Lamar University-Beaumont
Department of Chemistry and Physics
Omnibus Environmental Health and Safety Plan for Chemistry

Originally Prepared March 1991

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Last Revised and Updated November 2007

Office of Risk Management

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1. Introduction

1.1 Purpose

The goal in establishing this plan and it's associated regulation is to minimize the exposure of workers within the Chemistry Department to chemical and physical hazards associated with their employment or educational activities. It is also to ensure that chemical materials originating within the Chemistry Department do not become a environmental hazard to the community at large. To achieve this end goal, this document institutes work area safety and chemical exposure standards, regulates the maintenance and performance level of safety equipment, mandates waste handling rules, establishes the policy of providing information and training of workers, and documents responsibilities for tile management for the plan. This plan incorporates elements of federal and state law governing chemical hygiene, right to know, chemical waste management, and institutional safety.

1.2 Definition of Responsibilities

This section defines the responsibilities of various officials for the implementation and operation of this plan. A list of the names of those individuals will be prepared by the Director of Safety and Environmental Health each academic year and approved by the Chief Executive Officer of the university. Any changes in university and departmental officials and their areas of responsibility will be disseminated to faculty and staff and will be distributed to employees of the Chemistry Department as part of the yearly safety and chemical hygiene training program.

1.2.1 Chief Executive Officer

The Chief Executive Officer, (University President), has ultimate responsibility for chemical hygiene and safety within the university. The responsibilities of tile Chief Executive Officer include:

1. With other administrators, provide for the continuing support for institutional safety, chemical hygiene and hazardous waste handling.

1.2.2 Director of Risk Management

The Director of Risk Management has primary responsibility for reviewing the specific procedures involved in the Safety and Environmental Health Plan for compliance with federal state and local laws and regulations. The responsibilities of the Director include:

1. Oversight and coordination of activities and responsibilities of the Facilities Maintenance Department with the individual departments, to install and maintain safety and chemical hygiene equipment. (such as fume hoods, power lines, fire detection equipment, etc ...)

2. Oversight and coordination of activities and responsibilities of the Shipping and Receiving Office to ensure the proper handling of incoming hazardous materials.

3. Coordination and supervision of the training mandated by the plan with the department.

4. Coordination and supervision of the inspection of university facilities to ascertain the level of compliance with the plan.

5. Maintain knowledge of the current legal requirements for maintenance of safety equipment, for regulated substances, and for required chemical hygiene equipment and transmission of such knowledge as needed to the department or individual employees.

6. Establish and maintain an accurate record of:

   a. Measurements taken to monitor employee exposures, and any medical consultations and examinations including written opinions required by this standard.

   b. Reports of accidents and emergencies, including remedial actions taken.

   c. Review records of the examination and repair of safety and environmental health equipment, such as fire alarms and equipment, ventilation equipment, and other equipment maintained by the Facilities Maintenance Department..

   d. Records of safety and environmental health inspections and drills.

   e. A file of suggestions for changes and improvements to the plan, and reference literature for safety and chemical hygiene, including this plan.

1.2.3 Chemistry Department Safety and Chemical Hygiene Officer

The Departmental Safety and Chemical Hygiene Officer (Department Chair or Designate, acting as an Additional Duty Safety Officer (ADSO)), in conjunction with the Department Chair and the University Director of Risk Management, is responsible for establishing chemical hygiene and safety procedures within the department. This individual may be the same person as the Departmental Hazardous Waste Officer. This individual will:

1. Coordinate with the Director of Risk Management the safety and chemical hygiene related activities within the department, including, , the employee training program mandated by the plan.

2. Determine the required levels of protective apparel and equipment needed in the department, and oversee the maintenance of safety and chemical hygiene equipment within the department.

3. Coordinate the inspection of safety, hygiene, housekeeping and emergency equipment in the department to ascertain the level of compliance with the plan. This includes an official inspection, no less frequently than annually, of every area within the governance of the Chemistry Department, and any other mandated inspections.

4. Maintain knowledge of the current legal requirements for maintenance of safety equipment, for regulated substances, and for required chemical hygiene equipment and transmission of such knowledge as needed to the department, area supervisors, or individual employees.

5. Establish and maintain an accurate record of:

a. Any measurements taken to monitor employee exposures, and any medical consultations and examinations including written opinions required by this standard.

b. Reports of accidents and emergencies, including remedial actions taken.

c The departmental file of MSDSs and reference literature for safety and chemical hygiene, including this plan.

1.2.4 Chemistry Department Hazardous Waste Officer

The Departmental Hazardous Waste Officer, (Department Chair or Designate) is responsible, in coordination with the University Director of Risk Management for the proper handling and disposal of hazardous wastes generated in the activities of the department. This individual will:

1. Coordinate, in cooperation with the Director of Risk Management and with the Department ADSO, hazardous materials related activities within the department, within each work area, the training program mandated by the plan.

2. Determine the required levels of protective apparel and equipment needed in the department, and oversee the maintenance of hazardous materials equipment within the department.

3. Coordinate the inspection of departmental facilities to ascertain the level of compliance with the plan.

4. Establish and maintain an accurate record of:

   a. A cumulative record of waste generated and accumulated in the Department since the last disposal.

   b. Such department wide chemical and hazardous materials inventory as may be required.

1.2.5 Area Supervisors

The Area Supervisor is responsible for safety and environmental health within a designated area, (typically an individual room), or the activities of workers under the area supervisor's control. Coordinators of each specific laboratory course are to be considered the area supervisor for that course. For research laboratories, the senior faculty member overseeing the research will be the Area Supervisor. The Area Supervisor will:

1. Ensure that workers in their area have received process specific safety and chemical hygiene training, and ensure that proper safeguards and protective equipment for those processes are in place.

2. Know the current legal requirements for the safe use of equipment and chemicals involved in the processes specific to their area.

3. Ensure that facilities and training for use of any material being ordered for use in their area are adequate.

4. Be responsible for the accumulation, treatment, and proper handling of chemical wastes generated in their area.

5. Provide regular, formal inspections of safety, hygiene, housekeeping and emergency equipment in their area.

6. Perform an annual check (evaluation of containers and their contents) of chemical stores under their control and provide listings of chemicals stored to the Chemistry Department Director of Safety and Chemical Hygiene as required.

7. Review records of:

    a. Any measurements taken to monitor employee exposures, and any medical consultations and examinations including written opinions required by standards of good practice.

    b. Reports of accidents and emergencies, including remedial actions taken.

    c. Required annual Hazardous Communication training for all students and employees working in their area.

1.2.6 Laboratory Coordinators

Laboratory Coordinators fall into a special category of Area Supervisors. They are the individual faculty who dictate policy and procedure for a particular laboratory course. To ensure the safety and chemical hygiene of the students the laboratory coordinator will perform the following duties beyond those of the Area Supervisors.

1. Ensure that safety and hazardous waste handling information is distributed prior to the start of each experiment.

2. Students must be taught how to read and interpret MSDSs and instructed in all required safety and hazardous waste procedures. Laboratory Coordinators will ensure that records of the signed "Teaching Laboratories Safety Rules" are obtained from all students in class/laboratory sections and filed in the Department Office..

3. Either they or a non-coordinator faculty member should be present in the laboratory room at all times while a laboratory experiment is in progress.

4. Set guidelines for the cleanup of the laboratory including the balance and reagent areas, and for the storage of experimental equipment and reagents.

1.3 Classification of Individuals Subject to the Plan

The persons potentially subject to this document will be classed in one of four groups. Those grouping are

1.3.1 Faculty, Research, Laboratory and/or Chemical Stockroom Workers

Defined as those individuals working in the stock and laboratory preparation rooms, acting as teaching assistants, performing postgraduate research work, or taking part in a laboratory educational experience that does not have a classroom component. Such individuals will be responsible for the following:

1. Attend a yearly training session on procedures and precautions for handling hazardous substances and hazardous wastes.(All workers must attend an initial training session before commencing work in the Department.)

2. Plan and conduct each operation they perform in accordance with established procedures and regulations within this document.

3. At the conclusion of a research course or research project, all workers must complete satisfactory check out verifying that all remaining hazardous materials are stored properly, and all containers are fully and accurately labeled. Failure to do so will result in the individual accepting responsibility for the costs associated with the university's correcting deficiencies.

1.3.2. Minimal Exposure Workers

Defined as office and custodial workers who may as part of their duties be required to enter a laboratory or storage area, who will perform no manipulations of hazardous chemicals or equipment within that area. Assuming that the responsibilities placed on other workers are met, the potential for exposure to chemical hazards or mechanical hazards for such individuals should be minimal. Based on this knowledge, such workers will be provided a special training course that focuses on the recognition of potential hazard conditions and emergency procedures. These workers should not attempt to perform their duties in areas in which safety and health rules are being violated, but should report such conditions to the appropriate area supervisor.

1.3.3 Class/Laboratory Workers

Defined as students in lecture/laboratory educational programs that have both classroom and laboratory component. Such individuals will be responsible for the following:

1. Before commencing laboratory work, reading, understandimg and signing the "Teaching Laboratories Safety Rules" document.

2 Attending the prelaboratory lecture for each experiment prior to the performance of the experiment.

1.3.4 Single/Limited Exposure Workers

Classified as workers such as maintenance and repair personnel who may be required to enter and work in a laboratory or storage area. Such workers should obtain authorization from the Area Supervisor or the Departmental Safety and Chemical Hygiene Officer, who will normally accompany the individual into the work area and verify, or arrange for some other qualified person to verify that the work area is cleared or any potential hazard to the worker.

2. Safety and Hazardous Materials Plan

2.1 Standard Operating Procedures

2.1.1 General Work Rules

1. Working alone in the laboratory or chemical storage area is discouraged.At minimum there must be another individual, knowledgeableof the hazards of the work and the actions to be taken in the event of an emergency, who has agreed to check on the researcher on a half hour basis. Acutely toxic compounds or processes that may generate acutely toxic compounds should not be utilized when working alone.

2. Approved eye protection must be worn at all times within laboratories or chemical or glassware storage areas, regardless of whether a visitor or worker. The use of lasers and ultra-violet light sources will require the use of safety glasses rated for use with the frequencies of light involved. (See Section 2.1.3)

2A. Soft contact lenses must not be worn in any laboratory or chemical storage area."

3. When systems which emit electromagnetic radiation that may result in optical damage are used, the apparatus must be shielded optically and proper warnings placed at entry points to the area involved.

4. Tip-resistant shields must be used when an apparatus is used under a condition where explosion or implosion may occur. Dewars should have a metal shell polymer net or cloth tape coating as protection against implosion effects.

5. When working with flammable chemicals, sources of ignition near enough to cause fire or explosion, in the event of vapor release or liquid spill, (15 Feet) must be removed or extinguished.

6. All safety features of mechanical or chemical equipment must be in place and in working order, (this includes but is not limited to belt guards, radiation shields, fan covers, safety sensors and meters).

7. Water hoses must be secured to ensure that floods do not occur.

8. All electrical apparatus must be properly grounded, and the electrical insulation must be in good condition with no frayed or damaged cords.

9. All gas cylinders must be properly secured against tipping over, and be used only with the appropriate functioning pressure regulator. (see section 2.

10. Playing music in the laboratory will be allowed, provided it is acceptable to the area supervisor and the volume does not inhibit the observation of sounds that act as warnings of unsafe conditions.

11. Due to the problems associated with the trapping of chemicals between jewelry and the skin and with the decontamination of jewelry, the wearing of jewelry in the laboratory or chemical stock room is discouraged.

12. The last person out of each lab should secure the lab by turning off all unneeded gases, water and heat sources. The lab must be locked at all times that it is unattended.

13. When an operation is to be left unattended overnight, obtain approval from the area supervisor, leave the lights on, place an appropriate sign on the door to the laboratory and provide for containment of toxic substances in the event of a failure of utility service (such as cooling water) to the unattended operation.

14. Laboratory apparatus, glassware and/or chemicals are the property of the university and must not be removed from the building as they present a contamination hazard, and possible violations of state and federal law.

For the chemicals they work with, all workers should know and be constantly aware of the following:

1. The potential hazards of the chemicals, as indicated on the Material Safety Data Sheet (MSDS) and other appropriate references.

2. The appropriate safeguards for using the chemical, including personal protective equipment.

3. The location and proper use of emergency equipment.

4. The proper method of transport of chemicals within the facility.

5. The proper method and place for storage of the chemical when not in use.

6. Proper personal hygiene practice.

7. The appropriate procedure for dealing with emergencies, including evacuation routes, spill cleanup procedures and proper waste minimization and disposal.

2.1.2 Personal Hygiene

1. Wash promptly whenever a chemical has contacted the skin.

2. Avoid inhalation of chemicals. The use of a well ventilated fume hood is recommended when using volatile chemicals and may be mandated in some cases.

