

UNIFORMED SERVICES UNIVERSITY OF THE HEALTH SCIENCES



SUBJECT: Implementation of Chemical Hygiene Plan (CHP)

JUN 2 9 2011

Instruction 6407

(EHS)

ABSTRACT

This Instruction is issued to comply with the Occupational Safety and Health Administration regulation, "Occupational Exposure to Hazardous Chemicals in Laboratories." That regulation requires a written chemical hygiene plan to ensure safe use of hazardous chemicals and to ensure personnel are informed of the hazards associated with the chemicals and methods by which they are used.

A. Purpose.

This Instruction implements Occupational Safety and Health (OSHA) laboratory regulation, 29 CFR 1910.1450^a, hazard communication standard, 29 CFR 1910.1200^b, and portions of DoD Instruction 6050.5^c. This Instruction assigns responsibilities and provides information to help protect Uniformed Services University of the Health Sciences (USUHS) personnel, visitors, and the surrounding community from hazards associated with potentially dangerous chemicals.

B. References. See Enclosure 1.

C. Scope and Applicability.

This Instruction is applicable to all USUHS personnel planning for, or engaging in the use of hazardous chemicals in the laboratory as defined in 29 CFR 1910.1450^a. It is intended to complement existing Federal and State regulations and other USUHS safety-related instructions.

D. Policy.

1. Implementation of this Chemical Hygiene Plan (CHP) and the safe use and management of hazardous chemicals will be an integral part of every laboratory activity at USUHS.

2. This CHP shall be readily available to employees, employee representatives and, upon request, to the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

3. Laboratory procedures involving work with hazardous chemicals will be identified and addressed in research protocols through the use of Appendix (4) of USUHS Form No. 3208, "Assurance Supplement."

4. Employees shall be provided information and training to ensure that they are apprised of the hazards of chemicals present in their work area. Such information and training shall be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. In addition, bi-annual refresher training of employees shall be provided.

a. EHS provides bi-annual and refresher training that is an overview of Federal and DoD rules and regulations.

b. Principal Investigators (PIs) or Work Center Supervisors or their designated representatives provide lab specific or site specific training on hazards present in the lab or site and protective measures for those specific hazards. This lab/site specific training shall be provided at the time of an employee initial assignment to a work area and prior to assignments involving new or changes to hazards present.

5. The primary responsibility for recognizing, controlling, and correcting hazards within a work area rests with the Principal Investigator (PI). If not available, the PI may find it necessary to designate a qualified employee to act in his/her behalf. This designee must be a senior laboratory member, appointed in writing and the letter sent to the Department of Environmental Health and Occupational Safety (EHS) by the PI.

6. EHS periodically monitors work practices and areas to assist the University in maintaining safe facilities and procedures. The monitoring by EHS does not alleviate the responsibilities of individual workers, laboratory supervisors, or PIs.

E. Responsibility:

1. <u>President, USUHS</u> (PRS) has overall responsibility for implementation, management and enforcement of the CHP and hazard control procedures for the University.

a. Appoint a Chemical Hygiene Officer (CHO) to manage the University Chemical Hygiene Program. (The CHO is normally but not necessarily the Industrial Hygienist assigned to the Office of the Assistant Vice President for Safety and Environment (AVS).)

2. <u>The Deans of the respective USUHS</u> <u>Schools, the Directors of all USUHS</u> <u>Institutes and all USUHS Vice Presidents</u> shall:

a. Provide oversight of the CHP for all areas under their cognizance on behalf of the President.

3. Department Chairs shall:

a. Assure the safety of all personnel assigned to or working on projects under their direction.

b. Ensure PIs and laboratory personnel under their supervision, maintain adequate precautions for protecting the University and community from hazardous chemicals being used in their research, and ensure that laboratory personnel working with these chemicals are appropriately trained to use such materials and understand University policies and other governing federal and local regulations and standards.

4. <u>The Vice President for the Office of</u> <u>Research</u> (VPR) shall:

a. Forward to the Head, Occupational Safety Division (OSD) of EHS for review of those research/clinical investigation proposals/protocols that include the handling or use of chemicals;

b. Provide researchers with information concerning the approval process of working with hazardous chemicals in their protocols and necessary assurance documentation;

c. Provide EHS with appropriate access to the grant administration electronic

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and other associated records for the purpose of monitoring grant activity and hazardous chemical usage.

d. Ensure plans and programs for research laboratory renovation, conversion or expansion of any associated University spaces include proper review of health and safety and environmental protection design criteria and that appropriate regulatory standards are observed.

5. <u>Assistant Vice President for</u> <u>Environment and Safety (AVS)</u> shall:

a. Act as the Director of Environmental Health and Occupational Safety Department (EHS)

b. Supervise the CHO and the Head of the Occupational Safety Division (OSD) in the conduct of their duties regarding the Chemical Hygiene Program.

c. Assist in Monitoring the overall effectiveness of the Chemical Hygiene Program.

d. Ensure that Health and Safety Surveys are conducted at least annually in laboratories where hazardous chemicals are used.

e. Serve in an advisory capacity for policy matters relating to hazardous chemicals.

f. Manage the resources to support disposal of hazardous chemical waste at USUHS.

g. Review and approve all research/teaching protocols, including those using hazardous chemicals, prior to their commencing.

h. Provide technical advice pertaining to hazardous chemicals.

i. Inform as necessary, members of the USUHS Administration of the status of hazardous chemical control and chemical hygiene at USUHS. j. Have authority to stop any procedure, operation, or material acquisition if deemed unsafe.

k. Identify where new chemical hazards may exist.

l. Review policies for chemical risk assessment, provide comments to the Director, EHS, and make recommendations for reducing chemical hazards.

