**County of Henrico**

**Chemical Hygiene Plan**

**Department of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**



**Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

# Review & Accountability

**Reviewed by:**

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| **Laboratory Manager** | **signature** | **date** |
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| **Chemical Hygiene Officer (CHO)**  **(If different than Laboratory Manager)** | **signature** | **Date** |

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**Chemical Hygiene Plan**

# 1. Purpose

Implementing this Chemical Hygiene Plan (CHP) will minimize or eliminate the exposure risk of laboratory personnel to the health and physical hazards presented by using hazardous chemicals in County of Henrico laboratories. This written program meets Virginia Occupational Safety & Health Standard 29 CFR 1910.1450.

# 2. Scope and Application

This CHP applies only to laboratories as defined under 29 CFR 1910.1450. Therefore, Department of Public Utilities laboratories, and any other Henrico County work area classified as a laboratory, are not required to comply with the Hazard Communication Standard, 29 CFR 1910.1200, which covers hazardous chemical use in non-laboratory settings. Contact the Office of Emergency Management & Workplace Safety (EMWS) for assistance.

The County of Henrico CHP:

* Meets the requirements of 29 CFR 1910.1450;
* Designates a qualified person(s) for the implementation, oversight, and annual review of the CHP;
* Designates the Laboratory Manager or his/her designee as the person authorized to approve or disapprove laboratory procedures, and
* Incorporates standard operating procedures (SOPs) in accordance with section 10 of this plan.   
  The laboratory standard encourages laboratories to develop SOPs that are specific to the CHP.

# 3. Definitions

**Action Level** – A concentration designated for a specific substance, calculated as an 8-hour time weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance. This value is usually half of the Permissible Exposure Limit.

**Bio-Hazard** – a biological agent or condition that is hazardous to humans and/or the environment. Also, a hazard posed by such an agent of condition. Examples include: viruses, bacteria, plant or animal waste and bodily fluids.

**Chemical Fume Hood** – when used properly, are one of the most reliable engineering controls in the laboratory. They protect laboratory workers by containing vapors, dusts, gases, and fumes generated within the hood, and removing them as air flows into the hood and then out via the laboratory exhaust system.

**Chemical Hygiene Officer** – a specialist focused on compliance to a single standard—the Laboratory Standard, which applies to chemical exposure in laboratories.

**Designated area** – An area that may be used for work with particularly hazardous substances. A designated area may be the entire laboratory, an area of a laboratory, or a device such as a chemical fume hood.

**Hazardous chemical** – A chemical for which there is statistically significant evidence, based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed personnel.

**Laboratory** – A facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis, and can include greenhouses.

**Laboratory use of hazardous chemicals** – Handling or use of chemicals defined as such where all of the following criteria are met:

1. Chemical manipulations are carried out in a laboratory setting;
2. Multiple chemical procedures or chemicals are used;
3. The procedures involved are not part of a production process, nor in any way simulate a production process; and
4. Protective practices and equipment are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

**Laboratory supervisor** – An individual that has authority and responsibility for the personnel and procedures conducted in an individual laboratory. This person may or may not be the Chemical Hygiene Officer.

**Medical consultation** – Consultation which takes place between a licensed physician and an employee for the purpose of determining what medical examinations, procedures, or monitoring if any, are appropriate where a significant exposure to a hazardous chemical may have taken place.

**Particularly hazardous substances** – These include "select carcinogens", "reproductive toxins", and "substances with a high degree of acute toxicity".

**Permissible exposure level (PEL)** – The maximum permitted 8-hour time-weighted average concentration of an airborne contaminant.

**Physical hazard** – A substance for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive), or water-reactive.

**Protective laboratory practices and equipment** – Those laboratory procedures, practices and equipment accepted by laboratory health and safety experts as effective, or that the employer can show to be effective, in minimizing the potential for employee exposure to hazardous chemicals.

**Regulated carcinogen** – Any of the following substances or any substance containing any of the following substances: 1,2-Dibromo-3-Chloropropane (DBCP); 1,3-Butadiene; 2-Acetylaminofluorene; 3,3’-Dichlorobenzidine (and its salts); 4,4'-Methylene bis(2-chloroaniline); 4-Aminodiphenyl; 4-Dimethylaminoazobenzene; 4-Nitrobiphenyl; Acrylonitrile; alpha-Naphthylamine; Asbestos; Benzene; Benzidine (and its salts); beta-Naphthylamine; beta-Propiolactone; bis-Chloromethyl ether; Cadmium; Coke Oven Emissions; Dibromochloropropane (DBCP); Ethlyene Oxide; Ethylene Dibromide (EDB); Ethylene Oxide; Ethyleneimine; Formaldehyde; Inorganic Arsenic; Methyl Chloromethyl Ether; Methylendianiline; Methylene Chloride; N-Nitrosodimethylamine; Non Asbestiform Tremolite, Anthophyllite and Actinolite; Vinyl Chloride

**Reproductive toxins** – Chemicals affecting the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

**SDS** – Safety Data Sheet (formerly “Material Safety Data Sheet”, or “MSDS”.)

**Select carcinogen** – Any substance that meets one of the following criteria:

1. It is regulated by VOSH as a carcinogen (see regulated carcinogens listed above); or
2. It is listed under the category "known to be carcinogens", in Annual Report on Carcinogens by the National Toxicology Program (NTP)
3. It is listed under Group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC) (Vol. 1-48 and Supplements 1-8); or
4. It 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 following criteria:
   1. 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/m3;
   2. After repeated skin application of less than 300 mg/kg of body weight per week; or
   3. After oral dosages of less than 50 mg/kg of body weight per day.

# 4. Responsibilities

**The Department Head, or designee,** is responsible for establishing, implementing and maintaining a CHP that meets the needs of the laboratory and will ensure compliance with the plan.

**Employees and other authorized personnel** who are engaged in the laboratory use of hazardous chemicals are responsible for complying with departmental CHP and individual SOPs.

The **Chemical Hygiene Officer (CHO)** is responsible for the maintenance and annual review of the Chemical Hygiene Plan and for providing technical assistance to laboratory workers. The Chemical Hygiene Officer for the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Laboratory is: (*Insert Name*) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**The Department of Public Utilities** and any other department with an active laboratory is responsible for ensuring its CHP has been implemented and all responsible personnel have been trained and understand the Plan. If needed, EMWS will aid with laboratory safety and the CHP.

