181 | 99-55-8 | 5-Nitro-o-toluidine |
| U182 | 123-63-7 | 1,3,5-Trioxane, 2,4,6-trimethyl- |
| U182 | 123-63-7 | Paraldehyde |
| U183 | 608-93-5 | Benzene, pentachloro- |
| U183 | 608-93-5 | Pentachlorobenzene |
| U184 | 76-01-7 | Ethane, pentachloro- |
| U184 | 76-01-7 | Pentachloroethane |
| U185 | 82-68-8 | Benzene, pentachloronitro- |
| U185 | 82-68-8 | Pentachloronitrobenzene (PCNB) |
| U186 | 504-60-9 | 1-Methylbutadiene (I) |
| U186 | 504-60-9 | 1,3-Pentadiene (I) |
| U187 | 62-44-2 | Acetamide, -(4-ethoxyphenyl)- |
| U187 | 62-44-2 | Phenacetin |
| U188 | 108-95-2 | Phenol |
| U189 | 1314-80-3 | Phosphorus sulfide (R) |
| U189 | 1314-80-3 | Sulfur phosphide (R) |
| U190 | 85-44-9 | 1,3-Isobenzofurandione |
| U190 | 85-44-9 | Phthalic anhydride |
| U191 | 109-06-8 | 2-Picoline |
| U191 | 109-06-8 | Pyridine, 2-methyl- |
| U192 | 23950-58-5 | Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)- |
| U192 | 23950-58-5 | Pronamide |
| U193 | 1120-71-4 | 1,2-Oxathiolane, 2,2-dioxide |
| U193 | 1120-71-4 | 1,3-Propane sultone |
| U194 | 107-10-8 | 1-Propanamine (I,T) |
| U194 | 107-10-8 | n-Propylamine (I,T) |

| Number | C.A.S. | Substance |
|---|---|---|
| U196 | 110-86-1 | Pyridine |
| U197 | 106-51-4 | p-Benzoquinone |
| U197 | 106-51-4 | 2,5-Cyclohexadiene-1,4-dione |
| U200 | 50-55-5 | Reserpine |
| U200 | 50-55-5 | Yohimban-16-carboxylic acid, 11,17-dimethoxy-18-[(3,4,5-trimethoxybenzoyl)oxy]-, methyl ester,(3beta,16beta,17alpha,18beta,20alpha)- |
| U201 | 108-46-3 | 1,3-Benzenediol |
| U201 | 108-46-3 | Resorcinol |
| U203 | 94-59-7 | 1,3-Benzodioxole, 5-(2-propenyl)- |
| U203 | 94-59-7 | Safrole |
| U204 | 7783-00-8 | Selenious acid |
| U204 | 7783-00-8 | Selenium dioxide |
| U205 | 7488-56-4 | Selenium sulfide |
| U205 | 7488-56-4 | Selenium sulfide $SeS_2$ (R,T) |
| U206 | 18883-66-4 | Glucopyranose, 2-deoxy-2-(3-methyl-3-nitrosoureido)-, D- |
| U206 | 18883-66-4 | D-Glucose, 2-deoxy-2-[[(methylnitrosoamino)-carbonyl]amino]- |
| U206 | 18883-66-4 | Streptozotocin |
| U207 | 95-94-3 | Benzene, 1,2,4,5-tetrachloro- |
| U207 | 95-94-3 | 1,2,4,5-Tetrachlorobenzene |
| U208 | 630-20-6 | Ethane, 1,1,1,2-tetrachloro- |
| U208 | 630-20-6 | 1,1,1,2-Tetrachloroethane |
| U209 | 79-34-5 | Ethane, 1,1,2,2-tetrachloro- |
| U209 | 79-34-5 | 1,1,2,2-Tetrachloroethane |
| U210 | 127-18-4 | Ethene, tetrachloro- |
| U210 | 127-18-4 | Tetrachloroethylene |
| U211 | 56-23-5 | Carbon tetrachloride |
| U211 | 56-23-5 | Methane, tetrachloro- |
| U213 | 109-99-9 | Furan, tetrahydro-(I) |
| U213 | 109-99-9 | Tetrahydrofuran (I) |
| U214 | 563-68-8 | Acetic acid, thallium(1 + ) salt |
| U214 | 563-68-8 | Thallium(I) acetate |

