

4.5 LABORATORY CHEMICAL HYGIENE

National Park Service Policy

Each laboratory within each park will establish a chemical hygiene plan and program that is specific to the laboratory's operations in accordance with 29CFR1910.1450. The laboratory chemical hygiene plan is designed to reduce the possibility of injury or illness to employees by implementing specific procedures that will be followed when using hazardous chemicals in the laboratory.

Scope

A laboratory chemical hygiene plan and program will be implemented under the following circumstances:

1. When chemical manipulation is conducted on a laboratory scale.
2. When multiple chemical procedures are used.
3. When procedures are not a part of production or simulated production.

National Park Service Laboratory facilities and operations that may typically fall within the scope of the Laboratory Chemical Hygiene program include resources laboratories, medical laboratories, wastewater treatment and air quality laboratories performing analysis for determining compliance with discharge criteria. Implementation of a chemical hygiene plan requires and assumes that protective laboratory practices and equipment are available.

Laboratories that conduct analyses as part of a production processes, such as water quality analysis in the production of drinking water, are not within the scope of this section or 20 CFR 1910.1450. For this type of operation the requirements of Hazard Communication standard will be followed to inform workers of chemical hazards and protective measures.

References

1. 29 CFR 1910.1450 Occupational Exposure to Hazardous Chemicals in Laboratories.
2. 29 CFR 1910.84 Ventilation.
3. AIHA. 1995. Laboratory Chemical Hygiene, An AIHA Protocol Guide. American Industrial Hygiene Association.
4. USEPA Safety Health and Environmental Guidelines, Volume 1 Chapter 24, Chemical Hygiene Plan.
5. ANSI/AIHA. 2003. American National Standard – Laboratory Ventilation. ANSI/AIHA Z9.2—3. AIHA

Program Elements

1. *Chemical Hygiene Officer.* A Chemical Hygiene Officer (CHO) must be designated to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan. The CHO must be qualified by training and experience to provide technical guidance in the development, implementation and periodic review of the chemical hygiene plan.
2. *Hazardous Chemical Inventory.* An inventory of chemicals used in the laboratory must be conducted and updated as new chemicals are purchased. The inventory must be made available to all employees that use hazardous chemicals or that may potentially be exposed to them. A site-specific list of chemicals in the laboratory should be prepared and will also be included as part of the Chemical Hygiene Plan.
3. *Material Safety Data Sheets (MSDS).* MSDS's for all laboratory chemicals must be maintained and readily available to employees in the laboratory.
4. *Protective Practices and Equipment.* Protective laboratory practices must be implemented and protective equipment must be available and in common use to minimize the potential for employee exposure to hazardous chemicals.
5. **Minimize chemical exposures.** Because many laboratory chemicals are hazardous, general precautions for handling all laboratory chemicals should be adopted, rather than providing specific guidelines for particular chemicals. All skin contact with chemicals should be avoided and all operations will be designed to minimize the amount of material used. Knowledge of specific route(s) of chemical exposure (i.e., inhalation, ingestion, absorption and injection) as well as the target organs of those chemicals will enable NPS employees to better protect themselves with appropriate engineering and administrative controls, and personal protective equipment.
6. **Special hazards.** For substances that present extraordinary hazards, special precautions will need to be taken. The assumption is also made that any mixture will be more toxic than its most toxic component, and that all substances of unknown toxicity are toxic. Additional safety procedure may be required for employees working with particularly hazardous substances such as select carcinogens, reproductive toxins and substances with a high degree of acute toxicity. Provisions for work with these types of chemicals may include special designated work areas, containment devices such as fume hoods or glove boxes, special handling procedures, special procedures for safe removal of contaminated wastes, and decontamination procedures.

