

CHEMICAL HYGIENE PLAN

Section 0030

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INTRODUCTION

On January 31, 1990 the Occupational Safety and Health Administration (OSHA) promulgated a final rule for occupational exposure to hazardous chemicals in laboratories. Included in the standard, which became effective on 1 May, 1990 is a requirement for all employers covered by the standard to develop and carry out the provisions of a Chemical Hygiene Plan (CHP).

A CHP is defined as, "a written program which sets forth procedures, equipment, personal protective equipment and work practices that are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace". Components of the CHP must include standard operating procedures for safety and health, criteria for the implementation of control measures, measures to ensure proper operation of engineering controls, provisions for training and information dissemination, permitting requirements, provisions for medical consultation, designation of responsible personnel, and identification of particularly hazardous substances.

This plan is the Chemical Hygiene Plan developed for UNCG located in Greensboro, NC. This CHP is maintained readily available to laboratory employees at UNCG. All laboratory personnel must know and follow the procedures outlined in this plan. All operations performed in the laboratory must be planned and executed in accordance with the enclosed procedures.

In addition, each employee is expected to develop safe personal chemical hygiene habits aimed at the reduction of chemical exposures to themselves and co-workers.

This document was developed to comply with paragraph (e) of the referenced OSHA 1910.1450 standard. UNCG will maintain the facilities and procedures employed in the laboratory compatible with current knowledge and regulations in laboratory safety. This CHP will be reviewed, evaluated and updated at least annually and is readily available to employees, their representatives and any representative of the Assistant Secretary of Labor of OSHA.

Each department at UNCG using chemicals in a laboratory setting is required to appoint a Chemical Hygiene Officer. The Chemical Hygiene Officer is responsible for implementation of this Chemical Hygiene Plan. A list of departments and Chemical Hygiene Officers is found in Appendix I.

I. STANDARD OPERATING PROCEDURES FOR LABORATORY CHEMICALS

A. Chemical Procurement

1. The decision to procure a chemical shall be a commitment to handle and use the chemical properly from initial receipt to ultimate disposal.
2. Requests for procurement of new chemicals shall be submitted to the Chemical Hygiene Officer for approval. The form entitled New Chemical Purchasing Request, Appendix C to this plan, shall be used for this purpose. Information on proper handling, storage and disposal shall be known to all involved personnel prior to the procurement of the chemical. Chemicals utilized in the laboratory shall be those which are appropriate for the ventilation system.
3. All chemicals shall be received in a central location. Personnel who receive chemical shipments shall be knowledgeable of the proper procedures for receipt. Chemical containers shall not be accepted without accompanying labels, material safety data sheets (MSDS) and packaging in accordance with all appropriate regulations. All chemical shipments should be dated when received and opened. Refer to Appendix B if an MSDS is not received with the shipment.

B. Chemical Storage

1. Received chemicals shall be immediately moved to their designated storage area. Large glass containers shall be placed in carrying containers or shipping containers during transportation.
2. Storage areas shall be well illuminated, with all storage maintained below eye level. Large bottles shall be stored no more than two feet from ground level.
3. Chemicals shall be segregated by hazard classification and compatibility in a well identified area, with local exhaust ventilation.
4. Mineral acids should be separated from flammable and combustible materials. Separation is defined by NFPA 49 as storage within the same fire area, but separated by as much space as practicable or by intervening storage from incompatible materials.
5. Acid-resistant trays shall be placed under bottles of mineral acids.

6. Acid-sensitive materials such as cyanides and sulfides, shall be separated from acids or protected from contact with acids.
7. Highly toxic chemicals or other chemicals whose containers have been opened, shall be stored in unbreakable secondary containers.
8. Storage areas shall not be used as a preparation or repackaging area.
9. Storage areas shall be accessible during normal working hours. Storage areas are under the control of the Chemical Hygiene Officers.
10. When chemicals are removed from a storage area, they shall be placed in an outside container or bucket.
11. Storage of chemicals at the lab bench or other work areas shall be limited to those amounts necessary for one operation. The container size shall be the minimum convenient. The amounts of chemicals at the lab bench shall be as small as practical. Chemicals in the workplace shall not be exposed to sunlight or heat.
12. Stored chemicals shall be examined at least annually by the Chemical Hygiene Officer for replacement, deterioration, and container integrity. The inspection should determine whether any corrosion, deterioration, or damage has occurred to the storage facility as a result of leaking chemicals.
13. Periodic inventories of chemicals outside the storage area shall be conducted by the Chemical Hygiene Officer. Unneeded items shall be properly discarded or returned to the storage area.

C. Chemical Handling

Each laboratory employee with the training, education and resources provided by supervision, shall develop and implement work habits consistent with this CHP to minimize personal and co-worker exposure to the chemicals in the laboratory. Based on the realization that all chemicals inherently present hazards in certain conditions, exposure to all chemicals shall be minimized.

General precautions which shall be followed for the handling and use of all chemicals are:

1. Skin contact with all chemicals shall be avoided.

2. All employees shall wash all areas of exposed skin prior to leaving the laboratory.
3. Mouth suction for pipeting or starting a siphon is prohibited.
4. Eating, drinking, smoking, gum chewing, or application of cosmetics in areas where laboratory chemicals are present, shall be prohibited. These areas have been posted. Hands shall be thoroughly washed prior to performing these activities.
5. Storage, handling, or consumption of food or beverages shall not occur in storage areas or refrigerators also used for laboratory operations.
6. Risk determinations shall be conservative in nature.
7. Any chemical mixture shall be assumed to be as toxic as its most toxic component.
8. Substances of unknown toxicity shall be assumed to be toxic.
9. Laboratory employees shall be familiar with the symptoms of exposure for the chemicals with which they work and the precautions necessary to prevent exposure.
10. The intent and procedures of this Chemical Hygiene Plan shall be continuously adhered to.
11. In all cases of chemical exposure, neither the Permissible Exposure Limits (PELs) of OSHA or the Threshold Limit Values (TLVs) of the American Conference of Governmental Industrial Hygienists (ACGIH) shall be exceeded.
12. The engineering controls and safety equipment in the laboratory shall be utilized and inspected in accordance with Appendix A of this plan.
13. Specific precautions based on the toxicological characteristics of individual chemicals shall be implemented as deemed necessary by the Chemical Hygiene Officer (see VII-b). These special precautions are listed in Section VII of this plan.

D. Laboratory Equipment and Glassware

Each employee shall keep the work area clean and uncluttered. All chemicals and equipment shall be properly labeled in accordance with Section I-G of this plan. At the completion of each work day or operation, the work area shall be thoroughly cleaned and all equipment properly cleaned and stored.

In addition, the following procedures shall apply to the use of laboratory equipment:

1. All laboratory equipment shall be used only for its intended purpose.
2. All glassware will be handled and stored with care to minimize breakage; all broken glassware will be immediately disposed of in the broken glass container.
3. All evacuated glass apparatus shall be shielded to contain chemicals and glass fragments should implosion occur.

4. Labels shall be attached to all chemical containers, identifying the contents and related hazards.
5. Waste receptacles shall be identified as such.
6. All laboratory equipment shall be inspected on a periodic basis as specified in Appendix A, and replaced or repaired as necessary.