6. <u>Chemical Hygiene Officer</u> (CHO) shall:

a. Implement the guidance in the Chemical Hygiene Plan (CHP) for handling and managing hazardous chemicals;

b. Review the CHP annually, make any necessary recommendations for revision, submit for approval, issue announcements to reflect current regulatory requirements and implement the revised guidance.

c. Review research protocols and standard operating procedures as necessary for operations using hazardous chemicals;

d. If necessary, conduct preoperational surveys of new operations using hazardous chemicals to determine if any additional engineering or administrative controls might be necessary.

e. Review plans and specifications for all laboratory construction, renovation, or modification to ensure compliance with applicable regulations;

f. Assist the Safety Officer in investigating all reported incidents/accidents that involve hazardous chemicals;

g. Provide guidance on chemical waste handling and disposal and chemical waste management.

h. Conduct inspections of all laboratories where chemical waste is generated or stored;

i. Assist PIs and laboratory personnel if necessary in obtaining Material Safety

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Data Sheets (MSDS) for chemicals used, stored, or manufactured in their laboratories.

j. Maintain copies of chemical inventories for all the laboratories at the USUHS.

k. Evaluate potential for chemical exposures and conduct air samplings of laboratory operations where there is a reasonable probability that employee exposure exceeds the action level for a chemical (see 29 CFR 1910.450^a).

l. Coordinate with the Occupational Medicine Division when necessary for the pre-placement, pre-assignment, and periodic job-related medical surveillance for military and civilian (non-HMJF) employees potentially exposed to hazardous chemicals (see USUHS Instruction 3200^f) as required by regulations or deemed necessary.

m. Organize or coordinate training programs (lectures, demonstrations, programmed instruction, briefings, training guides and videos, computer based training etc.) on the safe use and management of hazardous chemicals and maintain records of those trained.

n. Provide or coordinate consultative evaluations or specialized surveys, including certification compliance of engineering controls, when applicable or as set forth in governing regulations and professionally recognized guidance.

o. Notify affected employees of the results of the sampling within 15 working days of receipt of the results. Notification will be in writing, either addressed specifically to the individuals or by posting results in an appropriate location that is accessible to the affected employees.

p. Have authority to stop any procedure, operation, or material acquisition if deemed unsafe.

q. Provide guidance and disseminate information to department chairs on related

hazardous chemical regulations and requirements.

r. Provide guidance in determining which chemicals are to be considered and treated as hazardous chemicals in accordance with this CHP.

7. <u>Principal Investigators (PIs)</u> Ensure that research/clinical investigation proposals involving the use of hazardous chemicals are submitted to the Vice President for the Office of Research (VPR), who will coordinate the routing of Appendix (4) of USUHS Form No. 3208, "Assurance Supplement" to the Occupational Safety Division for review by EHS.

a. Maintain a current electronic chemical inventory in the (current version) EHS provided web-based software program available to or maintained by the PI and/or his or her designee at their workstation desktop. . Ensure the electronic inventory is updated at least annually from their working copy or whenever substantial additions or deletions to the laboratory chemical inventory occur. Maintain and protect computer system passwords needed to access the electronic inventory system.

b. Develop "Laboratory Site Specific" training and safety guidelines and train laboratory workers regarding hazards and potential hazards of the specific laboratory and its operation. Inform personnel of early signs and symptoms of exposure to chemicals within the laboratory. Inform personnel of the location of this instruction, the laboratory specific guidelines or CHP, and specific chemical safety procedures relevant to hazardous chemicals involved with the research. protocol or operation with which they are involved. Document personnel safety training, retain copies, and maintain in an auditable form (e.g. binder or electronic file) for EHS review.

c. Consider chemical safety practices, facilities, and equipment in design of proposals for new research.

d. Consult with EHS on requirements for physical examinations, (Occupational Medicine Division and exposure monitoring, exposure control, and waste disposal. (Industrial Hygiene Division)

e. Advise EHS of all incidents or accidents involving hazardous chemicals or personnel exposure to hazardous chemicals in such an incident or accident.

f. Maintain records of personnel working with hazardous chemicals and provide this list to EHS upon request.

g. Select and assign personnel for laboratory duties only after consideration of their capabilities, understanding of safety, and any recommendations from the Occupational Physician concerning the possible increase in risk to the individual from exposure to chemicals.

h. Ensure that a research protocol or standard operating procedure is prepared and approved by EHS for laboratory operations using hazardous chemicals. Have alterations/modifications to protocol procedures approved before initiating changes.

i. Ensure that laboratory personnel receive job-related medical surveillance as directed by the Occupational Medicine Division, EHS.

j. Ensure that personnel have received hazard communication training prior to beginning work in the laboratory.

k. Ensure that personnel are provided and have received adequate training in the use of protective clothing and equipment necessary to conduct routine operations and for use during potential emergencies.

l. Perform routine inspections of laboratory operations involving hazardous chemicals to ensure compliance with the research protocol, USUHS procedures, the CHP, applicable regulations, and accepted safe practices.

m. Ensure hazardous waste generators and handlers receive training in the management of hazardous waste.

n. Control and limit access to laboratories and chemical storage areas.

o. Determine the specific type of engineering controls (ventilations such as chemical/biological hoods, etc.) required for use in specific research. EHS, through the Industrial Hygiene and Environment (IHE) Division, will provide consultation upon request, on types of engineering controls and recommended applications, as well as the evaluation of their effectiveness.

p. Prepare and keep current Laboratory Specific Emergency Response information and procedures the work spaces under their control and maintain copies readily available to lab employees.

q. Inform laboratory employees of accident and emergency response procedures relative to specific operations.

r. Determine if additional laboratory safety training is necessary, and if so, coordinate additional training with EHS.

s. Coordinate with EHS prior to bringing chemicals into the University through means other than routine procurement. This is to ensure proper storage, handling, control, and disposal of hazardous chemicals.

8. <u>Laboratory or Shop Supervisor</u> The Laboratory or Shop Supervisor shall be the primary person responsible for a laboratory or space or procedure utilizing hazardous chemicals when a Principal Investigator (PI) or his/her designee is not available.

9. Laboratory Workers shall:

a. Plan and conduct laboratory operations using hazardous chemicals and biological agents in accordance with the provisions of this Instruction, and if applicable, an approved standard operating procedure.

b. Review with their supervisor all procedures that involve the use or handling of hazardous chemicals.

c. Comply with medical screening procedures which are deemed necessary by applicable regulation, the PI or Departmental Chairperson in coordination with EHS.

d. Report, upon confirmation, their pregnancy or other significant medical conditions (i.e., respiratory problems) to the PI and EHS, so that chemical exposures can be evaluated. This action cannot be mandated, however, it is strongly encouraged for the health and safety of the employee.

e. Use protective clothing and equipment necessary to conduct the operation in a safe manner as prescribed by the PI, EHS, applicable regulation or best practices.

f. Report hazardous conditions, chemical spills, exposures or abnormal circumstances associated with a hazardous chemical to their supervisor, or, if left uncorrected by the supervisor, to EHS.

e. Manage waste in accordance with applicable environmental regulations and USUHS policies.

F. Effective Date.

This Instruction is effective immediately.

Chall. E.E.

Charles L. Rice, M.D. President

Enclosures: 1. References 2. USUHS 6407-M

Enclosure 1

REFERENCES

- (a) USUHS Instruction 6407,"Implementation of Chemical Hygiene Plan (CHP)," dated May 3, 2011 (hereby cancelled).
- (b) Title 29, Code of Federal Regulations, Part 1910.1450 "Occupational Exposures to Hazardous Chemicals in Laboratories; Final Rule," dated July 1, 2009.
- (c) Title 29, Code of Federal Regulations, Part 1910.1200, "Hazard Communication," dated July 1, 2009.
- (d) DoD Instruction 6050.5, "DoD Hazard Communication Program," dated August 15, 2006.
- (e) UHS Instruction 6404, "Management of Controlled Substances, Regulated Chemicals, and Alcohol," dated May 15, 2009.