7. **Provide adequate ventilation.** Adequate ventilation is required to maintain worker exposure below permissible exposure limits and Threshold Limit Values. The laboratory-type hood is a primary hazard control device that the laboratory worker depends upon for protection while working with hazardous materials. If designed, installed, operated and maintained properly, the laboratory fume hood will provide personnel with a high degree of protection and allow the user to work with a wide range of potentially hazardous material. Specific monitoring measures must be established for ensuring proper and adequate performance ventilation and other protective equipment.
8. *Chemical Receiving, Handling, Storage and Disposal.* Parks must establish procedures for receiving hazardous laboratory chemicals, their safe handling and storage, and proper disposal. Parks must ensure that labels on incoming containers of hazardous chemicals are not removed or defaced. Improper disposal of certain waste chemicals or other hazardous materials can cause fires, explosions, infections, release of toxic vapors and/or severe environmental damage. Safety and environmental considerations necessitate a good waste management program.
9. *Employee Exposure Determination.* The park must periodically measure the employee's exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the action level. The employee must be notified of the results within 15 working days after receipt of the monitoring results.
10. *Personnel Protective Equipment.* The use of personnel protective equipment may be necessary when feasible engineering and administrative controls are unavailable or there is a need to supplement those controls. When required, PPE will be provided by the park.
11. *Employee Information and Training.* All laboratory employees must be provided with information and training at the time of initial assignment to ensure they are aware of the chemical hazards in their labs. Additional training must be provided whenever there is a change in procedures, modification to the Chemical Hygiene Plan or use of a new chemical. Training must address the following topics:
 - a. The contents of this standard and its appendices must be made available to them.
 - b. The location and availability of the employer's Chemical Hygiene Plan.
 - c. The permissible exposure limits for OSHA.

- d. Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory.
- e. The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, Material Safety Data Sheets (MSDS) received from chemical suppliers.
- f. Methods and observations that may be used to detect the presence or release of a hazardous chemical.
- g. The physical and health hazards of chemicals in the work area.
- h. The measures they can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures and personal protective equipment to be used.
- i. Applicable details of the employer's written Chemical Hygiene Plan.

12. *Medical Consultation and Examination.* The park must provide medical attention to laboratory employees who work with hazardous chemicals under the following circumstances:

- a. **Medical Examination.** When a laboratory worker develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory.
- b. **Medical Monitoring.** When a laboratory worker is routinely exposed above the action level for an OSHA-regulated substance for which there are exposure monitoring and medical surveillance requirements. Refer to Section 4.9, Occupational Medical Screening and Surveillance for additional guidance.
- c. **Medical Consultation.** When an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure.

13. *Chemical Hygiene Plan.* Where hazardous chemicals are used in a laboratory covered by this section the park must develop and implement a written Chemical Hygiene Plan (CHP) that describes the specific measures that the park will take to ensure laboratory employee protection. The CHP must address the following elements:

- a. Standard safe operating procedures to be followed when laboratory work involves the use of hazardous chemicals.
- b. Criteria that the park will use to determine and implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, the use of personal protective equipment and hygiene practices. Particular attention shall be given to the selection of control measures for chemicals that are known to be extremely hazardous.
- c. Specific measures and other requirements to ensure that laboratory-type hoods and other protective equipment are functioning and performing properly.
- d. Procedures for providing employee information and training.
- e. Evaluation and approval requirements prior to implementation of new laboratory operations or activities.
- f. Provision of medical consultation and medical examinations.
- g. Designation of personnel responsible for implementation of the Chemical Hygiene Plan including the assignment of a Chemical Hygiene Officer.
- h. Additional employee protection requirements for work with particularly hazardous substances, such as select carcinogens, reproductive toxins and substances that have a high degree of acute toxicity. Specific consideration shall be given to the following provisions which shall be included where appropriate:
 - 1. Establishment of a designated area in which the work may be conducted.
 - 2. Use of containment devices such as laboratory-type hoods or glove boxes.
 - 3. Procedures for safe removal of contaminated waste.
 - 4. Decontamination procedures.

The CHP must be reviewed, evaluated for effectiveness and updated at least annually. The plan must be available to employees or their representatives.

Appendix B: Sample Chemical Hygiene Plan

Caution....

CHEMICAL HYGIENE PLAN
FOR
[YOUR PARK NAME]

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1.0 INTRODUCTION

The wastewater treatment laboratory is engaged in performing chemical and biological analyses from the [your park]'s wastewater, treated effluent, commercial wastes, receiving water and drinking water. [Your park] employees can potentially be exposed to many kinds of hazardous and toxic chemicals while being engaged in these kinds of analyses. In order to protect the employees from chemical exposure, the park has developed a comprehensive Chemical Hygiene Plan. All employees engaged in the laboratory use of hazardous chemicals are to comply with the requirements of this plan. The purpose of the policy is to protect employees from harm due to chemical exposure while they are working in the laboratory.

