

**ENVIRONMENTAL HEALTH & SAFETY PROGRAM**  
**for**  
**CHEMICAL WASTE MANAGEMENT**

Revised September 2000

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## I. INTRODUCTION

Virginia Commonwealth University and the Medical College of Virginia Hospitals (VCU/MCVH), under the direction of the Office of Environmental Health and Safety (*OEHS*), have an established program to meet the University and Hospital's chemical waste management needs. The *Chemical/Biological Safety Section of OEHS* administers this program and makes every effort possible to handle and dispose of waste properly and protect employee health and the environment. The following information details VCU's chemical waste management program.

## II. DEFINITIONS

**Acid:** An inorganic or organic compound that (1) reacts with a base to form a salt; (2) gives rise to an excess of hydrogen ions in solution. Examples of common laboratory acids include: acetic acid, hydrochloric acid and sulfuric acid.

**Base:** A compound that can ionize in solution and form hydroxide ions. Examples of "basic" compounds common in laboratories include: potassium hydroxide, sodium chloride and sodium hydroxide.

**CFR:** U. S. Code of Federal Regulations.

**Combustible Liquid:** Any liquid that has a flash point at or above 100 degrees F. and below 200 degrees F.

**Corrosive:** Aqueous waste that has a pH less than or equal to 2.0 or greater than or equal to 12.5.

**DEQ:** Department of Environmental; Quality.

**DOT:**Department of transportation

**EPA:** U.S. Environmental Protection Agency.

**Flash Point:** The minimum temperature at which a liquid gives off flammable vapors which, in contact with spark or flame, will ignite.

**Generator:** Any person, by site, whose act or process produces hazardous waste identified or listed in 40 CFR Part 261.

**Hazardous Waste:** The EPA regulations classify a waste as hazardous by either specifically including it on one of four lists or by defining four characteristics that the generator can use to determine whether a waste is hazardous.

The four lists of EPA hazardous wastes (40 CFR Part 261, Subpart D) are as follows:

1. *Hazardous Wastes from Nonspecific Sources*--includes spent solvents common in laboratory operations and the still bottoms from the recovery of these solvents.
2. *Hazardous Wastes from Specific Sources*--includes primarily industrial wastes not usually associated with laboratory operations.

3. *Discarded Commercial Chemical Products.*
4. *Discarded Off-Specification Chemicals, Containers and Spill Residues.*

If a waste is not listed, it is still a hazardous waste if it meets any of the following four characteristics; these characteristics can be determined by specific tests cited in the regulations (40 CFR 261, Subpart C):

1. **Ignitability**
2. **Corrosivity**
3. **Reactivity**
4. **EP (Extraction Procedure) Toxicity**

**NOTE:** EPA maintains and updates a list of "hazardous substances" in 40 CFR part 302.

**OEHS:** *Office of Environmental Health and Safety.*

**OSHA:** Occupational Safety and Health Administration.

**Oxidizer:** Substance that readily yields oxygen to stimulate the combustion of organic matter such as chlorate, permanganate, inorganic peroxide, or nitrate.

**RCRA:** Resource Conservation and Recovery Act.

**Reactive:** Any waste which rapidly undergoes violent chemical change or may be explosive or generate toxic fumes.

**TSD:** Treatment, Storage and Disposal facility.

### III. **PURPOSE**

Laboratories are responsible for only 0.1 - 1.0% of the total hazardous waste that is generated in the United States according to EPA estimates, but this comparatively low volume of waste is characterized by an enormously greater chemical diversity than industrial waste streams. In a university and hospital community such as VCU/MCVH, chemical wastes are generated in operations of diverse magnitude and complexity, and the amounts and varieties of the wastes generated vary accordingly. As a generator of such wastes, the VCU community has moral and legal obligations to see that the waste is handled and disposed of in ways that pose minimal potential harm to health and the environment. For these reasons, a chemical waste management program was established by *OEHS* to fulfill the following objectives:

1. Protecting the environment and preserving the health and safety of employees, students, patients, visitors, and the surrounding community.
2. Complying with regulations - federal, state, and local.
3. Establishing laboratory practices for reducing types and quantities of hazardous waste.
4. Educating the VCU community in the proper handling and disposal of hazardous waste.