3. Do not use mouth suction to pipet.

4. Wash well with soap and water before leaving the laboratory. Do not wash with solvents other than water.

5. Drinking, eating, smoking, and application of cosmetics is not allowed in the laboratory.

6. Food, beverages, tobacco, or cosmetics should not be stored in laboratories or chemical storage areas.

7. Skin contact with chemicals should be avoided as a cardinal rule.

2.1.3 Protective Clothing and Equipment

1. Eye protection worn when working with chemicals must meet the requirements of the American National Standard Institute (ANSI) Z87.1. This includes sideshields on glasses. When working with more than 10 ml. of a corrosive liquid, in addition to safety glasses, a face shield large enough to protect the chin, neck, and ears, as well as the face must be worn.

2. When working with corrosive liquids, allergenic, sensitizing or toxic chemicals, wear gloves made of a material known to be resistant to permeation by the chemical and tested by air inflation (do not inflate ,by mouth) for the absence of pin-hole leaks.

3. The use of laboratory aprons or coats in the laboratory or chemical storage area is encouraged. As a matter of safety, it is better that a worker be able to remove the outer layer of clothing in an emergency. Snap fasteners are recommended for laboratory coats Long-sleeved and long-legged clothing must be worn in the laboratory. No short pants, skirts, or short dresses are permitted. Long hair and/or loose clothing must be confined.

4. Wear low-heeled shoes with fully covered "uppers". Open toed shoes such as sandals or shoes constructed of woven materials may not be worn.

5. Gloves are recommended when working with chemicals and in some cases are required. They are also recommended when washing glassware. In order to avoid spread of chemicals on gloves they should be removed before touching other items including telephones doorknobs notebooks etc.

6. Whenever exposure to a chemical by inhalation is likely to exceed the threshold limit described in the MSDS or other appropriate reference, use an operating fume hood. If this is not possible a proper respirator must be worn. Consult with the Area Supervisor before undertaking such work.

7. All protective equipment should be inspected prior to use. Defective equipment should be brought to the attention of the Area Supervisor.

2.1.4 Housekeeping

1. Access to emergency equipment (fire extinguishers, eye washes, safety showers and exits) should not be blocked at any time, even temporarily.

2. The windows in doors may not be covered so as to inhibit observing conditions within a laboratory.

3. All doors to individual laboratories are to be unlocked when anyone is within the room.

4. Each Laboratory must have a notice posted in a prominent place in the laboratory, a notice including the names and phone numbers of each researcher using that laboratory and a number to call in emergency to reach the Area Supervisor for that room.

5. Chemicals and chemical wastes may not be stored in aisles, hallways, stairways or on floors or desks.

6. All laboratory prepared chemicals must be labeled with the identity of the contents (or indication of the origin, if the chemical identity of the contents is not yet known), any special hazards or storage instruction, and the user's identification at the end or each day.

7. All chemicals are to be placed in their assigned storage area following use or at the end of the day.

8. At the end of each day all unlabeled chemicals are to be considered wastes and treated accordingly.

9. Wastes must be stored in containers suitable for that waste, and must be labeled in accordance with departmental regulation.

10. Chemical spills are to be cleaned up promptly and the spilled chemical and clean up materials handled as wastes. Based on the size and the quantity of material involved and it's toxic or reactive properties, the spill should be reported to the area supervisors.

11. Work areas, including laboratory bench tops, should be kept clear of clutter, especially chemicals that are not in use.

12. Work surfaces and floors should be cleaned on a regular basis to remove chemical residues that may accumulate.

13. Strong cleaning agents such as nitric acid, chromic acid, sulfuric acid, strong oxidizers, or any chemical with a "per" in its name should be avoided in cleaning glassware. In addition, chromic acid should not be used to clean any glassware that has contained any halogenated compound.

13. At the end of the day equipment, and chemicals are to be secured and chemical storage areas, and laboratories locked by the last person to leave the area.

2.1.5 Prior Approval

Workers must obtain prior approval from the area supervisor to proceed with a laboratory task whenever:

1. A new or unfamiliar laboratory procedure or test is to be carried out.

2. It is likely that the toxic limit concentration for a chemical involved in the process could be exceeded or that other harm is likely.

3. There is a change in a procedure or test, even if it is very similar to prior practices. "Change in a procedure or test" means:

   a. A 10% or greater increase or decrease in the amount of one or more chemicals used.

   b. A substitution or deletion of any of the chemicals in a procedure.

   c. Any change in other conditions under which the procedure is to be conducted.

4. There is a failure of any of the equipment used in a process, in particular safeguards such as fume hoods or clamped apparatus.

5. An unexpected result has been experienced on a previous attempt of the procedure.

6. Members of the laboratory staff become ill due to a possible chemical exposure, suspect that they or others have been exposed to a hazardous material, or otherwise suspect a failure of any safeguards.

2.1.6 Chemical Purchase and Stockroom Control

1 Ordering of Chemicals:

a. Only Area Supervisors may order chemicals. This approval is in addition to any budgetary approval that may be necessary. Prior to orders for purchase the area supervisor must determine if any supplies of the chemical are currently in the departmental store room.

b. The Area Supervisor should determine before ordering chemicals the requirements for protective equipment and handling of the chemical, and ensure that any needed equipment is available.

c. Only the minimum amount of chemicals needed should be ordered, to ensure that large amounts of unused chemicals do not accumulate within the department. Large quantities of chemicals in excess of predicted requirements should not be purchased because the unit price is thereby reduced. Such excess chemicals will usually have to be disposed of as hazardous waste at significant cost.

2. Receipt of Chemicals:

a. The Chemistry Department stockroom personnel will remove all chemicals from their shipping containers, mark the receipt date. If the chemical has a known shelf life this expiration date should be noted on a separate tag on the container. (Unopened diethylether containers should not be kept for more than six months unless packed under nitrogen or other inert gas in sealed containers. Diethylether should not be kept for over one month after the container is initially opened.)

b. Shipments may not be picked up by the ordering individual until they have been authorized for pickup by the laboratory manager.

c. MSDSs should be reviewed by the worker using the chemical, and the Area Supervisor and then added to the departmental MSDS file if they are not already on record. If an MSDS is not available in the Department, and the chemical arrives in advance of the MSDS from the supplier, an MSDS should be located on the Internet before a chemical is used.

3. Transport of Chemicals:

a. All toxic, reactive or hazardous chemicals must be transported within the halls in the chemistry building on an approved cart or in an approved chemical transport bucket.

b. All transported chemicals must have a secure fitting cap on the container. Gas cylinders must be capped when moved even within laboratories.

c. Chemicals should not be transported via stairwells, or the passenger elevator unless absolutely necessary. The dumb waiter or, if necessary, the elevator without people in it should be used to transfer chemicals from floor to floor.

2.1.7 Procedures for Storage of Chemicals

Storage of chemicals in a laboratory is an issue largely under the control of the Area Supervisors. There are several regulations that apply, however, that workers must be aware of. These rules are:

1. Only minimal quantities of chemicals should not be stored in laboratories. The stockroom and approved chemical storage areas within the building should be used to store large quantities of chemicals and chemicals not currently used in the laboratory.

2. Only minimal quantities of flammable solvents should be stored in laboratories and they should be stored in approved fire safe containers and flammable solvents cabinets. (see section 2.2.2)

3. Many chemicals deteriorate with storage time. For this reason chemicals should be stored away from sources of heat, such as steam pipes, and out of sunlight. Each chemical should be labeled with the date it was opened. If need be expiration date should be noted on chemicals, such as diethylether.

4. Incompatible chemicals should not be stored together, such as acids and bases, or oxidizing and reducing agents, when uncertain of a compounds compatibility see the MSDS or check with the Area Supervisor.

5. At minimum there should be a yearly check of all chemicals in storage to determine if the containers are in good condition and to determine if the contents have deteriorated.

2.1.9 Procedures for Chemical Wastes

1. Process Derived Mixtures: The product of a process, solvent from a process or mixture containing either or both of those materials is not a waste until it is classified as such by the user. Area Supervisors and workers should be aware of the protocols to minimize the amounts of such material, either by separation of the components or by treatment of the material to reduce it's hazardous nature. For processes which are preformed on a regular or repeated basis the written protocol for that process should include the minimization and treatment information, as well as the classification of the ultimate waste materials.

2. Classification of Wastes: Wastes must be initially classified as hazardous or nonhazardous. Hazardous wastes are those defined by the United States Occupational Safety and Health Administration (OSHA) as a substance for which there is a statistically significant evidence, based on at least one scientific study, showing that acute or chronic harm may result from exposure to that chemical. This is regardless of whether the handling of the material is proper or improper.

3. Nonhazardous waste: Wastes that meet none of the criteria of hazardous wastes may be considered as nonhazardous. Following certification of a waste as nonhazardous it may be treated as general garbage. Is important however that the waste be certified first.

   a. Disposal of Nonhazardous Wastes: With the exception of glass wastes the Chemistry Department makes no rules regarding the landfill disposal of nonhazardous wastes. The City of Beaumont does regulate what wastes may be disposed of in the public sewers. Some of these rules are more stringent than the criteria for classification of a waste as hazardous. based on these rules nonhazardous wastes that do not meet the following requirements may not be disposed of in the sewer lines.

      (i) Any fat, oil, grease, ash, cinder, sand, mud, shavings, metal, glass, tar or other solid or viscous liquid substance which may cause obstruction to the flow in sewer of other interferences with the proper operation of the wastewater treatment system.

      (ii) Any liquid or vapor having a flash point temperature higher than 650C (1500F).

      (iii) Any wastewater with a pH less than 6.0 or above 11.0 or having any corrosive property capable of causing damage or hazard to structures, equipment, or personnel of the wastewater treatment system.

      (iv) Any waste or water containing suspended or undissolved solids of such character that unusual attention or expense is required to handle such material.

      (v) Any water with objectionable color.

      The chemistry department makes special exception regarding glass waste, in the disposal of materials into the general trash. Clean glass wastes, particularly broken glass, should be kept separate from the general garbage to avoid potential safety hazards to custodians. Specific glass containers will be made available in each laboratory area for the disposal of glass waste. Thermometers that are broken and their pieces may contain small amounts of mercury and should be placed in a separate labeled container from other glass,

4. Hazardous waste: A waste is hazardous if it fits into one of the following categories:

   a. Listed Waste: A listed waste is one included in one of four lists, generated by the United States Environmental Protection Agency (EPA), Identified by the letters F, K, P, and U. Within the lists the materials are assigned hazardous waste numbers and hazard rating by the EPA. The ratings systems and the lists *are provided in appendix . The definitions for the list types are as follows:

      (i) Type F wastes are generic categories of solvents and wastes and wastewater from some specific processes.

      (ii) Type K wastes are hazardous wastes from specific sources.

      (iii) Type P wastes include acutely hazardous wastes.

(iv) Type U wastes are specific commercial chemical products, chemical intermediates and off-specification chemical products.

b Characteristic Waste: If a waste is not found to be one of the Listed Wastes it may be an "unknown" waste, which must be tested to determine the nature of the waste properties or characteristics. The Characteristics to be evaluated are:

(i) Ignitability (Waste #D001): Any easily combustible or flammable liquid with a flash point less than 600 C (1400 F), or solid that burns easily.

(ii) Corrosivity (Waste #D002): Any waste that dissolves metals or other materials or burns the skin, pH less than 2 or greater than 12.5.

(iii) Reactivity (Waste #D003): Wastes which are unstable, release toxic gases, or undergo rapid or violent chemical reaction with water or other materials.

(iv) EP Toxicity (Waste #s D004-D017): Extracts of the material contain high concentrations of heavy metals and/or specific pesticides that could be released into ground water. Appendix 4 contains the list of the contaminates and their maximum allowed concentrations to exempt from EPA Toxic designation.

5. Hazardous Waste Accumulation and Storage: As waste is classified it must be accumulated and stored until it can be disposed of. The following rules should be applied to the accumulation and storage of materials classified as hazardous waste:

a. Hazardous wastes of differing classifications or physical properties should be kept in separate closed containers, as should wastes that are incompatible with one another. This will require that aqueous and organic wastes be separated. Halogenated and nonhalogenated organic wastes must also be kept separate from one another.

b Hazardous wastes must be stored in closed containers that can be sealed and are not subject to decomposition by the contents.

(i) Aqueous hazardous waste solutions should not be stored in metal drums. If of greater than pH of 8 such wastes should not be stored in glass containers.

(ii) Organic hazardous wastes should be accumulated and stored in containers which do not contain polymer components that may be structurally weaken by exposure to the wastes.