E. Personal Protective Equipment

1. Safety glasses meeting ANSI Z87.1 are required for all persons in a laboratory and must be worn at all times, when a splash hazard is present. The decision to allow contact lenses in the laboratory shall be made by the Chemical Hygiene Officer based on hazards present.
2. Chemical goggles and/or a full face shield shall be worn during chemical transfer and handling operations as procedures dictate.
3. Sandals, perforated shoes, and bare feet are prohibited. Safety shoes, per ANSI 47 are required where employees routinely lift heavy objects.
4. Lab coats are recommended for use in the laboratory. Laboratory coats will be laundered on a periodic basis, at least monthly. Laboratory coats shall be removed immediately upon discovery of significant contamination. Short pants may not be worn in a laboratory.
5. Appropriate chemical-resistant gloves based on the table in Appendix K shall be worn at all times when there may be skin contact with chemicals. Used gloves shall be inspected and washed prior to re-use. Damaged or deteriorated gloves will be immediately replaced. Gloves shall be washed prior to removal from the hands. Disposable, single use gloves shall not be reused.
6. Thermal-resistant gloves shall be worn for operations involving the handling of heated materials and exothermic reaction vessels. Thermal-resistant gloves shall be non-asbestos and shall be replaced when damaged or deteriorated.
7. Respirator usage shall comply with the OSHA Respiratory Protection Standard, 29 CFR 1910.134, and the UNCG Respiratory Protection Program.

F. Personal Work Practices

1. Department Heads and laboratory supervision must ensure that each employee knows and follows the rules and procedures established in this plan.
2. All employees shall remain vigilant to unsafe practices and conditions in the laboratory and shall immediately report such practices and conditions to the laboratory supervisor. The supervisor must correct unsafe practices and conditions promptly.
3. Long hair and loose-fitting clothing shall be confined close to the body to avoid being caught in moving machine/equipment parts, or flame.
4. Use only those chemicals appropriate for the ventilation system.
5. Avoid unnecessary exposure to all chemicals by any route.
6. Do not smell or taste any chemicals.
7. Encourage safe work practices in co-workers by setting the proper example. Horseplay is strictly forbidden.
8. Seek information and advice from knowledgeable persons, standards, and codes about the hazards present in the laboratory. Plan operations, equipment and protective measures accordingly.
9. Use engineering controls in accordance with Section III.
10. Inspect personal protective equipment prior to use. Wear appropriate protective equipment as procedures dictate and when necessary to avoid exposure.

G. Labeling

1. All containers in the laboratory shall be labeled. This includes chemical containers and waste containers. The label shall be informative and durable, and at a minimum, will identify contents, source, date of acquisition, storage location and indication of hazard.
2. Portable containers shall be labeled by the individual using the container.
3. Exemptions for labeling requirements shall be made for chemical transfers from a labeled container which is intended only for the immediate use by the employee who performed the transfer.
4. The labeling program shall be periodically inspected by the Chemical Hygiene Officer to ensure that labels have not been defaced or removed.

The form entitled Chemical Hazard Audit Checklist, Appendix D to this plan, shall be used for this purpose.

II. CRITERIA FOR IMPLEMENTATION OF CONTROL MEASURES

A. Initial Monitoring and Department of Homeland Security Chemicals of Interest

1. Initial Monitoring

A list of chemicals requiring initial monitoring is found in Appendix J. Sampling for evaluating employee exposure to chemical substances shall be conducted periodically or as specified by specific codes or regulations. The Department is responsible for identifying chemicals that require initial monitoring and arranging through the Office of Safety to have monitoring conducted. The results of air sampling studies performed in the laboratory are maintained and recorded on the form shown in Appendix E to this plan.

2. Department of Homeland Security Chemicals of Interest

(a) Background

On November 22, 2007, the Department of Homeland Security passed 6 CFR Part 27 "Appendix A to Chemical Facility Anti-Terrorism Standard Final Rule. This rule requires that any "Chemical Facility" report amounts of "Chemicals of Interest (COI's)" inventoried at these facilities. Under the rule Universities were established as "Chemical Facilities". Appendix M contains a list of COI's and amounts that are required to be reported within 60 days from the time they are received or produced. Because of this reporting requirement inventories of these chemicals on campus at any time requires particular attention.

(b) Responsibilities

The department head shall be responsible for reporting the amount of these chemicals on an annual basis. Reports should be directed to the Office of Safety, who will keep a master list of amounts of COI's and amounts on file.

B. Housekeeping

1. Each laboratory worker is directly responsible for the cleanliness of his or her work space, and jointly responsible for common areas of the laboratory. Department Heads shall insist on the maintenance of housekeeping standards.

2. The following procedures apply to the housekeeping standards of the laboratory:
 - (a) All spills on lab benches or floors shall be immediately cleaned and properly disposed of. Large spills will necessitate the implementation of the Emergency Action Plan per OSHA 1910.38 and 1910.120.
 - (b) The lab benches shall be kept clear of equipment and chemicals except those necessary for the work currently being performed.
 - (c) The work area shall be cleaned at the end of each operation and each day.
 - (d) All apparatus shall be thoroughly cleaned and returned to storage upon completion of usage.
 - (e) All floors, aisles, exits, fire extinguishing equipment, eyewashes, showers, electrical panels and other emergency equipment shall remain unobstructed.
 - (f) All labels shall face front.
 - (g) Chemical containers shall be clean, properly labeled and returned to storage upon completion of usage.
 - (h) All chemical wastes will be disposed of in accordance with UNCG Hazardous Waste Disposal Procedures, Section 0060.

C. Safety and Emergency Equipment

1. Telephone numbers of emergency personnel, supervisors and other workers, as deemed appropriate, have been posted.
2. All laboratory personnel will be trained in the proper use of fire extinguishers when hired and annually thereafter. Prior to the procurement of new chemicals, the Chemical Hygiene Officer shall verify that existing extinguisher and other emergency equipment are appropriate for such chemicals.
3. All employees who might be exposed to chemical splashes shall be instructed in the location and proper usage of emergency showers and eyewashes. The eyewash and emergency shower shall be inspected weekly. These inspections shall be performed by the laboratory employees. These inspections shall be in accordance with ANSI Z358.1 and manufacturer's specifications. Inspection records shall be maintained by the Chemical Hygiene Officer.
4. Location signs for safety and emergency equipment have been posted.

III. ENGINEERING CONTROLS

A. Intent

The engineering controls installed in the laboratory are intended to minimize employee exposure to chemical and physical hazards in the workplace. These controls must be maintained in proper working order for this goal to be realized.

B. Modification

No modification of engineering controls will occur unless testing indicates that worker protection will continue to be adequate.

C. Improper Function

Improper function of engineering controls must be reported to the Chemical Hygiene Officer immediately. The system shall be taken out of service until proper repairs have been executed.

D. Usage

All employees shall follow proper work practices when using the engineering controls.

1. Local Exhaust Ventilation:

The following procedures shall apply to the use of local exhaust ventilation:

- (a) Openings of hoods shall be placed as close as possible to sources of the air contaminant.
- (b) Clear the screen on the face of the hood prior to usage.
- (c) Hood fans shall operate when hoods are being used.
- (d) After using hoods, operate the fan for an additional period of time sufficient to clear residual contaminants from the duct work.
- (e) Prior to a change in chemicals or procedures, the adequacy of the ventilation system shall be determined by the Chemical Hygiene Officer.

2. Laboratory Hoods:

The laboratory hoods shall be utilized for all chemical procedures which might result in release of hazardous chemical vapors or dust. As general rule, the hood shall be used for all chemical procedures involving substances which are appreciably volatile and have a permissible exposure limit (PEL) less than 50 ppm.

The following work practices shall apply to the use of hoods:

- (a) Confirm adequate hood ventilation performance prior to opening chemical containers inside the hood. An inward flow of air can be

confirmed by holding a piece of paper at the face of the hood and observing the movement of the paper.