#### IV. REQUIREMENTS

All work which uses chemical substances eventually produces chemical wastes. Those generating this waste have moral and legal obligations to see that the waste is handled, transported and disposed of in ways that minimize both short-term and long-term harm to health and the environment.

On November 19, 1980, the U.S. Environmental Protection Agency (EPA) adopted federal regulations creating a Hazardous Waste Management System, under the authority of the *Resource Conservation and Recovery Act* (RCRA) of 1976 (see Code of Federal Regulations Title 40 parts 260-265). These regulations are designed to provide "cradle-to-grave" management of hazardous waste by imposing management requirements on generators and transporters of hazardous materials and upon owners and operators of treatment, storage and disposal facilities.

In Virginia, the Department of Environmental Quality (DEQ) has the responsibility of enforcing the federal program. Under this program, all generators are required to ensure that waste is properly identified and classified according to its hazard and that it undergoes proper treatment, packaging and disposal. Major amendments made in 1984 expand waste management requirements, ban land disposal of bulk liquid hazardous wastes, require regulation of underground storage tanks, and bring generators of smaller amounts of hazardous wastes under the law's regulatory requirements. Sections of RCRA provide for criminal penalties and citizen suits against individuals who violate hazardous waste regulations.

#### V. POINTS OF HAZARDOUS WASTE GENERATION AT VCU

| <b>SOURCE</b>          | <b>WASTE GENERATED</b>                                                                               |
|------------------------|------------------------------------------------------------------------------------------------------|
| Electrical Maintenance | Used transformer oils; used degreasers.                                                              |
| Machine Shop           | Used cutting oils; used degreasers.                                                                  |
| Paint Shop             | Waste solvents; paint sludges; paints.                                                               |
| Power Plant            | Boiler cleanout; acid wastes; mercury wastes.                                                        |
| Garage                 | Used oil; solvents.                                                                                  |
| Photographic Labs      | Used developers and fixers.                                                                          |
| Buildings and Grounds  | Pesticides, rodenticides, herbicides, fertilizers.                                                   |
| Research and Teaching  | Waste solvents; reagents; lab experimentation residues; glass cleaning solutions; equipment mercury. |

Air Conditioning Shop Contaminated compressor oils; freon mixtures.

Arts & Crafts Dept. Used solvents; thinners; acids; dyes and pigments; inks; photographic solutions.

Printing Operations Waste inks and solvents; blanket washes; photographic solutions.

## VI. WASTE MINIMIZATION EFFORT

Chemical waste management is a new and constantly changing field. Changes in technology, regulatory guidelines, rising costs of supplies, disposal, transportation, insurance, etc., make chemical waste management an extremely expensive process. Waste minimization is the only way to reduce some of the escalating costs of the current waste management system. There are a number of ways in which those who generate chemical wastes can help in the chemical waste management effort. Some useful waste minimization practices include the following:

- A. **Reduce the amount of chemicals ordered to decrease chemical waste.** One important aspect of a chemical waste management program is implementing the "less is better" concept. This concept is directed at **buying only quantities that will be used**. It may seem to be less expensive to buy chemicals in larger quantities but it is in fact more expensive if the cost for disposal is taken into consideration. It is therefore economically advantageous for VCU to purchase only quantities of chemicals which will be used up in the required processes.
- B. **Label all chemical waste containers appropriately.** This is an extremely important point. In order for any wastes to be disposed of, the contents must be known along with an approximate percentage breakdown. Testing of unknowns is very expensive. When you take the cost of testing an unknown and multiply it by hundreds of unknown wastes generated, the result is financially staggering.
- C. **Consolidate compatible chemical waste.** For example, instead of disposing of two, 4-liter containers with 500 milliliters each of a similar waste; consolidate this waste into one container. Utmost care must be exercised to ensure that incompatible chemicals are not mixed together. Such contact could result in a serious explosion or the formation of substances that are highly toxic or flammable or both. See *Appendix A* for a listing of some incompatible chemicals or call *OEHS* at 828-4866.
- D. **Do not let wastes accumulate.** Generally *OEHS* accepts no more than 20 liters of waste for each appointment. Chemical wastes should not be allowed to accumulate in laboratories or work areas in volumes greater than a few gallons.
- E. **Do not abandon labs with chemical wastes left behind!** Contact *OEHS* before leaving a laboratory space, and work out a mutually convenient schedule for proper disposal of unwanted chemicals.
- F. **Consult *OEHS* if a new research project is going to begin** that will generate large quantities of waste. By consulting *OEHS*, we will be better prepared to serve you in handling the particular waste generated.