(iii) Leave 2 inches enipty at the top of each container of liquid. Do not use wide moth containers for liquids.

c. All hazardous waste containers must be labeled with the following information:

(i) Once hazardous wastes have been introduced to a accumulation and storage container the date must be noted on the container and the container must be removed from the laboratory to a designated storage area at the end of a 30 day period.

(ii) The site where the waste originated, and the names of all contributors to the container. In teaching laboratories the identity of the laboratory and experiment is sufficient.

(iii) The amounts and identity of the contributions to the container. Hazardous wastes that represent less than 5% of the total container volume need not be listed unless they are classified as type P or EP toxic characteristic wastes. If the EPA waste identification number of a waste is known it should be included. Use full names of compounds not abbreviations or structures.

d. Waste must be removed from the laboratory to the stock room when containers are full or there is no expectation of any further wastes of the type in the container. Waste from teaching laboratories must be removed when all sections have completed the particular experiment that produces the waste. An exception to this exists where halogenated and non-halogenated organic solvent wastes produced in successive experiments are collected separately in larger containers. Such containers should be removed at the end of the semester.

e. Transport of waste must be done following the rules for the transport of any chemical material. (see section 2.1.6)

2.2 Procedure-Specific Safety and Environmental Health Rules

All routine or repeated laboratory procedures must contain a written description of the specific safety practices, incorporating the applicable precautions, described in this section. Workers should read and understand these practices before commencing a procedure.

2.2.1 Procedures for Toxic Chemicals

The MSDSs for many of the chemicals used in the laboratory will state recommended limits or OSHA-mandated limits, or both, as guidelines for exposure. Typical limits arc threshold limit values (TLV), permissible exposure limits (PEL), and action levels. When such limits are stated, they should be used to assist the Area Supervisor and chemical user in determining the safety precautions, control measures, and safety apparel that are required when working a toxic chemical.

1. When a TLV or PEL value is less than 50 ppm or 100 mg/m^3 the application of the chemical must occur in an operating fume hood, glove box, vacuum line, or similar device, which is equipped with appropriate traps and/or scrubbers. If none are available, no work should be performed using that chemical. If utilized, the concentration within the laboratory of such a chemical must be measured to ensure that exposure limits are not exceeded. Records of such measurements must by maintained by both the Area Supervisor and Departmental Safety and Chemical Hygiene Officer, measures above the allowed concentration must be reported to the workers involved. Such data should be incorporated in the yearly plan review.

2. If a TLV, PEL, or comparable value is not available for a substance, the animal or human median inhalation lethal concentration information, LC50, will be assessed. If that value is less than 200 ppm or 2000 mg/m^3 (when administered continuously for one hour or less), then the chemical must be used in an operating fume hood, glove box, vacuum line, or similar device, which is equipped with appropriate traps and/or scrubbers. If none are available, no work should be performed using that chemical. If utilized, the concentration in the laboratory of such chemicals must be measured to ensure that exposure limits are not exceeded. Records of such measurements must by maintained by both the Area Supervisor and Departmental Safety and Hazardous Materials Officer, measures above the allowed concentration must be reported to the workers involved. Such data should be incorporated in the yearly plan review.

3. Whenever laboratory handling of toxic substances with moderate or ,greater vapor pressures will be likely to exceed acceptable air concentration limits, laboratory work with such liquids and solids will be conducted in a fume hood, glove box, vacuum line, or similar device, which is equipped with appropriate traps and/or scrubbers. If none are available, no work should be performed using that chemical.

2.2.2 Procedures for Flammable Chemicals

In general, the flammability of a chemical is determined by its flash point, the lowest temperature at which an ignition source can cause the chemical to ignite momentarl under certain controlled conditions. Information of flash points is available in MSDSs for purchased chemicals.

1 Chemicals with a flash point below 93.3°C (200°F) will be considered "fire- hazard chemicals."

2. The National Fire Protection Association (NFPA) guidelines and OSHA standards on when a chemical is considered flammable apply to use of flammable chemicals in the laboratory. In all work with fire-hazard chemicals, follow the requirements of NFPA and NFPA Manual 45, "Fire Protection for Laboratories Using Chemicals" and the standards of 29 CFR, subparts H and L:.

3. Fire-hazard chemicals should be stored in a flammable-solvent storage area or in storage cabinets designed for flammable materials.

4. Fire-hazard chemicals should be used only in vented hoods and away from sources of ignition.

2.2.3 Procedures for Reactive Chemicals

1. A reactive chemical is one that meets one or more of the following criteria:

   a. Is described as such in the current edition of "Handbook of Reactive Chemical Hazards" by L. Bretherick or other authoritative source, is indicated to be reactive in the MSDS or on the label,

   b. Is ranked by the NFPA as 3 or 4 for reactivity,

   c. Is identified by the United States Department of Transportation (DOT) as:
   * An oxidizer,
   * An organic peroxide, or
   * An explosive, Class A, B, or C,

   d. Meets the EPA definition of reactive in 40 CFR 261.23

   e. Meets the OSHA definition of unstable in 29 CFR 1910.1450

   f. Is known or found to be reactive (will vigorously polymerize, decompose, condense, will become self-reactive under conditions of shock, pressure or temperature, or reacts with water to release a gas that is either flammable or presents a health hazard) with other substances.

2. Handle reactive chemicals with all proper safety precautions, including segregation in storage and prohibition on mixing even small quantities with other chemicals without prior approval and appropriate personal protection and precautions. Also be aware of time limits and conditions for the storage of reactive chemicals and use them up or dispose of thein as required. (Opened cans of diethylether should not be kept for more than one month)

2.2.4 Procedures for Corrosive awl Contact-Hazard Chemicals

1. A corrosive chemical is one that meets one or more of the following criteria:

   a. Is listed as such on the MSDS or the label,

   b. Fits the OSHA definition of corrosive in Appendix A of 29 CFR 1910.1200,

c. Fits the EPA definition of corrosive in 40 CFR 261.22 (has a pH greater than 12 or less than 2.5),

d. Is known or found to be corrosive to living tissue.

2. A contact-hazard chemical is an allergen or sensitizer that:

a. Is so identified in the MSDS or on the label,

b. Is so identified or described in the medical or industrial hygiene literature, or

c Is known or found to be an allergen or sensitizer.

3. Handle corrosive chemicals with all proper safety precautions, including wearing both safety glass or goggles and a face shield (see section 2.1.3 (1)), gloves tested for the absence of pin holes and known to be resistant to permeation or penetration, and a laboratory apron or laboratory coat.

2.2.5 Procedures for High and Low Pressure Systems

1. All pressurized gas cylinders must be properly labeled as to their contents and whether full of empty.

2. Pressurized gas bottles must be secured to avoid tipping.

3. Regulators must be used in dispensing pressurized gases.

4. Gas cylinders and lecture bottles must only be transported with the regulator removed and the safety cap on.

5. Transport of gas cylinders must be only be attempted using an approved cylinder cart.

6. All gas regulators and pressurized test vessels must be equipped with a burst disc.

7. All damaged, corroded, unused and empty gas cylinders must be removed form laboratories and placed in the empty cylinder storage area in the stock-room and properly secured.

8. Copper or brass regulators must not be used with acetylene systems.

9. Cryogenic liquids must not be confined except in approved containers. Care should be used when utilizing cryogenic liquids to avoid liquefying air, oxygen or argon, and to avoid to the possibility of cryogenic burns.

10. Low pressure and vacuum systems must utilize a functioning trapping device to avoid contamination of pumps and/or pump oil with vapors, particularly if those vapors create -a danger of explosion within the pump system.

11. Before applying vacuum to any system each component of the system must be certified to contain components that have been manufactured to withstand the pressures used. This includes checks of the structural integrity of the components, (cracks in glassware)

12. High and low pressure systems should be utilized only when working shielding has been applied to guard against the result of any rapid change in pressure brought about by implosion or explosion.

2.2.6 Procedures for Use of Radioactive Materials

Procedures and rules governing the use of radioactive materials are promulgated by the University Radiation Safety Officer for Radioactive Materials, currently Dr. George Irwin, and are included in the University's Radiation Safety Manual. Prior approval from Dr. Irwin is required before any use of Radioactive Materials can be allowed. Note that the Radioactive Materials License issued by the Texas Department of State Health Services covers items such as the source in the electron capture detectors in some gas chromatographs in the Department. Access to and use of these gas chromatographs is limited to those properly authorized under the rules contained in the Radiation Safety Manual.

2.2.7 Procedures for Use of Instruments

Specific instruments, either due to their expense to the department or to the potential hazard to users, will be assigned a specific Area Supervisor or Supervisors. Workers must seek and obtain the approval of the appropriate Area Supervisor to use these instruments. The Area Supervisor will keep records of the name of approved users.

2.2.8 Procedures for Ionizing Radiation

No ionizing radiation machines (as defined by the Texas Department of State Health Services, but see 2.2.6 above) are currently in use in the Chemistry Department. Rules regulating ionizing radiation producing machines elsewhere in the University are promulgated by the Radiation Safety Officer for ionizing radiation machines, currently Dr. David Cocke.

2.3 Procedures for Substances With a High or Unknown Degree of Acute Toxicity, Carcinogens, and Reproductive Toxins

The procedures in this section must be followed when working with more than 10 mg. of any carcinogen, reproductive toxin, substance that has a high degree of acute toxicity, or a chemical whose toxic properties are unknown.

2.3.1 Definitions of Substances

For the purposes of the "Chemical Hygiene Plan" the compounds in these categories will be called "inimical". The following definitions apply to these compounds:

1. Select Carcinogen: Any substance described as such in the MSDS or any substance that meets one of the following criteria:

   a. Is regulated as a carcinogen by OSHA; or

   b, Is listed under the category "known to be carcinogens" in the latest edition of the Annual Report on Carcinogens published by the National Toxicology Program (NTP); or

   c. Is listed under Group I ("carcinogenic to humans") in the latest edition by the International Agency for Research on Cancer Monographs (IARC); or

   d. Is listed in either Group 2A or 2B by IARC or under the category, reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the of the following criteria:

      (i) After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m^3;
      (ii) After repeated skin application of less than 300 mg/kg of body weight per week, or
      (iii) After oral dosages of less than 50 mg/kg of body weight per day.

2. Reproductive Toxin: Any substance described as such in an applicable MSDS or any chemical that has been shown to affect the reproductive capabilities including chromosomal damage (mutations) and effects on a fetus (teratogenesis).

3. Substance with a high degree or acute toxicity: Any substance for which the LD50 data described in the applicable MSDS cause the substance to be classified as a "highly toxic chemical" as defined in ANSI Z129.1.

4. Chemical whose toxic properties are unknown but may reasonably be expected to fall into the classes described in 1 through 3 above by virtue of it structure and/or functional groups and/or analogy with substances known to be inimical chemicals: A chemical for which there is no ' known statistically significant study conducted in accordance with established scientific principles that established its toxicity, but resembles in any way, a substance known to be an inimical chemical.

2.3.2 Designated Areas for Use of Inimical Chemicals

Inimical chemicals must be used in a designated area. A designated area may be a fume hood, glove box, portion of a laboratory, or an entire laboratory designated as the only area where work with

quantities of the inimical chemical in excess of a specific limit shall be conducted. Such areas shall be posted with their boundaries clearly marked. Only persons trained to work with inimical chemicals will work with those chemicals in the designated area. Such persons will:

1. Use the smallest amount of the chemical consistent with the requirement of the work to be done.

2. Use high-efficiency particulate air (HEPA) filters or high efficiency scrubber systems to protect vacuum lines and pumps.

3. Decontaminate the designated area when work is completed.

4. Prepare wastes from work with inimical chemicals for disposal in accordance with specific disposal procedures consistent with the Resource Conservation and Recovery Act (RCRA) and as described within this document.

2.3.3 Storage of Inimical Chemicals

Inimical chemicals must be stored in locked and enclosed spaces ideally with a slight negative pressure relative to the building and room pressure. p

2.3.4 Personal Protective Equipment for Use of Inimical Chemicals

When handling inimical chemicals, workers must wear long-sleeved disposable clothing and gloves known to resist permeation by the inimical chemicals to be used when working in designated areas.

2.4 Control Measures and Equipment

2.4.1 Eyewash Fountains and Safety Showers

1. All laboratories will be equipped with both eyewashes and safety showers. These must be located so they can be reached from any point in the laboratory within 10 seconds. Access to eyewashes and safety showers must never be blocked, even temporarily.

2. Floor drains should be provided under such apparatus to avoid the hazards of wet floors to individuals already in an emergency situation.

3. All eye washes should provide a copious and gentle flow of tempered aerated water for a period of at least 15 minutes. The eye wash should be tested and run for a period of three minutes monthly to reduce the threat of eye infections. Facilities found to not be up to the standard must be repaired immediately. Test records shall be maintained in the Facilities Management Work Order system.