- (f) USUHS Instruction 6401, "Biological Safety Manual," dated September 1, 2006.
- (g) USUHS Instruction 3200, "Research and Clinical Investigation," dated September 1, 2006.
- (h) USUHS Waste Disposal Guide, <u>http://www.usuhs.mil/ehs/waste.html</u>, dated July 21, 2010.
- (i) DoD Instruction 4715.4, "Pollution Prevention," dated July 6, 1998.
- (j) USUHS Instruction 6002, "USUHS Occupational Health and Safety Program, Including Work-Related Injuries, Illnesses, and Medical Emergencies Involving University Employees," dated February 9, 2011.

USUHS CHEMICAL HYGIENE PLAN

1. Policy.

a. The Chemical Hygiene Plan^a (CHP) establishes the minimum requirements for the safe use of hazardous chemicals in the laboratory. Chemical exposure shall be minimized through the use of engineering and administrative controls, work practices, and protective clothing and equipment.

b. Laboratory personnel shall not be exposed to airborne concentrations, which exceed the more stringent of either the Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV) for a specific compound or mixture. The most current editions of 29 CFR 1910.1000^b and Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices^c will be used for PELs and TLVs values.

c. Acutely toxic compounds, carcinogens, and reproductive toxins shall be handled using the special procedures found in paragraph 18.

d. Employees will be made aware of the CHP and its location. This CHP shall be readily available to employees, employee representatives and upon request, to the Assistant Secretary of Labor for the Occupational Safety and Health, U.S. Department of Labor, or designee.

e. Employees shall be notified of area and "personal" monitoring results within 15 days of receipt of results. Notification of results will be made in writing, either individually or by posting results in an appropriate location that is accessible to employees.

(1) Laboratory procedures involving work with hazardous chemicals will be identified and addressed in research protocols through the use of Appendix (4) of USUHS Form No. 3208, "Assurance Supplement". f. Laboratory work involving hazardous chemicals not covered by a research protocol will have an approved standard operating procedure detailing the procedures for handling hazardous chemicals.

g. Employees shall be provided information and training to ensure that they are apprised of the hazards of chemicals present in their work area. Such information and training shall be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. In addition, bi-annual refresher training of employees shall be provided. Refer to paragraph 9 for additional information and training.

2. Program Administration.

a. Research protocols shall be prepared for and include each laboratory operation using hazardous chemicals in accordance with USUHS Instruction 3200^d. According to USUHS Instruction 3200^d the protocol proposal shall be forwarded to EHS for review and comment prior to approval. EHS shall evaluate the use and management of hazardous chemicals identified for use in the protocol.

b. If necessary, a pre-operational survey shall be conducted by representatives from EHS to identify health, safety, and environmental compliance issues before a new operation begins. The protocol shall not be approved until the pre-operational survey is completed and operations are approved.

c. Annual health and Safety Surveys shall be conducted in each laboratory.

3. Procurement.

a. Certain purchase requests for chemicals identified by EHS will be coordinated with the Chemical Hygiene Officer (CHO) prior to purchase. Purchase requests for new (not previously purchased) chemicals for USUHS will be coordinated with the CHO prior to ordering. Chemicals identified by the CHO will be flagged for CHO approval before purchasing. The University Financial System (DAI) may be used to coordinate chemical purchases and CHO approval.

b. Requesters should review health and safety data on chemicals before purchasing to determine special requirements for handling, storage, and disposal.

(1) MSDSs for chemicals used at the USUHS are available through the chemical manufacturer either received with the product or available from the manufacturer's website. EHS has subscribed to an MSDS retrieval service and MSDS's can also be requested in EHS (Room A2020). Laboratory personnel can view or obtain copies of MSDSs at any time during normal duty hours by calling EHS (295-9443). If circumstances warrant, an EHS person is also available on a 24-hour basis through USUHS Security (295-3038).

c. Personnel shall inspect containers upon receipt to ensure they are intact and not leaking. All containers shall be labeled in accordance with 29 CFR 1910.1200^g. Damaged or unlabelled containers shall not be accepted.

d. The Director, EHS, will be consulted, and approval received before chemicals, of any kind, are brought into the University through means other than the routine procurement procedures.

4. Chemical Storage.

a. Central Storerooms.

(1) New facilities shall be provided with central storerooms designed and constructed in accordance with NFPA Standard 30^h. Hoods, gas cabinets, or ventilated storage rooms should be provided when acutely toxic gases are stored in the laboratory.

(2) Requirements for central storage at existing facilities shall be evaluated by EHS on a case-by-case basis.

b. General. Chemical storage inside the laboratory shall be limited to those chemicals necessary to complete daily laboratory requirements. Central storerooms shall be used when they are available. Chemicals should not be permanently kept on the bench. Open shelves should be designed with restraining devices or lips to prevent containers from creeping or tipping over.

(1) Chemicals should be stored according to the compatibility of the categories. A separate cabinet should be used for each storage group. Chemicals stored in trays, desiccators, or secondary containers (large enough to contain the spill from the original container) may be stored with chemicals from another group when they are located on the bottom of the cabinet.

(2) Chemicals within a given storage group may be incompatible with other chemicals in that group. Laboratory personnel shall determine intra-category incompatibility and minimize incompatible storage when possible. Spill trays should be used to reduce spreading in the event of spills or leaks.

(3) Chemicals shall be inspected by laboratory personnel at least semi-annually to determine their condition. Corroded or leaking containers should be replaced and turned in, along with outdated or excess chemicals.

(4) Cabinets shall be labeled with storage code and compatibility category.

c. Inventories.

(1) Chemical inventories shall be available for each individual room where chemicals are stored or used. The inventory shall be maintained by the principal investigator or other responsible party and list the chemical name, quantity stored and typical use rate. Chemical inventories shall be provided to EHS during Annual Health and Safety Surveys.

(2) Principal Investigators or their representative shall update the inventory at least annually or when major changes occur. Copies shall be made available to EHS upon request.

(3) Copies of chemical inventories are maintained electronically by EHS and are accessible in the event of an emergency.

(4) The chemical inventory will, as a minimum, consist of chemicals identified in the Chemical Hazard Index published by EHS, or any chemical identified as hazardous or toxic per attachment 2 of this Enclosure.