## VII. GUIDELINES FOR THE INVESTIGATOR

- A. **PROPER WASTE IDENTIFICATION IS CRITICAL!**

All chemical wastes must be identified by the generator before they are accepted by *OEHS* for recycling or disposal. Laboratory glassware containing reaction mixtures of unknown nature, and sometimes of unknown origin, can pose difficult disposal problems and may require costly analyses before removal and disposal can be accomplished. Such materials can be a frequent occurrence in research laboratories, particularly in those that have a high rate of personnel turnover. The disposal of an unlabeled "orphan" reaction mixture can sometimes be guided by knowledge of the chemistry that was being done by a departed laboratory worker. **It is the responsibility of the generator to ensure that all chemical wastes are adequately identified before being offered to *OEHS* for disposal.**

"Orphan" chemicals/reaction mixtures left by departed laboratory workers/researchers are the most frequent source of unknowns. Investigators should label all stored reaction mixtures with the name and concentration of the chemical compound, date that they were formed, the name of the investigator and a notebook reference. Laboratories are encouraged to institute a checkout procedure that requires departing workers to identify all reaction mixtures and unlabeled chemicals that they have not disposed of.

The potential consequences of incomplete or incorrect identification of hazardous wastes by the generator are serious and may include:

1. Selection of inappropriate waste treatment methods and disposal facilities with the potential for fire, violent chemical reactions and environmental impairment.
2. Inappropriate response to chemical exposures, spills and fires by emergency services.
3. Blending of incompatible wastes resulting in adulteration of large bulked waste streams, rendering them difficult and costly to treat.
4. Mislabeling of recycled materials.
5. Heavy fines, civil liability and penalties; restriction or termination of operating permits and access to waste treatment and disposal facilities.

The contents of all chemical waste containers are subject to analytical audit by the chemical safety staff, regulatory agencies and commercial facilities that receive wastes for treatment and disposal.

## B. **GENERAL LABELING GUIDELINES:**

Labeling is a federal requirement of the Hazard Communication Standard and the Hazardous Chemicals in Laboratories Standard (29 CFR 1900.1200 and 29 CFR 1910.1450, respectively). If the waste surplus chemical is in the original manufacturer's container, **confirm the identity** of the chemical before bringing it to *OEHS* for disposal. Any containers that were previously used to package other chemicals should be marked with a bold **XXX** through the original label and a new chemical tag should be attached to each container.

If the waste is a mixture, apply a chemical waste tag to the container and identify the chemical waste constituents by proper chemical name including any disinfectants used. Indicate the approximate quantity or concentration of each constituent. Avoid use of obscure chemical acronyms and brand names on chemical waste identification tags.

When it is necessary to biologically decontaminate chemical wastes packaged in an autoclave bag, the bag may remain chemically contaminated with a hazardous chemical after autoclaving and must be managed as chemical waste. In this situation, the *Office of Environmental Health & Safety* will accept the waste packaged in autoclave bags provided the generator certifies that the biological agent has been inactivated **and** all biohazard warning symbols have been removed from the bag or defaced.

### C. **SPECIAL CHEMICAL WASTES:**

Certain types of chemical wastes require special handling and precautions.