| Number | C.A.S. | Substance |
|---|---|---|
| U215 | 6533-73-9 | Carbonic acid, dithallium(1 + ) salt |
| U215 | 6533-73-9 | Thallium(I) carbonate |
| U216 | 7791-12-0 | Thallium(I) chloride |
| U216 | 7791-12-0 | Thallium chloride TlCl |
| U217 | 10102-45-1 | Nitric acid, thallium(1 + ) salt |
| U217 | 10102-45-1 | Thallium(I) nitrate |
| U218 | 62-55-5 | Ethanethioamide |
| U218 | 62-55-5 | Thioacetamide |
| U219 | 62-56-6 | Thiourea |
| U220 | 108-88-3 | Benzene, methyl- |
| U220 | 108-88-3 | Toluene |
| U221 | 25376-45-8 | Benzenediamine, ar-methyl- |
| U221 | 25376-45-8 | Toluenediamine |
| U222 | 636-21-5 | Benzenamine, 2-methyl-, hydrochloride |
| U222 | 636-21-5 | o-Toluidine hydrochloride |
| U223 | 26471-62-5 | Benzene, 1,3-diisocyanatomethyl- (R,T) |
| U223 | 26471-62-5 | Toluene diisocyanate (R,T) |
| U225 | 75-25-2 | Bromoform |
| U225 | 75-25-2 | Methane, tribromo- |
| U226 | 71-55-6 | Ethane, 1,1,1-trichloro- |
| U226 | 71-55-6 | Methyl chloroform |
| U226 | 71-55-6 | 1,1,1-Trichloroethane |
| U227 | 79-00-5 | Ethane, 1,1,2-trichloro- |
| U227 | 79-00-5 | 1,1,2-Trichloroethane |
| U228 | 79-01-6 | Ethene, trichloro- |
| U228 | 79-01-6 | Trichloroethylene |
| U234 | 99-35-4 | Benzene, 1,3,5-trinitro- |
| U234 | 99-35-4 | 1,3,5-Trinitrobenzene (R,T) |
| U235 | 126-72-7 | 1-Propanol, 2,3-dibromo-, phosphate (3:1) |
| U235 | 126-72-7 | Tris(2,3-dibromopropyl) phosphate |
| U236 | 72-57-1 | 2,7-Naphthalenedisulfonic acid, 3,3’-[(3,3’-dimethyl[1,1’-biphenyl]-4,4’-diyl)bis(azo)bis[5-amino-4-hydroxy]-, tetrasodium salt |