- (b) Keep the sash of the hood closed at all times except when adjustments within the hood are being made. At these times, maintain the sash height as low as possible.
- (c) Storage of chemicals and equipment inside the hood shall be kept to a minimum. Laboratory hoods are not designed for the storage of chemicals.
- (d) Minimize interference with the inward flow of air into the hood.
- (e) Leave the hood operating when it is not in active use if hazardous chemicals are contained inside the hood or if it is uncertain whether adequate general laboratory ventilation will be maintained when the hood is non-operational.
- (f) The ventilation system shall be inspected annually. The hood face velocity shall be maintained between 75 and 125 feet per minute. A record of each inspection shall be maintained by the Chemical Hygiene Officer. Ventilation measurements can be performed by the Office of Safety.
- (g) The hood shall not be used as a means of disposal for volatile chemicals.
- (h) Prior to the introduction of new chemicals, the adequacy of hood ventilation systems shall be determined by the Chemical Hygiene Officer.

3. Glove Boxes and Isolation Rooms:

The exhaust air from a glove box or isolation room will pass through scrubbers or other treatment before release into the regular exhaust system.

4. Cold Rooms and Warm Rooms:

Prior to the storage of any temperature sensitive materials, emergency procedures must be developed and documented within this Chemical Hygiene Policy. These Procedures will insure the safety of the materials in the event of a cold room or warm room failure.

5. Storage Cabinets:

Storage cabinets for flammable and hazardous chemicals will remain closed and latched except when removing or replacing chemicals.

IV. EMPLOYEE INFORMATION AND TRAINING

A. Hazard Information

All employee will be apprised of the hazards presented by the chemicals in use in the laboratory. Each employee shall receive training at the time of initial assignment to the laboratory, prior to assignments involving new exposure situations, and at a regular frequency as determined by the Chemical Hygiene Officer.

B. Training

This training shall include methods of detecting the presence of a hazardous chemical, physical and health hazards of chemicals in the lab, and measures employees can take to protect themselves from these hazards. The training shall present the details of the Chemical Hygiene Plan, and shall include:

1. the contents of the OSHA Laboratory Standard and its appendices (Appendix L);
2. the location and availability of the Chemical Hygiene Plan;
3. the permissible exposure limits for OSHA regulated substances or recommended exposure values for other hazardous chemicals not regulated by OSHA which are present in the laboratory;
4. signs and symptoms associated with exposure to the chemicals present in the laboratory;
5. location and availability of reference material on chemical hygiene;
6. Training shall be conducted by the Chemical Hygiene Officer. The Chemical Hygiene Training Checklist must be completed and copies maintained in the Department with one copy forwarded to the Office of Safety.

V. PRIOR APPROVAL OF LABORATORY ACTIVITIES

A. Permit System

A permit system shall be used for laboratory activities which present specific, foreseeable hazards to the employees. These activities include off-hours work, sole occupancy of building, hazardous operations and unattended operations. The permit entitled Chemical

Hygiene Permit is included in Appendix H to this plan and shall be executed prior to the performance of these activities.

1. Sole Occupancy and Off-hours Work:

Laboratory work, involving chemicals, shall not be performed when the only person in the building is the laboratory person doing the work, unless a permit has been issued. The Chemical Hygiene Officer shall determine hours during which laboratory work involving chemicals may be conducted. These hours will be determined by considering the safety of the laboratory personnel, and the emergency help that will be available. Work performed outside of these hours will require a permit.

2. Hazardous Work:

All hazardous operations are to be performed during a time when at least two personnel are present at the laboratory. At no time shall a laboratory person, while working alone in the laboratory, perform work which is considered hazardous. The determination of hazardous operations shall be made by the Chemical Hygiene Officer and permitted.

3. Unattended Operations:

When laboratory operations are performed which will be unattended by laboratory personnel (continuous operations, overnight reactions, etc.), the following procedures will be employed:

- (a) The permit system shall be utilized.
- (b) The laboratory supervisor will review work procedures to ensure the safe completion of the operation.
- (c) An appropriate sign will be posted at all entrances to the laboratory
- (d)) The overhead lights in the laboratory will be left on.
- (e) Precautions shall be made for the interruption of utility service during the unattended operation (loss of water pressure, electricity, etc.)
- (f) The person responsible for the operation will return to the laboratory at the conclusion of the operation to assist in the dismantling of the apparatus.

4. Children and Unauthorized Personnel in Hazardous Environments:

- (a) Access to areas identified as laboratories where hazardous chemicals and equipment are maintained is limited to authorized

University staff and students and other persons on official, related business. This requirement is intended to protect the health and well-being of all University employees and to avoid exposing unauthorized individuals to a hazardous environment.

- (b) Measures should be taken to ensure that persons entering these areas be appropriately trained and adequately protected from hazards and informed about the safety and emergency procedures relevant to their activities.

- (c) Children under the age of 18 are prohibited from entering laboratory areas or other areas where hazardous materials or conditions may be present unless:
 - (1) Such entry is in the context of a scheduled open house or tour;
 - (2) In the context of the normal duties of a student, student worker or intern who has been deemed competent to handle those risk factors by their supervisor;
 - (3) There exists written documentation by the department chair or director that approval has been given.

VI. MEDICAL CONSULTATIONS AND EXAMINATIONS

A. Opportunity for Medical Attention

An opportunity to receive medical attention is available to all employees who work with hazardous chemicals in the laboratory. The opportunity for medical attention will be made available to employees under the following circumstances:

- 1. Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory,

- 2. Medical surveillance programs will be established where exposure monitoring reveals an exposure level above the action level for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements, and/or,

- 3. Whenever an event takes place in the laboratory such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure, the employee will be provided an opportunity

for medical consultation for the purpose of determining the need for medical examination.

B. Cost

These medical consultations and examinations shall be provided without cost to the employees, without loss of pay, and at a reasonable time and place. The cost of any medical surveillance will be the responsibility of the department. Any injury or illness must be reported in accordance with the UNCG Occupational Injury Reporting Procedures.

C. Supervision

These medical consultations and examinations shall be administered by or under the direct supervision of a licensed physician. A current list of available physicians is maintained by the Chemical Hygiene Officer. Employees seeking the opportunity of medical consultation should request the listing from the Chemical Hygiene Officer.

VII. CHEMICAL HYGIENE RESPONSIBILITIES

A. Department Head

The Department Head has the ultimate responsibility for chemical hygiene throughout the laboratory and with assistance of other program administrators, will provide continued support for chemical hygiene.

B. Chemical Hygiene Officer

The Chemical Hygiene Officer shall:

1. work with administrators and other employees to develop and implement appropriate chemical hygiene policies and practices,
2. monitor procurement and use of chemicals in the lab, including determining that facilities and training levels are adequate for the chemicals in use,
3. perform regular, formal chemical hygiene and housekeeping inspections including inspections of emergency equipment,
4. help project directors develop precautions and adequate facilities,
5. maintain current knowledge concerning the legal requirements of regulated substances in the laboratory,
6. along with the other Chemical Hygiene Officers, review and improve the UNCG Chemical Hygiene Plan on an annual basis,
7. maintain overall responsibility for the laboratory operation,
8. ensure that workers know and follow the chemical hygiene rules,

9. determine the proper level of personal protective equipment, ensure that such protective equipment is available and in working order,
10. ensure that appropriate training has been provided to employees,
11. monitor the waste disposal program.

C. Laboratory Workers

The laboratory workers are individually responsible for:

1. planning and conducting each laboratory operation in accordance with the Chemical Hygiene Plan,
2. developing good personal chemical hygiene habits,
3. reporting hazards to the Chemical Hygiene Officer.

XIII. LABORATORY CLOSURE OR RELOCATION

During closure or relocation of a laboratory, the management of the laboratory chemicals shall be handled accordingly. These procedures/responsibilities are designed to facilitate the moving or closing process while keeping the safety of employees, students, contractors, as well as the environment in mind. All researchers should contact the Office of Safety, if needed, at least four weeks prior to work beginning.