#### 1. ***Temperature Sensitive Wastes***

Certain nitrosoguanidines, nitrosoureas and organic peroxides are examples of chemicals that are unstable, generate pressure, or may otherwise become hazardous at room temperature following prior rapid temperature changes. These compounds must be maintained by the investigator at a safe temperature until they are taken to *OEHS* for disposal.

**Do not pack temperature sensitive chemicals with nonsensitive chemicals.**

#### 2. ***Explosive or Highly Reactive Wastes***

Examples of potentially explosive chemicals encountered in VCU laboratories are azides, nitrosoureas and picric acid.

**\*\*\* IMPORTANT SAFETY PRECAUTIONS \*\*\***

- a. DO NOT PLACE CONTAINERS OF POTENTIALLY EXPLOSIVE CHEMICALS IN BOXES OF OTHER WASTE CHEMICALS.
- b. Pending removal from the work area, store explosives in appropriate incombustible cushioning material. **Do not place metal sensitive compounds such as picric acid in metal containers or wrap them with aluminum foil!**
- c. Certain chemicals such as dinitrophenol hydrazide, picric acid and other polynitro-compounds may become shock-sensitive and dangerous to handle if allowed to dry out. Keep these chemicals wet while in use and storage. If a container of this type of material has dried out do not attempt to add water,

open or touch it! **CLEAR ALL PERSONNEL FROM THE AREA AND CALL OEHS OR THE FIRE SAFETY SECTION FOR EMERGENCY ASSISTANCE.**

### 3. *Peroxide-Forming Chemicals*

Alkali metals, ethers, olefins, dienes and vinyl-halides are examples of chemicals that are prone to form peroxides when exposed to the air over a period of time. The peroxides are sensitive to heat, friction, impact and light and are among the most hazardous chemicals that are encountered in laboratories. Some of these peroxides can be extremely shock sensitive and violently explosive and, as such, require special care when handling.

Inventories of peroxide-forming chemicals must be minimized and managed carefully. Indicate the date of purchase or receipt and the date opened on all containers of these chemicals. **This information is needed to meet safety transportation and waste treatment facility requirements.**

Opened containers should be tested for peroxide formation or be discarded as chemical wastes within 3-6 months of opening, depending on the compound. Contact *OEHS* for recommendations on the proper handling of specific compounds.

**If a significant level of peroxide formation in a peroxide-forming chemical is indicated by test results or by formation of crystals in a container, do not attempt to move it. Clear personnel from the area and call *OEHS* for emergency assistance (828-4866).**

### 4. *Dioxin Group Chemicals*

Chlorinated phenols and phenoxyacetic acids, chemicals derived from these compounds, and wastes containing any detectable concentration of chlorinated dibenzo-p-dioxins or chlorinated dibenzofurans are included in this group. Wastes containing dioxins are difficult and costly to treat and dispose of due to regulatory restrictions and unavailability of permitted disposal facilities. **Presently, only one commercial facilities in the United States accept dioxin wastes for storage, treatment or disposal.** Therefore, the generation of dioxin wastes must be minimized. They must be segregated from all other wastes to reduce the volume of waste material that must be stored until treatment facilities become available. Any laboratory which intends to utilize dioxin-containing substances should contact *OEHS* for consultation.

## 5. *Compressed Gas Cylinders*

Compressed gas cylinders (both empty and filled) present unique problems as chemical wastes. The disposal cost of used gas cylinders far exceeds their acquisition costs. **All laboratories using compressed gas cylinders should make arrangements with the "supplier" to return/recycle the cylinders when they are no longer needed for research purposes.** All future purchases of compressed gas cylinders must be coordinated with companies or suppliers with return policies.

### D. **RESTRICTIONS ON ACCEPTING CHEMICAL WASTE**

Presently, *OEHS* will not accept the following waste materials:

- \* 1. Needles and broken glass (except for mercury-containing materials). These wastes should be placed in a "sharps container" and disposed of with regular solid waste.
- 2. Uranyl compounds [these compounds are to be classified as radioactive wastes and must be handled through the *Radiation Safety Office* (828-9131)].
- 3. Infectious waste material (see appropriate guidelines for disposing of infectious wastes).