(5) Inventories should include chemicals used in the specific laboratory or workspace but stored elsewhere.

d. Flammable and Combustible Liquids.

(1) The quantity of flammable and combustible liquids stored in a laboratory room shall not exceed 10 gallons or one month's supply, whichever is less. The quantity of liquids stored in an approved inside storage room shall be in accordance with NFPA Standard 30^{h} .

(2) Flammable and combustible liquids shall be stored in glass, metal, or plastic containers, which meet the requirements of NFPA Standard 30^{h} . Class I liquids shall be stored in approved safety cans when the container quantity exceeds 2 gallons. Combustible liquids shall be stored in approved safety cans when the container quantity exceeds 5 gallons per NFPA Standard 45^{i} . (3) Flammable and combustible liquids shall be stored in approved cabinets designed in accordance with NFPA Standard 30^h. Cabinets should not be located adjacent to an exit or in a stairwell. Cabinets shall not be vented without approval from EHS.

(4) The transfer of Class I liquids to smaller containers from bulk containers not exceeding 5 gallons shall be conducted in a chemical hood or in an approved inside storage room. The transfer of Class I liquids from bulk containers exceeding 5 gallons shall be conducted in an approved inside storage room or outdoors per NFPA Standard 45ⁱ.

(5) Class I liquids shall not be transferred between metal containers unless the containers are electrically bonded.

(6) Refrigerators and freezers used to store flammable liquids shall be explosion-proof or "laboratory safe" in accordance with NFPA Standard 45ⁱ.

e. Water Reactive Chemicals.

(1) Water reactive chemicals shall be segregated from other chemical storage. These chemicals should be stored in approved cabinets designed in accordance with NFPA Standard 30^h. If approved cabinets are not available, with their original containers, should be packed tightly in a metal can during storage. Some of the common water reactive chemicals are listed in Attachment 4 of this Enclosure. Consult EHS for more information.

(2) Water reactive chemicals shall not be stored with flammable or combustible liquids. Cabinets used for storage of water reactive chemicals shall be posted. "CAUTION – WATER REACTIVE CHEMICAL."

f. Shock Sensitive Chemicals.

(1) Unless the manufacturer has added an inhibitor, unopened containers of shock sensitive chemicals should be turned in after 12 months of storage. Once opened, shock sensitive chemicals should be turned in after 6 months of storage.

(2) Shock sensitive chemicals shall be prominently noted on the inventory. A list of shock-sensitive chemicals in included as Attachment 5 of this Enclosure. Consult EHS for further information.

g. Toxic Chemicals.

(1) Toxic chemicals should be segregated from other chemicals and stored in a closed cabinet. The cabinet shall be posted "TOXIC CHEMICALS." Flammable toxic chemicals shall be stored in accordance with paragraph d.

(2) Toxic chemicals should be stored in a well-ventilated area. The storage of unopened containers presents no unusual hazard. Once opened, containers should be sealed with paraffin or tape.

h. Compressed gases.

(1) General Requirements.

(a) Only personnel trained in the handling, transporting, storage, and use of compressed gases shall perform these operations.

(b) Gas cylinders shall be labeled or tagged to show their contents.

(c) Gas cylinders shall be secured by the use of clamps, chains, or straps while in storage or use.

(d) When gas cylinders are not in use, hand valves shall be tightly closed and the valve protector cap shall be in place.

(e) Compressed gas from cylinders shall be reduced through the use of a regulator specifically designed for that purpose.

(f) Reduction valves, gauges, and fittings used for oxygen shall not be used for other gases. Likewise valves, gauges, and fittings used for other gases shall not be used for oxygen.

(2) Storage Requirements.

(a) Gas cylinders stored outdoors shall be located in a secured area.

Gas cylinders shall not be stored near sources of ignition, heat, or open flames.

(b) Gas cylinders shall not be stored in a laboratory room. Requirements for cylinder use shall be kept to a minimum. Manifold systems should be used when feasible.

(c) Gas cylinder storage areas shall be posted with the names of the gases in storage. Areas where hydrogen or other flammable gases are stored shall be posted, "DANGER – FLAMMABLE GAS, NO SMOKING OR OPEN FLAMES WITHIN 50 FEET."

(d) Gas cylinders shall be segregated by their classification (i.e., flammable, toxic, or oxidizer). Oxidizers shall be separated from flammable gases as much as possible. Storage of these gases in close proximity must be approved by EHS.

(e) Full and empty gas cylinders shall be stored in separate locations of the storage area. Empty gas cylinders shall be appropriately marked.

(f) Empty gas cylinders shall be returned to the manufacturer for refilling. Non-refillable cylinders shall be disposed of in accordance with USUHS Instruction 6002^j.

(3) Acutely Toxic Gases.

(a) Acutely toxic gases used in the laboratory shall be stored in a chemical hood or gas cabinet. Administrative controls, such as reducing gas mixture concentrations and cylinder size, shall be used to minimize risk. Flow-limiting orifices shall be required on a case-by-case basis. If appropriate storage is not available, EHS will provide storage for acutely toxic gases.

(b) Outdoor storage facilities should be located at least 75 feet from buildings. A gas cabinet should be provided to handle leaking cylinders.

i. Distribution.

(1) Toxic, flammable, or corrosive chemicals should be placed in a carrying bucket or other unbreakable container when being moved between rooms or through the laboratory corridors.

(2) Wheeled carts should be used to move larger quantities of chemicals, which cannot be hand-carried. Wheels shall be designed to travel over uneven surfaces without tipping or stopping suddenly. Carts with open shelves should be designed with a restraining device or lip to prevent containers from creeping or tipping over.

(3) Freight elevators should be used to move chemicals between floors when available. Passenger elevators shall not be used when personnel are on-board, however, these may be placed out-of-service temporarily to move chemicals.

(4) Compressed gas cylinders shall be moved using a suitable hand truck. The gas cylinder shall be strapped in place with the valve protector cap installed. Only one cylinder shall be moved at a time. Acutely toxic gases should be moved during off-duty hours. Approved escape respirators shall be readily available in the event of an emergency.

5. Engineering Controls.

a. General Practice. Engineering controls including hoods, glove boxes, inhalation chambers, gas cabinets, local exhaust ventilation, and the practice of substituting less toxic chemicals, should be used to minimize exposure to all hazardous chemicals in the laboratory.

b. Laboratory Operations, which involve chemicals with a PEL or TLV of 100 ppm or less (gas or vapor) or 0.1 mg/m3 or less (aerosol) shall be planned and conducted using appropriate engineering controls. High-risk operations shall be conducted inside primary containment including chemical hoods or glove boxes. Low risk operations, where the potential for generation of gas, vapor, or aerosol contamination is remote, may be conducted on the open bench.

c. Design/Performance Criteria.

