DEPARTMENT OF LAW ENFORCEMENT
BUREAU OF FORENSIC SERVICES

Chemical Hygiene and Safety Plan

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INTRODUCTION

The Occupational Exposures to Hazardous Chemicals in Laboratories Standard, published by OSHA on January 31, 1990, requires the development and implementation of a written Chemical Hygiene and Safety Plan. These standards have been incorporated into Idaho Safety Code I.

The plan must be a written plan which is readily available to employees, their representatives, and, if necessary, representatives of OSHA (Department of Labor and Industrial Services and Industrial Safety Section). The Plan establishes two broad performance goals:

1. The Chemical Hygiene and Safety Plan must be "capable of protecting employees from health hazards associated with hazardous chemicals in that laboratory," and capable of providing a safe working environment.

2. The Chemical Hygiene and Safety Plan must be "capable of keeping exposures below...Permissible Exposure Limits: For laboratory uses of OSHA regulated substances, the employer shall assure that laboratory employees' exposures to such substances do not exceed the permissible exposure limits specified in 29 CFR 1910, Subpart Z".

Laboratories vary widely in mission and structure. It is impossible to design a set of rules that will cover all possible hazards and occurrences. Some general guidelines are given in this plan that experience has shown to be useful for avoiding accidents or reducing injuries in the laboratory.

This plan must be a "living" document. It must be completed based on the best current knowledge and information and continually be re-evaluated and updated as experience increases our knowledge.

A. Elements of the Plan

The Chemical Hygiene and Safety Plan has eight main elements:

1. Designation of responsible personnel.
2. Standard Operating Procedures.
3. Control measures.
4. Hood and protective equipment performance.
5. Circumstances where prior approval of an operation is required.
6. Procedures for handling particularly hazardous substances.
7. Provisions for medical consultation and examinations.
8. Employee information and training.

B. Chemical Hygiene Responsibilities

For the implementation of the Chemical Hygiene and Safety Plan, the Bureau of Forensic Services must designate specific personnel responsible for the plan, including a Chemical Hygiene Officer from each of the laboratories in the bureau, who together make up the Chemical Hygiene and Safety Committee.

C. The Chemical Hygiene Officer

The person selected by the Laboratory Manager as the Chemical Hygiene and Safety Officer has primary responsibility for the Chemical Hygiene and Safety Plan.

The Chemical Hygiene and Safety Officer must be qualified, by training or experience, to provide guidance in the development and implementation of the provisions of the Chemical Hygiene and Safety Plan.

The Chemical Hygiene and Safety Officer's responsibilities are:

- Work with supervisors/lab managers and other employees to develop and implement appropriate chemical hygiene and safety policies and practices.
- Monitor procurement, use, storage, and disposal of chemicals used in the lab.
- Maintain appropriate inventory at least annually.
- Help lab managers develop precautions and adequate facilities.
- Know the current legal requirements concerning regulated substances.
- Seek ways of improving the Chemical Hygiene and Safety Plan.
- Annually update the Chemical Hygiene and Safety Plan.

Every person in the laboratory is responsible for chemical hygiene, from the Bureau Chief to the people who conduct day-to-day operations in the labs.

The Bureau Chief has ultimate responsibility for chemical hygiene and safety within the Bureau and must, with other supervisors, provide continuing support for chemical hygiene and safety. The Bureau Chief must ensure that an effective safety program is in place and show an obvious and continuing interest in the safety program.

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The District Laboratory Supervisor has overall responsibility for chemical hygiene in the district laboratory, including responsibility to:

- Appoint a Chemical Hygiene (Safety) Officer.
- Ensure that workers know and follow the chemical hygiene and safety rules.
- Ensure that protective and emergency equipment is available and in working order and that appropriate training has been provided.
- Provide regular, formal chemical hygiene, safety, and housekeeping inspections, including routine inspections of emergency equipment.
- Know the current legal requirements concerning regulated substances.
- Determine the required levels of protective apparel and equipment.
- Ensure that facilities and training for use of any material being ordered are adequate.

The laboratory worker is responsible for planning and conducting each operation in accordance with the institutional chemical hygiene and safety procedures, and is required to develop good personal chemical hygiene habits and to review relevant MSDSs.