# 5. Information and Training

**Departments shall provide training to all persons working in the laboratory regarding the use of hazardous chemicals during the performance of job duties.** Laboratory personnel who have had training under the Chemical Hygiene Plan are not required to receive Hazard Communication training as long as all their work with hazardous materials falls within the scope and definition of “laboratory use”.

The information and training shall be provided to the laboratory personnel or other authorized person at the time of initial assignment to the laboratory, prior to assignments involving new exposure situations, and upon changes in the procedures used and/or new hazards present in the laboratory. Annual refresher training on the CHP is required for all laboratory employees and other authorized persons.

**Training shall include:**

1. Methods and observations that may be used to detect the presence or release of a hazardous chemical;
2. The physical and health hazards of chemicals in the work area;
3. The measures that can be taken to protect oneself from these hazards, including specific procedures the University has implemented to protect persons from exposure to hazardous chemicals, such as engineering controls, appropriate safe work/lab practices, emergency procedures, and personal protective equipment to be used;
4. The applicable details of the Chemical Hygiene Plan (i.e., relevant SOPs)

Training shall be documented in accordance with Departmental records and verified by EMWS. Affected department will maintain records of safety training completed by employees and others. Departments are responsible for documenting the training in laboratories, which will include the names of the trainees, the date, and the procedures covered.

# 6. General Laboratory Safety Rules

1. Know the location of emergency showers, eyewashes, first aid kits, emergency exits, spill kits, and fire alarm pull stations. In an emergency, dial 9-1-1.
2. Know the location of Safety Data Sheets. Ensure all personnel have been trained on this Chemical Hygiene Plan.
3. No food, beverage, smokeless tobacco, or application of cosmetics is allowed in the laboratory. No smoking is allowed in any area of a laboratory. Always wash hands after working with chemicals, even when gloves have been used.
4. Dress appropriately. Long hair, neckties, or loose clothing should be tied back or otherwise secured. No sandals, open-toed or perforated shoes are to be worn in the laboratory. Lab coats will be worn over short skirts (above the knee), shorts, or exposed midriffs.
5. Appropriate eye protection (safety glasses at a minimum) will be worn at all times in laboratories; see Section 15 and any applicable SOPs.
6. Wear the appropriate personal protective equipment for the chemicals in use. When wearing contact lenses, safety goggles must be worn.
7. Comply with warning signs and labels.
8. Do not directly smell or taste any chemical.
9. Never pipette or siphon by mouth.
10. Containers shall be kept closed when not actively in use.
11. When diluting strong acids, it is generally safer to add acid to water as water has a higher heat capacity and can absorb the heat generated by the dilution reaction.
12. Perform only those experiments or procedures that are authorized by the Department.
13. Report all injuries, fires, and accidents to your supervisor immediately. All fires, and the use of fire extinguisher and must be reported to the Laboratory Manager as soon as possible.
14. Any employee unsure of a procedure, or the hazards of a chemical, shall ask for guidance before performing the procedure.

# 7. Labeling

All containers of hazardous substances shall be labeled appropriately. The manufacturer's label shall not be removed from a container as long as the material or residues of the material remain in the container. The following information is to be provided on the manufacturer's label:

1. The identity of the hazardous substance.
2. Appropriate warning words and statements.
3. Appropriate precautionary measures.
4. Name and address of manufacturer or importer.

The Laboratory Manager or CHO will write the date received, and the date opened on the label of any chemicals that expire or can convert to a reactive material upon standing (a peroxide former).

All containers into which hazardous substances are transferred to, or prepared in, shall be labeled with the following information:

1. The identity and concentration of the hazardous substance.
2. A description of the hazards and precautionary measures. In containers smaller than one quart, descriptions can be limited to signal words such as "FLAMMABLE, CORROSIVE, TOXIC"; consult a recent original container, the SDS, or contact EMWS
3. for assistance.
4. It is good practice to put the date received, prepared or transferred on the label. This is required for peroxidizable chemicals such as ethers.

All containers in which hazardous waste is collected shall be labeled “Hazardous Waste”.

Labeling is not required for portable containers into which hazardous chemicals are transferred from labeled containers, and which are intended only for the immediate use of the individual who performs the transfer.

# 8. Chemical Procurement and Distribution

This Chemical Hygiene Plan includes protocols used by the laboratories under the Plan for purchasing and handling hazardous chemicals. The protocols should include the following considerations:

* 1. Substitute with less hazardous chemicals where possible.
  2. Limit purchases to amounts that can foreseeably be used in the next year or less.
  3. Utilize microscale techniques where feasible.
  4. Ensure that facilities and equipment are adequate for the intended use of the chemical.
  5. Ensure that equipment such as bottle carriers, carts with spill containment, or specialized containers are available for use if needed.
  6. Attempt to obtain an agreement in writing from the donor of free hazardous materials to accept the return of any unused portions.
  7. Ensure that a current Safety Data Sheet (SDS) is available or requested from the manufacturer for each chemical purchased.

Hazardous Chemicals Inventory

Each laboratory shall complete a hazardous chemical inventory. This inventory should be kept current. An annual review of the Hazardous Chemical Inventory list is required by the standard.

# 9. Storage of Chemicals in Laboratories

##### General Guidelines for Storage of Chemicals in Laboratories

1. Shelves used for chemical storage shall be of substantial construction and adequately braced. Shelves shall be provided with a lip or guard when used for the storage of individual containers, except when containers are stored in a hazardous materials storage cabinet or other furniture designed to prevent containers from falling off the shelf during seismic activity.

Containers are to be arranged in such a manner as to allow all labels to be seen. When this is impossible, the shelf may be labeled with a list of contents.

1. Chemicals should not be stored on the floor and should not protrude in to walkways.
2. Materials sensitive to light shall be stored in containers designed to protect the contents from light.

4. Food shall not be stored or consumed in areas where chemicals are used or stored.

5. Avoid eating, drinking, gum chewing, or application of cosmetics in areas where chemicals are present; wash hands before conducting these activities.

6. Avoid storage, handling, or consumption of food or beverages in storage areas, refrigerators, glassware or utensils that are also used for laboratory operations. Hallways and stairways should not be used as storage areas.

**Storage of flammable liquids in laboratories**

1. Storage of more than 25 gallons of flammable and combustible liquids (with a flash point less than 100º F) and 120 gallons of combustible liquids (with a flash point of less than 140 degrees F) shall

be in a flammable liquid storage cabinet. The manufacturer usually specifies that the cabinets meet the requirements of VOSH or NFPA 30 -Flammable Liquids Code.