2.0 RESPONSIBILITIES

The Laboratory Director has been designated the Chemical Hygiene Officer (CHO) for the environment testing laboratories in _____. The chemical hygiene officer's responsibilities are:

1. The CHO will develop and update the Chemical Hygiene Plan in conjunction with the _____ Safety Office. The CHO will provide technical assistance for the implementation of this plan and remain current on developing legal rules and regulations concerning chemicals used in the laboratory.
2. The CHO will ensure that employees comply with this plan.
3. The CHO will ensure that adequate emergency equipment, in proper working order, is available and that proper training in the use of such equipment has been provided to laboratory workers.
4. Provide information on special or unusual hazards in non-routine work.

Laboratory personnel responsibilities are to:

1. Use proper personal protection and safety equipment.
2. Keep exposure to chemicals to a minimum.
3. Avoid eating, drinking and smoking in areas where chemicals are present.
4. Plan in advance before performing a chemical analysis.
5. Complete and keep current the park's laboratory chemical hygiene training program.

Every laboratory worker has a responsibility to himself or herself and fellow workers to plan and execute laboratory operations in a safe manner.

3.0 STANDARD OPERATING PROCEDURES

3.1 General Principles for Laboratory Employees Working with Hazardous Chemicals:

1. Each employee will follow the safety rules and procedures that apply to the work being conducted. Employees will understand the potential hazards and appropriate safety precautions associated with each operation before beginning any new procedure.
2. Know the location the emergency equipment in the laboratory and be familiar with its use. Employees will be trained to know the correct procedure for obtaining additional help in an emergency. In addition, employees must be familiar with the emergency procedures of the laboratory. To **obtain outside emergency aid, _____ on any phone.**
3. Be certain all chemicals are correctly and clearly labeled in accordance with the [your park]'s Hazard Communications Policy. Post warning signs when unusual hazards, such as flammable materials, biological hazards or other special problems exist.
4. Avoid distracting or startling any other worker. Practical jokes or horseplay will not be tolerated at any time.
5. Use equipment only for its designated purpose.
6. Position and clamp apparatus thoughtfully in order to permit manipulation without the need to move the apparatus until the entire reaction is completed. Combine reagents in the appropriate order, and avoid adding solids to hot liquids.
7. Do not smell or taste chemicals. Equipment that can discharge toxic chemicals (i.e., vacuum pumps, distillation columns, etc.) must be vented into local exhaust fume hood.
8. Do not release toxic substances in cold rooms or warm rooms since these rooms use re-circulated air.

9. Avoid eating, drinking, smoking, gum chewing or applying cosmetics or lip balm in areas where laboratory chemicals are present. [Your park] has a “No Smoking” policy in all NPS buildings.
10. Avoid storing, handling or consuming food or beverages in storage areas, refrigerators used to store chemicals, glassware or utensils used for chemical analyses.
11. Wash areas of exposed skin thoroughly before leaving the laboratory. Wash promptly whenever a chemical has contacted the skin or eyes. Generally, flush the affected area with copious amounts of water for 15 minutes.
12. Keep work area clean and uncluttered with chemicals and equipment properly labeled and stored correctly. Clean up work area upon completion of an operation, analysis and experiment or at the end of each workday.
13. Laboratory workers will not use mouth suction for pipetting or starting a siphon. The use of suction bulbs is the appropriate method for pipetting.
14. Wear appropriate gloves and eye protection where chemicals are stored or handled. Use any other protective or emergency apparel and equipment as appropriate to protect everyone’s health and safety.
15. Avoid contact lenses while working in the laboratory.
16. Use appropriate respiratory equipment when air contaminant concentrations are not sufficiently restricted by engineering controls.
17. All laboratory personnel will know and understand the types of protective equipment available and will be trained in the selection of the appropriate PPE for each job.
18. Remove laboratory coats immediately after being significantly contaminated by chemical exposure.
19. Seek information and advice about the hazards. Plan appropriate protective actions and position equipment before beginning any new operations.
20. Use a laboratory fume hood for operations that might release toxic chemical vapors, gases, dusts, fumes or mists.
21. Confirm adequate fume-hood performance before use. Keep hood closed when adjustments are being made. Keep materials stored in hoods to a minimum, leave hood turned “on,” and do not allow materials to block vents or airflow.