Chemical hygiene and safety requires a coordinated effort on the part of all personnel. Under the Chemical Hygiene and Safety Plan, the following are some of the areas of responsibility that should be assigned to specific personnel, either to be performed by or under the supervision of the laboratory manager:

- Determine when exposure monitoring is necessary.
- Facilitate exposure monitoring procedures.
- Provide technical assistance in complying with the Chemical Hygiene and Safety Plan.
- Assist with safety precautions for new projects and procedures.
- Monitor procurement of new chemicals and MSDSs.
- Monitor collection and disposal of chemical wastes.

- Remain current on regulations and legal requirements regarding chemicals used in this facility.
- Ensure availability of proper protective equipment and that it is functioning properly.
- Ensure that protective and control equipment is functioning properly.
- Perform regular chemical hygiene, safety, and housekeeping instruction.
- Perform routine inspections of emergency equipment.
- Ensure that proper signs and labels are provided and used.
- Inventory and monitor chemicals that are particularly hazardous (see Appendix E).
- Determine when a complaint of possible over-exposure should be referred for medical consultation.
- Determine when an exposure assessment is appropriate and conduct as needed.

GLOSSARY

The following terms are used as part of the Chemical Hygiene Program:

ACUTE An adverse effect characterized by sharpness or severity with a sudden onset and short duration.

CARCINOGEN A substance capable of causing cancer.

CHEMICAL AGENTS A wide variety of fluids that have a high potential for body entry by various means. Some are more toxic than others and require special measures of control for safety and environmental reasons.

CHRONIC An adverse effect with symptoms that develop slowly over a long period of time or that frequently recur.

COMBUSTIBLE Able to catch on fire and burn.

DOT Department of Transportation.

EPA Environmental Protection Agency.

FLAMMABLE Capable of being easily ignited and of burning with extreme rapidity.

INFECTIOUS AGENTS Sources that cause infections either by inhalation, ingestion, or direct contact with the host material.

LABORATORY SCALE Work with chemicals that can easily and safety be manipulated by one person, excluding the commercial production of chemicals for sale.

LABORATORY USE A work place where relatively small quantities of hazardous chemicals are used on a non-production basis.

LC 50 The concentration of a substance in air that causes death in 50% of the animals exposed by inhalation. A measure of acute toxicity.

LD 50 The dose that causes death in 50% of the animals exposed by swallowing a substance. A measure of acute toxicity.

MSDS Material Safety Data Sheet.

MUTAGEN Capable of changing cells in such a way that future cell generations are affected. Mutagenic substances are usually considered suspect carcinogens.

OSHA Occupational Safety and Health Administration, the regulatory branch of the Department of Labor concerned with employee safety and health.

PEL Permissible Exposure Limit. This is the legally allowed concentration in the work place that is considered a safe level of exposure for an 8 hour shift, 40 hours per week.

Glossary

pH A measure of how acidic or caustic a substance is on a scale of 1 to 14. A pH of 1 indicates that a substance is acidic and a pH of 14 indicates that the substance is basic.

PHYSICAL AGENTS Work place sources recognized for their potential effects on the body. Heat exposure or excessive noise levels are examples of this risk group.

SENSITIZERS Agents to which repeated exposure over time creates an allergic reaction.

STEL Short Term Exposure Limit. Maximum concentration to which workers can be exposed for periods up to 15 minutes.

STERILITY Changes made in male or female reproductive systems resulting in the inability to reproduce.

TERATOGENS A substance that causes a deformity in newborns if a significant exposure exists during pregnancy.

TLV Threshold Limit Value. The amount of exposure allowable for an employee in an 8 hour day.

I. STANDARD OPERATING PROCEDURES

While it is impossible to design a set of rules and procedures that will cover every possible hazard or situation, this section of the plan lists general standard operating procedures for good chemical hygiene under most circumstances.

A. Minimize All Chemical Exposures

1. The hazards of handling chemicals may be classified as physical or chemical.

   Physical hazards include fire, explosion, and electric shock. Other physical hazards arise from containment measures like compressed gas cylinders, cryogenic equipment, refrigerators, and glass apparatus.

   Chemical hazards are associated with their toxic effects and may be chronic or acute. Acute hazards produce prompt or only slightly delayed effects such as serious burns, inflammation, allergic responses, or damage to the eyes, lungs, or nervous system. Some chemicals require only small amounts to cause death or severe injury. Some chemicals, such as chlorine or ammonia, give considerable warning.

   Chronic hazards show the toxicological effects after a long delay or after exposure over long periods of time. These effects may involve cumulative damage to many different organs or parts of the body. Some can be reversed by the elimination of exposure to the chemical; but some are nearly irreversible, especially after there has been much damage. Carcinogenic effects are usually chronic effects.

