



HAZARDOUS MATERIALS MANAGEMENT PROGRAM

Section 5. Hazardous Waste Management

CONTENTS

- 1.0 *PURPOSE*
- 2.0 *DEFINITIONS*
- 3.0 *WASTE COLLECTION, CONTAINMENT, AND DISPOSAL*
 - 3.1 *Chemical Waste*
 - 3.1.1 *Waste Accumulation*
 - 3.2 *Biological and Medical Waste*
 - 3.3 *Low-Level Radioactive Waste*
 - 3.4 *Other Waste*
- 4.0 *LABELING AND DOCUMENTATION*
- 5.0 *SEWER DISPOSAL*
- 6.0 *ENVIRONMENTAL MANAGEMENT SYSTEM*
 - 6.1 *Waste Minimization*
 - 6.2 *Recycling*
 - 6.3 *Other*
- 7.0 *APPROVAL AND REVIEW*

1.0 PURPOSE

The purpose of this chapter is to provide general guidelines to the hazardous materials user on reasonable measures to control and minimize the risks associated with handling and disposing of hazardous materials.

2.0 DEFINITIONS

Biohazardous Waste means any of the following:

- (a) Laboratory waste, including, but not limited to, all of the following:
 - (1) Human or animal specimen cultures from medical and pathology laboratories.
 - (2) Cultures and stocks of infectious agents from research and industrial laboratories.
 - (3) Wastes from the production of bacteria, viruses, spores, discarded live and attenuated vaccines used in human health care or research, discarded animal vaccines, including Brucellosis and Contagious Ecthyma, as identified by the department, and culture dishes and de-vices used to transfer, inoculate, and mix cultures.
- (b) Human surgery specimens or tissues removed at surgery or autopsy, which are suspected by the attending physician and surgeon or dentist of being contaminated with infectious agents known to be contagious to humans.

Chemotherapeutic Waste means agents that are no longer used to kill or prevent reproduction of malignant cells.

Hazardous Chemical Waste means chemical waste that exhibits any of the following properties:

Ignitability [22 CCR 66262.21]. A waste is ignitable if it is easily combustible or flammable, or, if ignited, burns so vigorously that it creates a hazard. This classification includes:

- A liquid (other than an aqueous solution containing less than 24 percent alcohol by volume) with a flashpoint equal to or less than 140 degrees F;
- A non-liquid, capable under standard temperature and pressure of causing fire by means of friction, absorption of moisture, or spontaneous chemical changes and which, when ignited, burns so vigorously and persistently that it creates a hazard;
- An ignitable compressed gas as defined in Department of Transportation (DOT) regulations; and
- An oxidizer as defined in DOT regulations.

Examples of ignitable wastes are: solvents (e.g. acetone, ether, alcohols, toluene, hexane, xylene, and ethyl acetate), Vaposteril solutions, paints and thinners, certain degreasers, epoxy resins, adhesives, rubber cement, and some inks;

Corrosivity [22 CCR 66261.22]. A waste is corrosive if it dissolves metals and other materials, or burns the skin or eyes on contact. This is also includes:

- A liquid or aqueous solution (solute mixed with an equivalent weight of water) having a pH ≤ 2 or ≥ 12.5 ; and
- A liquid or aqueous solution (solute mixed with an equivalent weight of water) that corrodes steel (SAE 20) at a rate greater than 0.250 (6.35 millimeters) per year.

Examples of corrosive wastes are acids (e.g. hydrochloric, sulfuric, nitric, and phosphoric), hydroxides (sodium, ammonium), corrosive cleaning solutions, rust removers, and bleach compounds;

Reactivity [22 CCR 66261.23]. A waste is reactive if it is:

- Unstable such that it catches fire, explodes, or releases fumes; and
- Undergoes rapid or violent chemical reactions when exposed to or mixed with water, air, or other materials.

This includes waste that: normally are unstable and readily undergo violent change without detonating; generate toxic gases, vapors or fumes when mixed with water and does so in a quantity sufficient to present a danger to life or the environment; are cyanide- or sulfide-bearing and when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors, or fumes; and are capable of detonation, explosive reaction or explosive decomposition.

Examples of reactive wastes are cyanide compounds, organic peroxides, and water reactives (sodium metal, calcium hydride, and phosphorus pentoxide), picric acid (dry), ammonium and sodium sulfide; and

Toxicity [22 CCR 66261.24] A waste is considered toxic if it exceeds specified concentrations of certain metals and organic compounds (as referenced in federal regulations) or exceeds stated criteria in several biological tests.