\* **NOTE:** All infectious needles and contaminated broken glass should be placed in "sharps" containers and taken by the investigator to the MCV incinerator area for proper disposal.

## VIII. **WASTE MANAGEMENT PROTOCOLS**

### A. **Office of Environmental Health and Safety (*OEHS*)**

The *Chemical/Biological Safety Section* of *OEHS* administers the chemical waste management program. *OEHS* adheres to the objectives listed in Section III of this program and makes every effort possible to handle and dispose of wastes properly to protect health and the environment.

#### 1. Waste Disposal Protocol

Protocols have been developed which instruct, in a step-by-step process, how chemical waste is to be disposed of on both campuses of the university. These protocols are listed in Section XIV (Medical Campus) and Section XV (Academic Campus) of the program.

#### 2. Segregation/Classification

After chemical waste has been received by *OEHS*, the process of segregation/classification takes place. Chemicals are physically separated according to

hazard category; i.e., oxidizing or reducing agents, water-reactive chemicals, air-reactive chemicals, flammables, poisons, corrosives, etc. and these waste chemicals are then segregated in the chemical storage facility awaiting the lab-packing, manifesting, transporting and ultimate disposal of the waste by the contracted disposal firm.

3. Bulk Flammable Liquids

Flammable liquids which exhibit certain characteristics for incineration purposes are combined into a 55-gallon bulk solvent drum. A sample of this liquid is tested by a laboratory for BTU value, chlorine content, percent water content, specific gravity, and percent ash content. This testing insures that the materials are suitable for incineration. Xylene, toluene and methanol are examples of flammable liquids that are "bulked" for incineration purposes.

4. Waste Oil

All uncontaminated waste oils are placed in bulk oil drums. A contractor then pumps the oil out of VCU's holding tank into their storage truck. The waste oil is then recycled and sold to other interested parties.

5. Labeling

Labeling is an essential element in maintaining the inventory and tracking system of a chemical waste management program. Each drum is specifically labeled according to the hazard class of waste it contains. A hazardous waste label which gives details such as the generator name, generator location, EPA I.D. number, manifest document number, etc., is also required for each drum.

6. Drum Content Sheets

For each lab pack that is filled and closed, there is a content sheet which corresponds to that particular drum. The content sheet includes a waste description and the quantity of each waste container that is placed into that drum. A copy of this content sheet follows the drum to its disposal destination.

**NOTE:** Although specific content sheets are not used for bulk flammable liquids, an inventory of type and quantity of waste is kept by *OEHS*.

**B. Hazardous Waste Manifests**

The ultimate tool in fulfilling the "cradle-to-grave" tracking system to follow generated wastes to their disposal site is the Hazardous Waste Manifest. The manifest documents all wastes leaving VCU and identifies the transporter and the disposal facility. The generator's name, generator identification number, quantity of material, DOT (Department of Transportation) number, hazard class, shipping name and identification numbers and signature of the generator

representative are some of the items that are required on a Hazardous Waste Manifest. A manifest accompanies all wastes to the TSD facilities and a copy is signed and returned to VCU upon receipt of the waste. This process enables VCU to keep track of their generated waste and to insure that it has been properly delivered to the disposal site. The manifesting process is a cooperative effort between VCU, the broker, and the TSD.

### C. **Transportation**

**CFR49** contains the complex, extensive regulations governing transportation of hazardous wastes regulations which are extensive and complex. Approved materials, containers, and appropriate labels are some of the areas that are covered by the regulations. No waste can be placed onto a vehicle for transportation until drums are labeled and the hazardous waste manifest has been completed. The transportation of waste from VCU is handled by a disposal contractor.