   Many people not involved in laboratory operations may be exposed to chemical hazards: Handling chemicals in evidence receiving areas, storerooms, stockrooms and in the transporting and disposing of chemicals. These people must be warned to take actions to protect themselves from such hazards, and taught what to do in case of an emergency.

2. Guidelines to Minimize Exposure

   a. Laboratory workers must know and follow the rules and procedures in the Chemical Hygiene and Safety Plan.

b. Always be alert to unsafe conditions and actions. Make sure they are corrected immediately. Someone else's accident can be as dangerous to you as any you might have.

c. Think, act, and encourage safety so it becomes a habit.

d. Always use common sense, good judgement, professional expertise, and safety awareness when it comes to hazardous chemicals. Practical jokes or horseplay cannot be tolerated at any time in the laboratory.

e. Always avoid unnecessary exposure to chemicals by any route.

f. Prevent quantities of chemical vapors or dust that might produce adverse toxic effects from entering the general laboratory atmosphere.

g. Avoid working alone in a building or in a laboratory if the procedures being conducted are hazardous. Arrangements can be made between bureau personnel or family to check periodically when working alone. Experiments known to be hazardous should not be done by a worker who is alone in the laboratory. When requesting approval from the supervisor for after hours work, the individual must specify type of work, work schedule, and safety arrangements.

3. Do Not Underestimate Risk

When dealing with chemicals, even if substances have no known significant hazards, always observe good laboratory practices. Minimize exposure by working in an exhaust hood, wearing eye and hand protection, and wearing a laboratory coat. If substances have special hazards, take special precautions. Consult any appropriate regulations to be advised of the necessary approvals, training, working conditions, monitoring, record keeping, and medical surveillance that might apply.

Chemical reactions involving two or more substances may form reaction products that are significantly more toxic that the starting reactants. Always assume that any mixture will be more toxic than its most toxic component and that all substances of unknown toxicity are toxic.

All new and untested chemicals and drug case samples should be treated as though they are toxic until proven otherwise. Since chemical research is concerned with new molecular structures, laboratory workers should try to anticipate the toxicity, acute or chronic, of a new substance. This is an important part of planning all research involving new chemicals and drug samples.

It is important for all laboratory workers to understand the types of toxicity, to know the routes of exposure, and to recognize the major classes of toxic and corrosive chemicals.

B. Routes of Exposure

Exposure to chemicals may occur by the following routes:

- Inhalation.
- Ingestion.
- Contact with skin and eyes.
- Injection.

1. Inhalation

Inhalation of toxic vapors, mists, gases, or dusts can produce poisoning by absorption through the mucous membrane of the mouth, throat, and lungs, which can seriously damage these tissues by local action. Inhaled gases or vapors may pass rapidly into the capillaries of the lungs and be carried into the circulatory system. This absorption can be extremely rapid. The rate will vary with the concentration of the toxic substance, its solubility in tissue fluids, the depth of respiration, and the amount of blood circulation; which means that it will be much higher when the person is active than when he or she is at rest.

The degree of injury resulting from exposure to toxic vapors, mists, gases, and dusts depends on the toxicity of the material and its solubility in tissue fluids, as well as on its concentration and the duration of exposure. Chemical activity and the time of response after exposure are not necessarily a measure of the degree of toxicity. Several chemicals (i.e. mercury and its derivatives) and some of the common solvents (benzene) are cumulative poisons that can produce body damage through exposure to small concentrations over a long period of time.

The American Conference of Governmental Industrial Hygienists (ACGIH) produces annual lists of Threshold Limit Values (TLVs) and Short Term Exposure Limits (STELs) for common chemicals used in laboratories. These values are guides, not legal standards, and are defined as follows:

- TLV - Time weighted average concentration for a normal 8 hour work day to which nearly all workers may be repeatedly exposed without adverse effect.

- STEL - Maximum concentration to which workers can be exposed for periods up to 15 minutes. Such exposures should be limited to no more than four per day with periods of at least 60 minutes each between exposures. The total time weighted exposures per day should not exceed the TLV value.

Most of the 1968 TLVs were adopted by OSHA in 1972 as legal Permissible Exposure Levels (PELs). The basis for selection of the TLVs appears to be more secure than the justification for the STELs. The TLVs provide a useful estimate of how much ventilation may be needed in laboratories where the occupants typically spend most of their working time.