(1) Chemical Hoods.

(a) Hoods shall have an average face velocity of 90 to 120 feet per minute (fpm) with the sash in the fully open position. Existing hoods designed and operating at 120 to 180 fpm may be used as long as adequate performance is documented. Sash stops should be installed when the face velocity requirement cannot be met with the sash in the fully open position. Individual velocity readings should be within 20 percent of the average face velocity to ensure uniform airflow.

(b) Hood performance shall be evaluated annually and after any repair or modification to the ventilation system. Interconnected systems shall be evaluated together to determine the overall system performance. Procedures used to evaluate hood performance shall be approved by the CHO.

(c) Hoods used for highly toxic compounds, carcinogens, or reproductive toxins should be equipped with an audible and visual alarm, which is activated when the centerline face velocity drops below 90 fpm. All hoods should be equipped with a manometer or magnehelic gauge so that laboratory personnel can monitor static pressure to determine when preventive maintenance is necessary.

(d) Prior to each day's operation, personnel will check the operation of the hood. If the hood does not appear to be operating properly, discontinue laboratory work and notify EHS immediately.

(2) Glove Boxes

(a) Glove boxes shall be maintained at a negative pressure of at least 0.25 inches water gauge.

A manometer or magnehelic gauge shall be installed to monitor differential pressure.

(b) Glove boxes shall have an inward velocity of at least 90 fpm through all open ports or doors. Total makeup air volume shall be adequate to prevent explosive concentrations of gas, vapor, or dust inside of the enclosure.

(c) Glove box performance shall be evaluated semi-annually, and after any repair or modification to the ventilation system.

(3) Inhalation Chambers. The design and performance criteria for inhalation chambers shall be the same as that for glove boxes.

(4) Gas cabinets.

(a) Gas cabinets shall be ventilated at a minimum rate of 80 cubic feet per minute (cfm) per square foot of cabinet space (cross-sectional area) or 125 cfm per cylinder. An inward velocity of at least 200 fpm shall be maintained through the access door.

(b) A manometer or magnehelic gauge shall be installed to monitor differential pressure.

(c) Cabinet performance shall be evaluated annually and after any repair or modification to the ventilation system.

(5) Local Exhaust Ventilation. Design/performance criteria for local exhaust ventilation should be in accordance with the ACGIH Industrial Ventilation Manual^k (latest edition). System performance shall be evaluated annually and after any repair or modification.

(6) Air Balance.

(a) Laboratories shall be maintained under negative pressure with respect to corridors and administrative areas. This requirement shall be monitored during hood performance evaluations. Exhaust air from chemical fume hoods shall not be recirculated. (b) Adequate conditioned makeup air shall be provided to ensure a safe environment and operation of the ventilation system.

(7) Biological Safety Cabinets. Laminar-flow devices such as biological safety cabinets, laminar flow hoods, and clean benches, which are designed, for the containment or isolation of biological (infectious) materials are not suitable for work involving hazardous chemicals. Such devices will not be used as substitutes for properly-functioning chemical fume hoods.

a. Preventive Maintenance. Laboratory ventilation systems should be provided routine maintenance.

b. Filtration and Vacuum Systems. House vacuums should be provided with in-line filters or traps (available from the Self Service Store) to prevent mechanical contamination. Vacuum pumps should be vented into a hood or exhaust ventilation systems.

6. Administrative and Work Practice Controls.

a. General. High-risk laboratory operations shall not be left unattended or conducted after normal duty hours without prior approval from EHS.

b. Signs and Labels.

(1) Entrances to laboratories and chemical storage rooms shall be clearly posted with the following information: Principal investigators and alternate names and telephone numbers for both work and home. Personnel should avoid posting items on the door, which may confuse or obscure important health or safety information.

(2) Locations of eyewash/safety showers, first aid kits, and fire extinguishers should be posted.

(3) Posting requirements for biological agents and radioactive materials are covered in other USUHS instructions.

c. Handling Chemicals.

(1) Working quantities of hazardous chemicals outside of storage during an operation shall be as small as practical. Containers shall be closed when not in use.

(2) Care should be taken to minimize aerosol formation during complex manipulations. Electrostatic powders and other solid materials shall be handled in solution whenever feasible. Glove boxes or glove bags inside a chemical hood may be required on a case-by-case basis.

(3) Mouth pipetting is prohibited. Do not use mouth suction for pipetting or starting a siphon.

d. Laboratory Glassware.

(1) Handling and storage procedures should be developed to minimize damage to glassware. Glassware should be inspected before each use. Damaged items shall be repaired or discarded in containers labeled "Glass Only."

(2) Glassware used for pressure or vacuum service shall be designed specifically for that purpose. Damaged or repaired glassware should not be used for pressure or vacuum operations. Pressure or vacuum operations shall be adequately shielded.

e. Chemical Hoods. The following work practices shall be used to ensure adequate hood performance:

(1) Work with the hood sash lowered to at least the point where the calibration checkpoint marks a line. This will allow for the optimum airflow rates to best control contaminants. **Do not place your head inside the hood.**

(2) Keep all apparatus and containers at least 8 inches behind the face of the hood to minimize spillage from the hood.

(3) Keep the slot in front of the lower hood baffle free from obstructions. Elevate all necessary apparatus and equipment.

(4) Minimize the storage of chemicals or hazardous waste inside the hood. Use

approved cabinet or satellite storage locations.

(5) Minimize pedestrian traffic past the open face of the hood. This may cause spillage of contaminants.

(6) Keep laboratory doors closed during laboratory procedures involving hazardous chemicals.

7. Protective Clothing and Equipment.

a. Eye Protection. Eye protection shall meet the requirements of ANSI Standard $Z87.1^{1}$.

(1) Eye protection suitable for the operation being conducted shall be worn in all laboratories where hazardous chemicals are being handled. Safety glasses shall be considered the minimum eye protection to be used in the laboratory. Chemical goggles shall be worn during operations where a splash hazard exists or where corrosives are used.

(2) Face shields shall be worn when additional eye/face protection is necessary against splash or projectiles. Face shields shall be used in combination with approved eye protection.

(3) Contact lenses are not recommended to be worn in the laboratory.

(4) Visitors shall comply with the above requirements.

b. Gloves

(1) Glove selection should be based on the potential and severity of liquid contamination as well as their suitability for the operation performed. For operations with the potential for prolonged or severe liquid contamination, selection shall be based on the available permeation and degradation data for the specific chemical. Contact the CHO for guidance.