2. Flammables shall not be stored in the same cabinet as oxidizers, strong acids or water-reactive materials in a way so they could mix during an unforeseen event.

##### Storage of corrosives in laboratories

1. Corrosives ought not be stored under sinks or in other areas where plumbing, equipment, or shelving

could be damaged by corrosive effects. Containers of hydrochloric acid, fuming acids, or other

volatile corrosives should be securely capped and stored away from reactives.

2. Strong acids (pH <2) and strong bases (pH >12.5) shall be stored separately in a manner precluding

their mixing during an unforeseen event. Where amounts are small, separation can be achieved by

either all the acids or all the bases being stored in separate containment such as bottle carriers, spill

pans, or other secondary containment. Organic acids (e.g., acetic) should be stored with organics,

not with strong inorganic acids.

# 10. Standard Operating Procedures

Each laboratory’s Chemical Hygiene Plan shall include standard operating procedures (SOPs) that are relevant to safety and health considerations of the laboratory covered by the specific plan to prevent exposure to health hazards. The SOPs should address work practices and policies necessary to protect personnel from the exposure to hazardous materials in the laboratory. If needed, an SOP template that may be adopted or adapted for use in with this CHPs is available in Appendix A.

# 11. Circumstances Under Which Prior Approval is Required

Each Chemical Hygiene Plan shall include designated persons who have authority under the plan to approve laboratory procedures and allow continuance of laboratory procedures under the conditions specified in this section.

Prior approval will be obtained from the appropriate designee for the following:

1. For new laboratory procedures.
2. When it is likely that the "Action Level" or "Permissible Exposure Limit" for a chemical may be exceeded.
3. For changes in procedures that may affect reaction rates, changes in temperatures, or flammability.
4. When ingredient chemicals in a procedure are substituted, added or deleted, or the amounts of chemicals are significantly increased or decreased.
5. For operations that are to be left unattended
6. For operations to be performed by an individual working alone in a laboratory.
7. For operations involving work with "particularly hazardous substances" as outlined in section 14 of this document.

Approval to continue or proceed will be obtained from the appropriate designee:

1. When there is a failure of equipment, especially safety control measures such as fume hoods, clamp apparatus, or temperature control.
2. When the procedure produces unexpected results
3. When signs and symptoms of chemical exposure are experienced.

**12. Determine and Implement Control Measures**

##### Hazard determination

1. Labels containing substance identification and hazard information on incoming material shall not be removed or defaced as long as any material or residue remains in the container.
2. All Safety Data Sheets (SDS's) received shall be retained.
3. Sufficient general ventilation, local ventilation, isolation, or respiratory protection (if exposure limits are exceeded) must be used to protect employees against airborne contaminants.
4. Isolation, shields or barriers, and chemical protective clothing and equipment may be selected for use with chemicals that may be absorbed in injurious levels by the skin. Permeation and degradation factors of protective clothing and equipment will be considered when making selections.
5. Control measures for fire and explosion hazards may include ventilation, controls as recommended by NFPA 70 - National Electrical Code, NFPA 45 – Fire Protection for Laboratories Using Chemicals, and other recognized standards and recommendations as warranted.

# 13. Provisions for Particularly Hazardous Substances

This section will apply to laboratory use of chemicals defined as "particularly hazardous substances". These include "select carcinogens", "reproductive toxins", and "substances with a high degree of acute toxicity".

Designated area:

1. A designated area may be the entire laboratory, an area of the laboratory, or a fume hood or glove box,
2. Storage or consumption of food, storage or use of containers of beverages, storage or application of cosmetics, smoking, storage of smoking materials, tobacco products or other products for chewing, or the chewing of such products, shall be prohibited in designated areas.
3. Use of particularly hazardous substances shall be limited to designated areas.
4. The location of the designated area shall be posted and persons working within the designated area shall be informed of the hazardous substances used there.

##### Use of containment devices and methods

1. Containment devices and methods should be used to minimize exposure to persons and to prevent contamination of areas outside the designated area.
2. Use of particularly hazardous substances in a manner which may produce vapors, dusts, mists, particularly hazardous gases or other airborne particulates shall be under a laboratory hood, in a glove box, or in a closed system.
3. Laboratory fume hoods in which other substances are used shall have an average face velocity of 100 linear feet per second, with no area falling below 70 linear feet per second.
4. Mechanical pipetting aids shall be used for all pipetting procedures (no mouth pipetting).
5. Work surfaces that may become contaminated with particularly hazardous substances shall be protected from contamination.
6. When working with regulated carcinogens, laboratory vacuum systems shall be protected with a double cold trap or with disposable absolute filters.
7. Persons working in the designated area shall remove protective equipment and wash their hands and forearms before engaging in other activities or before eating, drinking, smoking, or using toilet facilities.

Chemical Fume Hood Model and location(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

##### Procedures for safe storage and removal of hazardous waste

1. All waste contaminated with particularly hazardous substances should be collected in impervious containers that are compatible with the contaminant.
2. Wastes contaminated with different substances that are incompatible shall not be placed in the same container.
3. Contaminated sharps, contaminated broken glassware, etc. should be placed in a sturdy container such as a cardboard box and sealed before placing in a waste collection container.
4. All containers should be labeled with the contaminant(s). If the contaminant is a carcinogen, the words "Cancer-suspect Agent".
5. Hazardous waste shall not be accumulated at satellite locations (e.g., laboratories) for longer than 6 months and acutely hazardous waste volumes cannot exceed 1 quart. Waste pick up will be scheduled as per Department of Environmental Quality regulations.
6. Visual inspections of the waste collection room shall done no less than weekly and documented.

##### Decontamination procedures

1. Laboratory workers should consider whether or not decontamination of designated areas or PPE is appropriate. Decontamination procedures and use of PPE will vary according to the type of substance.
2. Small spills should be cleaned up immediately and the area decontaminated.
3. Large or particularly hazardous substance spills shall be referred to a qualified contractor, or County of Henrico Hazardous Materials Response Team. All laboratory personnel will evacuate the laboratory in the event of a very dangerous spill.