However, because of the many factors influencing toxicity, each situation should be evaluated individually and the TLVs used as guidelines rather than as fine lines between safe and dangerous concentrations.

The best way to avoid exposure to toxic vapors, mists, gases, and dusts is to prevent the escape of such materials into the working atmosphere and to ensure adequate ventilation by the use of exhaust hoods and other local ventilations.

The best way to prevent exposure to airborne substances is to prevent their escape into the working atmosphere by use of hoods and other ventilation devices. Chemicals should not be smelled. Operations such as running reactions, heating or evaporating solvents, and the transfer of chemicals from one container to another should normally be performed in a hood. Toxic substances and laboratory apparatus that may discharge toxic vapors must be stored in areas fitted with ventilation. If auxiliary local ventilation is not practical during measurement or storage, samples should be kept in containers.

2. Ingestion

Many of the chemicals used in the laboratory are extremely dangerous if they enter the mouth and are swallowed.

The relative acute toxicity of a chemical can be evaluated by determining its LD 50, which is defined as the quantity of material that, when ingested or applied to the skin in a single dose, will cause death of 50 percent of the test animals. It is expressed in grams or milligrams per kilogram of body weight. In addition, many chemicals may damage the tissues of the mouth, nose, throat, lungs, and gastrointestinal tract and produce systemic poisoning if absorbed through the tissues.

To prevent entry of toxic chemicals into the mouth, laboratory workers should wash their hands before eating, smoking, or applying cosmetics; immediately after use of any toxic substance; and before leaving the laboratory. Chemicals should not be tasted; and pipetting and siphoning of liquids should never be done by mouth. Eating, drinking, brushing teeth, application of cosmetics, or food storage should only be done in zero contamination areas (See Appendix A).

3. Contact with Skin and Eyes

Contact with the skin is a frequent mode of chemical injury. A common result of skin contact is a localized irritation; but an appreciable number of materials are absorbed through the skin with sufficient rapidity to produce systemic poisoning. The main portals of entry for chemicals through the skin are the hair follicles, sebaceous glands, sweat glands, and cuts or abrasions of the outer layers of the skin. The follicles and glands are abundantly supplied with blood vessels, which facilitates the absorption of chemicals into the body.

Contact of chemicals with the eyes is of particular concern because these organs are so sensitive to irritants. Few substances are innocuous in contact with the eyes; most are painful and irritating, and a considerable number are capable of causing burns and loss of vision. Alkaline materials, phenols, and strong acids are particularly corrosive and can cause permanent loss of vision. Also, eyes are very vascular and provide for rapid absorption of many chemicals.

Skin and eye contact with chemicals should be avoided by use of appropriate protective equipment. All persons in the laboratory should wear safety glasses as needed. Face shields, safety goggles, shields, and similar devices provide better protection for the eyes. Protection against skin contact may be obtained by use of gloves, laboratory coats, tongs, and other protective devices. Spills should be cleaned up promptly in accordance with the Spill Control Plan (See Appendix B).

In the event of skin contact, the affected areas should be flushed with water and medical attention should be sought if symptoms persist. In the event of eye contact, the eye(s) should be flushed with water for 15 minutes and medical attention should be sought whether or not symptoms persist.

Location of eye washes and emergency showers must be known by all employees.

4. Injection

Exposure to toxic chemicals by injection may occur in the Crime Laboratory. It can inadvertently occur through mechanical injury from glass or metal contaminated with chemicals or when chemicals are handled in syringes.

II. THE CHEMICAL HYGIENE PROGRAM

The Chemical Hygiene Program must be designed to minimize exposures. It must be a regular, on-going effort, not a standby or short-term activity. The program recommendations should be followed by all laboratory workers. Everyone must learn to work with and to accept the responsibility for the appropriate use of hazardous substances. The worker must learn to think about possible hazards and seek information and advice before starting any new experiment or procedure.

A. Planning

Safety is everyone's responsibility. Know the safety rules and procedures that apply to the work being done. Determine the potential hazards (physical, chemical, biological) and appropriate safety precautions before beginning any new operation. Get information and advice about hazards, plan appropriate protective procedures, and plan the positions of equipment before starting any new operation.

B. Beware of the PELs and TLVs

Do not exceed the Permissible Exposure Limits of OSHA and the Threshold Limit Values of the American Conference of Governmental Industrial Hygienists. Control measures should be designed and utilized to prevent exposures exceeding these guidelines.