### D. **Chemical Waste Treatment Methods**

The chemical wastes generated by the university/hospital community ultimately arrive at federally-approved treatment sites where the wastes may be treated prior to disposal. The various classes of chemical wastes require different handling procedures and some of the treatment methods for particular wastes may include:

- (1) ***Non-Chlorinated Solvents*** -Nonchlorinated solvents are processed so as to reclaim the solvents in as high a purity as is technically possible. The initial process involves passing the solvent over and through various filters to eliminate solid particles from the waste solvent. Next the solution is placed in a distillation process where the waste system is distilled and the distillate collected. This reclaimed solvent is now usually 80-100% pure and is sold to cement kilns.
- (2) ***Chlorinated Solvents*** -Chlorinated solvents are handled in the same manner as outlined above, but are handled by equipment which is kept separate from that used to reclaim the non-chlorinated solvent.
- (3) ***Organic Acids*** - Organic acids are handled on an individual basis, whereby the acids are collected in a reaction vessel and an alkaline solution is slowly introduced into the tank. The alkaline solution used is either waste alkaline liquids which have been given prior approval for use in the neutralization process or virgin alkaline liquids. Once enough alkaline solution has been added to the vessel to bring about approved neutralization, at a pH of 7.0, the solution is tested to insure that discharge proceeds within all EPA regulations (including the land disposal restriction under 40 CFR 268.32 which went into effect July 8, 1987.)
- (4) ***Inorganic acids*** -Inorganic acids are neutralized in the same manner as outlined above for organic acids, except that inorganic acids, can be handled in bulk rather than on an individual basis.

- (5) ***Oxidizers*** -Oxidizers are treated in individual reaction vessels with sodium bisulfate or similar compounds to neutralize the waste oxidizer compounds.
- (6) ***Inorganic Salts*** -Inorganic salts and certain organic salts, salts of Cd, Pb, Cu, Ni are also effectively neutralized in separate reaction vessels with the effluent being tested, as in all cases, before being discharged.
- (7) ***Cyanides*** -Solid cyanide compounds are tested for leaching using a 24-hour extraction process and a representative sample of the waste solid cyanide compound. Once the material passes the extraction tests and proves no leaching will occur, the solids are then collected and readied for disposal in a landfill certified by the particular state and the federal EPA. All liquid cyanide compounds are introduced into individual reaction vessels where they are effectively neutralized by approved and tested appropriate methods and the effluent is collected and tested.
- (8) ***Flammable Solids*** -Flammable solids, except for water- and air-reactive solids, are combined with stabilizing compounds which produce a concrete-like solid. Once tested and approved, this material is then shipped to a landfill, certified by the individual state and the federal EPA. All water reactives and air reactives are handled on an individual basis. Once tested to determine reactivity and special handling procedures, these compounds are transported to federally approved treatment sites where the compounds are essentially "detonated".

## IX. MANAGING ALDEHYDE BASED WASTE

Within various departmental laboratories, high level disinfectants, containing formaldehyde and glutaraldehyde, are used to preserve and sterilize materials and medical instruments. Because of various EPA disposal restrictions, large quantity users (i.e., used for cold sterilization of instruments or used for tissue fixing) of aldehyde based products must first neutralize the liquid prior to disposing of the product down the drain. Departments can properly treat up to 10% formalin (3.75% formaldehyde) or up to 4% glutaraldehyde solutions with a product such as **ALDE-X<sup>®</sup>**. These products can convert aldehydes into a non-toxic solution suitable for disposal down the drain. For additional information concerning the purchase of **ALDE-X<sup>®</sup>**, contact OEHS. Please note that no additional disposal requirements are necessary for small quantity users (less than 1 gallon) such as those departments who use aldehyde based products for table top disinfectants.

Chemical spills of the above mentioned aldehyde based products can also be treated using a spill kit. **Departments who use aldehyde based disinfectants should purchase and maintain in the area a spill kit to handle emergency spills.** For additional information concerning the purchase of a spill kit, contact OEHS.