| Number | C.A.S. | Substance |
|---|---|---|
| U236 | 72-57-1 | Trypan blue |
| U237 | 66-75-1 | 2,4-(1H,3H)-Pyrimidinedione, 5-[bis(2-chloroethyl)amino]- |
| U237 | 66-75-1 | Uracil mustard |
| U238 | 51-79-6 | Carbamic acid, ethyl ester |
| U238 | 51-79-6 | Ethyl carbamate (urethane) |
| U239 | 1330-20-7 | Benzene, dimethyl- (I,T) |
| U239 | 1330-20-7 | Xylene (I) |
| U240 | [1]94-75-7 | Acetic acid, (2,4-dichlorophenoxy)-, salts & esters |
| U240 | [1]94-75-7 | 2,4-D, salts & esters |
| U243 | 1888-71-7 | Hexachloropropene |
| U243 | 1888-71-7 | 1-Propene, 1,1,2,3,3,3-hexachloro- |
| U244 | 137-26-8 | Thioperoxydicarbonic diamide $[(H_2N)C(S)]_2 S_2$, tetramethyl- |
| U244 | 137-26-8 | Thiram |
| U246 | 506-68-3 | Cyanogen bromide (CN)Br |
| U247 | 72-43-5 | Benzene, 1,1'-(2,2,2-trichloroethylidene)bis[4- methoxy- |
| U247 | 72-43-5 | Methoxychlor |
| U248 | [1]81-81-2 | 2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenyl-butyl)-, & salts, when present at concentrations of 0.3% or less |
| U248 | [1]81-81-2 | Warfarin, & salts, when present at concentrations of 0.3% or less |
| U249 | 1314-84-7 | Zinc phosphide $Zn_3 P_2$, when present at concentrations of 10% or less |
| U271 | 17804-35-2 | Benomyl |
| U271 | 17804-35-2 | Carbamic acid, [1-[(butylamino)carbonyl]-1H-benzimidazol-2-yl]-, methyl ester |
| U278 | 22781-23-3 | Bendiocarb |
| U278 | 22781-23-3 | 1,3-Benzodioxol-4-ol, 2,2-dimethyl-, methyl carbamate |
| U279 | 63-25-2 | Carbaryl |
| U279 | 63-25-2 | 1-Naphthalenol, methylcarbamate |
| U280 | 101-27-9 | Barban |
| U280 | 101-27-9 | Carbamic acid, (3-chlorophenyl)-, 4-chloro-2-butynyl ester |
| U328 | 95-53-4 | Benzenamine, 2-methyl- |
| U328 | 95-53-4 | o-Toluidine |
| U353 | 106-49-0 | Benzenamine, 4-methyl- |

| Number | C.A.S. | Substance |
|---|---|---|
| U353 | 106-49-0 | p-Toluidine |
| U359 | 110-80-5 | Ethanol, 2-ethoxy- |
| U359 | 110-80-5 | Ethylene glycol monoethyl ether |
| U364 | 22961-82-6 | Bendiocarb phenol |
| U364 | 22961-82-6 | 1,3-Benzodioxol-4-ol, 2,2-dimethyl-, |
| U367 | 1563-38-8 | 7-Benzofuranol, 2,3-dihydro-2,2-dimethyl- |
| U367 | 1563-38-8 | Carbofuran phenol |
| U372 | 10605-21-7 | Carbamic acid, 1H-benzimidazol-2-yl, methyl ester |
| U372 | 10605-21-7 | Carbendazim |
| U373 | 122-42-9 | Carbamic acid, phenyl-, 1-methylethyl ester |
| U373 | 122-42-9 | Propham |
| U387 | 52888-80-9 | Carbamothioic acid, dipropyl-, S-(phenylmethyl) ester |
| U387 | 52888-80-9 | Prosulfocarb |
| U389 | 2303-17-5 | Carbamothioic acid, bis(1-methylethyl)-, S-(2,3,3-trichloro-2-propenyl) ester |
| U389 | 2303-17-5 | Triallate |
| U394 | 30558-43-1 | A2213 |
| U394 | 30558-43-1 | Ethanimidothioic acid, 2-(dimethylamino)-N-hydroxy-2-oxo-, methyl ester |
| U395 | 5952-26-1 | Diethylene glycol, dicarbamate |
| U395 | 5952-26-1 | Ethanol, 2,2’-oxybis-, dicarbamate |
| U404 | 121-44-8 | Ethanamine, N,N-diethyl- |
| U404 | 121-44-8 | Triethylamine |
| U409 | 23564-05-8 | Carbamic acid, [1,2-phenylenebis (iminocarbonothioyl)]bis-, dimethyl ester |
| U409 | 23564-05-8 | Thiophanate-methyl |
| U410 | 59669-26-0 | Ethanimidothioic acid, N,N’-[thiobis[(methylimino)carbonyloxy]]bis-, dimethyl ester |
| U410 | 59669-26-0 | Thiodicarb |
| U411 | 114-26-1 | Phenol, 2-(1-methylethoxy)-, methylcarbamate |
| U411 | 114-26-1 | Propoxur |

## N. Procedures for waste disposal from animal use areas

UNIVERSITY of HOUSTON

ENVIRONMENTAL HEALTH & LIFE SAFETY

The University of Houston has seen significant growth in biomedical research conducted at the institution. As the level of biomedical research increases, the levels of waste generated from these activities will increase. Environmental Health and Life Safety (EHLS) is tasked with the disposal of biological, chemical and other regulated wastes generated on campus. The following are general procedures to follow for the disposal of biological waste and other associated wasted from these research efforts.