3.2 Personal Hygiene

1. Wash well with soap and water before leaving the laboratory. Do not wash with solvents.
2. Confine long hair and loose clothing when in the laboratory.
3. Avoid exposure to gases, vapors and aerosols. Use appropriate safety equipment whenever such exposure is likely.
4. Do not eat, drink, smoke or apply cosmetics in the laboratory.
5. Do not bring food, beverages, tobacco or cosmetic products into chemical use or storage areas. Do not store food in areas intended for chemicals or samples. Glassware or utensils that have been used for laboratory operations should never be used to prepare or consume food or beverages

3.3 Protective Clothing And Equipment

All laboratory personnel will be provided with a sufficient number of lab coats for working in the laboratory. Inside the laboratory, the lab coat will be worn at all times when working with chemicals, samples and analytical processes. Lab coats will not be worn outside of the laboratory (lunchrooms, employee lounges and administrative areas).

All laboratory personnel will be provided with a pair of safety glasses. For employees who require corrective lenses, prescription safety glasses will be made available. These safety glasses shall be used when handling all hazardous materials to reduce the risk of exposures via splash hazards. Examples of materials used in laboratory operations are concentrated acids, alkalis, ammonia; preparing solutions of such chemical; or carrying out any operation that contains the possibility of a liquid splash or other similar hazard.

When working with corrosive, allergenic, sensitizing or toxic chemicals, wear gloves made of material known to be resistant to permeation by the chemical and tested by air inflation (do not inflate by mouth) for the absence of pin-hole leaks. Gloves are also to be used when handling _____, or any other material suspected of containing pathogenic organisms.

Shorts or short skirts will not to be worn in the laboratory. Always wear low-heeled shoes with fully covered uppers and non-slip soles. Do not wear shoes with open toes or with uppers constructed of woven or porous material.

Carefully inspect all protective equipment before using. Do not use defective protective equipment.

All mechanical equipment, such as vacuum pumps, will be adequately furnished with guards that prevent access to electrical connections or moving parts. Each laboratory worker will inspect equipment before using it to ensure that the guards are in place and functioning.

All employees are provided with hard hats. Hard hats are mandatory in all areas designated as hard-hat areas.

3.4 Housekeeping

1. Access to emergency equipment, showers, eyewashes and exits will never be blocked by anything, not even a temporarily parked cart.
2. All chemical containers must be labeled with at least the identity of the contents and hazards those contents present to users.
3. Keep all work areas, especially laboratory benches and hoods, clear of clutter.
4. Keep all aisles and hallways clear of chemicals.
5. All chemicals will be placed in their assigned storage areas at the end of each workday.
6. At the end of each workday, the contents of all unlabeled containers are to be considered wastes.
7. Biological, chemical and solid wastes will be properly labeled and kept in their proper containers.
8. Promptly clean up all spills, and properly dispose of the spilled chemicals and cleanup materials. (See Section 6.6)
9. All working surfaces will be cleaned regularly.
10. Chemicals will not be stored in aisles, on desks, on laboratory floors or in hallways. Chemicals may be stored on the floor in the chemical storeroom in the original shipping containers.

11. Remove broken glass from counters immediately and dispose of properly in marked containers. Do not use chipped, cracked or broken glassware.
12. Inoculated media used in microbiological tests in test tubes, petri dishes or other containers will be sterilized in the autoclave before it is disposed.
13. Only authorized personnel will be allowed into the laboratory area. The laboratory will be locked when not in use.