4, All safety showers should provide a minimum flow of 113.6 liters (30 gallons) per minute of tempered, potable water. The showers must be checked as functioning on a monthly basis and inspected by a licensed plumber once each long semester (or three times per year).. Facilities found to not be up to the standard must be repaired immediately. Test records shall be maintained in the Facilities Management Work Order system.

2.4.2 Fire Extinguishers

I Fire extinguishers in laboratories should be the appropriate type for the expected fire emergency and be capable of rapid use.

2. Carbon dioxide extinguishers shall be provided as the standard type of extinguisher in the Chemistry Building. Dry chemical fire extinguishers may be preferred for certain areas, especially where there may be a greater load of paper etc but carbon dioxide is applicable to most chemical fires. Carbon dioxide must not be used on fires involving finely divided metals..

3. Fire extinguishers must be inspected each month (visual check) and serviced by a trained individual once per year..

2.4.3 Ventilation.

1. General laboratory ventilation should meet the following standards:

   a. Laboratory ventilation should be maintained to meet the design specifications for the building. Shortcomings detected by the Energy Management System should be promptly rectified. The general air flow should be uniform throughout the laboratory. This flow is not necessarily sufficient to prevent accumulation of chemical vapors in the laboratory.

   b. Work with toxic chemicals that have low air concentration limits, or that have high vapor pressures, should always be done carried out in a fume hood, vacuum line or glove box.

c. Alterations to the ventilation system must only be performed by Facilities Maintenance personnel or contractors specifically tasked to make such alterations and must be tested to ensure that room ventilation has not suffered.

2. Fume hoods and their use should meet the following standards.

a. A fume hood with a minimum of 2.5 linear feet of hood space per person should be provided for every two workers if they spend most of their time working with chemicals. While this is a minimum space, some laboratories in which works will spent virtually all time working in the fume hood space requirements are double of more of the above figure.

b. Fume hoods should provide a minimum of 80 to 100 linear feet per minute of air flow regardless of door position.

c. Each fume hood should have a continuous monitoring device to allow convenient confirmation of adequate hood performance before and during use. The airflow in each hood in the Chemistry building is continuously monitored remotely by the Energy Management System.

d. The fume hood ventilation monitors should be tested and recalibrated if necessary annually or more often if needed to ensure the systems is working up to standard. Testing reports will be maintained in the Facilities Management Work Order System.

e. A fume hood is a safety backup for condensers, traps, or other devices that collect vapors and fumes. It is not to be used to "dispose" of chemicals by evaporation unless the vapors are trapped and recovered for proper disposal

f. Apparatus inside a hood should be placed on the floor of the hood at least six inches from the front edge.

g. Fume hood "doors" should be closed at least to the mark indicated on the hood door at all times except when necessary to adjust the apparatus that is inside the hood.

h . The hood fan should be "on" whenever a chemical is inside the hood, whether or not any work is being done in the hood. All hoods in the Chemistry Building are now designed to run continuously as part of the building air handling system, and the fan is not under the control of the worker, excepting the ability to activate the emergency purge mode. This increased the fan motor speed and hence increases the airflow. The emergency purge must not be activated unless necessary, as it disrupts the operation of the building ventilation system. Workers should be aware that activation of the fire alarm will, in compliance with the requirements of the Life Safety Code, shut off all fans in the building.

i. Workers should be aware of the steps that will be required in the event that a power or hood failure should occur.

j. Hood vents, ducts, and fans will be inspected once each three months to be sure that they are clean and clear of obstructions. If a fume hood is found to not be

working properly it should be labeled and a report 'made to the appropriate Area Supervisor.

k. Hoods are not to be used as storage areas for chemicals, apparatus or other materials.

3. Other Ventilation Devices:

a. Ventilated storage cabinets, canopy hoods, snorkels should have separate exhaust ducts.

b. Exhaust air from glove boxes should be passed through scrubbers or other treatment devices if necessary before being released into the regular exhaust system.

2.4.4 Vapor Detection

1. Odor should not be used as a means of determining that inhalation exposure limits may or may not has been exceeded.

2. Whenever there is a suspicion that the toxic chemical inhalation limit may have been exceeded the area supervisor should be notified immediately.

3. Respirators should be employed until the concentration of the suspect vapor has been measure and found to be below the limit.

2.4.5 Respirators

1. Workers should wear respirators whenever it is possible that engineering controls or work- practices could become or are i effective and that workers might be exposed to vapor or particulate concentrations greater than the PEL, action level, TLV, or similar~ limit, whichever is the lowest.

2. All workers who are likely to need to use respirators must be trained in their proper use, inspection and maintenance, and undergo annual medical testing and fit testing to ensure that they are in a satisfactory health condition to use a respirator. Area Supervisors must ensure the training of workers under their control. Written standard operating procedures governing the selection and use of respirators will be provided by and be on file with the Departmental Safety and Chemical Hygiene Officer.

2.4.6 Flammable Liquid Storage

1. Fire-hazard chemicals (see paragraph 2.2.2) in quantities greater than 3 Liters should be kept in metal safety cans designed for such storage. The cans should be used only as recommended by the manufacturer, including the following safety practices:

a. Never disable the spring-loaded closure.

b. Always keep the flame-arrestor screen in place; replace if punctured or damaged.

2. Fire-hazard chemicals should be stored in appropriately designed and

labeled cabinets. Cabinets designed for the storage of flammable materials should be properly used and maintained. Read and follow the manufacturer's information and follow the following safety practices:

a. Store only compatible materials inside a cabinet.

b. Do not store paper or cardboard or other combustible packaging material in a flammable-liquid storage cabinet.

c. The manufacturer establishes quantity limits for various sizes of flammable-liquid storage cabinets; do not overload a cabinet.

2.4.7 Low Temperature Storage

1. Only approved flammables storage or explosion proof refrigerators may be used to store chemicals. (Refrigerators and freezers from which all electrical connections have been removed from the storage compartment are acceptable, but it should be remembered that the such refrigerators that are not explosion proof, although qualified for storage of flammable, may produce sparks from electric motor brushes etc outside the cooled storage comopartment.)

2. No food, drink or personal use items may be stored in any chemical storage device.

3. Purchased materials requiring storage at lower that room temperature should be labeled by the vendor or manufacturer. Such materials should be stored at the indicated proper temperature immediately after receipt by the university.

4. Laboratory preparations that require low temperature storage should be labeled by the person who prepared them indicating the identity of the material, the date prepared, the temperature at which it is to be t red and the identity of the preparer. Such materials should be properly sealed to avoid contamination of the storage space by vapors.

2.5 Violations of Plan Regulations

In as much as these regulations are based on an interest in the safety of workers and legal requirements it is a necessity that there be a penalty phase, short of legal action, to underscore the seriousness of regulations and required practices promulgated in this plan. It is the desire of the University and Chemistry Department to encourage and require compliance before harm comes to the worker or the environment through unsafe action. With this in mind the following series of recourse actions is available to the safety and hazardous materials officials.

2.5.1 Single Violation by a Single Individual or Multiple Individuals

Such violations will be dealt with by the Area Supervisor who will discuss with the individual or group of individuals the nature of the violation and determine if the fault lies in a communication breakdown or individual irresponsibility.

2.5.2 Repeated Violation by Multiple Individuals

Such violations will be dealt with by a review of the situation. Review will be made by the Area Supervisors involved and the appropriate departmental officer to:

1. Rectify any communication breakdown.

2. Make a notation of the problem and solution, including recommendations for change of the plan rules to avoid future problems.

3. As necessary, circulate written clarification of the policy to all potentially affected workers and warnings to those involved in the violation.

4. Determine if mandated exposure limits have been exceeded and perform the any required duties, (offer of medical examinations, report to university Director of Risk Management, etc...).

2.5.3 Repeated Violation by a Single Individual

Such violations will be dealt with by a reviewed two Area Supervisors from the department and the appropriate departmental officer to:

1. Rectify any communication breakdown.

2. Make a notation of the problem and solution, including recommendations for change of the plan rules to avoid future problems.

3. Issue a written clarification of the policy to all potentially effected workers and warnings to those involved in the violation.

4. Determine if mandated exposure limits have been exceeded and perform the required duties, (medical examinations, report to university Director of Safety and Environmental Health, etc.)

5. Assess penalty if any to be placed on individual and/or Area Supervisor.

6. If repeated violations occur a meeting of the all department Area Supervisors and the appropriate departmental officer to determine if grounds exist to exclude the offending individual from further laboratory work.

2.5.4 Flagrant Violation of Safety and/or Hazard Rules

Such violations are those that result in the injury of workers or gross environmental damage must be dealt with immediately by a meeting of all Chemistry Department Area Supervisors, the appropriate departmental officer and the Director of Risk Management to ascertain the level of severity of the violation and the action to be taken against the individual and/or the Area Supervisor involved. Actions may range from the issue of a warning, to penalty, to dismissal of the worker. A complete report will be prepared on the incident and its outcome by the departmental officer.

2.5.5 Work Termination

If a worker terminates his/her relationship, either as student or employee, with the Chemistry Department, the worker must see to the successful completion of their "Check Out" sheet. If wastes are not labeled and disposed of or other areas not left in proper order, the Chemistry Department through the appropriate Area Supervisors will get things in order, but the costs associated with such effort will be calculated and the information submitted to the University administration for legal review with a view to billing the former worker. Until any outstanding amounts are paid the university will withhold transcript and other similar documents from the worker.

3 Emergency Procedures

Work within the laboratory and stockrooms requires that great care be taken to avoid hazardous situations. In the event that, despite all efforts to avoid them, emergency situations should occur workers must be aware of their role and duties to minimize the danger to themselves and others.

3.1 Heating/Air Conditioning/Ventilation/Plumbing Failures

1. Heating and air conditioning failures can represent dangers to the use and stability of chemicals as well as a danger to instruments. It the temperatures within a room or building should fall outside the range of 50 to 80 degrees Fahrenheit the problem should be reported to the Area Supervisor as a safety concern immediately. The Area Supervisor will then contact the Physical Plant office to obtain relief.

2. Plumbing and ventilation failures can represent safety, and chemical hygiene dangers. Area Supervisors should be notified immediately and no work should be attempted in the effected area until the Area Supervisor certifies the area safe.

3. Area Supervisors should compile reports of such failures for the Departmental Safety and Chemical Hygiene Officer.

3.2 Power Outages

In the case of a localized outage, such as a single outlet or room the Area Supervisor should be contacted. In the event of a building wide or area wide ~ power outage emergency lighting should come oil to ensure the safe evacuation of 'he laboratory or stockroom. To avoid hazards during and after the power failure, workers should take the following precautions.

1. If working alone get your partner (the person who is checking on you) and work with them while proceeding with the shut down aspect of these rules.

2. Turn off all heat sources and power consuming equipment.

3. Follow the accepted area procedure for care of vacuum systems that may have been on at the time of the outage.

4. Secure all reactions that may be in progress.

5. When the area is secure, exit the area and assemble at the designated location.

6. Report to the Area Supervisor, in writing, the actions taken and any problems encountered during the shut down.

3.3 Mechanical/Electrical Emergencies

These events may or may not involve workers, but do not involve hazardous chemicals.

1. Events Without Worker Involvement: These events are limited to incidents in which sudden unexpected physical changes occur, :,such as sudden violent pressure releases, loss of support resulting in the collapse of equipment or electrical arcing. In these instances the worker should notify both the Area Supervisor and the Departmental Safety and Chemical Hygiene Officer. After assessing the situation and determining the

extent of damage and need for repair and/or remediation both officials will certify the area and allow cleanup and new work to begin.

2. Events With Worker Involvement: These events will be ones like those described above with the exception the worker injury has resulted. The Area Supervisor and the Departmental Safety and Chemical Hygiene Officer should be contacted immediately. If neither is available the University Police should be contacted by calling 8311. The responding official will assess the situation and determine if the effected person or persons should be transported to the university health center or local hospital. The affected worker or workers will be afforded medical consultation at the cost of the university if required. Following removal of the injured party the work area will be sealed for investigation by the Director of Risk Management, the Departmental Safety and Chemical Hygiene Officer and two Area Supervisors. They will compile a report on the incident including any remedial action to be taken.

3.4 Chemical Emergencies

These emergencies will be classified as those that involve exposure or potential exposure to chemicals, regardless of whether or not as the primary or secondary effect of the incident.

3.4.1 Events Without Worker Contact

These events would be those such as spills of hazardous chemical compounds in which the worker has had no exposure to the material. The worker should follow the following protocol:

1. Obtain the necessary protective equipment contain the spill and close the area.

2. Notify the Area Supervisor and/or Departmental Safety and Chemical Hygiene Officer, who will certify the area and determine the course of action to be taken. Action will range from authorizing cleanup to declaring Evacuation Chemical Emergency.