(2) Nonstandard butyl rubber gloves can be used for operations where the potential for liquid contamination is minimal. If a high degree of manual dexterity is required and the potential for

liquid contamination is remote, disposablesurgical-latex gloves may be used.

(3) Insulated gloves shall be used to prevent contact with hot or cold surfaces. Asbestos-containing gloves shall not be used.

(4) The following glove discipline shall be followed:

(a) All gloves shall be visually inspected for cuts, tears, and degradation before each use. A leak test shall be performed (when and wherever appropriate) to identify pinholes. Damaged or leaking gloves shall not be used.

(b) Gloves, other than disposable type, shall be decontaminated as soon as practical after contamination during an operation. Disposable type gloves shall be removed without decontamination and disposed of appropriately; **reuse is prohibited.**

(c) Gloves shall not be removed from the working area of a hood once used unless they are to be disposed of.

(d) Personnel should become proficient at doffing gloves to prevent cross contamination. Employees shall wash their hands with soap and water after gloves have been removed.

c. Clothing.

(1) Lab coats or smocks shall be worn over street clothes inside all laboratories where hazardous chemicals are handled or stored. These shall not be worn for extended periods of time in non-laboratory areas except when transporting hazardous waste. Personnel shall remove and launder or dispose of these garments once contamination has occurred.

(2) Laboratory personnel shall wear closed-toe shoes. The use of sandals is prohibited. Steel-toe or conductive shoes shall be worn when determined necessary by the principal investigator or EHS.

(3) Chemical protective clothing including aprons, boots, or one-piece suits

shall be worn when there is a high risk of chemical contamination. Equipment shall be inspected for cuts, tears, and degradation before each use. Decontamination and doffing procedures shall be developed for individual protocols.

d. Respiratory protection. Use of respirators shall be in accordance with OSHA 29CFR1910.134. Military masks shall not be used to provide protection against non-surety chemicals unless they have been tested and found effective. For these cases, the military mask may be used for escape purposes only.

e. Eyewash/Safety Showers. Design and installation of new equipment shall comply with ANSI Standard Z358.1ⁿ.

(1) For new construction, an eyewash and safety shower shall be installed in each laboratory where hazardous chemicals are handled or stored. The adequacy of equipment in existing laboratories shall be determined by EHS.

(2) Equipment shall be inspected by the user periodically to determine if it is functional. Eyewashes shall be inspected by laboratory workers at least monthly. Safety showers shall be inspected at least annually by EHS.

(3) Signs should be used to post the location of each eyewash and safety shower in the laboratory.

(4) Equipment shall be accessible at all times. Personnel shall not store equipment, apparatus, or containers in front of an eyewash or safety shower.

8. Air Monitoring.

a. Air monitoring shall be conducted by EHS when there is a reasonable probability that employee exposure exceeds the action level for a chemical (see 29 CFR 1910.1450°).

b. If the initial determination indicates employees are exposed above the action level, or in its absence one-half of the PEL for an OSHA-regulated substance, periodic monitoring shall be conducted in accordance with respected references and the best available guidance.

c. The requirement for periodic air monitoring may be terminated when conditions are found to be safe and below levels which require periodic monitoring in accordance with the particular standard.

9. Information and Training.

a. Laboratory personnel shall be provided with information and training to ensure they are apprised of chemical hazards in the laboratory. At a minimum, the following health and safety information shall be provided (see 29 CFR 1910.1450°).

(1) Contents of the OSHA Laboratory Standard and its appendices.

(2) Location and availability of this CHP.

(3) PELs for OSHA –regulated substances.

(4) Signs and symptoms associated with exposure to hazardous chemicals used in the laboratory.

(5) Location and availability of reference material including MSDSs.

(6) Details of this CHP.

(7) Methods and observations that may be used to detect the presence of hazardous chemicals; (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released etc.).

(8) Physical and health hazards of chemicals used in the laboratory.

(9) Measures personnel can take to protect themselves from these hazards including use of engineering controls, work practices, and personal protective equipment.

b. Experimental agents. Health hazard information for experimental agents developed at USUHS shall be made available to personnel. c. Hazardous Waste. Personnel handling hazardous wastes shall be trained in the environmental requirements for its management. At a minimum, training shall include the following:

(1) Resource Conservation and Recovery Act (RCRA) including authority, regulatory framework, and general requirements.

(2) Site-specific information including facility operation, emergency equipment and procedures, inspection procedures, hazardous material pollution prevention, waste minimization, chemical reissue program, and hazardous waste turnin procedures.

10. Hazard Communication.

a. The hazard communication program shall be conducted in accordance with the USUHS Hazard Communication Program and DoD Instruction 6050.5^p. Some basic information on the University's Hazard Communication program is outlined here.

(1) New employees receive an initial briefing on the University's Hazard Communication program during their initial Safety orientation class provided by EHS.

(2) A copy of the Hazard Communication Rule is available for review at EHS in Room A2020.

(3) Laboratories and shops have primary responsibility for maintaining MSDS's or having the ability to obtain an MSDS through electronic means either stored locally or from the chemical manufacturer. EHS is the office of primary oversight for MSDSs and MSDS's can also be obtained at any time by contacting EHS at 295-9443.

(4) An inventory of hazardous chemicals for work areas is available from the responsible PI or from EHS on Room G040.

(5) Labels must be maintained on all containers.

(6) A refresher briefing on hazard communication is presented by EHS to those employees available in the work place at the time of the annual health and safety survey.

11. Personal Hygiene.

a. Food, drink, smoking material, or cosmetics shall not be carried into or stored in the laboratory. Personnel shall not eat, drink, smoke, chew gum, or apply cosmetics in the laboratory.

b. Personnel shall wash their hands after handling hazardous chemicals. Personnel shall shower after abnormal circumstances, which result in chemical contamination to the neck, arms, legs, or body.

c. Personnel shall restrain long hair and loose clothing to minimize the risk of chemical contamination.

d. Mouth pipeting is prohibited.

12. First Aid.

a. Laboratory personnel and supervisors should report all laboratory injuries and illnesses to EHS. The patient shall be seen by a qualified medical physician for treatment and the incident documented.

b. For severe injury or illness dial 777, report the injury and location of the emergency, and await ambulance transportation. Render appropriate first aid while waiting for transport. If only minor first aid is required, and there is not chemical contamination, personnel may be transported to a medial emergency room in a private vehicle.

c. The following general first aid procedures should be followed in the event of chemical contamination or acute exposure.

(1) Eye contact. Immediately flush eyes with water for at least 15 minutes. Hold eyelids apart to ensure adequate irrigation. Seek prompt medical attention.

(2) Skin contact. Immediately flush the affected area with water and remove

contaminated clothing. Wash the area with hand soap or mild detergent to remove any residual contamination. Seek prompt medical attention.