- The waste must be analyzed to determine if it contains any toxic metals or organic substances listed on Table 1 of 22 CCR 66261.24(a)(i) in excess of regulatory levels using a testing method called Toxicity Characteristic Leaching Procedure (TCLP). This is the federal or RCRA toxicity characteristic, meaning that any waste which exceeds the regulatory level is a RCRA regulated hazardous waste.
- The waste must be analyzed to determine whether it exceeds any of the regulatory levels established for inorganic or organic chemicals in Table II or Table III of 22 CCR 66261.24(a)(2). The test methods used are based on regulatory levels established for Soluble Threshold Limit Concentration (STLC) or Total Threshold Limit Concentration (TTLC).
- It must be determined whether the waste contains any carcinogenic substances (listed below) in a single or combined concentration of 0.001 percent by weight by testing or other information available.

Acrylonitrile

4-Aminodiphenyl Ethyleneimine (EL)

Benzidine and its salts
Methyl chloromethyl ether
bis (Chloromethyl) ether

A-Naphtylamine (1-NA)

1,2-Dibromo-3-chloropropane (DBPC)

B-Naphtylamine (2-NA)

2-Acetylaminofluorene

4-Nitrobiphenyl (4-NBP)

N-Nitrosodimethylamine (DMN)

B-Propiolactone (BPL)

Vinyl chloride (VCM)

4-Dimethylaminoazobenzene (DAB)

3,3-Dichlorobenzidine & DCB salts

- Objective biological tests (or data from such tests) must be used to determine whether the test material is more toxic than any of the criteria listed below:
 - a. An acute oral LD50 less than 5,000 mg. per kg.
 - b. An acute dermal LD50 less than 4,300 mg. per kg.
 - c. An acute inhalation LC50 less than 10,000 ppm as a gas or vapor.
 - d. An acute aquatic 96-hour LC50 less than 500 mg. per liter or it can cause illness or death if inhaled, swallowed or absorbed through the skin.

If any of these tests result in or indicate (published test data) greater toxicity than the threshold listed, the material is a hazardous waste. Examples of wastes meeting the toxic criteria are photochemicals (fixer and developer) and ethylene glycol antifreeze solution.

Low-level Radioactive Waste means radioactive material that:

- (A) Is not high-level radioactive waste, spent nuclear fuel, or byproduct material (as defined in section 11e.(2) of the Atomic Energy Act of 1954 (42 USC 2014(e)(2))); and
- (B) The Nuclear Regulatory Commission, consistent with existing law and in accordance with paragraph (A), classifies as low-level radioactive waste.

Low-level radioactive waste includes sources, devices or materials made radioactive by contamination or irradiation, and radionuclides no longer needed for research purposes. NOTE: “Low-level” does not necessarily imply that the activity of the waste is at safe or background levels.

Medical Waste means waste which meets both of the following requirements:

- (1) The waste is composed of waste which is generated or produced as a result of any of the following actions:

- (A) Diagnosis, treatment, or immunization of human beings or animals.
 - (B) Research pertaining to the activities specified in subparagraph (A).
 - (C) The production or testing of biologicals.
 - (D) The accumulation of properly contained home-generated sharps waste that is brought by a patient, a member of the patient's family, or by a person authorized by the enforcement agency, to a point of consolidation approved by the enforcement agency pursuant to Section 117904 or authorized pursuant to Section 118147.
 - (E) Removal of a regulated waste, as defined in Section 5193 of Title 8 of the California Code of Regulations, from a trauma scene by a trauma scene waste management practitioner.
- (2) The waste is either of the following:
- (A) Biohazardous waste.
 - (B) Sharps waste.

NOTE: "Biologicals" means medicinal preparations made from living organisms and their products, including, but not limited to, serums, vaccines, antigens, and anti-toxins. Medical waste includes trauma scene waste.

Mixed Waste means mixtures of medical and non-medical waste. Mixed waste is medical waste, except for all of the following:

- (a) Medical waste and hazardous waste is hazardous waste and is subject to regulation as specified in the statutes and regulations applicable to hazardous waste.
- (b) Medical waste and radioactive waste is radioactive waste and is subject to regulation as specified in the statutes and regulations applicable to radioactive waste.
- (c) Medical waste, hazardous waste, and radioactive waste is radioactive mixed waste and is subject to regulation as specified in the statutes and regulations applicable to hazardous waste and radioactive waste.