A. Responsibilities

1. Department/Researchers
 - a. Move all wanted equipment, glassware, supplies and any chemical, radioactive or biohazardous materials still in use to their new designated location.
 - b. Label all hazardous waste with a UNCG Hazardous Waste Label and request a pickup using Chemical Waste Removal Form. Please allow at least four weeks for complete removal of chemicals.
 - c. Request a terminal radiation survey (if applicable) from Office of Safety. Office of Safety will remove or deface all radiation warning signs and labels following successful completion of the survey.
 - d. Disinfect all surfaces, glassware, equipment, etc. associated with biohazardous materials. Coordinate disinfection of biosafety cabinets with approved vendor. Remove or deface all biohazard warning signs and labels following disinfections.
 - e. Ensure all equipment, benchtops, shelving, storage cabinets, fume hoods, and other accessible surfaces are free of visible chemical residue. Clean (detergent wipe down) surfaces/equipment as necessary and manage cleaning

materials as hazardous waste (if applicable).

1. Project Managers

- a. Request a hazardous materials survey of building from Office of Safety prior to construction activity.
- b. Notify contractors of all hazardous materials or conditions present in their work area.
- c. Keep departments, researchers, and Office of Safety apprised of construction schedule.
- d. Cease any work that may present hazardous work conditions until corrected.
- e. Work with Office of Safety to remove any hazardous materials found after work has been started.

2. Office of Safety

- a. Perform a survey to identify hazardous materials or other hidden hazards upon request from project manager.
- b. Submit Radiation Closure Permits if applicable to proper agency.
- c. Office of Safety personnel may only communicate to construction managers through the University project managers.
- d. Relocate and amend Laboratory Hazard Warning Sign.

B. Researcher Precautions/Procedures Prior to Relocation or Closure

1. Chemicals (Solids, Liquids, Gases)

- Close all containers securely to prevent leaks or spills.
- Ensure all chemical containers are properly labeled with complete chemical name.
- Segregate incompatible materials.
- If researcher moves their chemicals, you may contact Office of Safety for assistance in transporting.
- If outside hazardous waste transporter is used, then moving efforts should be coordinated with university project manager. The hazardous materials manifest created by hazardous materials transporter may only be signed by Office of Safety personnel.
- Identify usable chemicals which are in like new condition and offer to UNCG Orphan Chemical Program. Contact Office of Safety for assistance.
- Identify, label, and store appropriately all Hazardous Waste for removal by Office of Safety.
- Arrange to have unwanted cylinders returned to the supplier.

- Remove pressure regulators on wanted cylinders and screw cylinder caps in place. If moving cylinders, use a drum dolly fitted with cylinder straps during transport.
- Researchers who possess DEA License: Notify Greensboro DEA Agency of departure and terminate license if necessary. Contact Office of Safety to ensure proper disposal of schedule drugs.

2. Biological Materials

Animal and Human Tissue

- All animal and human tissue should be placed in biohazard bags or boxes for incineration.
- Refrigerators and freezers should be emptied and cleaned.

Microorganisms, Cultures, and Recombinant DNA

- All infectious and/or recombinant material should be placed in biohazard bags and sterilized.
- Incubators, ovens, refrigerators, and freezers should be emptied and cleaned.
- Disinfect all workbenches, instrumentation, and other laboratory equipment that may be contaminated during research.

3. Radiological Materials

- Notify the Radiation Safety Officer of your intention to relocate or terminate authorization.
- Perform a thorough radiation contamination survey of the laboratory, including equipment to determine if allowable contamination levels are achieved. Those areas found to exceed the allowable limits must be decontaminated and resurveyed until within allowable limits.
- Dispose of all radioactive materials if applicable by:
 - Transferring them to another authorized user, while complying with all license restrictions of that user.
 - Disposing of them through the Office of Safety.

IX. SPECIAL PRECAUTIONS

When laboratory procedures change to require the use of additional classifications of chemicals (allergens, embryotoxins, teratogens, carcinogens, etc.), additional special precautions shall be implemented as deemed necessary by the Chemical Hygiene Officer. The permit system shall be utilized for all special activities. All

questions regarding the use of the permit system should be addressed to the Chemical Hygiene Officer.

A. Working with Allergens and Embryotoxins (Special Precautions)

1. Suitable gloves to prevent hand contact shall be worn when exposed to allergens or substances of unknown allergen activity.
2. Women of child-bearing age will handle embryotoxins only in a hood with confirmed satisfactory performance and will use protective equipment to prevent skin contact as prescribed by the supervisor and Chemical Hygiene Officer.
3. Embryotoxins will be stored in adequately ventilated areas in unbreakable secondary containers.
4. The supervisor and Chemical Hygiene Officer will be notified of spills and other exposure incidents. A physician will be consulted when appropriate.

B. Working with Chemicals of Moderate Chronic or High Acute Toxicity (Special Precautions)

1. Areas where these chemicals are stored and used are of restricted access and have special warning signs.
2. A special hood with a minimum face velocity of 60 linear feet per minute or other containment device will be used. Released vapors will not discharge with the hood exhaust, but will be trapped.
3. Gloves and long sleeves will be used. Hands and arms will be washed immediately after working with these chemicals.
4. Two people will always be present during work with these chemicals.

C. Working with Chemicals of High Chronic Toxicity (Special Precautions)

1. All transfer and work with these substances shall be in a designated area: a restricted access hood, glove box or portion of lab.
2. Approval of the supervisor will be obtained before use.
3. Vacuum pumps must have scrubbers or high efficiency particulate absolute (HEPA) filters.
4. Any contaminated equipment or glassware will be decontaminated in the hood before removing them from the designated area.
5. For powders, a wet mop or vacuum with a HEPA filter will be used for cleanup.

6. The designated area will be marked with warning and restricted access signs.
7. Containers will be stored in a ventilated, limited access area in labeled, unbreakable, chemically resistant, secondary containers.

D. Working with Animals and Chemicals of High Chronic Toxicity (Special Precautions)

1. For large scale studies, special facilities with restricted access will be provided.
2. The substance will be administered by injection or gavage when possible rather than by diet. When diet is used, a caging system under negative pressure or under laminar air flow directed toward HEPA filters will be used.
3. Procedures will be used to minimize contaminated aerosols from food, urine and feces:
 - HEPA filtered vacuum equipment for cleaning.
 - Moisten contaminated bedding before removal from cage.
 - Mix diets in closed containers in hood
4. Plastic or rubber gloves and fully buttoned lab coats will be worn in the animal room.

E. Working with Organic Compounds that form Hazardous Peroxides

1. Some organic compounds, such as ethers, can react with oxygen from the air, forming unstable peroxides. Peroxide formation can occur under conditions of normal storage when compounds become concentrated by evaporation or mixed with other compounds. The accumulated peroxides can then violently explode when exposed to shock, friction, or heat. Pure compounds will accumulate peroxides more readily than compounds containing impurities.
2. Examples of organic compounds that form hazardous peroxides:
 - aldehydes, ketones, ethers.
 - Compounds with allylene ($\text{CH}_2=\text{CHCH}_2\text{R}$) structure.
 - Alkali metals, alkoxides, amines.
 - Vinyl and vinylidene compounds.
 - Compounds with benzylic hydrogen atoms.
3. Examples of chemicals which form hazardous peroxides during exposure to air:
 - cyclohexane
 - tetrahydrofuran
 - decalin
 - ethyl ether
 - tetralin
 - isopropyl ether

- dioxane (1,4)
 - potassium metal
 - sodium amide
 - divinyl acetylene
 - vinyl ethers
 - cumene
 - diazine
 - cyclopentene
4. Additional labeling of these compounds
In addition of proper primary and secondary labeling, write on the label "PEROXIDE FORMING CHEMICAL".
5. Storage and Handling
- Discard OPENED containers of peroxide forming chemicals after 6 months. Discard UNOPENED containers of peroxide forming chemicals after 12 months. Contact the Office of Safety for disposal.
 - Order peroxide-forming chemicals in small amounts and use quickly.
 - Include the DATE OF PURCHASE on label.
 - After opening, note the DATE OF USE on label.
 - Store in cool, dry, well-ventilated area, out of direct sunlight. Protect from extreme temperatures and rapid temperature changes.
 - Containers should be tightly sealed. DO NOT use corks or rubber stoppers to cap containers.
 - Store in amber glass or inert containers, preferably unbreakable.