# 14. Housekeeping, Maintenance and Inspections

##### Housekeeping

1. Laboratories should be kept free of clutter. Working areas should be cleaned up at the end of each operation and at the end of each day.
2. Small spills of chemicals should be cleaned up immediately. Spills which require measures beyond the laboratory personnel’s ability to clean up should be reported to the Department Head or designee immediately.
3. Safety showers, eyewashes, and fire extinguishers shall be free from any obstruction that would prevent access and use. Access to emergency exits shall be kept clear at all times.
4. Circuit breaker panels shall have an unobstructed clearance of 36".
5. The floor shall be kept clean and free of slip hazards by reasonable cleaning and immediate cleanup of spills.
6. Old containers, compromised containers, and chemical wastes should be disposed of promptly and not be allowed to accumulate. Hazardous waste materials should be disposed of in accordance with Section 19 of this plan.

##### Inspection and Maintenance of Protective Devices (Chemical Fume Hoods and Biosafety Cabinets)

1. Temperature control and over temperature shutoff devices on heating equipment should be tested in accordance with manufacturer recommendations to ensure proper operation.
2. All automatic shutoff devices should be tested in accordance with manufacturer recommendations to ensure proper operation.
3. Records of inspection and testing of above equipment will be maintained <***Insert Location***>, for 3 years.
4. Chemical fume hood certifications shall be done annually by a qualified contractor.
5. Explosion shields and isolation devices should be visually inspected by the user for cracks or other damage before each use.
6. Safety showers and emergency eyewashes shall be tested weekly by the designated person. Tags or a record sheet indicating date inspected and the inspector will be attached on or near the shower or eyewash, or stored in a separate notebook. (see Appendix D for weekly inspection sheet).
7. See Appendix C for Chemical Fume Hood safety guidelines.
8. See Appendix C for Biosafety Cabinet safety guidelines.

Laboratories shall be inspected at least annually by EMWS.

# 15. Personal Protective Equipment (PPE)

1. Eye and face protection shall be required whenever a reasonable probability that an injury can be prevented by wearing such equipment.
2. Selection of the proper type of eye and face protection should be in accordance with ANSI Z87.1.
3. When working with substances that are readily absorbed by the skin, or with substances that are highly corrosive to the skin, appropriate protection shall be provided to protect the laboratory worker from skin contact.
4. Skin protection may take the form of shields, isolation of the procedure, gloves, aprons, or other such protective equipment.
5. Gloves and chemical aprons should be selected according to the chemical resistance of the protective material to the chemical to be used.

# 16. Medical Consultation and Examinations

The County shall provide all persons involved in the laboratory use of chemicals an opportunity to receive medical attention, including any follow-up examinations that the examining physician determines to be necessary, under the following circumstances:

1. Whenever a laboratory worker develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory;
2. Where industrial hygiene monitoring in a laboratory reveals an exposure level routinely above the action level (or in the absence of an action level, the Permissible Exposure Limit or
3. Whenever an event takes place in the laboratory such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure.

All medical examinations in accordance with section 18 of this CHP shall be performed by or under the direct supervision of a licensed physician and shall be provided at no cost to the exposed laboratory employee.

The County shall provide the following to Employee Health or physician:

1. The identity of the hazardous chemical(s) to which the laboratory employee may have been exposed and a copy of the SDS, if available;
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 the exposure that the laboratory employee or laboratory student is experiencing, if any.

Exposure records shall be maintained by Employee Health, DPU, any other Department with a laboratory work area and EMWS.

# 17. Spills and Accidents

All laboratory personnel should be trained on the Department’s Emergency Action Plan. Personnel should know the primary and secondary evacuation routes from the laboratory. Know the location of emergency showers, eyewashes, first aid kits, emergency exits, spill kits, and fire alarm pull stations. In an emergency, dial 9-1-1 as soon as it is safe to do so.

##### Fires and Chemical Spills

1. Alert all personnel in the immediate vicinity.
2. If possible, confine the fire or chemical spill without endangering personnel.
   1. Stay between the emergency and an exit to avoid being trapped without a means of egress.
   2. Personnel who have received annual fire extinguisher training may fight incipient stage fires **ONLY** if it is safe to do so. Otherwise, evacuate the building at once.
   3. For emergencies inside the chemical fume hood, close the sash, if possible.
   4. Close laboratory doors, if possible, to prevent smoke or vapors from entering adjoining rooms and halls.
   5. For flammable liquid spills, shut off ignition sources, if possible. Avoid unplugging equipment due to possible electrical arc between receptacle and plug. Turn off the breaker if possible.
   6. For spills that can be managed by personnel who have received appropriate training, use the spill kit to clean the affected area. Notify the Department Head, CHO or Laboratory Manager of the situation as soon as it is safe to do so.
3. For larger spills, evacuate the emergency area. If in doubt, evacuate the building. If the emergency requires a building evacuation, engage the nearest fire alarm pull station.
4. Summon aid. For emergencies that require response from the fire department, police department, or paramedics, dial 9-1-1 as soon as it is safe to do so.

##### Clothing Fires

1. Keep the person on fire from running; even from running to a fire blanket.
2. Drop the person to the floor or other horizontal surface to prevent flames and hot gases from rising to the face and head.
3. Roll the person to snuff out the flames. Blankets can be effective. Safety showers may be effective if within a travel distance of one or two seconds.
4. Cool the person by removing smoldering clothing that has not adhered to the skin by using water and ice packs.
5. Call 9-1-1 as soon as it is safe to do so.

##### Chemical splash

1. Chemical splashes in the eyes
2. Immediately wash the eyes with potable water for at least 15 minutes.
3. Forcibly hold the eyelids open while continuously irrigating the eyes.
4. Do not use any substance other than potable water to wash the eyes.
5. Get medical assistance immediately.
6. Eyewash stations shall be tested and flushed weekly where there is a potential for exposure to corrosive materials.

1. Chemical splashes on the skin
2. Remove chemical contact with the skin by brushing off dry and water reactive chemicals and removing contaminated clothing and protective equipment that can be removed quickly (1 second or less).
3. Flush the injured area with copious amounts of potable water. Never use anything other than water or mild soap and water to clean chemicals from exposed skin.
4. Remove protective eyewear under the emergency shower as quickly as possible when chemicals have entered the eyes. In cases where the eyewear has not been breached by the chemical, remove the protective eyewear after head and face have been thoroughly washed.
5. Wash the affected area with potable water for 15 minutes or longer. Wash any part of the skin that may have had chemical contact or contact with contaminated wash water. Remove any clothing that may be contaminated with the chemical or contaminated with the wash water under the emergency shower.
6. Give special attention to areas that may by missed such as underneath the earlobes, underneath the arms, the crotch, between the toes, the creases at the sides of the nose, a deep cleft in the chin, etc.
7. Get medical assistance. Provide the SDSs for the spilled chemical(s) to medical personnel.
8. If the emergency water used for flushing is cold, the injured person should be treated for shock once washing is completed.
9. If a splash causes a thermal burn as well chemical burn, be sure to advise the attending medical personnel the nature of the chemical exposure.
10. After washing of the victim, advise rescuers to wash themselves to prevent injury from the diluted chemical that was washed off the victim.