Pathological Waste means tissue, organs, body parts, and fluids that have been removed by trauma, surgery, autopsy, or other medical procedure.

Pharmaceutical Waste means pharmaceuticals or over-the-counter drugs or medication for human or animal use including vaccines, antigens, serums, and anti-toxins that are no longer used or outdated.

Sharps Waste means any device having acute rigid corners, edges, or protuberances capable of cutting or piercing, including, but not limited to, all of the following:

- (a) Hypodermic needles, hypodermic needles with syringes, blades, needles with attached tubing, syringes contaminated with biohazardous waste, acupuncture needles, and root canal files.
- (b) Broken glass items, such as Pasteur pipettes and blood vials contaminated with biohazardous waste.
- (c) Any item capable of cutting or piercing that is contaminated with trauma scene waste.

3.0 WASTE COLLECTION, CONTAINMENT, AND DISPOSAL

Guidelines for the containment and disposal of the different waste streams are provided below.

3.1 Chemical Waste

Chemical waste is segregated into the following groups:

1. Flammable/combustible solvents e.g. acetone, xylene, methanol;
2. Halogenated solvents e.g. chloroform, methylene chloride;
3. Nitrogenous hydrocarbon e.g. trimethylamine, diisopropylamine;
4. Sulfurous hydrocarbon e.g. dimethylsulfoxide, dimethylsulfate;
5. Corrosives. A separate stream must be started for each of the following:
 - a. Mineral acids e.g. hydrochloric acid, sulfuric acid
 - b. Organic acids e.g. trichloroacetic acid, formic acid
 - c. Bases e.g. calcium oxide, sodium hydroxide
6. Aqueous solutions e.g. metal salts, ethidium bromide; and
7. Oils e.g. vacuum pump oil, motor oil.

NOTE: See SOP **Reactive Materials and Explosives** for handling and disposing of water reactives, peroxide formers, pyrophoric materials, and explosives.

EH&S will provide a safety can for the recycling of flammable and halogenated solvents.

1. Collect the chemical waste in appropriate containers described in the table below. Do not commingle or mix dissimilar waste streams.

Waste type	Waste container
Flammable liquids	glass bottles, steel cans, safety cans, high density plastic containers
Concentrated acids & bases	2.5 liter “acid” bottle. <i>Note: one gallon glass bottles are unacceptable for acids and bases; the high specific gravity of the substance and the thinness of one gallon glass containers increases the likelihood of container breakage.</i>
Trace contaminated solid waste	contaminated paper, gloves, etc. should be double-bagged using polyethylene bags
Aqueous solutions	glass bottles, plastic bottles, plastic cans
Broken mercury thermometers	broken thermometers without free-flowing mercury may be packaged in the same manner as trace contaminated solid waste. Broken thermometers with mercury should be contained in a glass or plastic bottle with a tight cap

2. Containers must be sealed airtight with a screw-on lid. Rubber stoppers, corks, and parafilm are not allowed. They must also be in sound condition, leak-proof, and appropriate for the waste type.
3. Do not fill liquid containers to more than 80% capacity. This is to prevent spillage on top of the container. The top and sides of the container must be free of liquid residue.
4. Solid chemical waste can be collected in plastic bags, fiber boxes or plastic containers.
5. Contact EH&S for waste pick-up.

3.1.1 Waste Accumulation

Storage time is limited to 90 days after a waste is first put into the container. The waste must then be shipped off site for disposal. Labs and service areas are considered satellite accumulation points and are exempt from the 90 day rule, although disposal must occur within one year from the initial date of accumulation. It is the policy of the University that labs and service areas will have waste removed after 9 months of accumulation.

3.2 Biological and Medical Waste

Biological and medical waste encompass solids, sharps, liquid waste, pharmaceuticals, chemotherapeutic, and pathological waste. EH&S will supply sharps containers, biological waste barrels with red biohazard bags, pharmaceutical containers, and chemo containers at no charge to the researcher.

Solid Waste is, but not limit to:

1. Gauze, paper towels, plastic-backed absorbent 4X4s or counter-top covers that have been contaminated with human fluids or biohazards;
2. Solid material that has been contaminated with animal blood;
3. Petri dishes;
4. Culture vials;
5. Gloves and other Personal Protective Equipment worn while working with biohazardous material or animals; and
6. Live or attenuated vaccines.