(3) Ingestion. Drink large amounts of water to dilute the chemical. Seek prompt medical attention.

(4) Inhalation. Move employee away from toxic atmosphere and expose to fresh air. Begin artificial respiration if breathing has stopped. Use CPR if the heart has stopped.

13. Medical Surveillance.

a. Medical examinations and consultation shall be performed by or under direct supervision of a licensed physician.

b. Replacement, reassignment, and periodic job-related medical surveillance shall be provided to all military and civilian employees potentially exposed to hazardous chemicals as required by USUHS Instruction 6002^j.

c. Additional medical attention shall be provided to employees under the following circumstances:

(1) When an employee develops signs or symptoms associated with occupational exposure to a hazardous chemical.

(2) When air sampling reveals exposure levels above the action level, or in its absence the PEL for an OSHA regulated substance. Medical surveillance shall comply with the requirements of that particular standard.

d. Medical consultation shall be provided whenever an abnormal event such as a spill, leak, or explosion takes place in the laboratory. Its purpose shall be to determine whether subsequent medical examination is necessary.

e. For medical examinations and consultation required under paragraph c, the examining physician shall provide a written opinion which includes the following:

(1) Any recommendations for further medical follow-up.

(2) Results of the medical examination and diagnostic tests.

(3) Any medical condition which may be revealed in the course of the examination that places the employee at an increased risk as a result of exposure to a hazardous chemical found in the workplace.

(4) A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination.

(5) The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.

f. Pregnancy Surveillance. Pregnancy surveillance if applicable, is monitored by the Occupational Medicine Division in EHS.

(1) Female employees of childbearing age shall be informed about reproductive hazards in the laboratory. The pregnant employee and her unborn child shall not be endangered by the work assignment.

(2) Pregnant employees are strongly encouraged to notify their principal investigator and EHS as soon as the pregnancy is known. The principal investigator shall notify EHS of pregnancies among their staff and report any known or suspected hazards to the pregnancy.

(3) EHS will, when notified of a pregnancy, conduct a pregnancy evaluation to assess hazards to the pregnancy.

g. When an employee has been referred to a physician, the physician shall be provided the following information.

(1) The identity of the hazardous chemical(s) to which the employee may have been exposed.

(2) A description of the conditions under which the exposure occurred including quantitative exposure data if available. (3) A description of the signs and symptoms of exposure that the employee is experiencing, if any.

14. Chemical Waste Disposal.

a. Laboratory wastes shall be handled and disposed of in accordance with applicable federal (Title 40, Code of Federal Regulations, Parts 260-265, "Hazardous Waste Managements Regulations"⁹), state (Title 26, Code of Maryland Regulations (COMAR), subtitle 13, "Disposal and Control of Hazardous Substances"^r), and local environmental regulations and policies. All chemicals in the laboratory shall be labeled properly to ensure their identities are retained from initial receipts. When chemicals are combined and become part of a laboratory waste mixture, a record of all chemicals in the mixture shall be maintained.

b. Personnel shall minimize the generation of hazardous waste whenever feasible. Common methods of waste minimization include substitution of less hazardous chemicals, process changes, purchasing only necessary quantities, recycling or reuse.

c. Containers holding hazardous waste shall be labeled with a USUHS Form No. 6301, "Hazardous Waste Disposal Label," and listed on an, "Internal Hazardous Waste Disposal Manifest," form, NNMC Form No. 6290.

d. Disposal procedures for hazardous waste are established by EHS. Researchers are encouraged to consult EHS to establish disposal procedures.

e. Non-hazardous chemical waste shall be disposed of in accordance with the USUHS Waste Disposal Guide^s.

15. Chemical Spills.

a. General.

(1) The spill of any quantity of a hazardous chemical which results in a release to the environment (i.e., air, land, or water) or exposure to personnel shall be immediately reported to EHS (295-3443/3323). Laboratory personnel may take action to stop or contain a spill if it can be done without endangering themselves or other personnel. When a spill causes a health hazard, all potentially affected laboratories shall be evacuated immediately.

(2) Personnel shall use appropriate protective equipment and clothing to minimize chemical exposure during spill clean up. Specific requirements shall be available through EHS.

(3) Laboratories shall have supplies and equipment to handle small spills. These include absorbents, neutralizers, mops, buckets, dustpans, paper towels, sponges, and waste containers.

(4) Spill trays shall be used for all complex operations where there is a reasonable probability that a spill could occur.

(5) Laboratory spills shall be reported to the EHS (295-9443/3323). All waste shall be handled in accordance with the USUHS Waste Disposal Guide^s.

b. Liquid Spills.

(1) Spills should be confined using trays, absorbents, or paper towels whenever feasible.

(2) Neutralize inorganic acids with an appropriate chemical or use an absorbent mixture (i.e., soda ash or diatomaceous earth). Other liquids should be absorbed with a non-reactive material, such as sand or vermiculite and placed in a suitable container.

(3) Flammable liquids. Turn off or remove all ignition or heat sources. Continuously ventilate the area. Absorb the liquid with a non-reactive material and place in a suitable container.

c. Solid Spills. Low toxicity materials should be swept into a dustpan and placed in a suitable container. Wet methods or HEPA filtered vacuum shall be used to clean up toxic materials. **Dry sweeping is prohibited.**

16. Emergencies.

a. Disaster Control/Emergency Response Information. It is the responsibility of the principal investigator, or other workplace supervisor, to provide updated emergency points of contact information to the main Security office.

b. Each principal investigator will write an emergency plan for each laboratory under his/her control and maintain copies in the laboratory. The emergency plan will include, but not be limited to, the following elements:

(1) Emergency alarm system. Laboratories should have a system available to alert personnel in the event of an emergency that may require evacuation. Personnel shall be familiar with the location and operation of the alarm system.

(2) Evacuation procedures. Primary and alternate routes shall be established as necessary and communicated to personnel. Outside assembly areas shall be designated.

(3) Shutdown Procedures. Instructions should be prepared for shutting down equipment or apparatus in the event of an emergency.

(4) Return procedures. Procedures shall be developed to ensure personnel do not re-enter the laboratory before the emergency is over.

(5) Drills. Drills incorporation all elements of the emergency plan should be conducted periodically to test the emergency plan.

c. Fires.

(1) Laboratory personnel shall not attempt to extinguish large fires. The following steps should be taken:

(a) Confine the fire by closing the hood sash or laboratory doors and fire doors as appropriate.

(b) Immediately evacuate the fire area and dial 777 to contact the base fire department. (c) Implement the Laboratory Emergency Plan as prescribed by the Principal Investigator.