## X. PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) is one of the best defenses against exposure to on-the-job hazards. A variety of specialized clothing and equipment is commercially available for use in the laboratory. The proper use of these items will minimize or eliminate exposure to the hazards associated with many laboratory operations. The protective equipment available for laboratory protection ranges from full bodysuits to partial body protection, such as gloves or boots. It is important to "fit the clothing to the hazard". Every laboratory worker should be familiar with the location and proper use of the available protective apparel and safety equipment and with emergency procedures. Instruction on the proper use of such equipment, emergency procedures, and first aid should be available to everyone who might need it. *OEHS* will assist investigators with the selection of appropriate personal protective equipment.

Personnel handling hazardous wastes or transporting hazardous chemicals to *OEHS* for disposal should utilize the following PPE depending on the nature of the waste being handled:

### A. **Eye Protection:**

*Glasses, Face Shields or Goggles.* Ordinary prescription glasses do not provide adequate protection from injury to the eyes. The minimum acceptable eye protection requires the use of hardened-glass or plastic safety spectacles.

### B. **Clothing and Footwear:**

When transporting or receiving chemical waste, a lab coat and disposable gloves should be worn at all times. However, more specialized "heavy-duty" gloves and protective clothing might be necessary when handling corrosives or other toxic chemicals.

Shoes should be worn at all times in buildings where chemicals are stored or used. More extensive foot protection than ordinary shoes may be required in some cases.

### C. **Respiratory Protective Equipment:**

Several types of nonemergency respirators are available for protection in atmospheres that are not immediately dangerous to life or health but could be detrimental after prolonged or repeated exposure. The choice of the appropriate respirator to use in a given situation will depend on the type of contaminant and its estimated or measured concentration, known exposure limits and hazardous properties (e.g., eye irritation or skin absorption). *OEHS* can provide guidance to individual laboratories in the selection of appropriate respiratory protection for the chemical hazard involved.

1. **Dust, Fume and Mist Respirators** - These respirators can be used only for protection against particular individual (or classes of) dusts, fumes, and mists as specified by the manufacturer.
2. **Chemical Cartridge Respirators** (half-face, full-face) - These respirators can be used only for protection against particular individual (or classes of) vapors or gases as specified by the respirator manufacturer and cannot be used at contaminant concentrations above that specified on the cartridge. The cartridge respirator is used by *OEHS*, for example, in combining bulk flammable solvents. All respirators are fit tested to the individual. Each person is provided their own personal respirator, and is required to follow proper maintenance practices.

D. **Gloves:** (*Appendix B*)

1. *Disposable Gloves*- these gloves are primarily used when accepting waste for disposal. It is standard practice to wear several pairs at one time for added protection.
2. *Neoprene Gloves* \*
3. *Polyvinyl Chloride (PVC)* \*
4. *Polyvinyl Alcohol (PVA)* \*

**\*NOTE:** These gloves are used for specific handling applications. *OEHS* can advise researchers/employees on the selection of appropriate gloves (or other personal protective equipment) for particular purposes.

XI. **PROPER TRANSPORTATION PRACTICES**

All wastes which are being transported to *Sanger Hall (B2-001)* for disposal should be in protected containers. A glass container of liquid, for example, should be transported in a non-breakable container which will serve to contain the fluid should the inner container break or leak. Only use freight elevators when transporting waste (**DO NOT USE PASSENGER ELEVATORS**).

XII. **DISPOSAL COST**

Because of the constraints being placed on chemical waste disposal, the cost of acceptable disposal methods is increasing dramatically. The cost of disposing of the chemical wastes generated at VCU changes on an annual basis. Interested parties may obtain information on the current chemical waste disposal costs by contacting *OEHS*.

XIII. **CHEMICAL SPILL EMERGENCY RESPONSE**

Each area or department within VCU/MCVH must be prepared to handle a spill of chemicals widely used within that department. Please note that pre-packaged emergency spill kits are available to handle small scale spills of solvents, biologicals and acids/caustics. These spill kits can be purchased through a local laboratory safety supply company.