C. Unattended Operations (Chemical Reactions and Manipulations)

Leave the lights on and place an appropriate sign on the door. Take the proper precautions for containment of toxic substances in case a utility service, such as cooling water, should fail during an unattended operation.

D. Glassware

Use equipment only for its designed purpose. Handle and store laboratory glassware with care to avoid damage or breakage. Use extra care with Dewar flasks and other evacuated glass apparatus. Shield or wrap them to contain chemicals and fragments should implosion occur. Repair or discard any damaged items. Use adequate hand protection when inserting glass tubing into rubber stoppers or corks or when placing rubber tubing on glass hose connections.

Proper instruction should be received in the use of glass equipment designed for specialized tasks that may present unusual risks for the for the first time user.

Position and clamp reaction apparatus thoughtfully in order to permit manipulation without the need to move the apparatus until the entire reaction is completed. Combine reagents in appropriate order and avoid adding solids to hot liquids.

E. Personal Hygiene

Contamination of food, drink, and smoking materials is a potential route for exposure to toxic substances. Food should be stored, handled, and consumed in an area free of hazardous substances. Activities such as eating, drinking, or applying cosmetics should only be carried out in zero contamination areas (See Appendix A). Food and beverages are allowed only in areas designated by the laboratory supervisor. Wash hands before doing any of these activities. Wash hands before using sanitary facilities after being in areas where evidence, chemicals, or hazardous materials are used or stored. Wash hands and arms immediately after handling any toxic or hazardous substances. Wash well before leaving the laboratory area. Do not use solvents on the skin.

Do not store food or beverages in laboratory refrigerators other than those specifically designated for food storage. Do not use glassware, utensils, or sinks which are used in laboratory operations to wash food items.

F. Personal Protection

Personnel must know the types of protective equipment available and use the proper type for each job. Everyone, including visitors, must wear the appropriate eye protection as necessary.

Use protective clothing, face shields, gloves, and other special clothing or footwear as needed.

If there is significant contamination, remove laboratory coats or other protective apparel immediately.

Use appropriate respiratory equipment when air contaminant concentrations are not sufficiently restricted by engineering controls. Inspect the respirator before use.

Specific requirements for selection and use of respiratory protection are listed in the laboratory's written respirator program (See Appendix C). Personnel must be properly trained before using any respiratory equipment.

Personnel must know the location and use of emergency equipment, how to obtain additional help in an emergency, and must be familiar with emergency procedures.

1. Personal Apparel

   Confine long hair and loose clothing. Do not wear loose (dangling neckties, too large lab coats, etc.), skimpy, or torn clothing. Loose or torn clothing could get caught in apparatus or on instruments. Skimpy clothing offers little protection if there is a chemical splash.

   Tuck away or remove loose or dangling jewelry. Rings may react with chemicals. Rings should also be removed when working around equipment with moving parts.

   A protective laboratory coat or apron should be worn at all times in areas designated to be contaminated (moderate to high - level 2). Lab coats should be removed before entering zero contamination areas.

   Appropriate footwear must be worn at all times in the laboratories and other contaminated areas. Inappropriate footwear would include sandals, perforated shoes, and canvas shoes.

2. Eye Protection

   It is very important that each operation be analyzed to ensure that adequate eye protection is used. When operations that involve potential hazard to the eyes are performed (such as handling unusually corrosive chemicals) more complete eye protection than spectacles should be worn. It is the responsibility of the laboratory supervisor to determine the level of eye protection required and to enforce eye-protection rules. Special precautions should be taken if contact lenses are worn in the laboratory.

   Forms of eye protection that may be required for a particular operation include the following:

a. Goggles

Goggles are not intended for general use. They are intended for wear when there is danger of splashing chemicals or flying particles. For example, goggles should be worn when working with glassware under reduced or elevated pressure and when glass apparatus is used in combustion or other high temperature operations. Impact protection goggles have screened areas on the sides to provide ventilation and reduce fogging of the lens. They do not offer full protection against chemical splashes. Splash goggles (acid goggles or face shields) that have splash proof sides should be used when protection from harmful chemical splash is needed.

b. Face Shields

Goggles offer little protection to the face and neck. Full face shields that protect the face and throat should always be worn when maximum protection from flying particles and harmful liquids is needed; for full protection, safety glasses should be worn with face shields. A face shield or mask may be needed when a vacuum system (which may implode) is used or when a reaction that has a potential for mild explosions is conducted.

c. Specialized Eye Protection

There are specific goggles and masks for protection against laser hazards, ultraviolet, or other intense light sources, as well as glassblowing goggles and welding masks and goggles. The laboratory supervisor should determined whether the task being performed requires specialized eye protection and insist on the use of such equipment if it is necessary.