##### Work-related injury or illness

For serious injuries or emergencies call 9-1-1.

**18. Medical Assistance for County Employees**

## **County of Henrico Employee Health**

Physical Location: Mailing Address:

7740 Shrader Road, Suite A P. O. Box 90775

Henrico, VA 23228 Henrico VA 23273-0775

Hours: Monday – Friday 8:00 a.m. to 4:30 p.m. Phone: 804-501-1600

E-mail: [but058@henrico.us](mailto:but058@henrico.us)

**19. Hazardous Waste Disposal**

##### Liquid Chemical Hazardous Waste Collection

1. Hazardous wastes shall be collected in containers that are compatible with the intended contents and that are in good condition.
2. Materials placed in the same collection container shall be compatible with all other materials in the container.
3. Containers shall be labeled appropriately.
4. Collection containers shall be kept securely closed except when adding hazardous material.
5. Secondary containment is required for all liquid hazardous wastes.
6. Hazardous wastes shall not be accumulated longer than twelve (12) months.
7. Hazardous waste collection site shall be visually inspected monthly, and documented.
8. A qualified hazardous waste contractor shall perform regular waste pick-ups. Waste shall not be allowed to accumulate.
9. Refer to departmental and Department of Environmental Quality procedures and the requirements outlined in Environmental Standard Operating Procedure 004 – Hazardous Waste Management for proper disposal methods.

##### Solid Hazardous Waste Collection

1. Solid hazardous wastes must be collected into compatible containers, kept closed except when adding waste and labeled properly labeled.
2. All sharps and broken glassware contaminated with hazardous chemicals should be placed in a puncture resistant container prior to disposal.

Location of Autoclave: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Appendix A

County of Henrico Laboratories

Standard Operating Procedure Template

|  |  |  |
| --- | --- | --- |
| Procedure title |  | |
| Procedure author |  | |
| Date of creation / revision |  | |
| Name of responsible person | Laboratory supervisor or laboratory worker | |
| Location to be performed | Room Number or Bench | |
| Proposal number(s): |  | |
| 1. | **This standard operating procedure (SOP) is for a** | |
| Specific laboratory procedure or experiment  Generic laboratory procedure that covers several chemicals  Generic use of specific chemical or class of chemicals with similar hazards | | |
| 2. | **Process or experiment description**  *Briefly summarize the process or experiment, including an estimate of how long the process takes and how frequently it will be conducted. Include total quantities (volume, mass) of the materials you to expect to use.* | |
|  | | |
| 3. | **Chemicals and Other Materials** | |
|  | | |
| 4. | **Safety equipment**  *Specify all equipment needed to perform research or experiment safely.* | |
| 4.a. | Engineering / ventilation controls  Examples: fume hood use, | |
| 4.b. | Personal protective equipment and other safety equipment  Examples: safety glasses, nitrile gloves, absorbent bench paper | |
| 4.c. | Location of nearest emergency safety equipment  Examples: eyewash station, spill kit | |
| Item | | Location |
| Eyewash / safety shower | |  |
| First aid kit | |  |
| Chemical spill kit | |  |
| Fire extinguisher | |  |
| Fire alarm manual pull station | |  |
| 5. | **Shipping and receiving requirements**  *Describe shipping or receiving requirements, especially for highly toxic, highly reactive/unstable, highly flammable, and corrosive materials.* | |
|  | | |
| 6. | **Designated area**  *Where highly toxic, highly reactive/unstable, highly flammable, and corrosive or nanomaterials are used, identify the designated work area(s) and the necessary personnel decontamination after completion of work.* | |
|  | | |
| 7. | **Step-by-step operating procedure**  *Provide a sequential description of work, including details such as chemical concentrations and when special safety equipment is to be utilized. Include temperature, pressure, and other experimental conditions. Schematics or pictures are suggested for complex setups.* | |
| 1. Step 2. Step   *Etc….* | | |
| 8. | **Special handling procedures, transport, and storage requirements**  *Describe special handling and storage requirements for hazardous chemicals in your laboratory, especially for highly reactive/ unstable and highly flammable materials and corrosives. Describe transport and secondary containment requirements, between the laboratory and beam lines or between facilities.* | |
|  | | |
| 9. | **Beam line handling and storage requirements**  *Describe sample handling procedures and sampling set up at the beam lines. Are samples sealed or open? Is ventilation required? Are heating, cooling, or gas distribution systems present?* | |
|  | | |
| 10. | **Emergency procedures**  *Indicate how spills, personnel exposure/injury, and other accidents should be handled and by whom. List emergency contact numbers.* | |
| **Life-threatening emergencies** (for example, fire, explosion, large-scale spill or release, compressed gas leak, valve failure)   1. **Call 911.** 2. Alert people in the vicinity and activate the local alarm systems. 3. Evacuate the area and go to emergency assembly point as indicated in the Department’s Emergency Action Plan. 4. Remain nearby to advise emergency responders. 5. Once personal safety is established, call the Department Head or his/her designee to activate internal response. 6. Provide local notifications.   **If personnel exposed or injured**   1. Remove the injured/exposed individual from the area, unless it is unsafe to do so because of the medical condition of the victim or the potential hazard to rescuers. 2. Administer first aid as appropriate. 3. Flush contamination from eyes/skin using the nearest emergency eyewash/shower for a minimum of 15 minutes. Remove any contaminated clothing. 4. Provided copies of Safety Data Sheets (SDSs) for all chemicals to which the victim was exposed to Emergency Responders.   **Non-life-threatening emergencies**   1. Alert the Laboratory Manager, Department Head, or other Responsible Person 2. Notify EMWS, or a Supervisor   **If personnel exposed or injured**  For non-emergency incidents, Contact Employee Health to schedule an appointment with a medical professional.  **For small spills / local cleanup**  In the event of a minor spill or release that can be cleaned up by local personnel (personnel are authorized via work planning and control to handle spilled material, appropriate PPE is available, compatible spill response material is readily available in sufficient quantity, and cleanup is safe):   1. Notify personnel in the area and restrict access. Eliminate all sources of ignition. 2. Review the SDS for the spilled material, or use your knowledge of the hazards of the material to determine the appropriate level of protection. 3. Wearing appropriate personal protective equipment, clean up spill. Collect spill cleanup materials in a tightly closed container. Manage spill cleanup debris as hazardous waste. 4. Store waste properly until removal from the premises.   **Building maintenance emergencies** (for example, power outages, plumbing leaks)  Submit a Facilities service request or call appropriate building manager. | | |
| **Additional emergency procedures**  *Describe additional, local emergency procedures.* | | |
| 11. | **Waste disposal**  *Identify amounts of waste anticipated and appropriate disposal procedures. Segregate waste by hazard class (for example, flammable, corrosive) and state (solid, liquid), label appropriately, and place in the laboratory’s hazardous waste cabinet.* | |
|  | | |
| **Additional waste guidelines**  *Describe additional, local waste guidelines.* | | |
| 12. | **Training requirements**  *List the general and laboratory-specific training required* | |
| Laboratory training for all affected personnel  Laboratory CHP Training  Hazardous Waste Management  Hazardous Materials Transportation General Awareness and Safety Training  Other: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Other: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | |
| **Additional training requirements**  *List additional, local training requirements.*   1. Additional training requirement 2. Additional training requirement | | |
| 13. | **Approval**  *Standard operating procedures must be approved by the laboratory manager and directorate safety coordinator.* | |
| Laboratory manager *(name, signature, date)*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Directorate safety coordinator *(name, signature, date)*:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | |
| **Additional approvals**  *List subject matter experts consulted for approval:*   1. Person consulted 2. Person consulted | | |
| **Additional prior approvals (required for particularly hazardous procedures)**  *List any tasks that require prior approval by the laboratory manager (for example, use of restricted chemicals and other higher hazard chemicals and running of higher hazard operations):*   1. Task requiring prior approval 2. Task requiring prior approval | | |