Before opening glass bottles, look for the presence of solids (crystals) or viscous liquid at the bottom of the bottle. These are good indicators of peroxide formation. If either are present – DO NOT OPEN OR HANDLE the container. Call the Office of Safety for assistance and possible deactivation of the material.

IX. RECORDKEEPING

- A. Accident investigations will be conducted by the supervisor with, if necessary, assistance from the Office of Safety and other personnel deemed necessary.
- B. Accident reports will be retained indefinitely by the Office of Safety.
- C. Exposure records for hazardous chemicals and harmful physical agents will be maintained for 30 years per 29 CFR 1910.1020. These records will be forwarded to the Office of Safety by the Chemical Hygiene Officer.
- D. Medical records for employees exposed to hazardous chemicals and harmful physical agents will be maintained for the duration of employment plus 30 years per 29 CFR 1910.1020. These records will be forwarded to the Office of Safety by the Chemical Hygiene Officer.
- E. Inventory and usage records for high risk substances (amounts of substances on-hand, amounts used and names of workers involved) shall be maintained for three years by the department and indefinitely by the

Office of Safety. These records will be forwarded to the Office of Safety by the Chemical Hygiene Officer.

- F. Records of inspections of equipment will be maintained for three years by the department and indefinitely by the Office of Safety. These records will be forwarded to the Office of Safety by the Chemical Hygiene Officer.
- G. Records of employee training will be maintained for three years by the department and indefinitely by the Office of Safety. These records will be forwarded to the Office of Safety by the Chemical Hygiene Officer.

X. CHEMICAL SPILL, RELEASES AND ACCIDENTS

In the event of a chemical spill, release or other accident, UNCG employees will adhere to the procedures outlined in the Emergency Response Plan as required by OSHA Standard 29 CFR 1910.38 and 1910.120.

XI. ANNUAL CHEMICAL HYGIENE PLAN AUDIT

The Chemical Hygiene Officer will conduct an audit of all phases of the Chemical Hygiene Plan each year. Results will be provided to the Department Head and the Office of Safety. Department Heads are responsible for taking corrective action. A meeting of Chemical Hygiene Officers and the Office of Safety should be scheduled whenever revisions to this plan are required.

XII. REFERENCES AND RECOMMENDED READING

- National Research Council, Prudent Practices for Handling Hazardous Chemicals in Laboratories, National Academy Press, Washington, D.C. 1981.
- National Research Council, Prudent Practices for Disposal of Chemicals from Laboratories, National Academy Press, Washington, D.C., 1983.
- Freeman, N.T., Introduction to Safety in the Chemical Laboratory, Academy Press, 1982.
- Manufacturing Chemists Association, Inc., Guide For Safety In The Chemical Laboratory, D. Van Nostrand Company, Inc., 1954.
- Green, Michael E., Safety in Working With Chemicals, MacMillan Publishing co., Inc. 1978.
- Pipitone, David A., Safe Storage of Laboratory Chemicals, Wiley & Sons, Inc. 1984.
- Code of Federal Regulations, 29 CFR Part 1910 Subpart Z section 1910.1450, Occupational Exposure to Hazardous to Hazardous Chemicals in Laboratories, 1990.

Appendix A

Laboratory Safety Equipment Inspection Schedule

<p><u>THE UNIVERSITY OF NORTH CAROLINA</u> GREENSBORO</p>		<p>LABORATORY SAFETY EQUIPMENT INSPECTION SCHEDULE</p>		Page 1 of 1
				Date:
Laboratory:				
Address:				
Laboratory Manager:			Telephone:	
<p>Purpose: The purpose of this schedule is to assure that all laboratory safety equipment is inspected on a routine basis by competent personnel. Records in the form of inspection tags, stickers, or logs will be maintained for all equipment.</p>				
Equipment	Location	Frequency of Inspection	Reference Standard Code, Procedure	Inspector
Chemical Hygiene Officer:			Telephone:	

Appendix B

Material Safety Data Sheets (MSDS's)

**THE UNIVERSITY OF NORTH CAROLINA at GREENSBORO
MATERIAL SAFETY DATA SHEETS (MSDS's)**

A. MSDS Format

MSDS's are written or printed material concerning product hazard determination, which are prepared and distributed with chemicals by chemical manufacturers and distributors. MSDS's are written in English and contain the following information:

- Identity of the chemical as provided on the container label;
- Physical and chemical characteristics of the material;
- Physical hazards of the material;
- Health hazards of the material;
- Primary route(s) of entry;
- Exposure limits, Threshold Limit Value (TLV), OSHA Permissible Exposure Limit (PEL), or Supplier recommended limits;
- Whether or not the material or components have been found to be a potential carcinogen by the International Agency for Research on Cancer (IARC), National Toxicology Program (NTP), or by OSHA;
- Applicable precautions for safe handling and use;
- Applicable control measures;
- Emergency and first-aid procedures;
- Date of preparation or date of last change;
- Name, address, and telephone number of the chemical manufacturer, importer, employer, or other responsible party, who can provide additional information.

B. Obtaining MSDS's

On all Purchase Requisitions for any chemicals, the Chemical Hygiene Officer will verify: "MSDS on file", "MSDS required", or "Material Exempt". Each Department Head is responsible for obtaining MSDS's for their respective areas. An MSDS should be available for every hazardous chemical listed on the inventory list.

Additionally MSDS's can be found on the UNCG Office of Safety webpage at the following address: <http://www.uncg.edu/sft/>

Department Heads will adhere to the following MSDS procedures:

UNCG Material Safety Data Sheet Program Procedures:

1. A department representative shall be appointed to be responsible for the *Department Master Notebook*. The name of this person shall be forwarded to the Office of Safety as the "contact person" for the department. This person will be responsible for maintaining and updating the notebook.
2. Copies of the *Department Master Notebook* shall be made and distributed within the department as specified in the **Departmental Implementation Procedures**.
3. The *Department Master Notebook* and its chemical inventory shall be updated continually and reviewed no less than once per quarter. To document that the notebook has been reviewed and updated as necessary, a form is provided in the *Master Notebook*. This form is to be signed and dated by the department representative at the time of review.
4. Departmental Request for MSDS form is to be copied, completed, and returned to the Office of Safety whenever a new chemical is purchased. A copy of this form is provided in the back flap of the *Department Master Notebook*.
5. The Office of Safety, in cooperation with Accounts Payable and Purchasing, has developed a procedure to allow the monitoring of most chemical purchasing. This will allow the Office of Safety to receive most MSDSs directly and forward them to the appropriate department. However, any MSDSs received by a department in a shipment should be copied and sent to the Office of Safety for placement in the *UNCG Master Notebook*. (Please include department name and location with copy.)
6. In the event an MSDS is not available, the Office of Safety will use the procedures in Section C to obtain an MSDS.

Departmental Implementation Procedures

1. The MSDS notebook provided to each department should be considered the *Department Master MSDS Notebook*. (The *Master Notebook* for departments using many chemicals may consist of several notebooks, but will be simply referred to as the *Master Notebook*.)
2. If the department has several remote locations where chemicals are being used, a copy of the MSDS for the particular chemical must be readily accessible to employees at each location. This requirement of the standard may make it necessary for the department to develop site specific notebooks using the *Master Notebook* as a source. Questions concerning specific requirements which may impact your department should be directed to the Office of Safety.

Ex.: A department using various chemicals in several laboratories should make copies of the MSDSs in the *Master Notebook* and distribute them to each location where the chemical is being used. Remember the MSDS must be available for timely use in an emergency.

A department using various commercial cleaning products at various sites on campus should make copies of the MSDSs from the *Master Notebook* and distribute them to various locations where specific chemicals are used. This may be a central location in the building which is accessible to the employees using the products.

3. The MSDS must be available to the employee during all hours when the employee is working with the chemical. The location of the *Master Notebook* and any site specific notebooks developed by the department must be explained to each employee, prior to their assignment to duties involving chemicals. (Training in the safe use of the chemical and other facets of the North Carolina Hazard Communications Standard must also be explained to the employee.)
4. An inventory of the chemicals used by the department should be placed at the beginning of the *Master Notebook*. It may be helpful to have this inventory organized by chemical storage location.
5. Maintaining the *Master Notebook*, and any site specific notebooks is the most important step in ensuring regulatory compliance and a safe workplace.

C. Review of MSDS's

The Chemical Hygiene Officer is responsible for reviewing all incoming data sheets for new and significant health/safety information. Any new information will be transmitted to Department Heads so appropriate measures can be taken to inform affected employees. If deficiencies exist or additional information is needed concerning MSDS's, the chemical manufacturer or supplier will be contacted to obtain necessary information. This can be accomplished through the Office of Safety.

D. MSDS Maintenance

The representative(s) appointed by the Department Head is responsible for maintaining the MSDS's.

The MSDS's for chemicals and the chemical inventory list are maintained by each department in a notebook titled *Department Master Notebook*. These are accessible to employees during each workshift.

Additionally a large amount of MSDS's can be located on-line at the following URL
<http://www.uncg.edu/sft/>

If MSDS's are not available or new chemicals in use do not have MSDS's, employees should contact their immediate supervisor.

A master copy of the MSDS's and inventory list will be maintained by the Office of Safety.

Appendix C

New Chemical Purchasing Request

Date:

1. Requesting Area: _____ 2. Requestor: _____

3. Chemical Substance: _____

4. Material Safety Data Sheet (MSDS) Attached: ____ Yes
This request cannot be processed unless the MSDS is attached.

5. Proposed Chemical Use (amounts, duration, etc.) _____

6. Engineering Controls (enclosures, ventilation systems, etc.): _____

7. Storage Requirements: _____

8. Employee Exposure: _____

9. Expected Workplace Exposure Levels: _____

10. Personal Protective Equipment Required:

____ Respiratory Protection _____
____ Eye and Face Protection _____
____ Protective Clothing _____

11. Required Medical Surveillance:

____ Pulmonary Tests _____
____ Urine Analysis _____
____ Blood Analysis _____

12. Routine Monitoring Requirements:

A. Workplace Exposure Levels: _____
B. Medical Surveillance: _____

13. Request approval by Chemical Hygiene Officer: _____

Date: _____

14. Route a copy to: Office of Safety

Appendix D

Chemical Hazard Audit Checklist

Date: _____

1. Chemical Substance Audited: _____
2. Work Area Audited: _____
3. Audit Performed By: _____
4. Reason for Audit:
____ Routine
____ Special - Reason: _____
5. Date Audit Performed: _____ 6. Time of Audit: _____ a.m. _____ p.m

7. Items Audited and Findings:

ITEMS	FINDINGS	RECOMMENDATIONS
____ Current MSDS in work area. ____ Engineering controls maintained ____ Labels appropriate. ____ Local fire chief notified. ____ Emergency procedures known. ____ Personal protective equipment used. ____ Workplace monitoring performed. ____ Employees told of monitoring results. ____ Required medical test performed. ____ Employee concerns, if any. ____ Supervisory concerns.		

8. Other comments: _____

9. Auditor's signature: _____ Date: _____

10. Route a copy to: 1- Work area supervisor, 2- Office of Safety.

Date:

Company:

Location:

Hazard Chemical Inventory

No.	Chemical Identity	Storage Location	Quantity Stored	Class	Comments

Appendix E
Exposure Sampling Data

THE UNIVERSITY OF NORTH CAROLINA
GREENSBORO

**AIR SAMPLING DATA
TABLE NUMBER**

Company:	Location:	Survey Date
Air Sampling Results for:		Sampled By:
Type Sample:		Analyte:
Sample Media:		Analytical Method:

ACGIH TLV-TWA:	OSHA PEL:	ODHA STEL:
-----------------------	------------------	-------------------

Sample Location	Sample Number	Time (Minutes)	Volume (Liters)	Sample Concentration	Unit¹	Date

Remarks:

1- ppm – Parts of vapor or gas per million parts of contaminated air by volume at 25° C and over 760 torr.
mg/m³ - Approximate milligrams of substance per cubic meter of air.
C - Ceiling limit – limit which should never be exceeded even instantaneously.

Appendix F

Chemical Hygiene Training Checklist

Appendix G

New Chemical Training Checklist

Date: _____

1. Work Area: _____ 2. Instructor: _____

3. Chemical Substance: _____

4. Material Safety Data Sheet (MSDS) Attached: ____ Yes

The MSDS must be attached to this New Chemical Training Sheet

5. New Chemical Use: _____

6. Employee Training Provided:

- | | |
|--|----------------------------|
| _____ MSDS reviewed | _____ Work area monitoring |
| _____ Engineering Controls | _____ Work practices |
| _____ Personal Protective Equipment | _____ Emergency procedures |
| _____ Detection of release or presence | _____ _____ |
| _____ Labels | _____ _____ |

7. Training Date: _____

8. Employees Trained:

Employee Name	Social Security Number	Employee Signature


9. Instructors Signature: _____

Date: _____

10. Route a copy to: 1- Area's Supervisor 2- Occupational Health Task Group
 3- Personnel Department File

Appendix H

Chemical Hygiene Permit

	Chemical Hygiene Permit		Page 1 of 1								
			Date: _____								
Permit Number: _____ Date: _____ Location: _____ Time: _____ Person Requesting Permit: _____											
Potential Hazards and Required Controls											
Safety			Health			Fire					
Hazards:			Hazards:			Hazards:					
Precautions	Y	N	NA	Precautions	Y	N	NA	Precautions	Y	N	NA
Provide guards				Possible Oxygen Deficiency				Fire Extinguishers			
Personal protective equip.				Special Ventilation				Open flame permit			
Special safety training				Toxic materials				Explosion protection			
Special safety procedures				Personal Protective Equip.				Remove combustibles			
Lockouts required				Special rescue procedures				Test atmosphere			
Unattended operation				Lockouts required				Emergency Egress			
Work alone				Exceed PELs				Pyrophorics			
Sole Occupancy								Unattended operation			
Special Considerations:			Special considerations:			Special considerations:					
Additional Comments:											
Approval of chemical Hygiene Officer:				Name:				Date:			

Appendix I

List of Chemical Hygiene Officers

**List of Chemical
 Hygiene Officers**

Date:

Department	Chemical Hygiene Officer
Biology	Robert Caple
Chemistry	Patty Regio
Clothing and Textiles	Dr. Charles Kim
Exercise and Sport Science	Dr. Alan Goldfarb
Food, Nutrition, and Food service Management	Dr. George Loo
Psychology	
Student Health Service	Derrick Lankford

Appendix J

Chemicals Requiring Initial Monitoring

If your lab uses any of the following chemicals, initial monitoring is required. Contact the UNCG office of Safety for more information.

Asbestos

Vinyl Chloride

Inorganic Arsenic

Lead

Cadmium

Benzene

1, 2 Dibromo- 3- chloropropane

Acrylonitrile

Ethylene Oxide

Formaldehyde

Methylene Dianiline

Methylene Chloride

Appendix K

Resistance to Chemicals of Common Glove Materials

Chemical	Natural	Neoprene Rubber	Nitrile	Vinyl
Acetaldehyde	G	G	E	G
Acetic Acid	E	E	E	E
Acetone	G	G	G	F
Acrylonitrile	P	G	--	F
Ammonium Hydroxide (sat)	G	E	E	E
Aniline	F	G	E	G
Benzaldehyde	F	F	E	G
Benzene^a	P	F	G	F
Benzyl Chloride^a	F	P	G	P
Bromine	G	G	--	G
Butane	P	E	--	P
Butyraldehyde	P	G	--	G
Calcium Hypochlorite	P	G	G	G
Carbon Disulfide	P	P	G	F
Carbon Tetrachloride^a	P	F	G	F
Chlorine	G	G	--	G
Chloroacetone	F	E	--	P
Chloroform^a	P	F	G	P
Chromic Acid	P	F	F	E
Cyclohexane	F	E	--	P
Dibensyl Ether	F	G	--	P
Dibutyl Phtalate	F	G	--	P
Diethanolamine	F	E	--	E
Diethyl Ether	F	G	E	P
Dimethyl Sulfoxide^b	--	--	--	--
Ethyl acetate	F	G	G	F
Ethylene Dichloride^a	P	F	G	P
Ethylene Glycol	G	G	E	E
Ethylene Trichloride^a	P	P	--	P
Fluorine	G	G	--	G
Formaldehyde	G	E	E	E
Formic Acid	G	E	E	E
Glycerol	G	G	E	E
Hexane	P	E	--	P
Hydrobromic Acid (40%)	G	E	--	E
Hydrochloric acid (conc)	G	G	G	E
Hydrofluoric Acid (30%)	G	G	G	E
Hydrogen peroxide	G	G	G	E
Iodine	G	G	--	G
Methylamine	G	G	E	E

Chemical	Natural	Neoprene Rubber	Nitrile	Vinyl
Methyl Cellosolve	F	E	--	P
Methyl Chloride ^a	P	E	--	P
Methyl ethyl ketone	F	G	G	P
Methylene Chloride ^a	F	F	G	F
Monoethanolamine	F	E	--	E
Morpholine	F	E	--	E
Napthalene ^a	G	G	E	G
Nitric Acid (conc)	P	P	P	G
Perchloric Acid	F	G	F	E
Phenol	G	E	--	E
Phosphoric Acid	G	E	--	E
Potassium Hydroxide (sat)	G	G	G	E
Propylene Dichloride ^a	P	F	--	P
Sodium Hydroxide	G	F	G	E
Sodium Hypochlorite	G	P	F	G
Sulfuric Acid (conc)	G	G	F	G
Toluene ^a	P	F	G	F
Trichloroethylene ^a	P	F	G	F
Tricresyl Phosphate	P	F	--	F
Triethanolamine	F	E	E	E
Trinitrotoluene	P	E	--	P

(E= excellent, G= Good, F= Fair, P= Poor)

a Aromatic and halogenated hydrocarbons will attack all types of natural and synthetic glove materials. Should swelling occur, the user should change to fresh gloves and allow the swollen gloves to dry and return to normal.

b No data on the resistance to dimethyl sulfoxide of natural rubber neoprene, nitrile rubber, or vinyl materials are available; the manufacturer of the substance recommends the use of butyl rubber gloves.

Appendix M

Department of Homeland Security Chemicals of Interest

Acetaldehyde

75-07-0 DHS

.3-Bis (2-Chloroethylthio) -n- pentane

142868-94-
8 DHS

.3-Bis (2-chloroethylthio_ -n- propane	63905-10-2	DHS
	142868-93-	
1,4-Bis (2-chloroethylthio) -n- Butane	7	DHS
1H- Tetrazole	288-94-8	DHS
2-Chloroethylchloromethylsulfide	2625-76-5	DHS
5-Nitrobenzotriazol	2338-70-0	DHS
Acetone cyanohydrin, stabilized	75-86-5	DHS
Acetyl Bromide	506-96-7	DHS
Acetyl Chloride	75-36-5	DHS
Acetyl Iodide	507-02-8	DHS
Allyltrichlorosilane, stabilized	107-37-9	DHS
Aluminum (powder)	7429-90-5	DHS
Aluminum Bromide, anhydrous	7727-15-3	DHS
Aluminum Chloride, anhydrous	7446-70-0	DHS
Aluminum Phosphide	2089-73-8	DHS
Ammonium Nitrate	6484-52-2	DHS
Ammonium Nitrate, solid	6484-52-2	DHS
Ammonium perchlorate	7790-98-9	DHS
Ammonium picrate	131-74-8	DHS
Amyltrichlorosilane	107-72-2	DHS
Antimony Pentafluoride	7783-70-2	DHS
Arsenic Trichloride	7784-34-1	DHS
Arsine	7784-42-1	DHS
Barium Azide	18810-58-7	DHS
Bis (2-chloroethylthio) methane	63869-13-6	DHS
Bis (2-Chloroethylthiomethyl) ether	63918-90-1	DHS
Boron Trichloride	10294-33-4	DHS
Boron Trifluoride	10294-34-5	DHS
Bromine	7726-95-6	DHS
Bromine Chloride	13863-41-7	DHS
Bromine Pentafluoride	7789-30-2	DHS
Bromine Trifluoride	7787-71-5	DHS
Butyltrichlorosilane	7521-80-4	DHS
Calcium Hydrosulfite	15512-36-4	DHS
Calcium Phosphide	1305-99-3	DHS
Carbonyl Fluoride	353-50-4	DHS
Carbonyl sulfide	463-58-1	DHS
Chlorine Dioxide	10049-04-4	DHS
Chlorine Pentafluoride	13637-63-3	DHS
Chlorine Trifluoride	7790-91-2	DHS
Chloroacetyl Chloride	79-04-9	DHS
Chlorosarin	1445-76-7	DHS
Chlorosoman	7040-57-5	DHS
Chlorosulfuric acid	7790-94-5	DHS
Chromium Oxychloride	14977-61-8	DHS
Cyanogen	460-19-5	DHS
Cyanogen Chloride	506-77-4	DHS
Cyclohexytrichlorosilane	98-12-4	DHS
DF	676-99-3	DHS
Diazodinitrophenol	87-31-0	DHS
Diborane	19287-45-7	DHS
Dichlorosilane	4109-96-9	DHS
	15715-41--	
Diethyl Methylphosphonie	0	DHS

Diethyldichlorosilane	1719-53-5	DHS
Diethyleneglycol Dinitrate	693-21-0	DHS
Dimethyldichlorosilane	75-78-5	DHS
Dingu	55510-04-8	DHS
Dinitrogen tetroxide	10544-72-6	DHS
Dinitrophenol	25550-58-7	DHS
Dinitroresorcinol	519-44-8	DHS
Diphenyldichlorosilane	80-10-4	DHS
Dipicryl sulfide	6/3/2217	DHS
Dipicrylamine [or] Hexyl	131-73-7	DHS
Dodecytrichlorosilane	4484-72-4	DHS
Ethyl phopsphonyl difluoride	753-98-0	DHS
Ethyldiethanolamine	139-87-7	DHS
Ethylphosphonothioc dichloride	993-43-1	DHS
Ethyltrichlorosilane	115-21-9	DHS
Fluorine	7782-41-4	DHS
Fluorosulfonic acid	7789-21-1	DHS
Germane	7782-65-2	DHS
Germanium tetrafluoride	7783-58-6	DHS
Guanyl nitrosaminoguanilydene hydrazine		DHS
Hexaethyl tetraphosphate and compressed gas mixtures	757-58-4	DHS
Hexafluoroacetone	684-16-2	DHS
Hexanitrostilbene	20062-22-0	DHS
Hexolite	121-82-4	DHS
Hexyltrichlorosilane	928-65-4	DHS
HMX	2691-41-0	DHS
HN 1 (nitrogen mustard-1)	538-07-8	DHS
HN2 (nitrogen mustard-2)	51-75-2	DHS
HN3 (nitrogen mustard-3)	555-71-1	DHS
Hydrogen bromide (anhydrous)	10035-10-6	DHS
Hydrogen chloride (anhydrous)	7647-01-0	DHS
Hydrogen cyanide	74-90-8	DHS
Hydrogen fluoride (anhydrous)	7664-39-3	DHS
Hydrogen Iodide, anhydrous	10034-85-2	DHS
Hydrogen peroxide (concentration of at least 35%)	7722-84-1	DHS
Hydrogen selenide	7783-07-5	DHS
Hydrogen sulfide	7783-06-4	DHS
Iodine pentafluoride	7783-66-6	DHS
Isopropylphosphonothioc dichloride	1498-60-8	DHS
Isopropylphosphonyl difluoride	677-42-9	DHS
Lead azide	13424-46-9	DHS
Lead styphnate	15245-44-0	DHS
Lewisite 1	541-25-3	DHS
Lewisite 2	40334-69-8	DHS
Lewisite 3	40334-70-1	DHS
Lithium amide	7782-89-0	DHS
Lithium nitride	26134-62-3	DHS
Magnesium (powder)	7439-95-4	DHS
Magnesium diamide	7803-54-5	DHS
Magnesium phosphide	12057-74-8	DHS
MDEA	105-59-9	DHS
Mercury fulminate	628-86-4	DHS
Methyl mercaptan	74-93-1	DHS
Methylchlorosilane	993-00-0	DHS

Methyldichlorosilane	75-54-7	DHS
Methylphenyldichlorosilane	149-74-6	DHS
Methylphosphonothioic Dichloride	676-98-2	DHS
Methyltrichlorosilane	75-79-6	DHS
N, N-(2-dipropylamino)ethanethiol	6/8/5842	DHS
N,N- (2- Diisopropylamino) ethanethiol	7/9/5842	DHS
N,N-(2-diethylamino) ethanethiol	100-38-9	DHS
N,N-(2-dimethylamino) ethanethiol	108-02-1	DHS
N,N-Diethyl phosphoramidic Dichloride	1498-54-0	DHS
N,N-Diisopropyl phosphoramidic Dichloride	23306-80-1	DHS
N,N-Dimethyl phosphoramidic dichloride	677-43-0	DHS
N,N-Dipropyl phosphoramidic dichloride	40881-98-9	DHS
Nitric Acid	7697-37-2	DHS
Nitric oxide	10102-43-9	DHS
Nitrobenzene	98-95-3	DHS
Nitrocellulose	9004-70-0	DHS
Nitrogen Mustard Hydrochloride	55-86-7	DHS
Nitrogen Trioxide	10544-73-7	DHS
Nitroglycerine	55-63-0	DHS
Nitromannite	15825-70-4	DHS
Nitromethane	75-52-5	DHS
Nitrostarch	9056-38-6	DHS
Nitrosyl Chloride	2696-92-6	DHS
Nitrotriazolone	932-64-9	DHS
Nonyltrichlorosilane	5283-67-0	DHS
o,o-Diethyl S-[2-(diethylamino)ethyl]phosphorothiolate	78-53-5	DHS
Octadecyltrichlorosilane	112-04-9	DHS
Octolite	57607-37-1	DHS
Octonal	78413-87-3	DHS
Octyltrichlorosilane	5283-66-9	DHS
Oleum (fuming sulfuric acid)	8014-95-7	DHS
O-Mustard (T)	63918-89-8	DHS
Oxygen Difluoride	7783-41-7	DHS
Pentolite	8066-33-9	DHS
Perchloryl Fluoride	7616-94-6	DHS
PETN	78-11-5	DHS
Phenyltrichlorosaline	98-13-5	DHS
Phosgene	75-44-5	DHS
Phosphine	7803-51-2	DHS
Phosphorous	7723-14-0	DHS
Phosphorous Oxychloride	10025-87-3	DHS
Phosphorous Pentabromide	7789-69-7	DHS
Phosphorous Pentachloride	10026-13-8	DHS
Phosphorous Pentasulfide	1314-80-3	DHS
Phosphorous Trichloride	12/2/7719	DHS
Picrite	556-88-7	DHS
Piperidine	110-89-4	DHS
Potassium Chlorate	4/9/3811	DHS
Potassium Cyanide	151-50-8	DHS
Potassium Nitrate	7757-79-1	DHS
Potassium Perchlorate	7778-74-7	DHS
Propylphosphonothioic Dichloride	1/8/2524	DHS
Propylphosphonothioic Difluoride	690-14-2	DHS
Propyltrichlorosilane	141-57-1	DHS

QL	57856-11-8	DHS
RDX	121-82-4	DHS
RDX and HMX mixtures	121-82-4	DHS
Sarin	107-44-8	DHS
Selenium Hexafluoride	7783-79-1	DHS
Sesquimustard	3563-36-8	DHS
Silicon Tetrachloride	10026-04-7	DHS
Silicon Tetrafluoride	7783-61-1	DHS
Sodium Azide	2628-22-8	DHS
Sodium Chlorate	5/9/7775	DHS
Sodium Cyanide	143-33-9	DHS
Sodium Hydrosulfite	7775-14-6	DHS
Sodium Nitrate	7631-99-4	DHS
Sodium phosphide	12058-85-4	DHS
Soman	96-64-0	DHS
Stibine	7803-52-3	DHS
Strontium Phosphide	12504-16-4	DHS
Sulfur Dioxide(anhydrous)	9/5/7446	DHS
Sulfur Mustard (Mustard gas (H))	505-60-2	DHS
Sulfur Tetrafluoride	7783-60-0	DHS
Sulfuryl Chloride	7791-25-5	DHS
Tabun	77-81-6	DHS
Tellurium Hexafluoride	7783-80-4	DHS
Tetranitroaniline	509-14-8	DHS
Tetrazene	109-27-3	DHS
Thiodiglycol	111-48-8	DHS
Thionyl Chloride	7719-09-7	DHS
Titanium Tetrachloride	75550-45-0	DHS
TNT (trinitrotolulene)	118-96-7	DHS
Torpex	67713-16-0	DHS
Trichlorosilane	10025-78-2	DHS
Triethanolamine	102-71-6	DHS
Triethanolamine Hydrochloride	637-39-8	DHS
Triethyl Phosphite	122-52-1	DHS
Trifluoroacetyl Chloride	354-32-5	DHS
Trifluorochloroethylene	79-38-9	DHS
Trimethyl Phosphite	121-45-9	DHS
Trimethylamine	75-50-3	DHS
Trinitroaniline	26952-42-1	DHS
Trinitroanisole	606-35-9	DHS
Trinitrobenzene	99-35-4	DHS
Trinitrobenzenesulfonic Acid	2508-19-2	DHS
Trinitrobenzoic Acid	129-66-8	DHS
Trinitrochlorobenzene	88-88-0	DHS
Trinitrofluorenone	129-79-3	DHS
Trinitro-meta0cresol	602-99-3	DHS
Trinitronaphthalene	55810-17-8	DHS
Trinitrophenetole	4732-14-3	DHS
Trinitrophenol	88-89-1	DHS
Trinitroresorcinol	82-71-3	DHS
Tritonal	54413-15-9	DHS
Tungsten Hexafluoride	7783-82-6	DHS