3. Gloves

Skin contact is a potential source of exposure to toxic materials. It is important that the proper steps be taken to prevent such contact.

a. Proper protective gloves (and other protective clothing, when necessary) should be worn whenever the potential for contact with corrosive or toxic materials and materials of unknown toxicity exists.

b. Gloves should be selected on the basis of the material being handled, the particular hazard involved, and their suitability for the operation being conducted.

c. Before each use, gloves should be inspected for discoloration, punctures, and tears.

d. Before removal, gloves should be washed appropriately. *NOTE: Some gloves (i.e. leather and polyvinyl alcohol) are water permeable.*

e. Glove materials are eventually permeated by chemicals. However, they can be used safely for limited time periods if specific use and glove characteristics (i.e. thickness and permeation rate and time) are known. Some of this information can be obtained from glove manufacturers or the gloves used can be tested for breakthrough rates and times.

f. Gloves should be replaced periodically, depending on frequency of use and permeability to the substance(s) handled. Gloves obviously contaminated (if impermeable to water) should be rinsed and then carefully removed.

g. Gloves should be worn whenever it is necessary to handle corrosive materials, rough or sharp edged objects, very hot or very cold materials, or whenever protection is needed against accidental exposure to chemicals. Gloves should not be worn around moving machinery. Many different types of gloves are commercially available.

(1) Leather gloves may be used for handling broken glassware, for inserting glass tubes into rubber stoppers, and for similar operations where protection from chemicals is not needed.

(2) There are various compositions and thicknesses of rubber gloves. Common glove materials include neoprene, polyvinyl chloride, nitrile, and butyl and natural rubbers. These materials differ in their resistance to various substances. Specific information on this topic is often available from glove manufacturers' catalogs, although such data are usually only qualitative (See Appendix D). Rubber gloves should be inspected before each use.

(3) Insulated gloves should be used when working at temperature extremes. Various synthetic materials such as Nomex and Kevlar can be used briefly up to 1000 degrees Fahrenheit. Gloves made with these materials, or in combination with other materials such as leather, are available. It is best not to use gloves made either entirely or partly of asbestos, which is regulated as a carcinogen under OSHA, although such gloves probably do not present a great hazard.

(4) Specialized gloves are manufactured for electrical linesmen, welders, and others. It is the responsibility of the laboratory supervisor to determine whether specialized hand protection is needed for any operation and to ensure that needed protection is available.

G. Special Situations

1. Prior Approval

Some laboratory operations require prior approval from the supervisor before they are carried out. The supervisor must be notified of the following:

a. When there is a failure of any of the equipment used in the process, especially safeguards such as fume hoods or clamp apparatus.

b. When members of the laboratory staff suspect exposure, smell chemicals, or otherwise suspect a failure of engineered safeguards.

c. For certain unattended operations.

d. If novel techniques or non-routine procedures are to be used.

e. Situations requiring prior approval for a procedure may also require a hazard review. The review is conducted by a group of senior lab personnel who consider the proposed activity and discuss the safety aspects of the procedure with the personnel involved. The procedure will be approved only after the safety questions are adequately answered and all are satisfied that it can proceed safely. A hazard review will generally be required before conducting a procedure that is new and complex or is suspected to be especially hazardous.

2. Particularly Hazardous Substances

Particularly hazardous materials, such as select carcinogens, reproductive toxins, and substances that have a high degree of acute toxicity, require special procedures and precautions.

In general, procedures for handling these particular hazardous materials include the following:

a. Using a hood where the specific procedures will be carried out. All hoods are identified as areas of special hazard and access should be restricted to personnel who are trained about the hazards and safe handling of the materials.

b. Decontamination procedures include extra precautions on the part of lab workers in maintaining good personal hygiene. No food, beverages, or tobacco products will be permitted in the restricted areas and workers should wash after working at any hood.

c. Procedures for safe removal of contaminated waste should be consistent with the laboratory's hazardous waste policy and must meet the requirements of applicable regulations.

The following are recommendations for handling of specific classes of particularly hazardous substances. A list of such hazardous substances used in the laboratory is found in Appendix E.