**Appendix B**

**Autoclave Safety**

****

**Autoclave Operation**

Autoclaves use high pressure and elevated temperature steam to kill microorganisms and render biohazardous material inactive. For effective sterilization, the materials/load must be saturated with steam. Air pockets or insufficient steam supply will prevent effective sterilization. Proper cycle parameters for effective decontamination of infectious waste are done using autoclave indicators and performing autoclave validations.

**Autoclave Training Requirements**

The Department Head, his/her designee, or the Chemical Hygiene Officer will be responsible for ensuring that all laboratory personnel who will be operating an autoclave have received appropriate training and the training shall be documented.

**Preparing Materials**

To ensure adequate penetration of steam, pack materials loosely. Do not intentionally crush waste to fill the bag with more material or overfill the waste bags. Bags/containers should be placed in a large, leak-proof, non-glass, shallow pan to contain spills and overflow.Stainless steel pans or plastics that can be autoclaved repeatedly at high temperatures are recommended. Before processing, open the bags/containers so that the steam can penetrate and effectively raise the temperature for adequate sterilization. A small amount of water may be added to ensure heat transfer inside the bag/container. If the bag is closed during autoclaving, the temperature of the contents may not be raised sufficiently for decontamination. If processing more than one tray, make sure that there is ample room between the trays so steam circulation is not impeded.

**Basic Operating Instructions**

The following are basic instructions for autoclave use but they do not replace the manufacturer's operating instructions and hands-on training. Before using any autoclave for the first time, read and thoroughly understand the operator's manual because many makes and models have unique characteristics.

**Autoclave Safety Guidelines**

Prevent injuries by adhering to these safety guidelines:

* Load the autoclave properly as per the manufacturer recommendations.
* Be sure to clean the drain strainer before loading the autoclave.
* Before loading containers of liquids into the autoclave, the caps must be loosened to avoid having the bottles shatter or explode during pressurization.
* Use a tray with a solid bottom and walls to contain bottles and catch spills.
* Add 1/4 to 1/2 inch of water to the tray so the bottles heat evenly.
* Don't load plastic materials that are not compatible with the autoclave.
* Individual glassware pieces should be within a heat resistant plastic tray on a shelf or rack, and never placed directly on the bottom of the autoclave.
* Make sure the door of the autoclave is fully closed and the correct cycle has been selected before starting.
* Wear heat-resistant gloves when cracking the autoclave door open after a cycle.
* Before removing autoclaved items, wait five minutes for loads containing only dry glassware, and ten minutes for autoclaved liquid loads.
* When removing items from the autoclave, wear a rubber apron, rubber sleeve protectors, heat resistant mitts/gloves and a face shield. Remove the load and let the glassware cool for fifteen minutes before touching pieces with ungloved hands.
* Be alert for autoclaved liquid bottles which are still bubbling. Let liquid loads stand in an out-of-the-way place for a full hour before touching any of the load with ungloved hands. Hot glassware and scalding liquids will cause serious burns.

**Never Autoclave the Following:**

* Sharps: It is not necessary to autoclave discarded sharps (used/unused needles and syringes, contaminated broken glass, microscope slides and coverslips, Pasteur pipettes, scalpel or razor blades) prior to disposal in a sharps disposal container. Always ensure that sharps containers are disposed of properly.
* Hazardous chemicals (including items contaminated hazardous chemicals). Do not autoclave flammable, reactive, corrosive, or toxic chemicals (e.g., alcohols, chloroform, acetic acid, formalin, or fixed tissues). Lab coats that have been contaminated with chemicals should not be autoclaved. They should be cleaned by an approved laundry service or disposed of as chemical waste.
* Dried bleach and bleach-associated materials, or nitrocellulose; both compounds pose a fire or explosion risk.
* Radioactive materials.
* Red bag biohazardous waste. This waste shall be collected for incineration by qualified contractors or County personnel.

**Testing Autoclaves Monthly for Effectiveness**

Autoclaves used for pathogen kill-loads or clean glassware sterilizing cycles, should be tested no less than once per month for killing effectiveness. The most common method of testing is using commercially available test indicator kits (usually Bacillus stearothermophilus). The indicator is placed in the center of a typical load and run through a sterilization cycle. Bury the indicator in the center of the load as waste is placed around it. After the cycle is finished, open the bag and removed the indicator. If no growth is detected, the cycle is functioning properly. If growth is noted on the autoclaved spore strips, try increasing the run time. If growth still occurs with run times of 45 minute or more, the autoclave may need maintenance and repair.

**Autoclave Performance Information**

Autoclaves shall be tested before being placed into service, and then retested periodically for effectiveness.