Solid waste must be placed in a red biohazard bag. The red bag will reside in a metal or plastic barrel with a lid. The biological waste barrel must be kept covered at all times and not overfilled. ***Red biohazard bags must be replaced weekly when anything is placed inside.***

Sharps Waste is, but not limited to:

1. Needles;
2. Razor blades and scalpels;
3. Microscope slides contaminated with biohazards;
4. Plastic pipettes and pipette tips;
5. Blood vials (Vacutainer tubes);
6. Broken glass contaminated with biohazards; and
7. Any contaminated material that can puncture or penetrate the skin or a red bag.

Sharps must go into the Sharps container and not be allowed to rest on the baffle. ***Sharps containers must be disposed of within a week after closing the lid.***

Liquid Waste, such as blood, body fluids, and liquids containing fibrin, may be disposed of through the sanitary sewer if the materials have been deactivated with 10 % bleach for 30 minutes and followed with copious amounts of water.

Pharmaceutical Waste will be placed in a Pharmaceutical waste container. The container will be labeled, “Pharmaceuticals: For Incineration Only”.

Chemotherapeutic Waste and waste contaminated with chemotherapeutic agents will be placed in specially marked, yellow collection container labeled with the words “Chemotherapy Waste” or “Chemo”. When the container is full, without compacting, the locking lid is to be secured to prevent the loss of contents prior to disposal.

Pathological Waste will be placed in a white pathological waste container with a locking lid. This waste must not be put in red biohazard containers.

Animal carcasses injected with a retroviral vector or carcinogen are to be placed in a labeled biohazardous bag and placed in a designated vivaria freezer for pick up. EH&S will ensure that it is disposed of properly.

Pathological waste must be immediately disposed of when generated.

3.3 Low-Level Radioactive Waste

See USC Radiation Safety Manual, Disposal of Radioactive Materials.

3.4 Other Waste

Glass

Intact laboratory glassware or chemical bottles should be decontaminated before disposal. Once cleaned of chemical contamination and/or sterilized or disinfected to remove any microbiological contamination, follow these steps:

1. De-label all chemical bottles (a permanent marker may be used to cover the chemical name).
2. Select a heavy cardboard box to place glass in (photocopy paper boxes are too flimsy).
3. DO NOT allow the box to overflow.
4. Seal the lid with tape (masking, shipping, etc.). Write on the container with a black indelible marker in large letters, "Clean Glass: Regular Waste Disposal." Note: If the cardboard container has punch-out holes on its sides for carrying, place tape across them.
5. Leave boxes near the regular trash bin for custodial pick-up. Custodians WILL NOT pick up boxes that are unsealed, unlabeled, or labeled “Contaminated Glass”.

NOTE: Broken glass contaminated with biohazards must be placed in a Sharps container. Broken glass that has residual chemical contamination will be placed in a heavy cardboard box and labeled “Contaminated Glass”. Contact EH&S for removal.

Gas Cylinders and Aerosol Cans

Compressed gas cylinders and aerosol cans should be handled in the following manner:

1. Large rechargeable gas cylinders will be returned to the Materials Management Department if the cylinders were originally purchased through them. Contact Materials Management to schedule a pickup; have the USC serial # (a white label located on the cylinder) available. Replace the cylinder cap before returning the cylinder.
2. All small gas cylinders, lecture bottles, and aerosol cans will be disposed of through EH&S.
3. Disposable propane and butane bottles should be submitted for waste pickup in accordance with normal disposal procedures. These will be punctured and placed into the metal recycling bins.
4. Never dispose of empty gas cylinders or aerosol cans in the medical waste containers.

4.0 LABELING AND DOCUMENTATION

All hazardous waste containers must be properly labeled with the chemical components they contain. Unused or outdated chemicals that are in their original containers with labels identifying the contents may be submitted for waste pickup as is; if the label appears faded or illegible, affix a new label or tag to the container. Collection containers used for mixed or spent waste must use a hazardous waste label or tag. To obtain the labels or tags, contact EH&S.