Report any spills of hazardous chemicals immediately by calling the **RADIATION/CHEMICAL EMERGENCY LINE** at **828-9834**. Properly protected, trained personnel will be available to evaluate and clean-up the spill. Do not call housekeeping to manage situations that they are not properly trained to handle. If a spill does occur, the following general procedures may be used but should be tailored to individual needs:

1. Attend to any persons who may have been contaminated. Chemical spills on the skin of eyes must be treated immediately.
2. Notify persons in the immediate area about the spill.

3. Evacuate all nonessential personnel from the spill area.
4. Refer to the appropriate material safety data sheet and if the spilled material is flammable, turn off ignition and heat sources.
5. Avoid breathing vapors of the spilled material; if necessary use an appropriate respirator.
6. Leave on or establish exhaust ventilation if it is safe to do so.
7. Secure the supplies necessary for the cleanup. Most small liquid spills (<100 ml.) can be absorbed with paper towels, sand or an absorbent.
8. During the cleanup operation, wear appropriate apparel.
9. Notify *OEHS* if a regulated substance is involved.

After cleanup of chemical spills, all materials, including any paper towels used in the cleanup, must be disposed of as wastes. Particular care should be exercised in handling the absorbent materials used in the cleanup of flammable liquids to protect against absorbent fire hazards.

#### **XIV. TRAINING**

The *OEHS* Staff is trained in proper waste segregation, evaluation, packing, regulations, personal protection, etc., on an annual basis. We will provide departmental training related to our chemical waste management program upon request.

## XV. WASTE PROTOCOL FOR THE MEDICAL CAMPUS

OEHS recognizes the necessity to inform University faculty and staff on the protocol for disposing of hazardous chemicals. Please read and adhere to the disposal procedures.

1. Hazardous waste and outdated chemicals will be accepted for processing on an appointment only basis on Tuesday and Thursday from 9:00 am to 10:30 am at the *OEHS*, Basement 2, room 001 (B2-001) of Sanger Hall.
2. Chemical wastes will be accepted in properly sealed, disposable bottles or containers. Containers sealed with parafilm, tape, etc, will not be accepted. Waste containers can be recycled if requested.
3. Due to the large volume of material received by our office, no more than 5 containers or 20 liters of waste will be accepted per day per investigator.
4. Each container of waste must be labeled with the following information:
  - a. **Contents** (completely written out - no abbreviations).
  - b. **Percentage of contents**
  - c. **Name of investigator**
  - d. **Date**
5. A **Hazardous Waste Disposal Form** (*Appendix C*) must accompany all waste brought to this office for disposal and include all information listed above. It must be signed by an individual responsible for generating the particular waste or having knowledge of the source and identity of the waste.
6. **Waste should be transported in protected containers.** For example, a glass container of liquid should be transported in a non-breakable container or on a cart which will serve to contain the fluid should the inner container break or leak.
7. **Waste should be transported on freight elevators only**--not on passenger elevators.
8. Any uncontrolled spills or releases of hazardous chemicals should be reported immediately to *OEHS* by calling the **RADIATION/CHEMICAL EMERGENCY LINE at 828-9834.**

**XVI. WASTE PROTOCOL FOR THE ACADEMIC CAMPUS**

1. Chemical waste for disposal is taken to Oliver Hall, room 3054, Chemistry Department Stockroom for disposal. Call Rinnie O'Conner before taking waste to Oliver Hall to arrange a mutually convenient time. Special arrangements for waste disposal may be made by contacting an OEHS representative at 828-4866.
2. Waste materials will only be accepted in properly sealed, disposable bottles or containers. Containers sealed with parafilm, tape, etc., will not be accepted. Waste containers may be recycled upon request.
3. Each container of waste must be labeled with the following information:
  - a. **Contents** (completely written out; no abbreviations)
  - b. **Percentage of contents**
  - c. **Name of investigator**
  - d. **Date**

[A waste disposal form is not necessary for the Academic Campus].
4. Transport waste in protected containers.
5. Use only freight elevators for transporting wastes.