(2) If feasible, small fires at the initial stage may be extinguished by designated laboratory personnel trained in the use of portable fire extinguishers. At least two personnel shall be available when the fire is extinguished. The following steps should be taken:

(a) Alert other personnel and have them dial 777 to notify the fire department.

(b) Extinguish the fire directing the discharge at the base of the flames.

(c) If the fire cannot be controlled, evacuate the area and implement the guidance in paragraph (b) above.

d. Ventilation failure.

(1) Operations shall be terminated in a safe manner in the vent of a low flow condition or complete ventilation failure. Personnel shall:

(a) Close the hand valve on all compressed gas cylinders.

(b) Turn off laboratory air, vacuum, and propane gas systems to equipment and apparatus.

(c) Close containers to volatile chemicals.

(d) Close the chemical sash hood.

(e) Evacuate the laboratory room.

(f) Report the incident to EHS (295-9443/9442).

(2) Personnel shall not re-enter the laboratory until ventilation has been restored for at least 30 minutes or until directed to do so by EHS.

(3) In cases where the operation could not be terminated and there is a reasonable probability that the laboratory atmosphere is unsafe, air monitoring may be necessary before reentry. The CHO shall be contacted for guidance (295-9442).

17. Housekeeping.

a. Laboratories shall be kept clean and free from obstructions. Personnel shall clean up work areas at the end of each day's operations. Chemical spills shall be cleaned up immediately to minimize contamination.

b. Hazardous waste shall be stored in appropriately marked closed containers and turned in to EHS for disposal. Non-hazardous sold and liquid waste shall be stored in appropriate receptacles or containers.

c. Equipment, apparatus, and chemical inventories shall be properly stored. Excess equipment and chemicals shall be turned in to minimize clutter in the laboratory.

d. Floors shall be cleaned routinely to minimize resuspension of dust and toxic contaminants. Wet methods or HEPA filtered vacuum shall be used for the clean up of toxic chemicals.

e. Stairways and halls shall not be used as storage areas. Access to exits and emergency equipment shall not be blocked.

18. Special Procedures for Handling Acutely Toxic Compounds, Carcinogens, or Reproductive Toxins.

a. General. In addition to the hygiene practices covered in the previous paragraphs, the following special procedures are to be used for laboratory operations involving acutely toxic compounds, carcinogens, or reproductive toxins. Information on chemical carcinogens is available through EHS.

b. Storage and Distribution.

(1) Acutely toxic compounds, carcinogens, and reproductive toxins should be segregated from other chemicals and stored in a well-ventilated area. When available, ventilated cabinets shall be used for storage.

(2) Cabinets shall be posted, "DANGER – CHEMICAL CARCINOGEN," "CAUTION – CANCER SUSPECT

AGENT," or "CAUTION – TOXIC AGENTS," as appropriate.

(3) Storage of unopened containers presents no special hazard. Once opened, containers of volatile chemicals shall be closed and sealed with parrafin or tape, or over packed in an unbreakable, sealed container.

(4) Acutely toxic compressed gases shall be stored in a chemical hood or gas cabinet. Time outside of storage shall be kept to the minimum required to do the work. EHS has storage available for acutely toxic compressed gases.

(5) Acutely toxic compounds, carcinogens, or reproductive toxins shall be placed in an unbreakable secondary container prior to transport through the laboratory. The secondary container should contain absorbent material to absorb the contents in the event of a spill. Secondary containers shall be appropriately labeled.

c. Engineering Controls.

(1) Laboratory operations which involve acutely toxic compounds, carcinogens, or reproductive toxins shall be planned and conducted using appropriate engineering controls. High-risk operations shall be conducted inside primary containment including chemical hoods, glove boxes, or inhalation chambers. Low risk operations, where the potential for generation of gas, vapor, and dust or aerosol contamination is remote, may be conducted on the open bench.

(2) Effluent from test equipment or apparatus shall be filtered or scrubbed before discharge into primary containment. House vacuums shall be provided with inline filters or traps to prevent contamination. Vacuum pumps shall be vented into a chemical hood or local ventilation system.

(3) Analytical instrumentation which generates vapor or aerosol contamination shall be vented into a hood or operated using local exhaust ventilation to capture air contaminants.

d. Administrative and Work Practice Controls.

(1) Two Man Rule. High-risk operations may require application of the two-man rule. Requirements shall be determined by the CHO on a case-by-case basis.

(2) Designated Area.

(a) Laboratory operations shall be conducted in a "designated area" where access to unauthorized personnel is restricted. The area may be the entire room, an area within the room, or the primary containment. Doors leading to the designated area shall remain closed at all times.

(b) Each designated area shall be posted, "DANGER – CHEMICAL CARCINOGEN," "CAUTION – CANCER SUSPECT AGENT," or "CAUTION – TOXIC AGENTS – AUTHORIZED PERSONNEL ONLY," as appropriate.

(3) Working surfaces. Working surfaces shall be non-porous and covered with absorbent, plastic-backed paper. Spill trays should be used with complex manipulations are conducted.

e. Decontamination. Contaminated equipment, apparatus, and glassware shall be decontaminated before removal from the designated area. Working surfaces shall be decontaminated prior to beginning new operations. Acetone, methanol, or water is recommended for solvent washing when chemical decontamination is not feasible.

f. Chemical Spills. Wet methods or HEPA filtered vacuum shall be used. **Dry Sweeping shall be prohibited.** To clean up spills of acutely toxic compounds, carcinogens, or reproductive toxins, personnel shall use appropriate protective clothing and equipment to minimize exposure.

g. Waste Disposal. Acutely toxic compounds, chemical carcinogens or reproductive toxins

shall be chemically decontaminated prior to disposal whenever feasible. Specific decontamination procedures shall be provided in the protocol. Decontamination and solvent wash solutions shall be disposed of in accordance with EHS guidance.

h. Animal Work.

(1) Administration of acutely toxic compounds, carcinogens, or reproductive toxins to animals shall be by injection or oral gavage instead of dietary whenever feasible. If dietary administration must be used, cages should be maintained under negative pressure. The diet shall be mixed in a chemical hood or under local ventilation.

(2) Work practice controls, including wet cleaning methods and HEPA filtered

vacuums, shall be used to minimize the generation of contaminated aerosols, including those from food, urine, and feces.

(3) Laboratory coats or smocks and gloves shall be worn in all animal-handling areas. Additional requirements, including head and shoe coverings or respiratory protection, shall be determined by CHO on a case-by-case basis.

19. General Laboratory Safety.

Laboratory equipment and apparatus shall be used in accordance with the manufacturer's specifications and instructions. The Director, EHS shall perform an equipment hazard analysis on all equipment developed in-house if applicable.