**Testing Periodicity or Schedule for Autoclaves in Use**

* Every 40 hours of use or monthly (whichever is shorter), a cycle must be run to monitor the effectiveness of the sterilization process. This is required for autoclaves that are used to inactivate human or non-human primate blood, tissues, clinical samples, or human pathogens, i.e., biohazardous waste.
* Every 6 months. Required for autoclaves that are used to inactivate other material.
* A commercially available test indicator kit that uses bacterial spores (Bacillus stearothermophilus) is the approved method of testing autoclave efficiency.

Most spore vial test kits require 56 to 60 °C incubation of the autoclaved test vial along with a non-autoclaved control vial. Incubation causes surviving spores to grow. Infectious waste treated in an autoclave must be subjected to one of the following temperature/pressure conditions:

Temperature of not less than 2500F for 90 minutes at 15 psi of gauge pressure,   
Temperature of not less than 2720F for 45 minutes at 27 psi of gauge pressure,   
Temperature of not less than 3200F for 16 minutes at 80 psi of gauge pressure.

**New autoclaves**

Before placing an autoclave into service, a test load approximating the weight and density of the type of waste generated shall be autoclaved with test spore vials. The spore vials should be placed at the bottom, top, front, rear, and center of the autoclave chamber. This can be achieved by either:

* + placing vials at those positions within one large test load, OR
  + making several smaller test packs with 1 vial at the center of each and placing the packs at those locations within the chamber.

The appropriate parameters for sterilization including temperature, pressure, and treatment time shall be determined in this way.

**Storage Information**

Adhere to the spore vial product information sheet for appropriate storage information, but, in general, spore vials should **not be frozen**. Each batch of vials has an expiration date. Vials should not be used after their expiration date.

**Recordkeeping**

The following records regarding autoclave use must be kept:

* An autoclave log book should be available at each work location at all times. If the log book is missing, or there are no blank logbook sheets, alert the PI or building manager so that the logbook can be replaced, or blank log sheets added to the notebook.
* Each load of material shall be logged as follows:
* Date, time, and technician's name
* Type of waste or cycle
* Confirmation of sterilization
* Record the temperature, pressure, and length of time the load is sterilized. Please note that temperature-sensitive autoclave tape **is not**sufficient to indicate that the load reached sterilization conditions because the tape will change color at lower temperatures, **OR**
* Save the autoclave print-out, if the autoclave has a working printer.

**Autoclave Standard Operating Procedures**

A written sterilization Standard Operating Procedure (SOP) should be in place for each specific autoclave. The SOP shall include the following:

* Parameters
* Appropriate parameters for sterilization shall be determined from the testing with spore vials.
* The time it takes to sterilize a load will change, depending upon the load density and the sterilization cycle one chooses. Therefore, tests should be performed which imitate these various situations.
* Protocol
* Identification of standard treatment containers and proper load placement shall be made.
* Cleaning
* The autoclave and work areas shall be cleaned after every use and the work area shall be disinfected as needed.

**Autoclave Sterilization Test Record Year: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Month | Date of Test | Technician | Test Type | Pass? (Y or N) |
| January |  |  |  |  |
| February |  |  |  |  |
| March |  |  |  |  |
| April |  |  |  |  |
| May |  |  |  |  |
| June |  |  |  |  |
| July |  |  |  |  |
| August |  |  |  |  |
| September |  |  |  |  |
| October |  |  |  |  |
| November |  |  |  |  |
| December |  |  |  |  |

**Appendix C**

**Chemical Fume Hood Safety**

**Before using a fume hood:**

* Operators should have an understanding of how a fume hood works,
* Operators shall be trained to use the hood(s),
* Know the hazards of the chemical(s) being used. Refer to the Safety Data Sheet if unsure,
* Verify that the hood is on
* Open the sash to its proper operating height, usually 18 inches. An arrow normally indicates the maximum sash height,
* Check the air gauge indicator to ensure the air flow is within the required range. Most models are designed to flow between 80-120 fpm (feet per minute).

**While using a fume hood:**

* Never place your head across the sash plane opening. For vertical rising sashes, keep the sash edge below chin level. For horizontal sliding sashes, keep the sash positioned in front.
* Always use appropriate eye protection,
* Never block airflow through the baffles or through the baffle exhaust slots,
* Elevate large equipment (e.g., a centrifuge) at least two inches off the base of the hood platform,
* All materials inside the hood should be kept at least six inches from the sash opening,
* When not working in the hood, keep the sash closed,
* Hazardous chemicals should never be stored in the hood permanently,
* Report a non-functioning hood to a supervisor immediately. Close the sash and mark or tag the hood so that no one uses it until repairs are made,
* If particularly hazardous chemicals are being used, review emergency procedures such as power outages, spills, fire, etc., so that a response is appropriate for the incident.

**Appendix D**

**Guidelines for Biosafety Cabinet Use**



Biological Safety Cabinets, (BSC), also known as tissue culture hoods, are designed to provide personnel, environmental and product protection when appropriate practices and procedures are followed. Class II BSC rely on directional movement of air to provide containment. Airflow is drawn into the front grille of the cabinet, providing personnel protection. The most commonly used BSC is a Class II A2. This type of cabinet is **not suitable** for volatile solvents.

BSC installation, required annual certification, decontamination and maintenance **must** be done by certified (accredited by the National Sanitation Foundation) professionals. Maintenance and certification will be done in accordance with all applicable regulations.

**Work Practice Controls**

Personal Protective Equipment:

• Appropriate personal protective equipment (PPE) must be worn. Lab coats must be buttoned. Gloves should be pulled over the wrists of lab coat, not worn inside coat. Additional PPE to be used as recommended.

Preparing BSC for work:

• Confirm BSC annual (within 12 months) certification is current; information found on sticker on front of BSC.

• Operate cabinet blowers at least 3-5 minutes before beginning work to allow the BSC to “purge” particulates.

• Use 70% ethanol to clean work surface of BSC and to disinfect any glass, etc. that is being used; amount of alcohol in BSC must be for only one day’s work.