3. If authorized the worker should obtain the cleanup equipment and supplies needed to begin cleanup.

4. Cleanup the spill and treat all cleanup materials as waste, disposing of them in the proper manner.

5. Submit a report of the incident to the Area Supervisor for use in the yearly review, and obtain permission from the Area Supervisor to reopen the area.

3.4.2 Events With Worker Contact

These events would be those that involve the exposure of workers to hazardous chemicals. It is noted that workers should be familiar with the MSDS for the compounds they use and therefore should be aware to the treatment for exposure to the chemical. The worker should seek the aid of laboratory partners immediately to remove and treat the effects of the exposure. The general protocol for treatment of chemical exposures should be:

1. Remove contaminated clothing as quickly as possible. (This underscores the recommendation to utilize both laboratory coats or aprons.)

2. Flush the exposed area with water for at least 15 minutes. This is particularly important in the case of chemicals in the eye. The eye wash and safety shower should be used as required.

3. In the case of exposure to hazardous or potentially hazardous chemicals the responding official will direct the worker to obtain medical consultation at university cost, even if not apparent bum, allergic reaction or other reaction may have occurred.

4. As soon as possible the Area Supervisor and the Departmental Safety and Chemical Hygiene Officer should be contacted. If neither is available the University Police should be contacted by calling 8311. The responding officer will assess the situation and determine if the effected person or persons should be transported to the university health center or local hospital. Employee(s), including student employee(s) will be afforded medical consultation as provided under the applicable Workers' Compensation statutes and regulations. Following removal of the injured party the work area will be sealed for investigation by the Director of r\Risk Management, the Departmental Safety and Chemical Hygiene Officer and two Area Supervisors. They will compile a report on the incident to including remedial action to be taken.

3.5 Fire Emergency

Fire emergencies can quickly get out of hand. Action must be taken rapidly. The evaluation of MSDS reports prior to beginning work should inform workers of the potential for fire and the type of apparatus to be used to extinguish any fire. In the event of a fire the worker should ensure that the University Police are called on 8311 and advised of the fire and its location (room number). To the extent that the worker is able without risk to him or herself, (s)he should:

1. Remove sources of fuel and/or heat that are not yet alight, and extinguish the flames. Flames may be extinguisher in a number of ways:

   a . Small fires may be suffocated by covering with an inverted beaker.

   b. Larger fires may require suffocation with the appropriate fire extinguisher or sand, in the case of metal of some reactive chemical reagents.

2. If a fire becomes out of control, the fire alarm should be sounded, the laboratory doors closed, but not locked, and building evacuated. The building must be evacuated because activating the fire alarm shuts off all ventilation in the building. Workers should assemble in the designated area outside the building on the Women's Gym side..

3. Workers involved in fires regardless of size should prepare a written report for the Area Supervisor who will review the events with the Departmental Director of Safety and Chemical Hygiene. The review of the event will be made part of the yearly review.

3.6 Declaration of Evacuation Emergency

In the event of an out of control fire emergency or chemical emergency it may be necessary to evacuate the building to ensure the safety of those within the building. This must not be done frivolously, but it is important that the call to evacuate be done rapidly before harm may come to workers. The building must be evacuated in the following situations:

1. In the case of any out of control fire – any fire that cannot be immediately extinguished without danger to any person.

2. In the case of the spill of any acutely toxic volatile liquid or gas that may induce rapid physiological damage.

3. In the case when the fire alarm has been activated by one of the electronic sensors or by a person activating a manual pull station alarm.

To call to evacuate the building one need only activate the fire alarm system. In the event that the cause of the evacuation emergency is a chemical spill the person who sent the alarm should contact the University Police on 8311 to confirm the chemical nature of the incident.

At the time of evacuation each worker, to the extent practical and safe, should turn off all equipment and secure all laboratories before leaving. The workers should assemble outside the building in the assigned area so that Area Supervisors may determine if all workers have evacuated the building.

3.7 Alarms

The Director of Risk Management will monitor the schedule of alarm and detector testing to ensure the operation of these safety devices.

4. Medical Consultation

4.1 When Medical Consultation is Indicated

Workers must have access to medical consultation, performed by or under the direct supervision of a licensed physician, at a reasonable time and place, without loss of pay and shall be without cost to the worker. In the case of employees, including student employees, the provisions and requirements of the applicable Workers' Compensation statutes and regulations will apply. Workers have the right to decline any medical evaluation or treatment and have a right to select the health care provider of their choosing. Workers' Compensation procedures include provisions that will pay for initial evaluation and/or emergency care regardless of the provider or facility. However, the Workers' Compensation system will only pay follow-up evaluation and treatment, in accordance with the applicable statutes and regulations. Medical consultation is indicated if:

1. Workers show signs or symptoms of exposure to chemical hazardous materials.

2. An action level, or PEL for any chemical is exceeded o multiple occasions and there is a substance specific standard established.

3. There is a spill, leak or explosion that makes it likely that the worker was exposed to a significant quantity of a hazardous chemical.

In such cases the Area Supervisor will direct the worker to the University Health Center, or in the appropriate case to an area hospital.

4.2 Information Provided to Physician

The physician must, to the maximum extent practical, be provided with the following information:

1. The identity of the hazardous chemical or chemicals to which the worker may have been exposed;

2. A description of the conditions under which the exposure occurred including quantitative exposure data, if available; and

3. A description of the signs and symptoms of exposure that the employee of exposure that the worker is experiencing, if any.

4.3 Physician Report

For consultation or examination required under this plan, the Area Supervisor will, to the extent permissible under the various privacy statutes, obtain from the examining physician a written opinion or copies of reports containing such opinions. A report of the incident will be placed on file with the Director of Risk Management with copies on file in the Department. In the case of employees, any medical records or opinions will be filed in the Workers' Compensation Records in the Human Resources Department. In the case of student who are not employees, any medical records or opinions will be maintained by the Division of Student Affairs or placed in the Confidential Section of the Student's Permanent University Record. Copies of available medical reports and opinions may be used internally by the Office of Risk Management in investigating the casue.

Any medical opinion should include, to the extent legally permissible:

1. Any recommendation for further medical follow up;

2. The results of the medical examination and any associated medical tests;

3. Any medical condition which may be revealed in the course of the examination which may place the worker at increased risk as a result of exposure to a hazardous chemical utilized in the work area; and

4. Evidence that the worker has been informed by the physician of the results of the consultation of medical examination and any further examination or treatment. Written opinions must not reveal any findings or diagnoses that are unrelated to the exposure incident.

5 Training Program

To ensure that each worker within the department has obtained an adequate level of understanding, knowledge and appreciation of the responsibilities and demands placed upon them by the legal requirements of safety, chemical hygiene and waste regulations the following formal training program will be presented each year. Area Super visors will also supplement this training with process specific training to workers in their areas.

5.1 Workers Subject to Training Program

All individuals who receive employment through the Chemistry Department must attend a training program based on the their classification within this Plan. (See Section 1.3)

5.2 The Safety and Environmental Health Training Program

This aspect of this plan is designed to provide an outline of topics that should be covered in the training program. The specifics of the presentation are left the University Director of Risk Management and the Departmental Directors of Safety and Chemical Hygiene and Hazardous Materials. The training will be designed to meet the requirements of the Texas Hazard Communication Act and the University Hazard Communication Plan. Much of the training will be provided by the appropriate area supervisors and will often be customized to address the specific situation and circumstances in which the worker will be working. The following will be communicated and/or made available to each worker:

5.2.1 Documentation

All information resources (laws, applicable governmental regulations, MSDSs, a copy of the current plan, the yearly review and other literature) utilized to generate and maintain the Hazard Communication Plan will be available within the Chemistry Department from the Departmental Safety and Chemical Hygiene Officer.

1. The plan document and its contents,
2. The list of cases in which written reports must be prepared and the rules for preparation,
3. The method for making suggestions for changes to the plan or for improvements in area or Chemistry Department safety or environmental health,
4. The location and availability of reference materials on the hazards, safe handling, storage and disposal of hazardous materials used in the Chemistry Department including, but not limited to MSDSs and other safety and hazardous materials references,
5. The Chemistry Department "Check Out" Sheet,
6. An overview of the MSDS, to include PELs and other recommended exposure limits,

5.2.2 Building Security

1. The rules for gaining access to the chemistry building and areas within the building,
2. The hours in which the stockroom and departmental offices are open,

3. The rules for work within the building after office hours and the rule requiring partners when working alone,

4. The rules covering locking of doors and access to exits and the covering of windows.

5. The method of warning of safety and hazards, including the placard warnings at entry points to laboratories.

5.2.3 Stockroom

1. The methods for inventory control and check out of stockroom materials.

2. The methods for check out of materials from the "Weekend Stockroom."

3. The rules for the ordering of chemicals.

4. The rules for the receipt of materials from the stockroom.

5.2.4 Transport of Chemicals

1. Rules of acceptable transport apparatus for reagent chemicals and wastes (Carts and Buckets)

2. Rules for the transport of gases, (Safety Carts, Regulators, and Caps)

5.2.5 Storage of Chemicals

1. The storage of gas cylinders within the stockroom, and the rules for storage of in laboratories including the requirement that cylinders be secured,

2. The proper storage of solvents and large quantity chemicals, including the use of storage cabinets,

3. The proper labeling of laboratory prepared chemicals,

4. The handling of dated chemicals,

5. The rules for the storage of chemicals in refrigerators,

5.2.6 Safety Rules

1. Overview of the departments general safety rules

2. Overview of process specific safety rules

3. How to recognize potential hazard situations, including methods and observations to detect the presence or release of hazardous chemicals,

4. Physical and chemical hazards in the work area,

5. Rules for proper maintenance of equipment, (electrical, mechanical, and water use)

6. The proper use of personal safety and protection equipment,

7. What to do in tile event of evacuation.

5.2.7 Teaching Laboratories

1. The responsibilities of laboratory coordinators

2. Overview of the "Teaching Laboratories Safety Rules"

3. Proper methods for chemical distribution and waste handling,

4. What to do in the event of evacuation.

5.2.8 Waste Handling

1. Proper handling of glass wastes

2. Proper handling of chemical wastes, including treatment/minimization, mixing of wastes, storage containers and labels, storage time les, transport of wastes,

5.2.9 Emergencies

1. Power outage procedure

2. Physical plant procedures, including heating, air conditioning, ventilation, water, reports,

3. Mechanical/electrical procedures, with and without injury, reports,

4. Chemical procedures, with and without contact, treatments for contact, availability of medical consultation, alarms, reports

5. Fire Procedures, types, treatment, alarms, reports, extinguisher training.

6. Evacuation procedures, assembly areas, including university evacuation.

Due to -the large variety of processes and chemicals used in the department much of the burden for specific safety and environmental health training will fall to the individual Area Supervisors. Area Supervisors should seek the assistance if needed of the Departmental Safety and Chemical Hygiene and Hazardous Materials Directors. The Directors should seek out the Area Supervisors to ensure that they are up to date on the regulations and allowed exposure limits they and workers under their control utilize. Specifically, Area Supervisors should make their work aware of:

1 PELs for the specific hazardous compounds used in the area,

2. Signs and symptoms associated with exposures to hazardous chemicals used in the laboratories.

6 Program Review

The plan and other associated plans will be reviewed annually by the Director of Risk Management, the Chair of the Department of Chemistry and Physics, the Departmental Safety and Chemical Hygiene Officer and the Hazardous Waste Coordinator Officer. This group should review the following information.

1. Records of Hazardous Communication training of faculty and full –time staff, and existence of records of hazardous communication and general lab safety training give to students in organized laboratory courses, and individual research laboratories.

2. Records of safety inspections carried out during the preceding year. This should include all repairs or other corrective action required and/or taken.

3. Records of Safety and or Environmental Health "incidents" within the year including the required initial and follow-ups reports.

4. The departmental chemicals and hazardous waste inventory, including locations and gross quantities of materials as required.

5. A listing of suggestions received during the year concerning safety and environmental health within the department.

6. A listing of actions taken to remedy situations noted in the previous years review or brought up during the year.

Appendix I

Safety and Environmental Health Officers

Chief Executive Officer:	Dr. James Simmons President, Lamar University 100 Plummer Building P.O. Box 10001 Ext. 8405
University Director of Risk Management	Dr. John A. Whittle O-95 Maes Building P.O. Box 10807 Ext. 8276
Chair, Dept of Chemistry and Physics	Dr. Keith C. Hansen 121G Chemistry Building P.O. Box 10022 Ext. 8266
Chemistry Dept. Hazardous Waste Coordinator:	Mr. Arthur Bradberry 112 Chemistry Building P.O. Box 10022 Ext.8279
Chemistry Dept. Safety and Chemical Hygiene Officer	Ms. Marsha Williams 121J Chemistry Building P.O. Box 10022 Extn 8273

Appendix 2
Student Lab Safety Rules

Safety Regulations For Chemistry Department Teaching Laboratories

1. Approved eye protection, with side shields, must be worn AT ALL TIMES.

2. Long sleeved, and legged clothing, and shoes with solid uppers must be worn in the laboratory. Long hair and/or loose clothing must be confined.