1. Attach the label or tag to each container as soon as the collection is started. Record the starting date on the label.
2. Fill out a **Hazardous Waste Disposal Record** (HMMP Forms) for each container. Follow directions on the form. The disposal record is a specialized packing slip designed to meet regulatory labeling requirements for transporting hazardous waste. It is required for every waste container submitted to EH&S for disposal. Failure to properly complete the disposal record may delay the collection of the waste.
3. Collection containers must be submitted for disposal within one year of the label start date, regardless of whether or not the container is filled.
4. When submitting a container for disposal, include the information below on the label or tag:
 - a. The words "Hazardous Waste." (if not using a standard HazMat label).
 - b. The initial date of accumulation (i.e., when the first waste was placed in the container).
 - c. The name and campus address of the person producing the waste (i.e., the individual who first placed waste in the container).
 - d. The composition of the waste (i.e., names, not abbreviations, of the chemical contents of the waste).
 - e. The physical state of the waste (i.e., liquid, solid or gas).
 - f. The hazard category of the waste (i.e., reactive, corrosive, toxic or ignitable).

5.0 SEWER DISPOSAL

The disposal of chemical waste into the sanitary sewer is regulated by the Clean Water Act. This initiative requires polluted water to be pretreated to remove toxic waste before it is discharged into the sewer. The sanitary sewer cannot be used as an outlet to dispose of toxic chemical waste. The EPA can impose heavy fines for the illegal dumping of chemical waste in the sanitary sewer.

Laboratory personnel should contact the Environmental Specialist to obtain advice on proper sewer disposal of chemical waste. Do not dispose "down the drain" the following:

1. Highly toxic or carcinogen waste even in trace amounts.
2. Any material containing heavy metals. Heavy metals with concentration greater than 1.0 ppm (1.0 mg/liter) are toxic. The following metals are toxic (as are most other metals):

arsenic	cadmium	copper	manganese	nickel	selenium	uranium
barium	chromium	lead	mercury	osmium	silver	zinc
3. Flammable or combustible materials.
4. Corrosives and reactives.

The sanitary sewer will be used only for the disposal of non-toxic buffer solutions and dilute solutions of alcohols and acetone used in the cleaning of glassware. Toxic waste cannot be present in greater than 1 ppm concentration. Please note that any 1% solution is 10,000 ppm in concentration.

6.0 ENVIRONMENTAL MANAGEMENT SYSTEM

The Environmental Management System (ISO 14001) is a holistic approach to managing an organization's impact on the environment. The system seeks to identify all significant environmental impacts and develop policies, procedures, practices, and goals to continuously minimize those impacts. USC's EMS reduces environmental impact through the following:

6.1 Waste Minimization

- Used batteries (e.g. lead acid, alkaline, NiCad, etc.) are collected and shipped to a battery recycler. Lead acid and NiCad batteries are recycled; the others are disposed of properly.
- Elemental mercury is collected and recycled through a contractor. NOTE: The research community is encouraged to mitigate or discontinue use of mercury, a highly toxic material.
- Container Management. EH&S supplies safety cans to collect flammable/combustible solvents and halogenated solvents.
- Chemical Exchange. Chemicals that are (a) in their original containers, (b) in good condition, and (c) have not exceeded their expiration date may be recycled through the Chemical Exchange Program. Members of the research community interested in obtaining or donating chemicals may contact Laboratory Safety or EH&S.

6.2 Recycling

- Freon. Decommissioned refrigerators are picked up by FMS to recycle the Freon from compressors. Refrigerators that were used to store biological materials, chemicals, or radioisotopes must be decontaminated prior to release to FMS. Contact EH&S for more information.
- Silver. Photographic waste is funneled through a contractor specialized in silver recovery.
- Fluorescent light bulbs (intact and broken) are collected by FMS and EH&S and sent to a recycler. Intact tubes are refitted with new electrodes and a primer gas. Broken tubes are ground down and recycled.
- E-Waste. Retired electronic components (computer monitors, CPUs, printers, etc.) that are still functional may be recycled through Surplus Sales. Contact Surplus Sales to schedule a pick up. Expired components are shipped to a recycler where they are broken down for re-use.

6.3 Other

Mercury thermometer replacement. As noted above, elemental mercury use is highly discouraged unless unavoidable. Digital- and ethanol-based thermometers are a suitable, arguably better alternatives to mercury. Contact Laboratory Safety or EH&S for more information.

7.0 APPROVAL AND REVIEW

Date prepared: March 1, 2004 By: Angel Burgos, Alfred M. Bouziane

Date revised: By: