

**University of North Dakota
Safety and Environmental Health Office**

Chemical Hygiene Plan
Department of
Effective: July 1, 1999

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I. Introduction:

A. Purpose

Attention: Each Laboratory Safety Coordinator (LSC) or Principle Investigator (PI) must review the Chemical Hygiene Plan (CHP) and decide how to apply pertinent sections to the chemicals and procedures used in the laboratory. If changes, deletions and/or modifications are necessary, the (LSC) and/or the (PI) or designee must modify the text to address local hazards, policies and procedures.

The University of North Dakota has developed and implemented a written Chemical Hygiene Plan (CHP) in conjunction with the Institutional Biosafety Committee, University Loss Control Committee and the Radiation and Hazardous Chemical Waste Committee.

This Chemical Hygiene Plan describes policies, procedures, equipment, personal protective equipment and work practices that are capable of protecting employees from the hazards presented by many hazardous chemicals used in laboratories. This Plan is intended to meet the requirements of the federal Occupational Safety and Health Administration (OSHA) standard, Occupational Exposure to Hazardous Chemicals in Laboratories.

This Chemical Hygiene Plan is intended to safely limit laboratory workers' exposure to hazardous substances. Laboratory workers must not be exposed to substances in excess of the permissible exposure limits (PEL) specified in OSHA rule 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances.

The Occupational Safety and Environmental Health Office (OSEHO) has overall responsibility for the administration of the *University's Chemical Hygiene Plan*. The OSEHO is available to provide assistance to all departments who may be effected by the *Chemical Hygiene Plan*.

Attention: Pay particular attention to the following paragraph. If you, as a Laboratory Safety Coordinator (PI or designee) suspect exposure concentrations exceed allowable levels, please contact the OSEHO for air monitoring assistance.

An employee's workplace exposure to any regulated substance must be monitored if there is reason to believe that the exposure will exceed an action level or a PEL. If exposures to any regulated substance routinely exceed an action level or permissible exposure level there must also be employee medical surveillance.

B. Scope and Application

Attention: In this section, specify which researchers and laboratories in the department are covered by this standard. The text below provides guidance. Some departments have provided a list of (PI's) and locations, and a phrase describing of the type of research occurring in each area.

This plan applies where "laboratory use" of hazardous chemicals occurs. Laboratory use means handling or use of chemicals in which all of the following conditions are met:

1. the handling or use of chemicals occurs on a "laboratory scale", that is, the work involves containers which can easily and safely be manipulated by one person,
2. multiple chemical procedures or chemical substances are used, and
3. protective laboratory practices and equipment are available and in common use to minimize the potential for employee exposures to hazardous chemicals.

At a minimum, this definition covers employees (including student employees, technicians, faculty, supervisors, lead researchers and physicians) who use chemicals in teaching, research and clinical laboratories at the University of North Dakota. Certain non-traditional laboratory settings may be included under this standard at the option of individual departments within the University. The (LSC) or designee must ensure that laboratory students, while not legally covered under this plan, will be given training commensurate with the level of hazard associated with their laboratory work.

This plan does not apply to laboratories whose function is to produce commercial quantities of material. Also, where the use of hazardous chemicals provides no potential for employee exposure, such as in procedures using chemically impregnated test media and commercially prepared test kits, this standard will not apply. When laboratory work is limited to use of these commercially available kits, a Chemical Hygiene Plan is not required.

II. Policy:

The University strives to provide a safe and healthy environment for its students, faculty, staff and visitors. All faculty, supervisors and other persons in authority, are enjoined to provide for safety in the environment and operation under their control. This is accomplished as much as practical with acceptable engineering and administrative controls. The University subscribes to recognized national standards of safety as defined in published material from organizations such as the North Dakota Worker's Compensation Bureau, the state Fire Laws, the Environmental Protection Agency, the

Department of Transportation and the Federal Occupational Safety and Health Act (OSHA). The Occupational Safety and Environmental Health Office has been assigned the responsibility of administering the University's safety program.

III. Responsibilities:

Attention: Implementation of the Chemical Hygiene Plan at the University is a shared responsibility. Employees, supervisors, department heads, deans, administrative staff, and OSEHO staff all have roles to play. These roles are outlined below. The Department Heads should tailor these general descriptions to fit the reality of the distribution of responsibility within the department.

A. Department Chair/Division Heads: Are responsible for ensuring implementation of the Chemical Hygiene Plan to their departments. Also to ensure:

1. That the CHP is customized for each department/division for implementation as a departmental chemical safety program.
2. That a Laboratory Safety Coordinator (PI or designee) is assigned for the department, division or work area.
3. That employees are trained or otherwise qualified with respect to the potential health hazards in their workplace and the measures to be taken with regard to their protection.
4. That laboratory students not covered under this standard are given training commensurate with the level of hazard associated with their laboratory work.

B. Principal Investigators: Are responsible for assuring that activities conducted under their supervision are reviewed for environmental, and safety and health problems. Also to ensure:

1. That known hazards are identified and labeled with the appropriate hazard warnings.
2. The OSEHO or Department Chair/Division Head is notified if any unforeseen hazards are encountered through the course of work.

C. Occupational Safety and Environmental Health Office: Is responsible for working closely with departments to ensure effective implementation of this Chemical Hygiene Plan. In addition (OSEHO) shall:

1. Appoint a Chemical Hygiene Officer to provide technical guidance in the development and implementation of the provisions of this Chemical Hygiene Plan.

2. Maintain a central file of Material Safety Data Sheets (MSDS's) for hazardous chemicals. Any additional MSDSs that are specifically requested by employees or supervisors will also be maintained.

D. Audit for compliance with the (CHP).

d. Laboratory Safety Coordinator: Is responsible for serving as a focal point for laboratory health and safety activities within the unit. In addition, the LSC shall:

1. Act as a liaison with the OSEHO
2. Submit a copy of the modified CHP to the Chemical Hygiene Officer.
3. Conduct routine inspections to ensure compliance with the customized CHP.
4. Coordinate any updates or changes to the customized CHP as directed from the Chemical Hygiene Officer.

IV. Standard Operating Procedures:

Attention: Insert the name of the college/department/division in the title and first sentence, and identify the designated Laboratory Safety Officer. Note whether the Chemical Hygiene Plan pertains to the named division, department or entire college. Note that the plan has been modified to incorporate location-specific information.

This section summarizes laboratory-specific SOPs. The full text of these SOPs is included in Appendix A, or can be obtained from the referenced PI, or from the Laboratory Safety Coordinator, _____, for the Department of _____

A. Criteria for Implementation of Control Measures:

Attention: This section should not require extensive tailoring. However, laboratory safety coordinators for some departments have provided descriptions and floor plans that identify the location of equipment such as fume hoods, biological safety cabinets, glove boxes, showers, eye washes, fire extinguishers, etc.

Engineering controls, personal protective equipment, hygiene practices, and administrative controls each play a role in a comprehensive laboratory safety program. Implementation of specific measures must be carried out on a case-by-case basis, using the following criteria for guidance in making decisions. Assistance is available from the OSEHO.

Principle investigators/supervisors are responsible for the health and safety of persons in the laboratories/workplaces under their supervision. The following general rules and practices will assist in carrying out this responsibility:

1. Laboratory operations:

- a. All work being conducted and its scale must be appropriate to the available physical facilities and especially to the quality of air ventilation.
- b. A serious working atmosphere needs to be maintained. Absolutely no horseplay, fooling around or practical jokes will be allowed.
- c. Maintenance of a safe and clean work area (personal housekeeping) is the responsibility of each lab worker and lab supervisor under response for all employees.
- d. Assume any unfamiliar chemical is hazardous.
- e. Clean up your work area prior to leaving the laboratory.
- f. Wash hands, face, and arms thoroughly if contaminated and always wash before leaving the laboratory.
- g. Always wash before eating, drinking, smoking or applying make-up after working in a laboratory.
- h. Never taste a chemical.
- i. Check odors only if instructed to do so, by gently wafting some of the vapor towards your nose with your hand over the open container top.
- j. Pipetting by mouth is forbidden.
- k. Work with corrosive agents such as acids and bases should be conducted with particular care to avoid skin and eye contact.
- l. Report broken thermometers to the lab supervisor.
- m. Always add acid to water.
- n. Think twice before lighting a Bunsen burner and verify that no flammable vapors are present.
- o. If any chemical is splashed or spilled on your skin or body, immediately wash off the chemical and rinse for 15 minutes.

- p. Compressed gas cylinders must be secured at all times to a fixed object.
- q. All chemicals should be stoppered or capped at all times when not in immediate use. This includes hazardous waste.
- r. Hazardous chemicals stored in breakable containers should be provided with secondary containment.
- s. Absolutely no chemicals or chemical materials are to be put down the drain or placed in the trash without prior authorization.
- t. Beware of broken glass. Do not use damaged, cracked or broken glassware.
- u. Dispose of broken glassware and dangerous items such as syringes in special containers as directed by your LSC. Do not place in the regular trash.
- v. Do not store equipment, backpacks, coats, chemicals or other materials on the floor or in other places where laboratory workers can trip or knock over the item, or in places that would block fire exits.
- w. Electrical equipment always means the chance of shock or fire. Do not touch with wet hands or while standing on a wet floor.

2. Ventilation Requirements: The best way to prevent exposure to airborne substances is to prevent their escape into the working atmosphere by use of hoods and other engineering controlled ventilation devices.

a. Fume Hoods: The laboratory fume hood is a major protective device available to laboratory workers. Hoods are designed to capture airborne concentrations of chemicals that escape from their containers or apparatus and to remove them from the laboratory environment before they can be inhaled. Characteristics to be considered in requiring fume hood use are physical state, volatility, toxicity, flammability, eye and skin irritation, odor, and the potential for producing aerosols. A fume hood should be used if a proposed chemical procedure exhibits any one of these characteristics: (1) airborne concentrations might approach the action level or permissible exposure limit, (2) flammable vapors might approach one tenth of the lower explosion limit, (3) materials of unknown toxicity are used or generated, or (4) the odor produced is annoying to laboratory occupants or adjacent units.

Procedures that can generally be carried out safely outside the fume hood include those involving (1) water-based solutions of salts, dilute acids,

bases, or other reagents, (2) very low volatility liquids or solids, (3) closed systems that do not allow significant escape to the laboratory environment, and (4) extremely small quantities of otherwise problematic chemicals. The procedure itself must be evaluated for its potential to increase volatility or produce aerosols.

Hoods should not be used for chemical storage; bottles sitting in a hood interfere with the proper air flow.

In specialized cases, fume hoods will contain exhaust treatment devices, such as water wash-down for perchloric acid use, or charcoal or HEPA filters for removal of particularly toxic or radioactive materials.

3. Protective Equipment:

a. Safety Shields: Safety shields, such as the sliding sash of a fume hood, are appropriate when working with highly concentrated acids, bases, oxidizers or reducing agents, all of which have the potential for causing sudden spattering or an explosive release of material. Reactions carried out at non-ambient pressures (vacuum or high pressure) require safety shields, as do reactions that are carried out for the first time, including reactions significantly scaled up from normal operating conditions. High strength barriers coupled with remote handling devices may be necessary for safe use of extremely shock sensitive or reactive chemicals.

b. Glove boxes or vented gas cabinets: may be required when it is necessary to provide an inert atmosphere for the chemical procedure taking place, when capture of any chemical emission is desirable, or when the standard laboratory fume hood does not provide adequate assurance that overexposure to a hazardous chemical will not occur. The presence of biological or radioactive materials may also mandate certain special containment devices.

c. Localized exhaust ventilation: such as is usually installed over atomic absorption units, may be required for instrumentation that exhausts toxic or irritating materials to the laboratory environment. Ventilated chemical storage cabinets or rooms should be used when the chemicals in storage may generate toxic, flammable or irritating levels of airborne contamination.

e. Fire Extinguishers: must be located in all laboratory facilities. "A-B-C" type fire extinguishers can be used on most types of fires, but never endanger your life or the lives of other by using them. Even if the fire has been put out with fire extinguishers, the Fire Department still must be called to determine that the fire has been completely extinguished.

- f. **Emergency Eyewash and Shower Stations:** must be available whenever injurious or corrosive materials are present in the workplace. For further information, please refer to the Standard Practice for Emergency Eyewash and Shower Stations.
- g. **Carts, trays, boxes or other containers:** must be used to transport materials between the stockroom and labs or between labs.

4. Personal Protective Equipment: Individuals, who work with hazardous chemicals must be provided with proper protective equipment, by the department. The equipment to be used is determined by the Laboratory Safety Coordinator or Chemical Hygiene Officer or competent persons, upon review of the Material Safety Data Sheets (MSDS) and procedures. Individuals in labs must be trained in the proper use of the appropriate protective equipment that is relevant to their particular hazardous chemical. This protective equipment may include, but is not limited to:

- a. **Eye Protection:**
 - i. Safety Glasses
 - ii. Safety Goggles
 - iii. Face Shields

Eye protection is required for all personnel and any visitors whose eyes may be exposed to chemical or physical hazards. Side shields on safety glasses provide some protection against splashed chemicals or flying particles, but goggles or face shields are necessary when there is a greater than average danger of eye contact. A higher than average risk exists when working with highly reactive chemicals, concentrated corrosives, or with vacuum or pressurized glassware systems.

Contact lens users shall wear required eye protection (glasses, goggles, or face shields) in hazardous areas. Soft contact lenses shall not be worn in any area where toxic fumes are capable of damaging the eyes. Employees who wear contact lenses shall notify their supervisors. Employees should be aware of the following known facts regarding contact lenses: Contact lenses provide little protection to the eye from external forces; they may even compound the severity of an injury. Contact lenses may trap toxic or dangerous substances that are harmful to the eye; they also decrease the effectiveness of emergency eyewash fountains. Soft contact lenses may absorb and be contaminated by chemical reagents and fumes. LSC or CHO may determine the wearing of contact lenses unacceptable in some work environments. Unacceptable environments include chemical fumes, vapors, or splashes; intense heat; or a very dusty atmosphere.

b. Full-body splash protection:

- i. Lab Coats
- ii. Aprons
- iii. Cover-alls with the appropriate chemical resistance

Lab coats or other similar clothing protectors are strongly encouraged for all laboratory personnel.

c. Hand and Foot Protection:

- i. Gloves with appropriate chemical resistance
- ii. Gloves with thermal protection
- iii. Abrasion resistant gloves
- iv. Closed-toed shoes
- v. Shoe covers

Gloves made of appropriate material are required to protect the hands and arms from thermal burns, cuts, or chemical exposure that may result in absorption through the skin or reaction on the surface of the skin. Gloves are also required when working with particularly hazardous substances where possible transfer from hand to mouth must be avoided. Thus gloves are required for work involving pure or concentrated solutions of all carcinogens, reproductive toxins, substances which have a high degree of acute toxicity, strong acids and bases, and any substance on the OSHA PEL list carrying a "skin" notation.

Gloves should be carefully selected using guides from the manufacturers; however, glove-resistance to various chemical materials will vary with the manufacturer, model and thickness. Therefore, review a glove-resistance chart from the manufacturer you intend to buy from before purchasing gloves.

Bare feet are not permitted in any laboratory. Sandals and open-toed shoes are also discouraged in all laboratories and are not permitted in any situation where lab coats and gloves are required. All persons in labs must also wear long pants where lab coats and gloves are required.

Supervisors shall designate areas, activities, and tasks which require specific types of personal protective equipment as described above.

d. Respiratory Protection:

Employees of the University of North Dakota who wear respirators must be pre-approved by the OSEHO, and be under a medical surveillance program. Individuals who wear, or need to wear respirators must comply with the University's Respiratory Protection Program.

V. Workplace Monitoring of Safety Equipment:

Attention: Each LSC should identify the safety equipment to be used in the laboratory, and ensure that all employees are properly trained in its use. Since no two fume hoods operate exactly alike, be sure you and your staff understand the operating principals and use safe operating procedures. Please call OSEHO for assistance. The LSC should insert the phone number of the Physical Plant which serves the laboratories in the department.

Laboratory fume hoods must be vented with the exhaust located in such a position not to contaminate air being drawn into the general ventilation system. Each laboratory fume hood will be inspected, monitored and annually tested by the OSEHO. Fume hood performance evaluations will be conducted by the Occupational Safety and Environmental Health Office. Fume hoods must be monitored daily by the user to ensure that air is moving into the hood. Any malfunctions must be reported immediately to the OSEHO office. The hood should have a continuous reading device, such as a pressure gauge, to indicate that air is moving correctly. Users of older hoods without continuous reading devices should attach a strip of tissue or yarn to the bottom of the vertical sliding sash. The user must ensure the hood and baffles are not blocked by equipment and bottles, as air velocity through the face may be decreased. OSEHO staff will measure the average face velocity of each fume hood annually. If, during the annual check, a hood is not operating properly, OSEHO staff may request that you check to ensure the baffles are adjusted properly, and that the exhaust slots are not blocked by bottles and equipment. If these adjustments do not help, OSEHO staff will report the deficiency to the Physical Plant for servicing. All fume hood testing and maintenance will be done in accordance with the University's Standard Operating Procedures for Fume Hoods.

Quality: General air flow should not be turbulent and should be relatively uniform throughout the laboratory, with no high velocity or static areas; air flow into and within the hood should not be excessively turbulent.

Eye washes must be flushed weekly, and showers monthly. This will ensure that the emergency equipment is working, and that the water is clean, should emergency use become necessary. The Laboratory Safety Coordinator should coordinate with the OSEHO to ensure that emergency showers and eye washes are flushed. Fire extinguishers will be checked annually. The user is responsible for checking regularly to ensure that other protective equipment is functioning properly. The OSEHO staff can assist with these evaluations, should assistance be necessary.

Any laboratory equipment that could potentially be contaminated with a hazardous chemical, radiation or a biohazard, must be decontaminated and released for maintenance/repair. This process is coordinated through the OSEHO.

A. Modifications and New Systems:

Often times the modification of safety equipment must occur to ensure the safety of faculty, staff and students working in the laboratories. These changes must be made when appropriate testing of the existing equipment confirms a problem, or when new processes warrant additional safety equipment. When new safety equipment, is installed in University facilities, specific procedures for its use must be developed. The LSC must promptly train employees on the use of new safety equipment. The OSEHO is available as a resource to assist with these processes.

B. Procedures and Rules for Working with Chemicals:

1. Material Safety Data Sheets:

Material Safety Data Sheets (MSDS's) are documents which inform the user of the specific hazards involved in the handling of a chemical. It is required that a chemical manufacturer or importer have a MSDS for each hazardous material. The (MSDS) should be sent the first time a hazardous material is ordered, or when a change in the composition of the material has occurred. The MSDS's must be readily available and accessible for review by any employee, as a source document, to provide the necessary information during any work day. A copy of the MSDS is to be forwarded to the OSEHO, where a central file of all MSDS's exists.

The following requirements apply to chemical substances that are developed in the laboratory:

- a.** If the composition of a chemical substance which is produced exclusively for the laboratory's use is known, the principal investigator/lab supervisor must determine if it is a hazardous chemical (e.g., through knowledge or literature search). If the chemical is determined to be hazardous, the principal investigator/lab supervisor must provide appropriate training to protect personnel who use the substance.
- b.** If a chemical produced is a byproduct of unknown composition, the principal investigator/lab supervisor must assume that the substance is hazardous and must comply with the applicable requirements contained in this CHP.
- c.** If a chemical substance is produced for another user outside a UND laboratory, the laboratory has become a manufacturer for that particular substance. All such substances must comply with the labeling and MSDS requirements contained in OSHA's Hazard Communication Standard (29 CFR 1910.1200).

2. Labeling and Signs:

Signs and labels of the following types shall be posted in all laboratories, or areas of concern where necessary:

- a.** Emergency telephone numbers of University and local emergency response facilities.
- b.** Identification labels on all containers that contain or are associated with hazardous materials (including waste receptacles).
- c.** Location signs for eyewash stations, safety showers, fire extinguishers.
- d.** Exit signs at the exit of the facilities.
- e.** Warning signs and labels on/in areas or equipment that have potential hazards.

3. Labeling:

All containers of hazardous materials must be identified when ever left unattended for extended periods such as breaks or overnight. Containers of non-hazardous substances should be labeled also to avoid the high costs associated with identification and disposal of unknown substances. Minimum identification requirements are as follows:

- a.** Do not remove or deface the manufacturer's labels on incoming hazardous material containers.
- b.** All peroxide forming chemicals must be labeled as "Peroxidizable" and they must contain the date the container was opened.
- c.** Hazard warnings (e.g. flammable, corrosive, carcinogen, etc.) should be included on all containers of hazardous materials.
- d.** Labels would be dated and they should identify the person in charge of the material.
- e.** The chemical name or common name of the substance should be used in lieu of abbreviations or formulas.
- f.** If there are large quantities of containers of samples, prepared solutions, or similar, with the same hazardous substance, batch labeling of a tray, cabinet, or refrigerator will suffice.

3. Labeling (cont.):

g. When containers are too small to be labeled with the preceding information and when batch labeling is not viable, then a log reference where the log contains the information regarding contents, the person in charge and the date is acceptable. Log references should include hazard warning statements for hazardous materials.

h. All hazardous chemical waste containers must be labeled with the words “Hazardous Waste,” content, and the accumulation start date. See the *UND Management and Disposal of Hazardous and Chemical Wastes* guidebook.

i. Labels must be legible and in English. Departments having employees who speak other languages may add the information in their language.

4. Chemical Receiving:

a. Before a substance is received at the University, MSDS information on proper handling, storage, and disposal shall be made available to those who will be involved with that substance. This includes the following people, the Chemical Hygiene Officer, Department Heads, Faculty, Teaching Assistants, Custodian(s), Students, and Stockroom Clerks.

b. No containers will be received without the proper MSDS forms.

5. Storage of Chemicals:

All chemicals should be stored according to the specific hazards of the chemical. UND uses the following color coding system to assist departments with chemical storage.

Note: See Appendix B, The UND Chemical Code.

BLUE: for health hazards
RED: for flammable hazards
YELLOW: for reactivity hazards
WHITE: for contact hazards
GREEN: for low or no hazard

Group chemicals with similar color coding together. For example, flammable solvents, marked with a red label, should be stored by themselves, ideally in a flammable liquid storage cabinet.

5. Storage of Chemicals (cont.):

- a. All chemicals should be purchased in the smallest possible quantities consistent with the manner in which they are used.
- b. Some non-reactive chemicals having long shelf lives may be purchased in larger amounts, providing adequate storage facilities exist.
- c. The accumulation of excess chemicals can be avoided by purchasing the minimum quantities necessary for a project.
- d. All chemicals should be stored with attention to incompatibilities, so that if containers break in an accident, reactive materials do not mix and react violently.

6. Working with Hazardous Chemicals:

Minimizing the exposure to chemicals is essential when working in an environment with chemicals. Precautions should be taken to avoid exposure by the principle routes, they are as follows:

- a. **Avoiding Eye Injury:** Eye protection should be required for all personnel and visitors in all locations where chemicals are stored or used. (See “Personal Protective Equipment”, Section IV.A.4).
- b. **Avoiding Ingestion of Hazardous Chemicals:** Eating, drinking, gum chewing, applying cosmetics, and taking medicine in areas where hazardous chemicals are used is strictly prohibited. Laboratory refrigerators, ice chests, cold rooms, ovens, and so forth must not be used for food storage or preparation. Wash hands with soap and water immediately after working with any laboratory chemicals, even if gloves have been worn.
- c. **Avoiding Inhalation of Hazardous Chemicals:** Toxic chemicals or compounds of unknown toxicity should never be smelled. Procedures involving volatile toxic substances and operations involving solid or liquid toxic substances should be conducted in a laboratory fume hood.
- d. **Avoiding Injection of Hazardous Chemicals:** Syringes are often used for transferring solutions of chemicals and in conjunction with biohazardous materials. Many of these syringes are fitted with sharp needles. The risk of inadvertent injection is significant, and vigilance is required to avoid a needle stick. All needles must be properly disposed of in sharps containers. Other sharps such as broken glass, etc., must also be disposed of in puncture proof containers.

7. Minimizing Skin Contact:

Wear gloves whenever handling hazardous chemicals, sharp-edged objects, very hot or very cold materials, toxic chemicals, and substances of unknown toxicity.

8. Clothing and Protective Apparel:

Long hair and loose clothing or jewelry must be confined when working in the laboratory. Unrestrained long hair, loose or torn clothing, and jewelry can dip into chemicals or become ensnared in equipment and moving machinery. Clothing and hair can catch fire.

9. Transport of Chemicals:

Chemicals being transported outside the laboratory or between stockrooms and laboratories must be in break-resistant containers or break-resistant secondary containers, or on carts that have a raised edge to prevent containers from falling off, or to contain a spill. Secondary containers commercially available are made of rubber, metal, plastic, etc. that are equipped with carrying handles, and are large enough to contain the substance in the event of breakage. If chemicals must be shipped, the OSEHO can be contacted for assistance.

10. Disposal of Chemicals:

Chemical waste generated at the University is disposed of either as a non-hazardous waste or as a hazardous waste. The determination of a hazardous waste is based upon the potential hazards of the chemical to the environment. To dispose of chemical waste, a Waste Disposal Form/Manifest must be completed and submitted to the OSEHO. Upon receipt of the Waste Disposal Form/Manifest, OSEHO staff will pick up the wastes. For further information regarding the disposal of chemicals, the UND Guidebook, *The Management and Disposal of Hazardous and Chemical Wastes*, should be referenced.

VI. Responding to Accidents and Emergencies:

A. Preparation for Emergencies:

All laboratory personnel should know what to do in case of an emergency. Laboratory work should not be undertaken without knowledge of the following points:

1. How to report and initiate emergency response in case of a fire, injury, chemical spill, or other emergencies.
2. The location of emergency equipment such as safety showers and eyewashes.
3. The location of fire extinguishers and spill control equipment.
4. The locations of all available exits for evacuation from the laboratory.

B. Handling the Accidental Release of Hazardous Substance:

In the event of a laboratory scale spill, the following general guidelines for handling it should be followed:

1. Call 9-911 (or 911) when the situation poses immediate danger to people, property or process.
2. Notify other laboratory personnel of the accident and, if necessary, evacuate the area.
3. Tend to any injured or contaminated personnel and, if necessary, request emergency help.
4. Take steps to confine and limit the spill if this can be done without risk of injury or contamination.
5. Report the release/spill to the OSEHO at 7-3341, during daytime hours, or 7-3491 or 7-2591 after hours for assistance. If the OSEHO determines that the department or LSC can safely clean up the spill, appropriate procedures should be used. Dispose of contaminated materials properly as chemical waste.

C. Responding to Fires:

Fires are one of the most common types of laboratory accidents. Accordingly, all personnel should be familiar with general guidelines to prevent and minimize injury and damage from fires. At the department's request, hands-on experience with common types of extinguishers can be coordinated through the OSEHO.

VII. Employee Information and Training:

Attention: All employees including PIs must be trained on the information contained in the Chemical Hygiene Plan. The OSEHO provides a Laboratory Safety Course for all employees working in labs. This formal training must occur at initial hire. The Chemical Hygiene Plan itself, will serve as the primary part of the Laboratory Safety Training Manual. In addition, each PI or designee is responsible for ensuring that laboratory employees are provided with training about the specific hazards of chemicals present in their laboratory work area, and methods to control exposure to such chemicals. Such training must be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new potential exposure situations. All training must be properly documented with the records maintained by the OSEHO.

All employees of the University of North Dakota must receive training and have information available to them on the hazards of chemicals in their work area. In addition to the Laboratory Safety Training Course, the OSEHO will also provide Right-To-Know training, to all non-laboratory departments using hazardous chemicals, and a four hour training course, as needed for any users of radioactive materials at UND.

A. MSDS Files: Each lab should have a MSDS file for chemicals present in that laboratory. The MSDS should list the physical and health hazards for that chemical. A copy of the chemical hygiene plan should be accessible to all employees.

B. Training: Departments that engage in the laboratory use of hazardous chemicals are responsible for identifying employees who require training and for coordinating such training.

Employee training programs must include, at a minimum, the following subjects:

- 1. Detection:** Methods of detecting the presence of hazardous chemicals (observation, odor, real-time monitoring, air sampling, etc.);
- 2. Basic toxicological principles:** including toxicity, hazard, exposure, routes of entry, acute and chronic effects, dose-response relationship, LD50, threshold limit values and permissible exposure limits, exposure time, and health hazards related to classes of chemicals;
- 3. Good laboratory practice:** including: general techniques designed to reduce personal exposure by controlling hazards, as well as specific protective mechanisms and warning systems used in individual laboratories. Appropriate use of fume hoods is to be specifically addressed;

4. Description of information available: including Material Safety Data Sheets;

5. Emergency response actions appropriate to individual laboratories;

6. Applicable details of the departmental Chemical Hygiene Plan: including general and laboratory-specific Standard Operating Procedures;

7. An introduction to the Hazardous Chemical Waste Management guidebook;

VIII. Required Approvals

Attention: Certain laboratory operations, procedures or activities may warrant prior approval from a designated supervisor. The PIs in the department must consider the toxicity of the chemicals used, the hazards of each procedure, and the knowledge and experience of the laboratory workers, and decide which will require pre-approval. These procedures must be identified when the CHP is modified for a particular department. If no such pre-approvals are warranted, a memo to this effect shall be placed in the Departmental CHP. Tables containing information about some specific materials can be found in Appendix C.

A. OSEHO Approval: Prior approval is required for certain hazardous materials. OSEHO approval is required for all Radioactive material, and Drug Enforcement Agency (DEA) listed Controlled Substance orders.

B. Users of Duty-free alcohol: must also consult the OSEHO to verify that such material is being utilized in accordance with the University's Bureau of Alcohol, Tobacco and Firearms permit.

C. Biohazardous Materials: Prior approval from the Institutional Biosafety committee is required for the use of certain Biohazardous Materials.

D. DEA listed Essential or Precursor Chemicals: Some chemical suppliers of may require the submission of an authorization form with the purchase order. The OSEHO can authorize such purchases, or a departmental employee can be listed as an authorized buyer with such suppliers.

If a department has identified procedures requiring prior approval in addition to those special conditions mentioned above, a written record of approvals must be kept within the department.

IX. Medical Consultation and Examination:

Attention: This section requires minimal tailoring. PI's must be aware of when an employee is entitled to receive medical attention, and must ensure employees are also aware of the process that will be followed.

A. All employees who work with hazardous chemicals will have an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, 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.
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.
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.

The Chemical Hygiene Officer must be contacted whenever the need for medical consultation or examination occurs, or when there is uncertainty as to whether any of the above criteria have been met.

B. All medical examinations and consultations must be performed by the University's Designated Medical Provider (DMP), unless an individual has specified a different DMP in writing to the OSEHO prior to injury. When emergency and after-hours medical attention is required, dial 9-911 and request an ambulance. Employees must inform their supervisors of injuries within 24 hours. A UND Incident Report form and Supervisor's Incident Investigation form(Appendix D) must be filled out for any incident or near incident as soon as possible, and must be submitted to the OSEHO.

C. The OSEHO will provide the examining physician with the following information:

1. **The identity** of the hazardous chemical(s) to which the employee may have been exposed;
2. **A description of the conditions** under which the exposure occurred including quantitative exposure data, if available; and
3. **A description of the signs and symptoms** of exposure that the employee is experiencing, if any.

IX. Medical Consultation and Examination (cont.):

The above information must be collected and transmitted by the employee's supervisor or department to the Occupational Safety and Environmental Health office.

D. Reports: The examining physician will provide to the Occupational Safety and Health office a written report including the following:

1. Any recommendation for further medical follow-up;
2. The results of the medical examination and any associated tests;
3. Any medical condition which 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; and
4. A statement that the employee has been informed by the physician of the results of the consultation or medical examination, and any medical condition resulting from a workplace chemical exposure that may require further examination or treatment.

The written opinion will not reveal specific findings of diagnoses unrelated to occupational exposure. The Occupational Safety and Environmental Health office will notify the employee's department of any required actions that could result from the medical consultation or examination.

X. Personnel:

Attention: Compliance with the Laboratory Safety Standard is a shared responsibility. In Subsection 2, note whether the CHP covers an entire college, a department or a specific laboratory only. Provide the name of the Laboratory Safety Coordinator (LSC), and describe the LSC's assigned responsibilities. In Subsection 3, note whether or not a safety committee has been formed, and if so, what its responsibilities are.

The following individuals and groups have responsibilities for implementation of various aspects of the University of North Dakota's Chemical Hygiene Plan.

A. Chemical Hygiene Officer: The University of North Dakota's Chemical Hygiene Officer is Jason Uhlir, Occupational Safety and Environmental Health Office. Address: Aux. Service building, PO Box 9031 (701)-777-3341.

B. College or Departmental Laboratory Safety Coordinator: The name of the college or departmental Laboratory Safety Coordinator should be listed

here. The specific duties of each LSC will be determined at the college or departmental level.

C. College or Departmental Safety Committee: The designation of a safety committee to assist the safety officer in his/her required duties is encouraged. If a committee has been formed, it's members and functions should be listed here.

D. Occupational Safety and Environmental Health Office: The OSEHO offers assistance in a wide range of health and safety issues. A departmental organizational chart, list of services offered, and staff phone numbers are included in Appendix E.

XI. Additional Employee Protection for Work with Particularly Hazardous Substances:

Attention: This section requires tailoring. The PIs in the department must consider the toxicity of the chemicals used and the hazards of each procedure, and decide whether the procedure requires the use of additional protective measures. The additional protective measures should be incorporated in the Standard Operating Procedure. Each PI should forward a list of these SOPs to the departmental LSC for reference in this section of the CHP. If none of the SOPs require additional protective measures, the PI should note this fact and forward a brief explanation to the LSC. OSEHO staff are available to help PIs evaluate the need for additional protective measures.

Additional employee protection will be considered for work with particularly hazardous substances. These include: select carcinogens, reproductive toxins, peroxide forming substances, shock sensitive substances, poisonous gases, pyrophoric chemicals, substances with the threat of rapid polymerization and substances which have a high degree of acute toxicity (see Appendix F).

Procedures involving particularly hazardous chemicals must be evaluated for the level of employee protection required. Specific consideration will be given to the need for:

A. Planning;

B. Establishment of a designated area;

C. Access control

D. Special precautions such as:

1. use of containment devices such as fume hoods or glove boxes;
2. use of personal protective equipment;
3. isolation of contaminated equipment;
4. practicing good laboratory hygiene; and
5. prudent transportation of very toxic chemicals.

E. Planning: for accidents and spills;

F. Special storage and waste disposal practices.

1. Carcinogens: Are defined as those substances for which the evidence from human studies indicates that there is a causal relationship between exposure to the substance and human cancer. Without establishing PEL's, OSHA promulgated standards in 1974 to regulate the industrial use of 13 chemicals identified as potential occupational carcinogens. Exposures of workers to these 13 chemicals are to be controlled through the required use of engineering controls, work practices, and personal protective equipment, including respirators.

2. Reproductive Toxins: Any substance described as such in the applicable MSDS, or any substance identified as a reproductive toxin by the Oak Ridge Toxicology Information Resource Center (TIRC), (615)-576-1746, or, for teratogen only, any substance identified as such in Thomas H. Shepard, Catalog of Teratogenic Agents, 6th Ed., Johns Hopkins Press, 1989.

3. Substances that have a high degree of Acute Toxicity: Any substance for which the LD50 data described in the applicable MSDS, cause the substance to be classified as a highly toxic chemical as defined in ANSI Z129.1.

4. Peroxide forming substances: Certain chemicals can form explosive peroxide crystals, and therefore require special handling procedures after the container is opened.

5. Shock sensitive substances: Certain chemicals may explode when subjected to shock or friction. Therefore, users must have appropriate laboratory equipment, information, knowledge and training to use these substances safely.

6. Poisonous gases: Certain gases have an extremely high potential for causing significant harm if not adequately controlled.

7. Pyrophoric chemicals: Certain chemicals readily oxidize and ignite spontaneously in air. Users must demonstrate that they have the appropriate laboratory equipment, information, knowledge and training to use these substances safely.

8. Chemicals of Unknown Toxicity: Chemicals whose toxic properties are unknown, a chemical for which there is no known statistically significant study conducted in accordance with established scientific principles that establishes its toxicity.

XII. Record keeping:

A. Exposure evaluation:

Any records of exposure evaluation carried out by individual departments (including continuous monitoring systems) will be kept within the department and also sent to the Occupational Safety and Environmental Health office. Results of exposure evaluations carried out by OSEHO will be kept by OSEHO and sent to the affected department. Raw data will be kept for one year and summary data for the term of employment plus 30 years.

B. Medical consultation and examination:

Results of medical consultations and examinations will be kept by the DMP for a length of time specified by the appropriate medical records standard. This time will be at least the term of employment plus 30 years as required by OSHA.

C. Training:

Employee training should be documented by a class sign-in sheet that bears the following information: A description of the training; the name of the instructor; the date the training was conducted. This documentation must be forwarded to the OSEHO, and copies should be kept in the individual's department or college for at least five years.

D. Fume hood monitoring:

Data on annual fume hood monitoring will be kept in the OSEHO.

XIII. Review and Update of Chemical Hygiene Plan

On an annual basis, this Chemical Hygiene Plan will be reviewed and evaluated for effectiveness by the Radiation Safety and Hazardous Chemical Waste Committee, and updated as necessary. Any changes in the Chemical Hygiene Plan will be transmitted to college and departmental Laboratory Safety Coordinator, who are responsible for carrying out a similar review and modification of their plans. Revised CHP's shall be submitted to the Chemical Hygiene Officer.

This Chemical Hygiene Plan Is Approved:

Chair, Radiation Safety and Hazardous

Chemical Waste Committee

Chemical Hygiene Officer

Appendix A
Departmental Standard Operating Procedures (SOP's)

Appendix B
UND Chemical Code

Appendix C
Substances requiring special approval:

Attention: New drug enforcement administration requirements control the manufacture, distribution, export and import of certain chemicals. As of March 18, 1989, the following chemicals and their salts, isomers, and salts of optical isomers in threshold amounts, are subject to Federal Requirements under the Chemical Diversion and Trafficking Act of 1988. By your purchase you may be subject to record-keeping and reporting requirements of Federal Law. If you are not aware of this law, you should contact your local Drug Enforcement Administration office.

PRECURSOR CHEMICALS

ESSENTIAL CHEMICALS

N-Acetylanthranilic acid
Anthranilic acid
Benzyl cyanide
Ephedrine
Ergonovine
Ergotamine
3,4-Methylenedioxyphenyl-2-propanone
Norpseudoephedrine
Phenylacetic acid
Phenylpropanolamine
Piperidine
Pseudoephedrine
Benzaldehyde

Acetic anhydride
Acetone
Benzyl chloride
2-Butanone
Ethyl ether
Hydriodic acid
Mehtyl Ethyl Ketone (MEK)
Potassium permanganate
Toluene

The law also requires that certain records be kept regarding the distribution, export, and import of a tableting or encapsulating machine. The following list is of the different classifications of DEA Regulated Substances:

Appendix C (cont.)
Substances requiring special approval:

SCHEDULES OF CONTROLLED SUBSTANCES

Schedule I.

- (1) Acetyl-alpha-methylfentanyl(N-[1-(1-methyl-2-phenethyl)-4-piperidinyl]-N-phenylacetamide)
- (2) Acetylmethadol
- (3) Allylprodine
- (4) Alphacetylmethadol (except levo-alphacetylmethadol also known as levo-alpha-acetylmethadol, levomethadyl acetate, or LAAM)
- (5) Alphameprodine
- (6) Alphamethadol
- (7) Alpha-methylfentanyl (N-[1-(alpha-methyl-beta-phenyl)ethyl-4-piperidyl] propionanilide; 1-(1-methyl-2-phenylethyl)-4-(N-propanilido) piperidine)
- (8) Alpha-methylthiofentanyl(N-[1-methyl-2-(2-thienyl)ethyl-4-piperidinyl]-N-phenylpropanamide)
- (9) Benzethidine
- (10) Betacetylmethadol
- (11) Beta-hydroxyfentanyl (N-[1-(2-hydroxy-2-phenethyl)-4-piperidinyl]-N-phenylpropanamide)
- (12) Beta-hydroxy-3-methylfentanyl (other name: N-[1-(2-hydroxy-2-phenethyl)-3-methyl-4-piperidinyl]-N-phenylpropanamide)
- (13) Betameprodine
- (14) Betamethadol
- (15) Betaprodine
- (16) Clonitazene
- (17) Dextromoramide
- (18) Diampromide
- (19) Diethylthiambutene
- (20) Difenoxin
- (21) Dimenoxadol
- (22) Dimepheptanol
- (23) Dimethylthiambutene
- (24) Dioxaphetyl butyrate
- (25) Dipipanone
- (26) Ethylmethylthiambutene
- (27) Etonitazene
- (28) Etoxidine
- (29) Furethidine
- (30) Hydroxypethidine
- (31) Ketobemidone
- (32) Levomoramide

Appendix C (cont.)
Substances requiring special approval:

- (33) Levophenacymorphan
- (34) 3-Methylfentanyl (N-[3-methyl-1-(2-phenylethyl)-4-piperidyl]-N-phenylpropanamide)
- (35) 3-methylthiofentanyl (N-[(3-methyl-1-(2-thienyl)ethyl)-4-piperidinyl]-N-phenylpropanamide)
- (36) Morpheridine
- (37) MPPP (1-methyl-4-phenyl-4-propionoxypiperidine)
- (38) Noracymethadol
- (39) Norlevorphanol
- (40) Normethadone
- (41) Norpipanone
- (42) Para-fluorofentanyl (N-(4-fluorophenyl)-N-[1-(2-phenethyl)-4-piperidinyl]propanamide)
- (43) PEPAP (1-(2-phenethyl)-4-phenyl-4-acetoxypiperidine)
- (44) Phenadoxone
- (45) Phenampromide
- (46) Phenomorphan
- (47) Phenoperidine
- (48) Piritramide
- (49) Proheptazine
- (50) Properidine
- (51) Propiram
- (52) Racemoramide
- (53) Thiofentanyl (N-phenyl-N-[1-(2-thienyl)ethyl-4-piperidinyl]propanamide)
- (54) Tilidine
- (55) Trimeperidine

Opium derivatives:

- (1) Acetorphine
- (2) Acetyldihydrocodeine
- (3) Benzylmorphine
- (4) Codeine methylbromide
- (5) Codeine-N-Oxide
- (6) Cyprenorphine
- (7) Desomorphine
- (8) Dihydromorphine
- (9) Drotebanol
- (10) Etorphine (except hydrochloride salt)
- (11) Heroin
- (12) Hydromorphanol
- (13) Methyldesorphine
- (14) Methyldihydromorphine
- (15) Morphine methylbromide

Appendix C (cont.)
Substances requiring special approval:

- (16) Morphine methylsulfonate
- (17) Morphine-N-Oxide
- (18) Myrophine
- (19) Nicocodeine
- (20) Nicomorphine
- (21) Normorphine
- (22) Pholcodine
- (23) Thebacon

Hallucinogenic substances:

- (1) Alpha-ethyltryptamine
Some trade or other names: etryptamine; Monase; <greek-a>-ethyl-1H-indole-3-ethanamine; 3-(2-aminobutyl) indole; <greek-a>-ET; and AET.
- (2) 4-bromo-2,5-dimethoxy-amphetamine
Some trade or other names:
4-bromo-2,5-dimethoxy-<greek-a>-methylphenethylamine; 4-bromo-2,5-DMA
- (3) 4-Bromo-2,5-dimethoxyphenethylamine
Some trade or other names: 2-(4-bromo-2,5-dimethoxyphenyl)-1-aminoethane; alpha-desmethyl DOB; 2C-B, Nexus.
- (4) 2,5-dimethoxyamphetamine
Some trade or other names: 2,5-dimethoxy-<greek-a>-methylphenethylamine; 2,5-DMA
- (5) 2,5-dimethoxy-4-ethylamphet-amine
Some trade or other names: DOET
- (6) 4-methoxyamphetamine
Some trade or other names: 4-methoxy-<greek-a>-methylphenethylamine; paramethoxyamphetamine, PMA
- (7) 5-methoxy-3,4-methylenedioxy-amphetamine
- (8) 4-methyl-2,5-dimethoxy-amphetamine
Some trade and other names:
4-methyl-2,5-dimethoxy-<greek-a>-methylphenethylamine; ``DOM``; and ``STP``
- (9) 3,4-methylenedioxy amphetamine
- (10) 3,4-methylenedioxymethamphetamine (MDMA)
- (11) 3,4-methylenedioxy-N-ethylamphetamine (also known as) N-ethyl-alpha-methyl-3,4(methylenedioxy)phenethylamine, N-ethyl MDA, MDE, MDEA
- (12) N-hydroxy-3,4-methylenedioxyamphetamine (also known as) N-hydroxy-alpha-methyl-3,4(methylenedioxy)phenethylamine, and N-hydroxy MDA
- (13) 3,4,5-trimethoxy amphetamine

Appendix C (cont.)

Substances requiring special approval:

- (14) Bufotenine
Some trade and other names: 3-(α -Dimethylaminoethyl)-5-hydroxyindole;
3-(2-dimethylaminoethyl)-5-indolol; N, N-dimethylserotonin;
5-hydroxy-N,N-dimethyltryptamine; mappine
- (15) Diethyltryptamine
Some trade and other names: N,N-Diethyltryptamine; DET
- (16) Dimethyltryptamine
Some trade or other names: DMT
- (17) Ibogaine
Some trade and other names: 7-Ethyl-6, α ,7,8,9,10,12,13-
octahydro-2-methoxy-6,9-methano-5H-pyrido [1', 2':1,2] azepino[5,4-b] indole;
Tabernantheiboga
- (18) Lysergic acid diethylamide
- (19) Marihuana
- (20) Mescaline
- (21) Parahexyl--7374; some trade or other names: 3-Hexyl-1-
hydroxy-7,8,9,10-tetrahydro-6,6,9-trimethyl-6H-dibenzo[b,d]pyran; Synhexyl.
- (22) Peyote
Meaning all parts of the plant presently classified botanically as *Lophophora williamsii* Lemaire, whether growing or not, the seeds thereof, any extract from any part of such plant, and every compound, manufacture, salts, derivative, mixture, or preparation of such plant, its seeds or extracts (Interprets 21 USC 812(c), Schedule I(c) (12))
- (23) N-ethyl-3-piperidyl benzilate
- (24) N-methyl-3-piperidyl benzilate
- (25) Psilocybin
- (26) Psilocyn
- (27) Tetrahydrocannabinols

Synthetic equivalents of the substances contained in the plant, or in the resinous extractives of *Cannabis*, sp. and/or synthetic substances, derivatives, and their isomers with similar chemical structure and pharmacological activity such as the following:
 Δ^1 cis or trans tetrahydrocannabinol, and their optical isomers
 Δ^6 cis or trans tetrahydrocannabinol, and their optical isomers
 $\Delta^3,4$ cis or trans tetrahydrocannabinol, and its optical isomers
(Since nomenclature of these substances is not internationally standardized, compounds of these structures, regardless of numerical designation of atomic positions covered.)

- (28) Ethylamine analog of phencyclidine
Some trade or other names: N-ethyl-1-phenylcyclohexylamine, (1-phenylcyclohexyl)ethylamine, N-(1-phenylcyclohexyl)ethylamine, cyclohexamine, PCE

Appendix C (cont.)

Substances requiring special approval:

- (29) Pyrrolidine analog of phencyclidine
Some trade or other names: 1-(1-phenylcyclohexyl)-pyrrolidine, PCPy, PHP
- (30) Thiophene analog of phencyclidine
Some trade or other names: 1-[1-(2-thienyl)-cyclohexyl]-piperidine, 2-thienylanalog of phencyclidine, TPCP, TCP
- (31) 1-[1-(2-thienyl)cyclohexyl]pyrrolidine
Some other names: TCPy

Depressants:

Unless specifically excepted or unless listed in another schedule, any material, compound, mixture, or preparation which contains any quantity of the following substances having a depressant effect on the central nervous system, including its salts, isomers, and salts of isomers whenever the existence of such salts, isomers, and salts of isomers is possible within the specific chemical designation:

- (1) Mecloqualone
- (2) Methaqualone

Stimulants:

Unless specifically excepted or unless listed in another schedule, any material, compound, mixture, or preparation which contains any quantity of the following substances having a stimulant effect on the central nervous system, including its salts, isomers, and salts of isomers:

- (1) Aminorex (Some other names: aminoxaphen; 2-amino-5-phenyl-2-oxazoline; or 4,5-dihydro-5-phenyl-2-oxazolamine)
- (2) Cathinone
Some trade or other names: 2-amino-1-phenyl-1-propanone, alpha-aminopropiophenone, 2-aminopropiophenone, and norephedrone
- (3) Fenethylamine
- (4) Methcathinone (Some other names: 2-(methylamino)-propionophenone; alpha-(methylamino)propionophenone; 2-(methylamino)-1-phenylpropan-1-one; alpha-N-methylaminopropiophenone; monomethylpropion; ephedrone; N-methylcathinone; methylcathinone; AL-464; AL-422; AL-463 and UR1432), its salts, optical isomers and salts of optical isomers
- (5) (<plus-minus>)cis-4-methylaminorex ((<plus-minus>)cis-4,5-dihydro-4-methyl-5-phenyl-2-oxazolamine)
- (6) N-ethylamphetamine
- (7) N,N-dimethylamphetamine (also known as N,N-alpha-trimethylbenzeneethanamine; N,N-alpha-trimethylphenethylamine)

Appendix C (cont.)
Substances requiring special approval:

Temporary listing of substances subject to emergency scheduling. Any material, compound, mixture or preparation which contains any quantity of the following substances:

- (1) N-[1-benzyl-4-piperidyl]-N-phenylpropanamide (benzylfentanyl), its optical isomers, salts and salts of isomers
- (2) N-[1-(2-thienyl)methyl-4-piperidyl]-N-phenylpropanamide (thenylfentanyl), its optical isomers, salts and salts of isomers

Schedule II.

- (1) Raw opium
- (2) Opium extracts
- (3) Opium fluid
- (4) Powdered opium
- (5) Granulated opium
- (6) Tincture of opium
- (7) Codeine
- (8) Ethylmorphine
- (9) Etorphine hydrochloride
- (10) Hydrocodone
- (11) Hydromorphone
- (12) Metopon
- (13) Morphine
- (14) Oxycodone
- (15) Oxymorphone
- (16) Thebaine

Opium poppy and poppy straw.

Coca leaves (9040) and any salt, compound, derivative or preparation of coca leaves (including cocaine (9041) and ecgonine (9180) and their salts, isomers, derivatives and salts of isomers and derivatives), and any salt, compound, derivative, or preparation thereof which is chemically equivalent or identical with any of these substances, except that the substances shall not include decocainized coca leaves or extraction of coca leaves, which extractions do not contain cocaine or ecgonine.

Concentrate of poppy straw (the crude extract of poppy straw in either liquid, solid or powder form which contains the phenanthrene alkaloids of the opium poppy), 9670.

Appendix C (cont.)
Substances requiring special approval:

Opiates. Unless specifically excepted or unless in another schedule any of the following opiates, including its isomers, esters, ethers, salts and salts of isomers, esters and ethers whenever the existence of such isomers, esters, ethers, and salts is possible within the specific chemical designation, dextrophan and levopropoxyphene excepted:

- (1) Alfentanil
- (2) Alphaprodine
- (3) Anileridine
- (4) Bezitramide
- (5) Bulk dextropropoxyphene (non-dosage forms)
- (6) Carfentanil
- (7) Dihydrocodeine
- (8) Diphenoxylate
- (9) Fentanyl
- (10) Isomethadone
- (11) Levo-alpha-acetylmethadol
[Some other names: levo-alpha-acetylmethadol, levomethadyl acetate, LAAM]
- (12) Levomethorphan
- (13) Levorphanol
- (14) Metazocine
- (15) Methadone
- (16) Methadone-Intermediate, 4-cyano-2-dimethylamino-4,4-diphenyl butane
- (17) Moramide-Intermediate, 2-methyl-3-morpholino-1, 1-diphenylpropane-carboxylic acid
- (18) Pethidine (meperidine)
- (19) Pethidine-Intermediate-A, 4-cyano-1-methyl-4-phenylpiperidine
- (20) Pethidine-Intermediate-B, ethyl-4-phenylpiperidine-4-carboxylate
- (21) Pethidine-Intermediate-C, 1-methyl-4-phenylpiperidine-4-carboxylic acid
- (22) Phenazocine
- (23) Piminodine
- (24) Racemethorphan
- (25) Racemorphan
- (26) Remifentanil
- (27) Sufentanil

Stimulants:

Unless specifically excepted or unless listed in another schedule, any material, compound, mixture, or preparation which contains any quantity of the following substances having a stimulant effect on the central nervous system:

- (1) Amphetamine, its salts, optical isomers, and salts of its optical isomers
- (2) Methamphetamine, its salts, isomers, and salts of its isomers
- (3) Phenmetrazine and its salts
- (4) Methylphenidate

Appendix C (cont.)
Substances requiring special approval:

Depressants:

Unless specifically excepted or unless listed in another schedule, any material, compound, mixture, or preparation which contains any quantity of the following substances having a depressant effect on the central nervous system, including its salts, isomers, and salts of isomers whenever the existence of such salts, isomers, and salts of isomers is possible within the specific chemical designation:

- (1) Amobarbital
- (2) Glutethimide
- (3) Pentobarbital
- (4) Phencyclidine
- (5) Secobarbital

Hallucinogenic substances:

(1) Dronabinol (synthetic) in sesame oil and encapsulated in a soft gelatin capsule in a U.S. Food and Drug Administration approved drug product. [Some other names for dronabinol:

(6aR-trans)-6a,7,8,10a-tetrahydro-6,6,9-trimethyl-3-pentyl-6H-dibenzo[b,d]pyran-1-ol, or (-)-delta-9-(trans)-tetrahydrocannabinol]

(2) Nabilone [Another name for nabilone: (<plus-minus>) -trans-3-(1,1- dimethylheptyl) -6,6a,7,8,10,10a-hexahydro-1-hydroxy-6,6-dimethyl-9H-dibenzo[b,d]pyran-9-one]

Immediate precursors:

Unless specifically excepted or unless listed in another schedule, any material, compound, mixture, or preparation which contains any quantity of the following substances:

(1) Immediate precursor to amphetamine and methamphetamine:

(I) Phenylacetone - Some trade or other names: phenyl-2-propanone; P2P; benzyl methyl ketone; methyl benzyl ketone;

(2) Immediate precursors to phencyclidine (PCP):

(I) 1-phenylcyclohexylamine

(ii) 1-piperidinocyclohexanecarbonitrile (PCC)

Schedule III.

(1) Those compounds, mixtures, or preparations in dosage unit form containing any stimulant substances listed in schedule II which compounds, mixtures, or preparations were listed on August 25, 1971, as excepted compounds under Sec. 1308.32, and any other drug of the quantitative composition shown in that list for those drugs or which is the same except that it contains a lesser quantity of controlled substances.

- (2) Benzphetamine
- (3) Chlorphentermine
- (4) Clortermine
- (5) Phendimetrazine

Appendix C (cont.)
Substances requiring special approval:

Depressants:

(1) Any compound, mixture or preparation containing:

- (i) Amobarbital
- (ii) Secobarbital
- (iii) Pentobarbital

or any salt thereof and one or more other active medicinal ingredients which are not listed in any schedule.

(2) Any suppository dosage form containing:

- (i) Amobarbital
- (ii) Secobarbital
- (iii) Pentobarbital

or any salt of any of these drugs and approved by the Food and Drug Administration for marketing only as a suppository.

(3) Any substance which contains any quantity of a derivative of barbituric acid or any salt thereof

(4) Chlorhexadol

(5) Lysergic acid

(6) Lysergic acid amide

(7) Methyprylon

(8) Sulfondiethylmethane

(9) Sulfonethylmethane

(10) Sulfonmethane

(11) Tiletamine and zolazepam or any salt thereof

Some trade or other names for a tiletamine-zolazepam combination product:

Telazol

Some trade or other names for tiletamine:

2-(ethylamino)-2-(2-thienyl)-cyclohexanone

Some trade or other names for zolazepam:

4-(2-fluorophenyl)-6,8-dihydro-1,3,8-trimethylpyrazolo-[3,4-e] [1,4]-diazepin-7(1H)-one,
flupyrzapon

Nalorphine 9400.

Narcotic Drugs.

Anabolic steroids.

Appendix C (cont.)
Substances requiring special approval:

Schedule IV.

- (1) Alprazolam
- (2) Barbitol
- (3) Bromazepam
- (4) Camazepam
- (5) Chloral betaine
- (6) Chloral hydrate
- (7) Chlordiazepoxide
- (8) Clobazam
- (9) Clonazepam
- (10) Clorazepate
- (11) Clotiazepam
- (12) Cloxazolam
- (13) Delorazepam
- (14) Diazepam
- (15) Estazolam
- (16) Ethchlorvynol
- (17) Ethinamate
- (18) Ethyl loflazepate
- (19) Fludiazepam
- (20) Flunitrazepam
- (21) Flurazepam
- (22) Halazepam
- (23) Haloxazolam
- (24) Ketazolam
- (25) Loprazolam
- (26) Lorazepam
- (27) Lormetazepam
- (28) Mebutamate
- (29) Medazepam
- (30) Meprobamate
- (31) Methohexital
- (32) Methylphenobarbital (mephobarbital)
- (33) Midazolam
- (34) Nimetazepam
- (35) Nitrazepam
- (36) Nordiazepam
- (37) Oxazepam
- (38) Oxazolam
- (39) Paraldehyde
- (40) Petrichloral
- (41) Phenobarbital
- (42) Pinazepam
- (43) Prazepam

- (44) Quazepam
- (45) Temazepam
- (46) Tetrazepam
- (47) Triazolam
- (48) Zolpidem

Fenfluramine: Any material, compound, mixture, or preparation which contains any quantity of, Fenfluramine, including its salts, isomers (whether optical, position, or geometric), and salts of such isomers, whenever the existence of such salts, isomers, and salts of isomers is possible

Stimulants: Unless specifically excepted or unless listed in another schedule, any material, compound, mixture, or preparation which contains any quantity of the following substances having a stimulant effect on the central nervous system, including its salts, isomers and salts of isomers:

- (1) Cathine ((+)-norpseudoephedrine)
- (2) Diethylpropion
- (3) Fencamfamin
- (4) Fenproporex
- (5) Mazindol
- (6) Mefenorex
- (7) Pemoline (including organometallic complexes and chelates thereof)
- (8) Phentermine
- (9) Pipradrol
- (10) SPA ((-)-1-dimethylamino-1,2-diphenylethane)

Pentazocine.

Appendix C (cont.)
Substances requiring special approval:

Schedule V.

Buprenorphine

Pyrovalerone

Appendix D
Incident Report Form and Supervisors Incident Investigation Form

Appendix E
OSEHO Organizational Chart/Information

Appendix F

Tables of: Carcinogens, Reproductive Toxins, Chemicals with highly acute toxicity, Peroxide forming substances, Shock sensitive chemicals, Poisonous Gases, Pyrophoric Chemicals.

THIRTEEN OSHA-REGULATED CARCINOGENS:

2-acetylaminofluorene	4-aminodiphenyl
benzidine	bis-chloromethyl ether
3,3'-dichlorobenzidine	4-dimethylaminoazobenzene
ethyleneimine	meth-yl chloromethyl ether
alpha-naphthylamine	beta-naphthylamine
4-nitrobiphenyl	N-nitrosodimethylamine
beta-propiolactone	

Attention: NIOSH has identified numerous substances that should be treated as potential occupational carcinogens even though OSHA may not have identified them as such. In determining their carcinogenicity, NIOSH uses the OSHA classification outlined in 29 CFR 1990.103. If the material you are using is listed in the above table, or is identified as a potential carcinogen on the MSDS, the precautions discussed in section XI.A should be followed.

EXAMPLES OF REPRODUCTIVE TOXINS:

- Arsenic and certain arsenic compounds
- Benzene
- Cadmium and certain cadmium compounds
- Carbon disulfide
- Ethylene glycol monomethyl and ethyl ethers
- Ethylene oxide
- Lead compounds
- Mercury compounds
- Toluene
- Vinyl chloride
- Xylene
- Additional substances identified on the MSDS

Appendix F (cont.)

CHEMICALS THAT ARE HIGHLY TOXIC:

Attention: The following list of chemicals are extremely hazardous. All laboratory personnel and employees must have knowledge of the dangers of these chemicals prior to the use, and documentation of training in safe operating procedures.

The List of Extremely Hazardous Substances

CAS No.	Chemical name	CAS No.	Chemical name
75-86-5	Acetone Cyanohydrin		
1752-30-3	Acetone Thiosemicarbazide		
107-02-8	Acrolein		
79-06-1	Acrylamide		
107-13-1	Acrylonitrile		
814-68-6	Acrylyl Chloride		
111-69-3	Adiponitrile		
116-06-3	Aldicarb		
309-00-2	Aldrin		
107-18-6	Allyl Alcohol		
107-11-9	Allylamine		
20859-73-8	Aluminum Phosphide		
54-62-6	Aminopterin		
78-53-5	Amiton		
3734-97-2	Amiton Oxalate		
7664-41-7	Ammonia		
300-62-9	Amphetamine		
62-53-3	Aniline		
88-05-1	Aniline, 2,4,6-Trimethyl-		
7783-70-2	Antimony Pentafluoride		
1397-94-0	Antimycin A		
86-88-4	ANTU		
1303-28-2	Arsenic Pentoxide		
1327-53-3	Arsenous Oxide		
7784-34-1	Arsenous Trichloride		
7784-42-1	Arsine		
2642-71-9	Azinphos-Ethyl		
86-50-0	Azinphos-Methyl		
98-87-3	Benzal Chloride		
98-16-8	Benzenamine, 3-(Trifluoromethyl)-		
100-14-1	Benzene, 1-(Chloromethyl)-4-Nitro-		
98-05-5	Benzeneearsonic Acid		
3615-21-2	Benzimidazole, 4, 5- Dichloro-2-(Trifluoromethyl)-		
98-07-7	Benzotrichloride		
100-44-7	Benzyl Chloride		
140-29-4	Benzyl Cyanide		

15271-41-7 Bicyclo[2.2.1]Heptane-2-Carbonitrile, 5-Chloro-6-
 (((Methylamino)Carbonyl)Oxy)Imino)-, (1s-(1-alpha, 2-beta, 4-alpha,
 5-alpha,6E))-
 534-07-6 Bis(Chloromethyl) Ketone
 4044-65-9 Bitoscanate
 10294-34-5 Boron Trichloride
 7637-07-2 Boron Trifluoride
 353-42-4 Boron Trifluoride Compound With Methyl Ether (1:1)
 28772-56-7 Bromadiolone
 7726-95-6 Bromine
 1306-19-0 Cadmium Oxide
 2223-93-0 Cadmium Stearate
 7778-44-1 Calcium Arsenate
 8001-35-2 Camphechlor
 56-25-7 Cantharidin
 51-83-2 Carbachol Chloride
 26419-73-8 Carbamic Acid, Methyl-, O-(((2,4-Dimethyl-1,
 3-Dithiolan-2-yl)Methylene)Amino)-
 1563-66-2 Carbofuran
 75-15-0 Carbon Disulfide
 786-19-6 Carbophenothion
 57-74-9 Chlordane
 470-90-6 Chlorfenvinfos
 7782-50-5 Chlorine
 24934-91-6 Chlormephos
 999-81-5 Chlormequat Chloride
 79-11-8 Chloroacetic Acid
 107-07-3 Chloroethanol
 627-11-2 Chloroethyl Chloroformate
 67-66-3 Chloroform
 542-88-1 Chloromethyl Ether
 107-30-2 Chloromethyl Methyl Ether
 3691-35-8 Chlorophacinone
 1982-47-4 Chloroxuron
 21923-23-9 Chlorthiophos
 10025-73-7 Chromic Chloride
 62207-76-5 Cobalt, ((2,2'-(1,2-Ethanediy)bis (Nitrilomethylidyne))
 Bis(6-Fluorophenolato)) (2-)-N,N',O,O')-
 10210-68-1 Cobalt Carbonyl
 64-86-8 Colchicine
 56-72-4 Coumaphos
 5836-29-3 Coumatetralyl
 95-48-7 Cresol, o-
 535-89-7 Crimidine
 4170-30-3 Crotonaldehyde
 123-73-9 Crotonaldehyde, (E)-
 506-68-3 Cyanogen Bromide

506-78-5 Cyanogen Iodide
 2636-26-2 Cyanophos
 675-14-9 Cyanuric Fluoride
 66-81-9 Cycloheximide
 108-91-8 Cyclohexylamine
 17702-41-9 Decaborane(14)
 8065-48-3 Demeton
 919-86-8 Demeton-S-Methyl
 10311-84-9 Dialifor
 19287-45-7 Diborane
 111-44-4 Dichloroethyl ether
 149-74-6 Dichloromethylphenylsilane
 62-73-7 Dichlorvos
 141-66-2 Dicrotophos
 1464-53-5 Diepoxybutane
 814-49-3 Diethyl Chlorophosphate
 71-63-6 Digitoxin
 2238-07-5 Diglycidyl Ether
 20830-75-5 Digoxin
 115-26-4 Dimefox
 60-51-5 Dimethoate
 2524-03-0 Dimethyl Phosphorochloridothioate
 77-78-1 Dimethyl sulfate
 75-78-5 Dimethyldichlorosilane
 57-14-7 Dimethylhydrazine
 99-98-9 Dimethyl-p-Phenylenediamine
 644-64-4 Dimetilan
 534-52-1 Dinitrocresol
 88-85-7 Dinoseb
 1420-07-1 Dinoterb
 78-34-2 Dioxathion
 82-66-6 Diphacinone
 152-16-9 Diphosphoramidate, Octamethyl-
 298-04-4 Disulfoton
 514-73-8 Dithiazanine Iodide
 541-53-7 Dithiobiuret
 316-42-7 Emetine, Dihydrochloride
 115-29-7 Endosulfan
 2778-04-3 Endothion
 72-20-8 Endrin
 106-89-8 Epichlorohydrin
 2104-64-5 EPN
 50-14-6 Ergocalciferol
 379-79-3 Ergotamine Tartrate
 1622-32-8 Ethanesulfonyl Chloride, 2-Chloro-
 10140-87-1 Ethanol, 1,2-Dichloro-, Acetate
 563-12-2 Ethion

13194-48-4 Ethoprophos
 538-07-8 Ethylbis(2-Chloroethyl)Amine
 371-62-0 Ethylene Fluorohydrin
 75-21-8 Ethylene Oxide
 107-15-3 Ethylenediamine
 151-56-4 Ethyleneimine
 542-90-5 Ethylthiocyanate
 22224-92-6 Fenamiphos
 115-90-2 Fensulfothion
 4301-50-2 Fluenetil
 7782-41-4 Fluorine
 640-19-7 Fluoroacetamide
 144-49-0 Fluoroacetic Acid
 359-06-8 Fluoroacetyl Chloride
 51-21-8 Fluorouracil
 944-22-9 Fonofos
 50-00-0 Formaldehyde
 107-16-4 Formaldehyde Cyanohydrin
 23422-53-9 Formetanate Hydrochloride
 2540-82-1 Formothion
 17702-57-7 Formparanate
 21548-32-3 Fosthietan
 3878-19-1 Fuberidazole
 110-00-9 Furan
 13450-90-3 Gallium Trichloride
 77-47-4 Hexachlorocyclopentadiene
 4835-11-4 Hexamethylenediamine, N,N'-Dibutyl-
 302-01-2 Hydrazine
 74-90-8 Hydrocyanic Acid
 7647-01-0 Hydrogen Chloride (gas only)
 7664-39-3 Hydrogen Fluoride
 7722-84-1 Hydrogen Peroxide (Conc > 52%)
 7783-07-5H Hydrogen Selenide
 7783-06-4 Hydrogen Sulfide
 123-31-9 Hydroquinone
 13463-40-6 Iron, Pentacarbonyl-
 297-78-9 Isobenzan
 78-82-0 Isobutyronitrile
 102-36-3 Isocyanic Acid, 3,4-Dichlorophenyl Ester
 465-73-6 Isodrin
 55-91-4 Isofluorphate
 4098-71-9 Isophorone Diisocyanate
 108-23-6 Isopropyl Chloroformate
 119-38-0 Isopropylmethylpyrazolyl Dimethylcarbamate
 78-97-7 Lactonitrile
 21609-90-5 Leptophos
 541-25-3 Lewisite

58-89-9 Lindane
7580-67-8 Lithium Hydride
109-77-3 Malononitrile
12108-13-3 Manganese,Tricarbonyl Methylcyclopentadienyl
51-75-2 Mechllorethamine
950-10-7 Mephosfolan
1600-27-7 Mercuric Acetate
7487-94-7 Mercuric Chloride
21908-53-2 Mercuric Oxide
10476-95-6 Methacrolein Diacetate
760-93-0 Methacrylic Anhydride
126-98-7 Methacrylonitrile
920-46-7 Methacryloyl Chloride
30674-80-7 Methacryloyloxyethyl Isocyanate
10265-92-6 Methamidophos
558-25-8 Methanesulfonyl Fluoride
950-37-8 Methidathion
2032-65-7 Methiocarb
16752-77-5 Methomyl
151-38-2 Methoxyethylmercuric Acetate
80-63-7 Methyl 2-Chloroacrylate
74-83-9 Methyl Bromide
79-22-1 Methyl Chloroformate
60-34-4 Methyl Hydrazine
624-83-9 Methyl Isocyanate
556-61-6 Methyl Isothiocyanate
74-93-1 Methyl Mercaptan
3735-23-7 Methyl Phenkapton
676-97-1 Methyl Phosphonic Dichloride
556-64-9 Methyl Thiocyanate
78-94-4 Methyl Vinyl Ketone
502-39-6 Methylmercuric Dicyanamide
75-79-6 Methyltrichlorosilane
1129-41-5 Metolcarb
7786-34-7 Mevinphos
315-18-4 Mexacarbate
50-07-7 Mitomycin C
6923-22-4 Monocrotophos
2763-96-4 Muscimol
505-60-2 Mustard Gas
13463-39-3 Nickel Carbonyl
54-11-5 Nicotine
65-30-5 Nicotine Sulfate
7697-37-2 Nitric Acid
10102-43-9 Nitric Oxide
98-95-3 Nitrobenzene
1122-60-7 Nitrocyclohexane

10102-44-0 Nitrogen Dioxide
 62-75-9 Nitrosodimethylamine
 991-42-4 Norbormide
 0 Organorhodium Complex (PMN-82-147).
 630-60-4 Ouabain
 23135-22-0 Oxamyl
 78-71-7 Oxetane, 3,3-Bis(Chloromethyl)-
 2497-07-6 Oxydisulfoton
 10028-15-6 Ozone
 1910-42-5 Paraquat Dichloride
 2074-50-2 Paraquat Methosulfate
 56-38-2 Parathion
 298-00-0 Parathion-Methyl
 12002-03-8 Paris Green
 19624-22-7 Pentaborane
 2570-26-5 Pentadecylamine
 79-21-0 Peracetic Acid
 594-42-3 Perchloromethylmercaptan
 108-95-2 Phenol
 4418-66-0 Phenol, 2,2'-Thiobis(4-Chloro6-Methyl)-
 64-00-6 Phenol, 3-(1-Methylethyl)-, Methylcarbamate
 58-36-6 Phenoxarsine, 10,10'-Oxydi-
 696-28-6 Phenyl Dichloroarsine
 59-88-1 Phenylhydrazine Hydrochloride
 62-38-4 Phenylmercury Acetate
 2097-19-0 Phenylsilatrane
 103-85-5 Phenylthiourea
 298-02-2 Phorate
 4104-14-7 Phosacetim
 947-02-4 Phosfolan
 75-44-5 Phosgene
 732-11-6 Phosmet
 13171-21-6 Phosphamidon
 7803-51-2 Phosphine
 2703-13-1 Phosphonothioic Acid, Methyl-, O-Ethyl O-(4- (Methylthio) Phenyl) Ester
 50782-69-9 Phosphonothioic Acid, Methyl-, S-(2-(Bis(1Methylethyl)Amino)Ethyl)
 O-Ethyl Ester
 2665-30-7 Phosphonothioic Acid, Methyl-, O-(4-Nitrophenyl) O-Phenyl Ester
 3254-63-5 Phosphoric Acid, Dimethyl 4-(Methylthio)Phenyl Ester
 2587-90-8 Phosphorothioic Acid, O,O-Dimethyl-S-(2-Methylthio) Ethyl Ester
 7723-14-0 Phosphorus
 10025-87-3 Phosphorus Oxychloride
 10026-13-8 Phosphorus Pentachloride
 7719-12-2 Phosphorus Trichloride
 57-47-6 Physostigmine
 57-64-7 Physostigmine, Salicylate (1:1)
 124-87-8 Picrotoxin