3. Consumption of food, or beverages is not permitted in the laboratory. Smoking is not permitted within the chemistry building.

4. Only authorized materials, needed for the experiment, should be present in the work area or aisles. Place backpacks, coats, etc. in the area provided.

5. Do not touch chemicals or mouth pipet. Avoid breathing vapors from reactions or open containers. Use the fume hoods if noxious vapors or flammable gases are likely to be evolved in a reaction.

6. Avoid distracting or startling other workers. Practical jokes, horseplay, and running often lead to accidents and will not be tolerated.

7. Never perform any experiment or modifications of an experiment without the instructors consent.

8. Before using open flames in the laboratory remove all open container of flammable materials and obtain the consent of the instructor. Never se open flames with diethyl ether in the room. Extinguish flames as soon as they are no longer needed.

9. Do not dispose of any materials without instruction as to the proper method of disposal. Never place materials in unmarked containers.

10. Identify the position of the nearest fire extinguisher, eye wash and safety shower before beginning an experiment.

11. In the event of a fire, spill or accident notify the instructor at once. Be prepared to shut down your experiments and evacuate the laboratory in an orderly fashion.

12. Wash your hands with soap and water immediately after the laboratory.

13. Laboratory apparatus, glassware and/or chemicals may not be remove from the building.

I have read the above safety rules and will observe them in this chemistry course. I have also made myself familiar with the position and operation of the fire extinguisher, safety shower and eye wash in the laboratory.

Course _____ Name :_____

Date- _____ Signature:_____

Appendix 3
Checklist for Student End of Lab Research Work

Student Name Degree Type

Date Research Began Data Research Ends

Research Mentor

Project Title

Waste and Safety Training

Date Initial Training: Dates renewal-

Keys (Authorizing Personal Initial Receipt)

Room	Date Received	Date Returned
Room	Date Received	Date Returned
Room	Date Received	Date Returned
Room	Date Received	Date Returned

Final Research Report or Thesis Received

Desk and research area is clean

Glassware is clean and returned to storage

Equipment has been maintained (Inspect for leaking pumps, frayed electrical cords, dirty probes, proper response of test mixtures, etc.)

All reagents are returned to proper storage

Samples are labeled and prepared for storage

Waste has been fully labeled.

Notebooks and lose Data (Chromatographs,
Spectra, etc.) labeled and turned in

Permanent address

Final grade authorization cleared

Appendix 4
EPA HAZARDOUS WASTE CODES

Code Waste **description**

Characteristic Hazardous Waste

D001 Ignitable waste-A solid exhibits the characteristic of ignitability if a representative sample of the waste has any of the following properties: (1) It is a liquid, other than an aqueous solution containing less than 24 percent alcohol by volume and has a flash point less than 60°C(140°F) as determined by a Pensky-Martens Closed Cup Tester, using the test method specified in ASTM Standard D-93-79 or D-93-80, or a Setaflash Closed C p Tester, using the method specified in ASTM Standard D-3278-78, or as determined by an equivalent test method approved by the Administrator under procedures set forth in 40 CFR Part 260. (2) It Is not a liquid and is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard. (3) It is an ignitable compressed gas as defined in 49 CFR Part 173 and as determined by the test methods described in that regulation or equivalent test methods approved by the Administrator under 40 CFR Part 260. (4) It is an oxidizer as defined in 49 CFR Part 173.

D002 Corrosive waste-A solid waste exhibits the characteristic of corrosivity if a representative sample of the waste has either of the following p rope ties: (1) It is aqueous and has a pH less than or equal to 2 or greater than or equal to 12.5, as determined by a pH meter using either an EPA test method or an equivalent test method approved by the Administrator under the procedures set forth in 40 CFR Part 260. (2) It is a liquid and corrodes steel (SAE 1020) AT A RATE GREATER THAN 6.35 MM (0.25 inch) per year at a test temperature of 55 C (130 F) as determined by the test method specified in NACE (National Association of Corrosion Engineers) Standard TM-01069 or an equivalent test method approved by the Administrator under the procedures set forth in 40 CFR Part 260.

D003 Reactive waste: A solid waste exhibits the characteristic of reactivity if a representative sample of the waste has any of the following properties:
(1) It is normally unstable and readily undergoes violent change without detonating.
(2) It reacts violently with water.
(3) It -forms potentially explosive mixtures with water.
(4) When mixed with water, it generates toxic gases, vapors or fumes n a quantity sufficient to present a danger to human health or the environment.
(5) It is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.
(6) It is capable of detonation or explosive decomposition or reaction at standard temperature and pressure.
(7) It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure
(8) It is a forbidden explosive, a Class A explosive, or a Class B explosive as defined in 49 CFR Part 173.

EP Toxicity-A solid waste exhibits the characteristic of EP toxicity if, sing the test methods described in 40 CFR Part 261 Appendix 11 or equivalent methods approved by the Administrator under the procedures set forth in 40 CFR Part 260, the extract from a representative sample of the waste contains any of the contaminants listed as D004 thru D017 at a concentration equal to or greater than the respective value given. Where the waste contains less than 0,5 percent filterable solids, the waste itself, after filtering, is considered to be the extract for the purposes of this section.

Code	Waste **Description**	Maximum Concentration (milligrams per liter)
D004	Arsenic	5.0
D005	Barium	100.0
D006	Cadmium	1.0
D007	Chromium	5.0
D008	Lead	5.0
D009	Mercury	0.2
D010	Selenium	1.0
D011	Silver	5.0
D012	**Endrin** (1.2,3,4,10,10-hexachloro-1,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo,(endo-5,8-dimethano-naphthalene)	0.02
D013	Lindane (1,2,3,4,5,6-hexa-chlorocyclohexane, gamma isomer)	0.4
D014	Methoxychlor(1,1,1- trichloro2,2 bis[p-rnethoxyphenyl]ethane)	10.0
D015	Toxaphene ($C_{10}H_{10}C_8$, technical chlorinated camphene, 67-69 percent chlorine)	0.5
D016	2,4-D(2,4-dichlorophenoxyacetic acid)	10.0
D017	2,4,5-TP Silvex (S2,4,5-trichlorophenoxypropionic acid)	1.0

Hazardous Waste from Nonspecific Sources

F001 The following spent halogenated solvents used in degreasing: tetrachloroethylene, trichlorethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride and chlorinated fluorocarbons and all spent solvent mixtures/blends used in degreasing containing, before use, a total of 10 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

F002 The following spent halogenated solvents: tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-triclliloroethane, 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 10 percent or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F001, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.

Code	**Waste** Description
F003	The following spent nonhalogenated 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 nonhalogenated solvents; and all spent solvent mixtures/blends containing, before use, one or more of the above nonhalogenated solvents, and a total of 10 percent or more (by volume) of one or more of those solvents listed in F001, F002, F004, and FOOS; and still bottoms from the recovery of these spent solvents and spent solvent mixtures
F004	The following spent nonhalogenated solvents: cresols and cresylic acid, and nitrobenzene; all spent solvent mixtures/blends containing before use a total 10 percent or more (by volume) of one or more of the above nonhalogenated solvents or those spent listed in F001, F002, and FOOS; and still bottoms from the recovery of these spent solvents and spent solvent mixtures
F005	The following spent nonhalogenated solvents: toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, and 2nitropropane; all spent solvent mixtures/blends containing, before use, a total of 10 percent or more (by volume) of one or more of the above nonhalogenated solvents or those solvents listed in FOOL F002, or F004; and still bottoms from the recovery of these spent solvents and spent solvent mixtures
F006	Wastewater treatment sludges from electroplating operations except from the following processes: (1) Sulfuric acid anodizing of aluminum; (2) till plating on 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
F007	Spent cyanide plating bath solutions from electroplating operations
F008	Plating bath residues from the bottom of plating baths from electroplating operations where cyanides are used in the process
F009	Spent stripping and cleaning bath solutions from electroplating operations were cyanides are used in the process.
F010	Quenching bath residues from oil baths from metal heat treating operations where cyanides are used in the process
F011	Spent cyanide solutions from salt bath pot cleaning from metal heat treating operations
F012	Quenching waste water treatment sludges from metal heat treating operations where cyanides are used in the process
F019	Wastewater treatment sludges from the chemical conversion coating of aluminum
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 (if hexachlorophene from highly purified 2,4,5-trichlorophenot.)

Code	Waste Description
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 derivatives
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
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 2,4,5trichlotophenol.)
F024	Wastes including but not limited to, distillation residues, heavy ends, tars, and reactor clean-out wastes from the production of chlorinated aliphatic hydrocarbons, having a carbon content from one to five, utilizing fr e radical catalyzed processes. (This listing does not include light ends, spent filters and filter aids, spent dessicants, wastewater, wastewater treatment sludges, spent catalysts, and "K" listed wastes-Hazardous Wastes from Specific Sources.)
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
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 synthesized from prepurified 2,4,5-trichlorophenol as the sole component.)
F028	Residues resulting from the incineration or thermal treatment of soil contaminated with EPA hazardous waste nos. F020, F021, F022, F023, F026, and F027

Discarded Commercial Chemical Products, Off-Specification Species, Container Residuals, and Spill Residues Thereof - Acute Hazardous Waste

Code	Waste Description
P023	Acetaldehyde, Chloro-
P002	Acetamide, N- (aminothioxomethyl)-
P057	Acetamide, 2-fluoro-
P058	Acetic acid, fluoro-, sodium salt
P066	Acetimidic acid, N-[(methylcarbamoyl) oxylthio-, methyl ester
P002	1-Acetyl-2-thiourea
P003	Acrolein
P070	Aldicarb
P004	Aldrin
P005	Allyl alcohol
P006	Aluminum phosphide
P007	4-alpha-Aminopyridine
P009	Ammonium picrate
P119	Ammonium vanadate
P010	Arsenic acid
P012	Arsenic (III) oxide
P011	Arsenic (V) oxide
P011	Arsenic pentoxide
P012	Arsenic trioxide
P038	Arsine, diethyl
P036	Arsenous dichloride, phenyl-
P054	Aziridine
P013	Barium cyanide
P024	Benzenamine, 4-chloro-
P077	Benzenamine, 4-nitro-
P028	Benzene, (chloromethyl)-
P042	1,2-Benzenediol, 4[1-hydroxy -2-(methylamino)ethyl]-
P046	Benzeneethanamine, alpha, alpha-dimethyl-
P014	Benzenethiol
P001	2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-l-phenylbutyl)-and salts
P028	Benzyl chloride
P015	Beryllium dust
P016	Bis(chloromethyl)ether
P017	Bromoacetone
P018	Brucine
P021	Calcium cyanide
P022	Carbon disulfide
P022	Carbon disulfide
P095	Carbonic dichloride
P023	Chloroacetaldehyde
P024	p-Chloroaniline
P029	Copper cyanide
P030	Cyanides (soluble cyanide salts), not otherwise specified
P031	Cyanogen
P033	Cyanogen chloride

P034	2-Cyclohexyl-4,6-dinitrophenol
P036	Dichlorophenylarsine
P037	Dieldrin
P038	Diethylarsine
P041	Diethyl-p-nitrophenyl phosphate
P040	O,O-Diethyl O-pyrazinylphosphorothioate
P043	Diisopropyl fluorophosphates (DEP)
P004	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-(1-alpha, 4-alpha. 4a-beta, 5-alpha, 8-alpha, 8a-beta)-
P060	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-(1-alpha, 4-alpha, 4a-beta, 5-beta, 8-beta, 8a-beta)-
P037	1,2,3,4,10,10-Hexahydro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo,exo-1,4,5,8-demethanonaphthalene
P051	1,2,3,4,10,10-Hexahydro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo,endo-1,4,5,8-demethanonaphthalene
P060	Hexachlorohexahydro-exo-exodemethanonaphthalene
P044	Dimethoate
P045	3,3-Dimethyl-1-(methylthio)- 2-butanone, O-[(methylamino) carbonyloxime
P046	alpha,alpha-Dimethylphenethylamine
P047	4,6-Dinitro-o-cresol and salts
P048	2,4-Dinitrophenol
P020	Dinoseb
P085	Diphosphoramide, octamethyl-
P039	Disulfoton
P049	2,4-Dithiobiuret
P050	Endosulfan
P088	Endothal
P051	Endrin
P042	Epinephrine
P101	Ethylcyanide
P054	Ethyleneimine
P097	Famphur
P056	Fluorine
P057	Fluoroacetamide
P058	Fluoroacetic acid, sodium salt
P065	Fulminic acid, mercury (2+)salt
P059	Heptachlor
P062	Hexaethyltetraphosphate
P116	Hydrazinecarbothioamide
P068	Hydrazine, methyl-
P063	Hydrocyanic acid
P063	Hydrogen cyanide
P096	Hydrogen phosphide
P064	Isocyanic acid, methyl ester
P060	Isodrin
P007	3 (sH) -Isoxazolone, 5-(aminomethyl)-
P092	Mercury, (acetato-O)phenyl-