3.4 Prior Approval

Employees must obtain prior approval to proceed with a laboratory task from the Laboratory Director whenever:

1. A new laboratory procedure or test is to be carried out.
2. It is likely that toxic limit concentrations could be exceeded or that other harm is likely.
3. There is a change in a procedure or test, even if it is very similar to prior practices. "Change as a procedure or test" means:
 - a. A 10% or greater increase or decrease in the amount of one or more chemicals used.
 - b. A substitution or deletion of any of the chemicals in a procedure.
 - c. Any change in other conditions under which the procedure is to be conducted.
4. There is a failure of any of the equipment used in the process, especially of safeguards such as fume hoods.
5. There are unexpected results.
6. Members of the laboratory staff become ill, if it's suspected that they or others have been exposed, or otherwise there's a suspected failure of any safeguards.

4.0 CONTROL MEASURES AND EQUIPMENT

Chemical safety is achieved by continual awareness of chemical standards and by keeping the chemical under control by using precautions, including engineering safeguards such as hoods. Laboratory personnel will be familiar with the precautions to be taken, including the use of engineering and other safeguards when working with hazardous materials. Laboratory supervisors will be alerted to detect the malfunction of engineering controls and other safeguards. All engineering controls must be properly maintained, inspected on a regular basis and never overloaded beyond their design limits.

4.1 Ventilation

1. Laboratory ventilation will not be less than eight air changes per hour. This flow is not necessarily sufficient to prevent accumulation of chemical vapors. Work with toxic chemicals that have low air-concentration limits or that have high vapor pressures will always be conducted in a hood.
2. [Your park]'s environmental testing laboratories are equipped with one fume hood each. Fume hoods will be certified annually and inspected monthly for efficiency, to provide a minimum of 70- to 90-feet per minute face velocity of air flow.
3. Laboratory staff will understand and comply with:

The apparatus inside the hood will be placed on the floor of the hood at least six inches from the front edge.

- a. Fume hood windows will be lowered (closed) at all times except when necessary to raise (open) them to adjust the apparatus that are inside the hood. At an absolute minimum, the hood shall not be used with the sash any higher than the marked height for desired efficiency.
- b. The hood fan will be kept "on" whenever a chemical is inside the hood, whether or not any work is being done in the hood.
- c. In the event of a power failure or other hood failure, turn off the apparatus and evacuate the area until it is safe to return. If possible, use auxiliary ventilation to dissipate the vapors.
- d. Hood vent ducts and fans will be inspected annually to be sure they are both clean and clear of obstruction. Plant maintenance personnel will conduct inspections.
- e. Fume hoods will not be used as storage areas for chemicals, apparatus or other materials.

Flammable-liquid Storage

1. Fire-hazard chemicals in quantities greater than 500 ml will be kept in the flammable storage cabinet.
2. Store only compatible materials inside the cabinet.
3. Do not store paper or cardboard or other combustible packaging material in the flammable storage cabinets.

Eyewash Fountains and Safety Showers

1. An emergency eyewash fountain is located next to the sink in _____.
A safety drench-type shower is located in the _____.
2. Showers and eyewash fountains will be inspected monthly.
3. Be sure that access to the eyewash fountains and the safety shower is not restricted or blocked by temporary storage of objects or in any other way.

4.4 Fire Safety

1. A _____ fire extinguisher is located in the laboratories near _____.
2. In the event of a fire in the laboratory, the following procedure is to be followed.
 - a. Notify any personnel in the area, as well as the Shift Supervisor.
 - b. Shut off any gas or electricity, if necessary.
 - c. If hazardous materials are not involved, try to put out the fire using the _____ fire extinguisher if it can be done safely.
 - d. If the fire is not controllable, evacuate the area and call the fire department ____ (Put Telephone number here).

4.5 Evacuation

Maps are posted throughout the plant showing various evacuation routes. Note that in case of a chlorine leak, the route will be away from, and upwind of, the chlorine source.

4.7 Chemical Spill Kits

1. Spill Control Kits for acids, caustics and solvents are located in the laboratory. Additional supplies are located in the outside storage area.
2. For small spills of acids and caustics, shaker bottles of neutralizers are located in various locations around the laboratory.
3. A mercury spill kit is located near _____. This is to be used in the case of a broken thermometer. Note that a broken thermometer in an oven presents the additional hazard of increased mercury vapors. Turn off the power to the oven immediately.
4. All mercury spill and chemical spills in excess of one gallon will be reported to the environmental compliance officer and the safety office.
5. For additional information on the cleanup of liquid spills, see Section 6.6.

4.8 First Aid Kits

1. First aid kits are located in the _____.
2. Report any injury, no matter how minor, to your supervisor. Fill out the appropriate injury reporting forms as soon as possible.

5.0 SPECIFIC SAFETY PROCEDURES

5.1 Strong Acids and Alkalis

1. Never pour water into an acid. Keep acid away from combustible materials. Protect acid bottles from heat and sunlight. Immediately after emptying bottles, rinse them thoroughly. Keep the outside of acid bottles and the stoppers clean and dry.
2. Use appropriate gloves and safety glasses when handling acids or alkalis.
3. When corrosive materials have been spilled on lab floors or bench space, use the appropriate neutralizing agent and cleanup kit (see Section 6.6).
4. Flush any spill on your body or eyes with copious amounts of water for at least 15 minutes.

5. Do not pour strong acid into the sink. Dilute it with water before pouring it into the sink, and run water while disposing and for several minutes afterward. Ammonia and other strong alkalis will be neutralized with an acid before flushing.
6. For additional safe handling practices and procedures, consult the respective MSDS.

5.2 Carcinogens, Reproductive Toxins, Highly Acute Toxins

1. Select Carcinogen: Any substance defined as such in 29 CFR 1910.1450 or its corresponding MSDS. Chemicals whose toxic properties are unknown: any chemical for which there is no known scientific data relating to its toxic characteristics.
2. Reproductive Toxin: Any substance identified in the applicable MSDS that affects either male or female reproductive systems and may impair the ability to have children.
3. Acute Toxin: Any substance in which the LD50 data described in the applicable MSDS causes the substance to be classified as a “highly toxic chemical” as defined in ANSI Z129.1.
4. Designated Areas: Those areas within the laboratory where work must be performed when using select carcinogens, reproductive and acute toxin or any chemical that may release vapors, mists or dusts. The work will be performed in fume hoods or glove boxes located in these areas.

When working with carcinogens, reproductive and acute toxins, the following controls and handling techniques shall be implemented:

1. Personnel protective clothing shall be worn at all times during operations which require the use of these chemicals as outlined in 4.0 of this plan.
2. Proper handling and storage procedures will be followed in accordance with the type of chemical used.
3. When feasible, all operations will be performed under a workable fume hood.
4. Only the smallest amounts of chemical will be utilized that is consistent with the requirements of the work to be done.

5. Designated work areas will be properly decontaminated when work is completed utilizing appropriate procedures.
6. The CHO shall institute additional control measures and specific precautions for chemical handling, as appropriate.
7. For additional safe handling practices and procedures, consult the respective Material Safety Data Sheet.

5.3 Organic Solvents

1. All organic solvents shall be stored in the Flammable Storage Cabinet.
2. The analyst shall limit the volume of the organic solvent at the bench to a maximum of 1 L. The transfer of solvent from the storage container into the smaller container shall take place under a properly operating hood.
3. Use gloves suitable for the solvent in use.
4. Spills shall be cleaned up with the Solvent Spill Kit. (See Section 6.6)
5. For further specific details on the safe handling of a particular solvent, consult the MSDS before use.

6.0 CHEMICALS RECEIVING, HANDLING, STORAGE AND DISPOSAL

6.1 Receiving

1. All shipment containers are checked by laboratory personnel for the correct amount and the condition of the shipment. Containers are opened, and all the items are checked, dated and compared with the packing slip for the correct amount and identity. The chemicals are then placed in the proper storage area for that chemical.
2. New and updated MSDSs will be added to the current MSDS inventory. A copy of the MSDS will be forwarded to the safety office.
3. Chemical inventories will be updated when a shipment of material has arrived. The safety office will be notified of the inventory change.

6.2 Handling

The chemical requiring storage may be a solid or liquid. The hazardous nature of each chemical must be considered individually and in relation to other chemicals that may be stored in the same area. The hazardous nature of each chemical is labeled on the package and also on the container. Carefully read the instructions given on the package before attempting to open it. After opening the package, take out the chemical containers.

Chemicals can be grouped into the following categories: flammable, toxic, explosive, oxidizer, corrosive and water-sensitive chemicals.

1. *Flammable Chemicals:* All flammable chemicals, except when under use (container of not more than 1 liter), will be stored in the Flammable Storage Cabinet. Some of the common flammable liquids present in the wastewater laboratory are ethanol and acetone.
2. *Toxic Chemicals:* Most chemicals are considered toxic. In order to adequately evaluate the danger involved on exposure to them, the relationship between frequency, duration and concentration of exposure, and the toxic hazard must be known. *Toxic substances can enter the body by inhalation, ingestion or absorption through the skin, or by any combination of these routes.* Some chemicals will decompose to form toxic materials when in contact with heat, moisture or acids. The manufacturer gives information concerning toxicity and potential toxic hazards, to some extent, on the container. Additional information can be obtained from the respective MSDS. *Treat every substance as highly toxic unless you know definitely that it is not.* Highly toxic chemicals in a wastewater laboratory include: salts of cyanide, mercury, sulfides, etc.
3. *Oxidizing Agents:* These are chemicals that can supply energy to a reaction. Some examples of oxidizing agents common to a wastewater laboratory are: nitrates, nitrites and dichromates. Since oxidizing agents can initiate the combustion reaction, these materials present a definite fire hazard when stored with combustibles. Some oxidizing materials will react with oxidizing agents at room temperature to produce a fire or explosion.

Oxidizing agents shall not be stored in the same area with any fuel such as flammables, organic chemicals, dehydrating agents or reducing agents. Any spill in the storage area will be cleaned up immediately.

4. *Corrosive Chemicals*: Many acids and alkalis are corrosive to their containers, other materials in the storage area and body tissue. Acids react with many metals to form hydrogen gas. Alkalis may form hydrogen gas on contact with aluminum. Since hydrogen forms an explosive mixture with air, accumulation of hydrogen must be prevented.

Some of the corrosive chemicals are mineral acids (nitric, sulfuric, hydrochloric, etc.), organic acids (acetic), organic solvents (chlorinated hydrocarbon solvents, alcohols, etc.) and caustic alkalis.

6.3 Labeling

In order to insure the safety of laboratory workers, the following pertains to the labeling of chemicals and chemical solutions:

1. Do not remove or deface existing labels on incoming containers of hazardous substances unless the container or subsequent containers are marked again with the required information.
2. All containers shall be properly labeled showing contents, physical and health hazards.
3. All labels and warnings are to be legible and prominently displayed.
4. All containers shall be labeled to show actual contents.
5. All hazardous chemicals will be properly labeled.
6. Portable or "batch" containers of a hazardous material will also contain a proper label once the container leaves the immediate control of the person making the transfer.

6.4 Storage

In determining the arrangement of chemicals in the storage area, the hazardous nature of each chemical must be considered. *“Incompatible chemicals” (as outlined below) will never be stored together:*

CHEMICAL	SEGREGATE FROM
Flammable liquids	Nitrate, Nitric Acids, Ammonia
Acids, Strong	Alkalis, Strong
Mercury	Ammonia
Nitric Acid	Acetic Acid, Sulfuric Acid, Flammable Liquids, Nitrites
Acetic Acid	Nitric Acid
Carbon, Activated	Oxidizers
Sodium Azide	Acids, Oxidizers
Nitrates	Acids, Nitrites
Nitrites	Acids, Oxidizers

Upon arrival in the laboratory, all chemical containers shall be dated and stored in the appropriate storage area. In the chemical storage area, *all chemicals will be arranged alphabetically in the shelves, except for incompatible chemicals*. Larger reagent bottles will be stored on the lower shelves or floor. All reagent containers shall be dated when first opened.

6.5 Disposal

1. No solvents or flammable liquids shall be disposed of in the sink. The spent solvents shall be collected in suitable containers.
2. Strong acids and alkalis shall be neutralized before being poured into the sink. The sink shall be flooded with copious amounts of water after the disposal of these chemicals.
3. Carcinogens and other dangerous chemicals shall not be disposed of in the sink. These spent chemicals shall be collected separately and disposed of as hazardous waste.
4. Special wastes are to be stored in the container provided.

5. All spent coliform media shall be sterilized in the autoclave before disposal.
6. For additional information on proper disposal of chemicals, see the respective MSDS.

6.6 Spill and Leak Response

If a spill or leak of dangerous chemicals occurs in the laboratory, the following general procedures shall be used.

1. Notify persons in the immediate area of the spill.
2. Evacuate all nonessential personnel from the spill area.
3. If the spilled material is flammable, turn off ignition and heat source.
4. Avoid breathing vapors of spilled material.
5. Leave on or establish exhaust ventilation if it is safe to do so.
6. Secure supplies to effect cleanup.
7. During cleanup, wear appropriate apparel.

For handling of spilled liquids:

1. Confine or contain the spill to a small area. Do not let it spread.
2. For small quantities of inorganic acids or bases, use the appropriate Spill Kit, located in the laboratory. For small quantities of other materials, absorb with a non-reactive material, such as Spill Control Pillows, located on the BOD incubator.
3. Sweep up any broken glass and absorbent material.
4. Carefully pick up and clean any cartons or bottles that may have been splashed or immersed.
5. Dispose of residues according to safe disposal procedures.

For handling of spilled solids:

Generally, sweep spilled solids of low toxicity and place them in a solid-waste container for disposal.

7.0 EMPLOYEE TRAINING PROGRAM

All laboratory personnel will receive training in the general hazardous materials area.

The training program will ensure that each employee receives instruction in the following areas:

1. An in-depth explanation of the Material Safety Data Sheet (MSDS) and terms typically used in evaluation of the chemical nature and hazards associated with hazardous materials.
2. Understanding the routes of exposure and the ways in which hazardous materials can affect workers.
3. Understanding the methods commonly used to detect release of and exposure to hazardous substances.
4. Emergency spill procedures/contingency planning and procedures to follow if employees are exposed to hazardous materials.
5. The measures employees can use to protect themselves from these hazards, including specific procedures such as appropriate work practices, personal protective equipment and emergency procedures.
6. An overview of the requirements of the Hazard Communication Regulation, including employee rights under the regulation.
7. Steps NPS has taken to lessen or prevent employee exposure to hazardous substances.

A two-hour initial training course will be conducted for all laboratory workers with an annual one-hour refresher.

8.0 MEDICAL CONSULTATION AND MEDICAL EXAMINATIONS

8.1 _____ will provide all employees who work in the laboratory with hazardous chemicals an opportunity to receive a medical examination under the _____ Medical Surveillance Program. The _____ Medical Surveillance program is administered by the _____. This program consists of a baseline physical, blood tests, routine biennial exams and review of all examination data by a licensed physician. _____ has entered into an agreement with _____ to be the custodian of all medical records. Medical examinations and interpretation of results will be administered by _____'s medical review officer (MRO). Follow-up examinations may occur:

1. Whenever an employee develops signs or symptoms associated with hazardous chemicals to which the employee may have been exposed in the laboratory.
2. Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for an OSHA-regulated substance for which there are exposure monitoring and medical surveillance requirements, medical surveillance shall be established for the affected employee as prescribed by the particular standard.
3. Whenever an event takes place in the work area such as a spill, leak explosion or other occurrence resulting in the likelihood of a hazardous exposure.

8.2 All medical examinations and consultations will be performed under the direct supervision of the FOH MRO.

The exam will be provided without cost to the employee, without loss of pay and at a reasonable time and place.

8.3 NPS shall provide the following information to the physician:

1. Identity of the hazardous chemical(s).
2. Description of the conditions under which the exposure occurred.
3. Description of the signs and symptoms of exposure that the employee is experiencing.

8.4 _____ shall obtain a written opinion from the examining physician, which will include:

1. Recommendations for further medical followup.
2. Results of the medical examination and any associated tests.
3. Any medical condition that may be revealed in the course of the examination, which may place the employee at 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 condition or medical examination and any medical condition that may require further examination or treatment.

9.0 MATERIAL SAFETY DATA SHEETS

10.0 CHEMICAL LISTING