Working in the BSC:

* When working in the cabinet, move arms in and out slowly, perpendicular to the face opening to reduce disruption of air curtain.
* Perform all operations at least 4 inches from the front grille on the work surface.
* For BSC clean-up, apply 70% ethanol using wipes vs. spray bottles to minimize solvent vapor concentrations being re-circulated in the hood. Cabinet sash to remain open to allow for alcohol evaporation; sash can be lowered after sufficient time. The recommended minimum time for sash opening is 10 minutes.
* Do not bring potentially contaminated materials out of the cabinet until they have been surface decontaminated.
* Disposable under pads can be placed on the work surface but must not cover the front or rear grille openings. The use of toweling facilitates routine cleanup and reduces splatter and aerosol generation during an overt spill.
* Place all material as far back in the cabinet as practical, toward the rear edge of the work surface and away from the front grille of the cabinet.
* Place aerosol-generating equipment (e.g. vortex mixers, tabletop centrifuges) toward the rear of the cabinet.
* The workflow should be from “clean to dirty”. Materials and supplies should be placed in the cabinet in such a way as to limit the movement of “dirty” items over “clean” ones.

**Open Flames in a BSC:**

* **Never use open flames in BSC.**
* If a researcher requests to use open flames, OSEH personnel will meet with the researcher and discuss issues and solutions.
* If it is deemed necessary for the procedure, use a pilotless burner or safety touch-plate microburners to provide a flame on demand.
* The Centers for Disease Control and Prevention (CDC) reports that “open-flames are not required in the near microbe-free environment of a biological safety cabinet” and create “turbulence which disrupts the pattern of air supplied to the work surface," jeopardizing the sterility of the work area. This is also the recommendation of the World Health Organization (WHO) as well as major BSC manufacturers.
* Early microbiologists had to rely on open flames to ensure sterility. With the advancement of modern technology, including the introduction of the BSC, the use of an open flame is no longer necessary.

**UV Lights in a BSC:**

The Center for Disease Control (CDC) and the National Institutes of Health (NIH) agree that UV lamps are not recommended nor required in BSC. UV lamps must be turned off when the room is occupied to protect eyes and skin from UV exposure, which can burn the cornea and cause skin cancer. Proper use and cleaning of BSC negates any need for the use of UV lamps. Numerous factors affect the activity of the germicidal effect of UV light, which require regular cleaning, maintenance and monitoring to ensure germicidal activity.

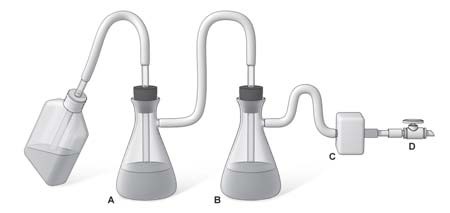
**Protective** **Equipment**

Appropriate personal protective equipment (PPE) must be worn. Lab coats must be buttoned. Gloves should be pulled over the wrists of lab coat, not worn inside coat. Additional PPE to be used as recommended.

Note: Respirators are masks designed to protect the wearer from specific airborne hazards and are different from surgical masks, which protect the wearer only from splashes and are primarily intended to protect others from infectious aerosols exhaled by the wearer, such as bacteria or certain viruses. Respirator use requires employee participation in the County’s Respiratory Protection Program, which involves medical clearance and annual fit testing and training. Please be clear about use of surgical masks versus respirators. (Do NOT use the vague term “masks”).

**Waste Disposal**

A vacuum flask system is required to provide protection to the central building vacuum system or vacuum pump and to personnel who service the equipment. The figure below illustrates a proper set-up for handling liquid waste.



The left suction flask (A) is used to collect the contaminated fluids into a suitable decontamination solution; the right flask (B) serves as a fluid overflow collection vessel. An in-line HEPA filter (C) is used to protect the vacuum system (D) from microorganisms.

* Connect primary flask to an overflow collection flask and to an in-line HEPA filter.
* Both flasks shall contain an appropriate disinfectant for the material used, such as a bleach solution.
* The vacuum flasks may be set up within the cabinet; however, to save room, the system can be placed on the floor beneath or next to the BSC, using a secondary container to contain the flasks and a longer hose connection to the vacuum system.
* Once inactivation occurs, liquid materials can be disposed of as noninfectious waste in the sink. Empty the waste from the flask when it reaches no higher than ¾ full. Replace the flask with fresh disinfectant.
* All bio-hazardous waste shall be disposed of properly. Contact the Laboratory Manager, CHO or Department Head.

**Exposures/Unintended Contact**

For all emegencies, call 9-1-1.

**Appendix E**

**Glove Selection Guide**



The hand protection standard (29 CFR 1910.138), states that employers must select appropriate gloves to protect employees from hand hazards. Employees must be trained to know when gloves are necessary, what type of gloves are necessary, how to properly don, doff and adjust their gloves. Also, employees must be aware of any glove limitations, proper glove care, maintenance, and how to dispose of gloves properly.   Rubber (latex, nitrile, or butyl), plastic, or synthetic rubber-like materials such as neoprene can protect workers from chemical hazards as well as reduce the risk of exposure to blood and other potentially infectious materials.

**Commonly Used Gloves:**

**Butyl Rubber Gloves**

These gloves protect against nitric acid, sulfuric acid, hydrofluoric acid, red fuming nitric acid, and peroxide.  Butyl rubber gloves are highly impermeable to gases, chemicals, and water vapor.  In addition, they resist abrasion and remain flexible at low temperatures.

**Natural Latex or Rubber Gloves**

These gloves protect an employee’s hand from most water solutions of acids, alkalis, salts, and ketones.  They are not recommended for working with non-water solution hazardous chemicals.  They are frequently used to protect against contact with blood or other potentially infectious materials.

***NOTE:* *Thin surgical-style latex gloves offer very limited protection from many chemicals.***  
   
Latex gloves have caused allergic reactions in some individuals.  Hypoallergenic gloves, glove liners, and powderless gloves are possible alternatives for individuals who are allergic to latex gloves.

**Neoprene Gloves**

Neoprene gloves provide protection against a broad range of corrosives chemicals.  They are resistant to oils, greases, alcohols, resins, alkalis, organic acids, and many solvents.  Neoprene has poor resistance to chlorinated aromatic solvents, phenols, and ketones.  These gloves have good pliability, finger dexterity, high density, and tear resistance.

**Nitrile Gloves (Nitrile-Butadiene Rubber (NBR) marketed as Sol-Vex or Nitrile)**

Nitrile gloves are an excellent choice if work involves aromatic petroleum, and chlorinated solvents such as trichloroethylene and perchloroethylene.  Nitrile gloves stand up to heavy use even though they are designed for work where dexterity and sensitivity are required.  They are generally resistant to abrasions, punctures, snags, and tears.

**Silvershield or 4H Gloves**

These gloves provide excellent chemical resistance, but are stiff and have poor grip and fit.  They are commonly used of HazMat work and are an appropriate choice for universal spill kit gloves.