P065 Mercury fulminate

P082 Methamine,N-methyl-N-nitroso-

P016 Methane, oxybis(chloro-

P112 Methane, tetranitro-

P118 Methanethiol, trichloro-

P050 6,9-Methano-2,4,3-benzodi-oxathiepen,6,7,8,9 10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide

P059 4,7-Methano- 1H-indene, 1,4,5.6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-

P066 Methomyl

P067 2-Methylaziridine

P068 Methyl hydrazine

P064 Methyl isocyanate

P069 2-Methyllactonitrile

P071 Methyl parathion

P072 alpha-Naphthylthiourea

P073 Nickel carbonyl

P073 Nicotine and salts

P076 Nitric oxide

P077 p-Nitroanilinc

P078 Nitrogen dioxide

P076 Nitrogen oxide NO

P078 Nitrogen oxide N02

P081 Nitroglycerine

P082 N-Nitrosodimethylamine

P084 N-Nitrosomethylvinylamine

P074 Nickel cyanide

P085 Octamethy lpyrophosophoramide

P087 Osmium oxide

P087 Osmium tetroxide

P088 7-Oxabicyclo[2.2.llheptane-2,3-dicarboxylic acid

P089 Parathion

P034 Phenol, 2-cyclohexyl-4,6-dinitro-

P048 Phenol, 2,4-dinitro

P047 Phenol, 2-methyl-4,6-dinitro- and salts

P020 Phenol,2-(I1-methylpropyl)-4,6-dinitro-

P009 Phenol, 2,4,6-trinitro-, ammonium salt

P092 Phenylmercury acetate

P093 Phenylthiourea

P094 Phorate

P095 Phosgene

P096 Phosphine

P041 Phosphoric acid, diethyl 4-nitrophenyl ester

P039 Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl] ester

P094 Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester

P044 Phosphorodithioic acid, O,O-dimethyl S [2-(methylamino)-2-Oxoethyl] ester

P043 Phosphorofluoric acid, bis(l-methylethyl)-ester

P089 Phosphorothioic acid, O,O-diethyl-O-(4-nitrophenyt) ester

P040 Phosphorothioic acid, O,O-diethyl-O-pyrazinyl ester

P097 Phosphorothioic acid, O-[4-(dimethylamino)sulfonylphenyl] O,O-dimethyl ester

P071 Phosphorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester

P110 Plumbane, tetraethyl-

P098 Potassium cyanide

P099 Potassium silver cyanide

P070 Prop anal,2-methyl-2-(methylthio)-, O-[(methylamino) Carbonyl]oxime

P101 Propanenitrile

P027 Propanenitrile,3-chloro

P069 Propanenitrile, 2-hydroxy-2methyl

P081 1,2,3-Propanetriol, trinitrate

P017 2-Propanone, 1-bromo-

P102 Propargyl alcohol

P003 2-Propenal

P005 2-Propen-l-ol

P067 1,2-Propylenimine

P102 2-Propyn-l-ol

P008 Pyridinamine

P075 Pyridine, (S)-3-(1-methyl-2-pyrrolidinyl)-, and salts

P111 Pyrophosphoric acid, tetraethyl ester

P103 Selenourea

P104 Silver cyanide

P105 Sodium azide

P106 Sodium cyanide

P107 Strontium sulfide

P108 Strychnidin-10-one, and salts

P018 Strychnidin-10-one, 2,3dimethoxy-

P108 Strychnine and salts

P115 Sulfuric acid, thallium(I) salt

P109 Tetraethy1dithiopyrophosphate

P110 Tetraethyl lead

P111 Tetraethylpyrophosphate

P112 Tetranitromethane

P062 Tetraphosphoric acid, hexaethyl ester

P113 Thallic oxide

P113 Thalliuni(III) oxide

P114 Thallium(I) selenite

P115 Thallium(I) sulfate

P109 Thiodiphosphoric acid, tetraethyl ester

P045 Thiofanox

P049 Thioimidodicarbonic diazide

P014 Thiophenol

P116 Thiosemicarbazide

P026 Thiourea, (2-chlorophenyl)-

P076 Thiourea, 1-naphthalenyl-

P093 Thiourea, phenyl-

P123 Toxaphene

P118 Trichloromethanethiol

P119 Vanadic acid, ammonium salt

P120 Vanadium(V) oxide

P084 Vinylamine, N-methyl-nitroso-

P001 Warfarin

P121 Zinc cyanide

P122 Zinc phosphide

Discarded Commercial Chemical Products, Off-Specification Species, Container Residues, and Spill Residues Thereof-Toxic Waste

U001	Acetaldehyde
U034	Acetaldehyde. trichloro-
U187	Acetamide, N-(4-ethoxyphenyl)-
U005	Acetamide, N-914-fluoren-2-yl
U112	Acetic acid, ethyl ester
U 144	Acetic acid, lead salt
U214	Acetic acid, thallium (1+) salt
U232	Acetic acid, (2,4,5-trichlorophenoxy)-
U002	Acetone
U003	Acetonitrile
U004	Acetophenone
U005	2-Acetylaminofluorene
U006	Acetyl chloride
U007	Acrylamide
U008	Acrylic acid
U009	Acrylonitrile
U011	Amitrole
U012	Aniline
U014	Auramine
U015	Azaserine
U010	Azirino(2', 3':3,4) pyrrolo-[1,2-a]indole-4,7-dione, 6-amino-8-[((aminocarbonyl)ocy)methyl]-l,la,2,8,8a,8b-hexahydro-8a-methoxy-5-methyl-
U157	Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-
U016	3,4-Benzacridine
U017	Benzal chloride
U192	Benzamide, 3,5-dichloro-N-(l,l-diethyl-2-propynyl)-
U018	Benz[a]anthracene
U094	Benz[a] anthracene, 7,12-d.imethyl-
U012	Benzenamine
U014	Benzenamine,4,4'-carbonimidoyl-bis(N,N-dimethyl-)
U049	Benzenamine, 4-chloro-2-methyl-
U093	Benzenamine,N,N-dimethyl-4-(phenylazo)-
U328	Benzenamine, 2-methyl-
U353	Benzenamine, 4-methyl-
U158	Benzenamine, 4,4'-methylenebis(2-chloro-)
U222	Benzenamine, 2-methyl-, hydrochloride
U181	Benzenamine, 2-methyl-5-nitro
U019	Benzene
U038	Benzeneacetic acid, 4-chloro-alpha-(4-chlorophenyl)-alpha-hydroxy, ethyl ester
U030	Benzene, 1-bromo-4-phenoxy-
U035	Benzenebutanoic acid, 4-[bis(2-chloroethyl) amino]-
U037	Benzene, chloro-
U221	Benzenediamine. ar-methyl-

U028	1,2-Benzenedicarboxylic acid, bis (2-ethylhexy) ester
U069	1,2-Benzenedicarboxylic acid, dibutyl ester
U088	1,2-Benzenedicarboxylic acid, diethyl ester
U102	1,2-Benzenedicarboxylic acid, dimethyl ester
U107	1.2-Benzenedicarboxylic acid, di-n-octyl ester
U070	Benzene, 1,2-dichloro-
U071	Benzene, 1,3-dichloro-
U072	Benzene, 1,4-dichloro-
U060	Benzene, 1,1'-(2,2-dichloroethylidene)bis[4-chloro-
U017	Benzene, (dichloromethyl)-
U223	Benzene, 1,3-diisocyanatomethyl-
U239	Benzene, dimethyl-
U201	1,3-Benzenediol
U127	Benzene, hexachloro-
U056	Benzene, hexahydro-
U220	Benzene, methyl-
U105	Benzene, 1-methyl-2,4-dinitro-
U106	Benzene, 2-methyl-1,3-dinitro-
U055	Benzene, (1-methylethyl)-
U169	Benzene, nitro-
U183	Benzene, pentachloro-
U185	Benzene, pentachloronitro-
U020	Benzenesulfonic acid choride
U020	Benzenesulfonyl chloride
U207	Benzene, 1,2,4,5-tetrachloro-
U061	Benzene, 1,1'-(2,2,2-trichloroethylidene)bis[4-chloro-
U247	Benzene, 1,1'-(2.2,2-trichloroethylidene)[4-ethoxy-
U023	Benzene, (trichloromethyl)-
U234	Benzene, 1,3,5-trinitro-
U021	Benzidine
U202	1,2-Benzisothiazol-3-(2H) one,1,1-dioxide and salts
U203	1,3-Benzodioxole, 5-(2-propenyl)-
U141	1,3-Benzodioxole, 5-(l-propenyl)-
U090	1,3-Benzodioxole, 5-propyl
U064	Benzo[rst]pentaphene
U022	Benzo[a]pyrene
U197	p-Benzoquinone
U023	Benzotrichloride
U085	2,2'-Bioxirane
U021	(l,l'Biphenyl)-4,4'diamine
U073	(1,1'-Biphenyl)-4,4'-diamine, 3,3-dichloro-
U091	(1,1'-Biphenyl)-4,4'-diamine, 3,3'-dimethoxy-
U095	(1,1'-Biphenyl)-4,4'-diamine, 3.3'-dimethyl-
U027	Bis(2-chloroisopropyl)ether
U024	Bis(2-chloromethoxy)ethane
U028	Bis(2-ethylhexyl)phthalate

U225	Bromoform
U030	4-Bromophenyl phenyl ether
U128	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-
U172	1,Butanamine, N-butyl-N-nitroso-
U031	1-Butanol
U159	2-Butanone
U160	2-Butanone peroxide
U053	2-Butenal
U074	2-Butene, 1,4-dichloro-
U143	2-Butenoic acid, 2-methyl-, 7-[(2,3-dihydroxy-2-(1-methoxyethyl)-3-methyl -l-oxobutoxy) methyl-12,3,5,7 a-tetrahydro-1-pyrrolizin-1-yl ester, [1S-[alpha (Z),7(2S, 3R),7aa;-Pha])-
U031	n-Butyl alcohol
U136	Cacodylic acid
U032	Calcium chromate
U238	Carbamic acid, ethyl ester
U178	Carbamic acid, imethylnitroso-, ethyl ester
U097	Carbamic chloride, dimethyl-
U114	Carbamodithioic acid, 1,2-ethanediylbis-, salts and esters
U062	Carbamothioic acid, bis(l-methylethyl)-S-(2.3-dichoro-2-propenyl) ester
U215	Carbonic acid, dithallium(1+) salt
U033	Carbonic difluoride
U156	Carbonochloridic acid, methyl ester
U033	Carbon oxyfluoride
U211	Carbon tetrachloride
U034	Chloral
U035	Chlorambucil.
U036	Chlordane
U026	Chlornaphazine
U037	Chlorobenzene
U039	p-Chloro-m-cresol
U041	I-Chloro-2,3-epoxypropane
U042	2-Chloroethyl vinyl ether
U044	Chloroform
U046	Chloromethyl methyl ether
U047	beta-Chloronaphthalene
U048	o-Chlorophenol
U049	4-Chloro-o-toluidine, hydrochloride
U032	Chromic acid, calcium salt
U050	Chrysene
U051	Creosote
U052	Cresole (Cresylic acid)
U053	Crotonaldehyde
U055	Cumene
U246	Cyanogen bromide
U197	2,5-Cyclohexadiene-1, 4-dione
U056	Cyclohexane
U057	Cyclohexanone
U130	1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-
U058	Cyclophosphamide