110-89-4 Piperidine
 23505-41-1 Pirimifos-Ethyl
 10124-50-2 Potassium Arsenite
 151-50-8 Potassium Cyanide
 506-61-6 Potassium Silver Cyanide
 2631-37-0 Promecarb
 106-96-7 Propargyl Bromide
 57-57-8 Propiolactone, Beta-
 107-12-0 Propionitrile
 542-76-7 Propionitrile, 3-Chloro-
 70-69-9 Propiophenone, 4-Amino-
 109-61-5 Propyl Chloroformate
 75-56-9 Propylene Oxide
 75-55-8 Propyleneimine
 2275-18-5 Prothoate
 129-00-0 Pyrene
 140-76-1 Pyridine, 2-Methyl-5-Vinyl-
 504-24-5 Pyridine, 4-Amino-
 1124-33-0 Pyridine, 4-Nitro-,1-Oxide
 53558-25-1 Pyriminil
 14167-18-1 Salcomine
 107-44-8 Sarin
 7783-00-8 Selenious Acid
 7791-23-3 Selenium Oxychloride
 563-41-7 Semicarbazide Hydrochloride
 3037-72-7 Silane, (4-Aminobutyl) Diethosymethyl-
 7631-89-2 Sodium Arsenate
 7784-46-5 Sodium Arsenite
 26628-22-8 Sodium Azide (Na(N₃))
 124-65-2 Sodium Cacodylate
 143-33-9 Sodium Cyanide (Na(CN))
 62-74-8 Sodium Fluoroacetate
 13410-01-0 Sodium Selenate
 10102-18-8 Sodium Selenite
 10102-20-2 Sodium Tellurite
 900-95-8 Stannane, Acetoxytriphenyl-
 57-24-9 Strychnine
 60-41-3 Strychnine Sulfate
 3689-24-5 Sulfotep
 3569-57-1 Sulfoxide, 3-Chloropropyl Octyl
 7446-09-5 Sulfur Dioxide
 7783-60-0 Sulfur Tetrafluoride
 7446-11-9 Sulfur Trioxide
 7664-93-9 Sulfuric Acid
 77-81-6 Tabun
 7783-80-4 Tellurium Hexafluoride
 107-49-3 TEPP

13071-79-9 Terbufos
 78-00-2 Tetraethyllead
 597-64-8 Tetraethyltin
 75-74-1 Tetramethyllead
 509-14-8 Tetranitromethane
 10031-59-1 Thallium Sulfate
 6533-73-9 Thallous Carbonate
 7791-12-0 Thallous Chloride
 2757-18-8 Thallous Malonate
 7446-18-6 Thallous Sulfate
 2231-57-4 Thiocarbazine
 39196-18-4 Thiofanox
 297-97-2 Thionazin
 108-98-5 Thiophenol
 79-19-6 Thiosemicarbazide
 5344-82-1 Thiourea, (2-Chlorophenyl)-
 614-78-8 Thiourea, (2-Methylphenyl)-
 7550-45-0 Titanium Tetrachloride
 584-84-9 Toluene 2,4-Diisocyanate
 91-08-7 Toluene 2,6-Diisocyanate
 110-57-6 Trans-1,4-Dichlorobutene
 1031-47-6 Triamiphos
 24017-47-8 Triazofos
 76-02-8 Trichloroacetyl Chloride
 115-21-9 Trichloroethylsilane
 327-98-0 Trichloronate
 98-13-5 Trichlorophenylsilane
 1558-25-4 Trichloro(Chloromethyl) Silane
 27137-85-5 Trichloro(Dichlorophenyl) Silane
 998-30-1 Triethoxysilane
 75-77-4 Trimethylchlorosilane
 824-11-3 Trimethylolpropane Phosphite
 1066-45-1 Trimethyltin Chloride
 639-58-7 Triphenyltin Chloride
 555-77-1 Tris(2-Chloroethyl)Amine
 2001-95-8 Valinomycin
 1314-62-1 Vanadium Pentoxide
 108-05-4 Vinyl Acetate Monomer
 81-81-2 Warfarin
 129-06-6 Warfarin Sodium
 28347-13-9 Xylylene Dichloride
 58270-08-9
 Zinc,Dichloro(4,4-Dimethyl5(((Methylamino)Carbonyl)Oxy)Imino)P
 entae nitrile)-, (T-4)-
 1314-84-7 Zinc Phosphide

BIOLOGICALLY ACTIVE COMPOUNDS:

protease inhibitors
transcriptional inhibitors
phosphatase inhibitors
kinase inhibitors

mitogenic compounds

Castor bean (*Ricinus communis*) lectin: Ricin B, RCA toxins

N-methyl-N'-nitro-N-nitrosoguanidine: carcinogen (this chemical forms explosive compounds upon degradation)

Phalloidin from *Amanita Phalloides*: used for staining actin filaments

Retinoids: potential human teratogens

Streptozotocin: potential human carcinogen

Urethane (ethyl carbamate): an anesthetic agent, potent carcinogen and strong teratogen, volatile at room temperature.

Diisopropyl fluorophosphate: highly toxic cholinesterase inhibitor; the antidote, atropine sulfate and 2-PAM (2-pyridinealdoxime methiodide) must be readily available

Jaquurity bean lectin (*Abrus precatorius*)

Appendix F (cont.)

PEROXIDE-FORMING CHEMICALS:

Attention: The chemicals listed below can form explosive peroxide crystals on exposure to air, and therefore require special handling procedures after the container is opened. Some of the chemicals form peroxides that are violently explosive in concentrated solution or as solids, and therefore should never be evaporated to dryness.

A. Severe Peroxide Hazard with Exposure to Air

(discard within 3 months from opening)

diisopropyl ether (isopropyl ether)	divinylacetylene (DVA)
vinylidene chloride (1,1-dichloroethylene)	potassium metal
sodium amide (sodamide)	potassium amide

B. Peroxide Hazard on Concentration

Do not distill or evaporate without first testing for the presence of peroxides (discard or test for peroxides after 6 months)

acetaldehyde diethyl acetal (acetal glyme)	ethylene glycol dimethyl ether
cumene (isopropylbenzene)	ethylene glycol ether acetates
cyclohexene	ethylene glycol monoethers
(cellosolves)	
cyclopentene	furan
decalin (decahydronaphthalene)	methylacetylene
diacetylene (butadiene)	methylcyclopentane
dicyclopentadiene	methyl isobutyl ketone
diethyl ether (ether)	tetrahydrofuran (THF)
diethylene glycol dimethyl ether (diglyme)	tetralin (tetrahydronaphthalene)
dioxane	vinyl ethers

C. Hazard of Rapid Polymerization Initiated by Internally-Formed Peroxides

Liquids: (discard or test for peroxides after 6 months)

-chloroprene (2-chloro-1,3-butadiene)	-vinyl acetate
	-styrene

Gases: (discard after 12 months)

-butadiene	-vinylacetylene (MVA)
	-tetrafluoroethylene (TFE)

Appendix F (cont.)

POISONOUS GASES:

These chemicals are highly toxic gases at ambient temperature and pressure. They have an extremely high potential for causing significant harm if not adequately controlled.

Arsine	Nitrogen trioxide
Boron trichloride	Nitrosyl chloride
Chlorine pentafluoride	Oxygen difluoride
Chlorine trifluoride	Phosgene
Cyanogen	Phosphine
Cyanogen chloride	Phosphorus pentafluoride
Diborane	Selenium hexafluoride
Dinitrogen tetroxide	Stibine
Fluorine	Sulfur tetrafluoride
Germane	Tellurium Hexafluoride
Hydrogen selenide	Tetraethyldithiopyrophosphate
Nitric oxide	Tetraethylpyrophosphate
Nitrogen dioxide	

Attention: *Departments may choose to add other chemicals to the above list: for example, sulfur-containing compounds such as mercaptans can cause significant odor problems when used in the laboratory. Pre-approval of the conditions under which they can be used may prevent odor complaints.*

SHOCK SENSITIVE CHEMICALS:

The classes of chemicals listed below may explode when subjected to shock or friction. Therefore users must have appropriate laboratory equipment, information, knowledge and training to use these compounds safely.

- Acetylenic compounds, especially polyacetylenes, haloacetylenes, and heavy metal salts of acetylenes (copper, silver, and mercury salts are particularly sensitive).
- Acyl nitrates
- Alkyl nitrates, particularly polyol nitrates such as nitrocellulose and nitroglycerine
- Alkyl and acyl nitrites
- Alkyl perchlorates
- Amminemetal oxosalts: metal compounds with coordinated ammonia, hydrazine, or similar nitrogenous donors and ionic perchlorate, nitrate, permanganate, or other oxidizing group.
- Azides, including metal, nonmetal, and organic azides
- Chlorite salts of metals, such as AgClO_2 and $\text{Hg}(\text{ClO}_2)_2$
- Diazo compounds such as CH_2N_2
- Diazonium salts, when dry

Appendix F (cont.)

- Fulminates such as mercury fulminate ($\text{Hg}(\text{CNO})_2$).
- Hydrogen peroxide (which becomes increasingly treacherous as the concentration rises above 0%, forming explosive mixtures with organic materials and decomposing violently in the presence of traces of transition metals).
- N-Halogen compounds such as difluoroamino compounds and halogen azides.
- N-Nitro compounds such as N-nitromethylamine, nitrourea, nitroguanidine, and nitric amide.
- Oxo salts of nitrogenous bases: perchlorates, dichromates, nitrates, iodates, chlorites, chlorates, and permanganates of ammonia, amines, hydroxylamine, guanidine, etc.
- Perchlorate salts (which can form when perchloric acid mists dry in fume hoods or associated duct work. Most metal, nonmetal, and amine perchlorates can be detonated and may undergo violent reaction in contact with combustible materials).
- Peroxides and hydroperoxides, organic
- Peroxides (solid) that crystallize from or are left from evaporation of peroxidizable solvents.
- Peroxides, transition-metal salts
- Picrates, especially salts of transition and heavy metals, such as Ni, Pb, Hg, Cu, and Zn
- Polynitroalkyl compounds such as tetranitromethane and dinitroacetonitrile.
- Polynitroaromatic compounds especially polynitrohydrocarbons, phenols, and amines (e.g., dinitrotoluene, trinitrotoluene, and picric acid).

PYROPHORIC CHEMICALS:

The classes of chemicals listed below will readily oxidize and ignite spontaneously in air. Therefore, users must demonstrate to the department that they have the appropriate laboratory equipment, information, knowledge and training to use these compounds safely.

- Grignard reagents, RMgX
- Metal alkyls and aryls, such as RLi , RNa , R_3Al , R_2Zn
- Metal carbonyls such as $\text{Ni}(\text{CO})_4$, $\text{Fe}(\text{CO})_5$, $\text{Co}_2(\text{CO})_8$
- Alkali metals such as Na, K
- Metal powders, such as Al, Co, Fe, Mg, Mn, Pd, Pt, Ti, Sn, Zn, Zr
- Metal hydrides such as NaH , LiAlH_4
- Nonmetal hydrides, such as B_2H_6 and other boranes, PH_3 , AsH_3
- Nonmetal alkyls, such as R_3B , R_3P , R_3As
- Phosphorus (white)