### Animal Carcasses

Animals are commonly used in research at the University. Carcasses should be placed in freezers for transport to the crematorium located in the Health and Biomedical Science Center Building (#592). All carcasses should be placed in bag prior to being placed in the freezer.

### Sharps

Sharps containers are available from Research Stores and multiple vendors in the area. Sharps containers must have a functional lid and should be full when requesting a waste pick-up. Full is when the level of material inside the container has reached the “full” marked line or when the sharp being deposited cannot fully clear the opening under the power of gravity.

Used syringes or other sharps should be disposed of in sharps containers. Syringes with drugs or chemical waste should be segregated in a chemical sharps container for proper disposal as a chemical waste sharp. This should be properly labeled as “Chemical Waste Sharp”. Please note that researchers and principle investigators must not dispose of their excess chemicals in sharps containers.

### Bedding

In most cases animal bedding is collected, and placed in a dumpster for disposal.

However there may be cases where bedding used within 72 hours of administration of a chemotherapeutic or some other medication is a concern. Researchers must identify the compound(s) of concerning when requesting a waste pick up for contaminated bedding and the pertinent dates.

### Bedding with chemical waste:

Rodent cages with chemical agents, carcinogens or chemotherapeutic agents should be labeled. The label should be fixed to the box so that the label follows the cage through the disposal process.

Chemotherapy drugs include, but are not limited to, the following: Amascrine, Bleomycin, BRDU, Carboplatin, Carmustine, Chlorambucil, Cisplatin, Cyclophosphamide, Cyclosporin A, Dacarbazine, Dactinomycin, Daunorubicin, Docetaxel, Doxorubicin, EDU, Epirubicin (Ellence), Esorubicin, Etoposide, Etoposide Phosphate, Idarubicin, Ifosfamide, Irinotecan, Mechlorethamine, Menogaril, Mitomycin-C, Mitoxantrone, Oxaliplatin, Paclitaxel (Taxol), Tamoxifen, Teniposide, Topotecan, Vinblastine, Vincristine, Vindesine, and Vinorelbine.

Cages are to be returned to dirty side cage wash and the contents of the cage is disposed of in the following manner.

1. A powered air-purifying respirator (PAPR) should be worn when dumping cages.
2. Bedding should be dumped using the downdraft dump station.
3. Bedding should be dumped into a yellow chemical waste bag.
4. The yellow chemical waste bag should be placed into a 5 gallon screw top pail, then sealed.
5. EHLS will then dispose of the pail through our hazardous waste vendor.

## Bedding with biologic waste

Cage Decontamination:

All procedures performed during cage decontamination will take place in the biosafety cabinet. Bedding and remaining food pellets will be removed from the cage and placed in a red biohazard bag. Any residual bedding will be wiped out with a paper towel, and the paper towel will be placed in the biohazard bag. The empty cage(s) will be sprayed, inside and out, with Spor-Klenz. Proper PPE must be worn at all times while handling Spor-Klenz and components will remain wet with Spor-Klenz for a minimum of 10 minutes. After contact time has transpired, all cage components will be stacked and placed in a red biohazard bag.

Biohazard bags containing bedding, remaining food pellets and cages will be tied, and the outside will be sprayed with Spor-Klenz. The bag containing bedding and remaining food pellets will be disposed of in a marked biohazard box.

## General trash

The general trash should be limited to discarded paper, packing material, empty containers and items you would expect in your kitchen trash can. Please mindful of the custodial staff and placing material in the general trash can.

D.W Brammer 10/1/2015

Animal Care Operations Representative (signature and date)

Scott C Sullivan 10/1/15

EHLS Representative (signature and date)

## O. Laboratory management plan

The laboratory management plan is available from the EHLS website.