U240	2.4-D, salts and esters
U059	Daunomycin
U060	DDD
U061	DDT
U062	Diallate,
U063	Dibenz[a,h]anthracene
U064	Dibenzo[a,i]pytene
U066	1,2-Dibromo-3-chloropropane
U069	Dibutyl phthalate
U070	o-Dichlorobenzene
U071	m-Dichlorobenzene,
U072	p-Dichlorobenzene
U073	3,3'-Dichlorobenzidine
U074	1,4-Dichloro-2-butene
U075	Dichlorodifluoromethane
U078	1,1-Dichloroethylene
U079	1,2-Dichloroethylene
U025	Dichloroethyl ether
U081	2,4-Dichlorophenol
U082	2,6-Dichlorophenol
U240	2,4- Dichlorophenoxy acetic acid salts and esters
U083	1,2-Dichloropropane
U084	1,3-Dichloropropene
U085	1,2:3,4-Diepoxybutane
U108	1,4-Diethyleneoxide
U086	N,N-Diethylhydrazine
U087	O,O-Diethyl-S-methyl-dithiophosphate
U088	Diethyl phthalate
U089	Diethylstilbestrol
U090	Dihydrosafrole
U091	3,3'-Dimethoxybenzidine
U092	Dimethylamine
U093	Dimethylaminoazobenzene
U094	7,12-Dimethylbenz[a]anthracene
U095	3,3'-Dimethylbenzidine
U096	alpha,alpha-Dimethylbenzylhydroperoxide
U097	Dimethylcarbamoyl chloride
U098	1,1-Dimethylhydrazine
U099	1,2- Dimethylhydrazine
U101	2,4-Dimethylphenol
U102	Dimethyl phthalate
U103	Dimethyl sulfate
U105	2,4-Dinitrotoluene
U106	2,6-Dinitrotoluene
U107	Di-n-octyl phthalate
U108	1,4-Dioxane
U109	1,2-Diphenylhydrazine
U110	Dipropylamine
U111	Di-n-propyinitrosamine
U001	Ethanal
U174	Ethanamine, N-ethyl-N-nitroso-

U155	1,2-Ethanediamine, N,N-dimethyl-N'-(2-thienylmethyl)-
U067	Ethane, 1,2-dibromo-
U076	Ethane, 1.1-dichloro-
U077	Ethane, 1,2-dichloro-
U131	Ethane, hexachloro-
U024	Ethane, 1, 1'-[methylenebis(oxy)]bis [2-chloro-
U117	Ethane, 1,1'-oxybis-
U025	Ethane, 1,1'-oxybis[2-chloro-
U184	Ethane, pentachloro-
U208	Ethane, 1,1,1,2-tetrachloro
U209	Ethane, 1, 1,2,2-tetrachloro
U218	Ethanethioamide
U227	Ethanol, 2-ethoxy-
U359	Ethane, 1, 1,2-trichloro-
U173	Ethanol, 2,2'-(nitrosoimino)bis-
U004	Ethanone, 1-phenyl-
U043	Ethene, chloro-
U042	Ethene, (2-chloroethoxy)-
U078	Ethene, 1,1-dichloro-
U079	Ethene, 1,2-dichloro-,(E)-
U210	Ethene, tetrachloro
U228	Ethene, trichloro
U112	Ethyl acetate
U113	Ethyl acrylate
U238	Ethyl carbamate
U038	Ethyl 4,4'-dichlorobenzilate
U114	Ethylenebisdithiocarbamic acid, salts and esters
U067	Ethylene dibromide
U077	Ethylene dichloride
U359	Ethylene glycol monoethylether
U115	Ethylene oxide
U116	Ethylene thiourea
U117	Ethyl ether
U076	Ethylidene dichloride
U118	Ethyl methacrylate
U119	Ethylmethanesulfonate
U120	Fluoranthene
U122	Formaldehyde
U123	Formic acid
U124	Furan
U125	2-Furancarboxaldehyde
U147	2,5-Furandione
U213	Furan, tetrahydro-
U125	Furfural
U124	Furfuran
U206	D-Glucopyranose, 2-deoxy-2(3-methyl-3-nitrosourcido)-
U126	Glycidylaldehyde
U163	Guanidine, N-methyl-N'-nitro-N-nitroso-
U127	Hexachlorobenzene

U128	Hexachlorobutadiene
U129	Hexachlorocyclohexane(gamma isomer)
U130	Hexachlorocyclopentadiene
U131	Hexachloroethane
U132	Hexachlorphene
U243	14exachloropropene
U133	Hydrazine
U086	Hydrazine, 1,2-diethyl-
U098	Hydrazine, 1, 1 -dimethyl-
U099	Hydrazine, 1,2,-dimethyl
U109	Hydrazine, 1,2 -diphenyl
U134	Hydrofluoric acid
U 134	Hydrogen fluoride
U135	Hydrogen sulfide
U096	Hydroperoxide,l-methyl-l-phenylethyl-
U136	Hydroxydimethylarsine xide
U116	2-Imidazolidinethione
U137	Indeno[1,2,3-cd]pyrene
U139	Iron dextran
U190	1,3-Isobenzofurandione
U140	Isobutyl alcohol
U141	Isosafrole
U142	Kepone
U143	Lasiocarpine
U144	Lead acetate
U146	Lead, bis(acetate-O)tetrahydroxytri-
U145	Lead phosphate
U146	Lead subacetate
U129	Lindane
U147	Maleic anhydride
U148	Maleic hydrazide
U149	Malonitrile
U150	Melphalan
U151	Mercury
U152	Methacrylonitrile
U092	Methanamine, N-methyl-
U029	Methane, bromo-
U045	Methane, chloro-
U046	Methane, chloromethoxy-
U068	Methane, dibromo-
U080	Methane, dichloro-
U075	Methane, dichlorodifluoro-
U138	Methane, iodo-
U119	Methanesulfonic acid, ethyl ester
U211	Methane, tetrachloro-
U153	Methanethiol
U225	Methane, tribromo-
U044	Methane, trichloro-
U121	Methane, trichlorofluoro-
U123	Methanoic acid
U154	Methanol
U155	Methapyrilene

U142	1,3,4-Metheno-2H-cyclobutal[cd]pentalen-2-one, l,la,3,3a,4,5,5a,5b,6-decachlorooctahydro-
U247	Methoxychlor
U154	Methyl alcohol
U029	Methyl bromide
U186	1-Methylbutadiene
U045	Methyl chloride
U156	Methylchlorocarbonate
U226	Methylchloroform
U157	3-Methylcholanthrene
U158	4,4'-Methylenebis(2-chloroaniline)
U068	Methylene bromide
U080	Methylene chloride
U159	Methyl ethyl ketone
U160	Methyl ethyl ketone peroxide
U138	Methyl iodide
U161	Methyl isobutyl ketone
U162	N-Methyl-N'-nitro-N-nitrosoguanidine
U161	4-Methyl-2-pentanone
U164	Methylthiouracil
U010	Mitomycin C
U059	5,12-Naphthacenedione, (8S-cis)-8-acetyl-10-[(3-amino-2,3,6-trideoxy)-alpha-L-Iyxo-hexopyranosyl)oxyl]-7,8,9 10-tetrahydro-6,8,11-trihydroxy-1-methoxy-
U165	Naphthalene
U047	Naphthalene, 2-chloro-
U166	1,4-Naphthalenedione
U236	2,7-Naphthatenedisulfonic acid, 3,3'-dimethyl-(1,I'-biphenyl)-4,4' diyl)]-bis(azo)bis(S-amino-4-hydroxy)-, tetrasodium salt
U166	1,4-Naphthoquinone
U167	alpha-Naphthylamine
U168	beta- Naphthylamine
U026	2-Naphthylamine, N,N'-bis (2-chloromethyl)-
U167	I-Naphthylenamine
U168	2-Naphthylenamine
U217	Nitric acid, thallium(l+) salt
U169	Nitrobenzene
U170	p-Nitrophenol
U171	2-Nitropropane
U172	N–Nitrosodi-n-butylamine
U173	N-Nitrosodiethanolamine
U 174	N-Nitrosodiethylamine
U176	N-Nitroso-N-ethylurea
U 177	N-Nitroso-N-methylurea
U179	N-Nitroso-N-methylurethane
U179	N-Nitrosopiperidine
U180	N-Nitrosopyrrolidine
U181	5-Nitro-o-toluidine
U193	1,2-Oxathiolane,2,2-dioxide

U058	2H-1,3,2-Oxazaphosphorin-2-amine,N,N-bis(2-chloroethyl)tetrahydro-, 2-oxide
U115	Oxirane
U126	Oxiranecarboxyaldehyde
U041	Oxirane, (chloromethyl)-
U182	ParaLdehyde
U183	Pentachlorobenzene
U184	Pentachloroethane
U185	Pentachloronitrobenzene (PCNB)
U242	Pentachlorophenol
U186	1,3-Pentadiene
U187	Phenacetin
U188	Phenol
U048	Phenol, 2-chloro-
U039	Phenol, 4-chloro-3-methyl-
U081	Phenol,2,4-dicliloro-
U082	Plienol,2,6-dichloro-
U089	Phenol,4.4'-(1,2-diethyl- 1,2-ethenediyl)bis-, (E)-
U101	Phenol,2,4-dimethyl-
U052	Phenol, methyl-
U132	Phenol,2,2'-methylenebis[3,4,6-trichloro-
U170	Phenol, 4-nitro-
U242	Phenol, Pentachloro-
U212	Phenol, 2,3,4,5-tctrachloro
U230	Phenol, 2,4,5-trichloro-
U231	Phenol,2,4,6-trichloro-
U150	L-Phenylalanine,4-[bis(2-chloroethyl)amino]-
U145	Phosphoric acid, lead salt
U087	Phosphorodithioic acid, O,O-diethyl-, S-methyl-, ester
U189	Phosphorous sulfide
U190	Phthalic anhydride
U191	2-Picoline
U179	Piperidine, 1-nitroso-
U192	Pronamide
U 194	1-Propanamine
U111	1-Propanamine, N-nitroso-N-N-propyl-
U101	1-Propanamine, N-propyl-
U066	Propane, 1,2-dibromo-3-chloro-
U149	Propanedinitrile
U171	Propane,2-nitro-
U027	Propane,2,2'-oxybis[2-chloro-
U193	1,3-Propane sultone
U235	1-Propanol,2,3-dibromo-, phosphate (3:1)
U140	1-Propanol, 2-methyl-
U002	2-Propanone
U084	1-Propane, 1,3-dichloro-
U152	2-Propanenitrile,2-methyl-
U007	2-Propenamide
U243	1-Propene, hexachloro-
U009	2-Propenenitrile

U008	2-Propenoic acid
U113	2-Propenoic acid, ethyl ester
U118	2-Propenioc acid, 2-methyl-, ethyl ester
U162	2-Propenoic acid, 2-methyl-, methyl ester
U233	Propionic acid, 2-(2,4,5-trichlorophenoxy)-
U194	n-Propylamine
U083	Propylene dichloride
U148	3.6-Pyridazinedione, 1,2-dihydro-
U196	Pyridine
U191	Pyridine, 2-methyl-
U237	2,4(l H,3H)-Pyrimidinedine,5-[bis(2-chloroethyl)amino]
U164	4-(1 H)-Pyrimidinone, 2,3 dihydro-6-methyl-2-thioxo-
U180	Pyrrolidine, 1-nitroso-
U200	Reserpine
U201	Resorcinol
U202	Saccharin and salts
U203	Safrole
U204	Selenious acid
U204	Selenium dioxide
U205	Selenium sulfide
U015	L-Serine, diazoacetate (ester)
U233	Silvex
U206	Streptozotocin
U103	Sulfuric acid, dimethyl ester
U189	Sulfur phosphide
U232	2,4,5-T
U207	1,2,4,5-Tetrachlorobenzene
U208	1,1,1,2-Tetrachloroethane
U209	1,1,2,2-Tetrachloroethane
U210	Tetrachloroethylene
U212	2,3,4,6-Tetrachlorophenol
U213	Tetrahydrofuran
U214	Thallium(l) acetate
U215	Thallium(l) carbonate
U216	Thallium chloride
U217	Thallium(l) nitrate
U218	Thioacetamide
U153	Thiomethanol
U244	Thioperoxydicarbonic diamide, tetramethyl-
U219	Thiourea
U244	Thiuram
U220	Toluene
U221	Toluenediamine
U223	Toluene diisocyanate
U328	o-Toluidine
U353	p-Toluidine
U222	o-Toluidine hydrochloride
U011	1H-1,2,4-Triazol-3-amine
U226	1, 1, 1-Trichloroethane

U227	1, 1,2-Trichlorethane
U228	Trichloroethylene
U121	Trichloromonofluoromethane
U230	2,4,5-Trichlorophenol
U231	2,4,6-Trichlorophenol
U234	sym-Trinitrobenzene
U182	1,3,5-Trioxane,2,4,6-trimethyl-
U235	Tris(2,3-dibromopropyl) phosphate
U236	Trypan blue
U237	Uracil mustard
U176	Urea, N-ethyl-N-nitroso-
U177	Urea, N-methyl-N-nitroso
U043	Vinyl chloride
U248	Warfarin, when present in concentrations of 0.3% or less
U239	Xylene
U200	Yohimban-16-carboxylic acid, 11, 17-dimethoxy-18-[(3,4,5-trimethoxybenzoyl)oxy]-, methyl ester
U249	Zinc phosphide, when present at concentrations of 10% or less