Allergens (Examples: diazomethane, isocyanates, bichromates, formaldehyde, or certain phenols)

- A wide variety of substances can produce skin and lung hypersensitivity. Because of this variety, and because of the varying response of individuals, suitable gloves and eye protection should be used to prevent hand and eye contact with allergens or substances of unknown allergenic activity.

Embryotoxins (Examples: organomercurials, lead compounds, formamide)

- Because the period of greatest susceptibility to embryotoxins is the first 8 to 12 weeks of pregnancy, which includes a period when a woman may not know she is pregnant, women of child-bearing potential should take care to avoid skin contact with all chemicals. All hoods or other essential engineering controls should be known to be operating at required efficiency before work with embryotoxins is started.

- Store these substances (properly labeled) in an adequately ventilated area in a proper container.

- Notify the Laboratory Manager, Safety Committee, and Division Safety Officer of all incidents of exposure or spills. Consult a qualified physician when appropriate.

Chemicals of Moderate and High Chronic or High Acute Toxicity

(Examples: diisopropylfluorophosphate, hydrofluoric acid, hydrogen cyanide, hydrogen sulfide, vinyl chloride, nitrogen dioxide)

- Supplemental rules are to be followed, in addition to those mentioned above.

- The aim is to minimize exposure to these toxic substances, by any route, using all reasonable precautions.

- Use and store these substances only in areas of restricted access with special warning signs.

- Always use a hood (previously evaluated to confirm adequate performance with a face velocity of 60 to 125 linear feet per minute) or other containment device for procedures which may result in the generation of aerosols or vapors containing the substance. Trap released vapors to prevent their discharge with the hood exhaust in case of major spills.

- Always avoid skin contact by use of gloves and long sleeves (and other protective apparel as appropriate). Always wash hands and arms immediately after working with these materials.

- Make sure that at least two people are present, when possible, if a compound in use is highly toxic or of unknown toxicity.

- Store containers of these chemicals in a ventilated area in appropriately labeled, unbreakable, chemically resistant containers.

- Use chemical decontamination by chemical conversion whenever necessary. See Appendix H, Waste Disposal Policy, and the section for storage and disposal of contaminated waste.

- Clean the hood after each use.

- Remove any contaminated protective apparel and dispose of it properly.

- If using toxicologically significant quantities of such a substance on a regular basis (for example, three times a week), consult a qualified physician concerning desirability of regular medical surveillance.

- Make sure the controlled area (or hood) is conspicuously marked with warning and/or restricted access signs and that all containers of these substances are appropriately labeled with identity and warning labels.

- Make sure that contingency plans, equipment, and materials to minimize exposures of people and property, in case of an accident, are available.

III. ENGINEERING CONTROL MEASURES

A. Hoods

Engineering controls start with the general ventilation system, which should have air intakes and exhausts located so as to avoid intake of contaminated air. This system should provide a source of air for breathing and for input to local ventilation devices. It should be relied on for protection from toxic substances released into the laboratory. The system should ensure that laboratory air is continually replaced, preventing increase of air concentrations of toxic substances during the working day, by directing air flow into the laboratory from non-laboratory areas and outside. Thus, air pressure in the laboratories should always be negative with respect to the rest of the building. Also, air intakes for a laboratory building should be located in such a way that reduces the possibility that the input air will be contaminated by exhaust air.

The fume hood is the primary engineering control in the lab. A laboratory hood with 2.5 linear feet of hood space per person should be provided as needed. Each hood should have a continuous monitoring device to allow convenient confirmation of adequate hood performance before use. If this is not possible, working with substances of unknown toxicity should be avoided or other types of local ventilation devices should be provided.

Other local ventilation devices include ventilated storage cabinets and canopy hoods. These should be provided as needed. Each canopy hood should have a separate exhaust duct.

Any alteration of the ventilation system should be made only if thorough testing indicates that worker protection from airborne toxic substances will continue to be adequate.

1. Use of a Hood

a. Use the hood for operations which might result in the release of toxic or hazardous chemical vapors or dust. A hood should be considered as a backup safety device to contain and exhaust toxic, offensive, or flammable materials. It is not a method for disposing of chemicals. Apparatus used in hoods should be fitted with condensers, traps, or scrubbers to contain and collect waste solvents or toxic vapors or dusts. Highly toxic or offensive vapors should always be scrubbed or adsorbed before the exit gases are released into the hood exhaust system.

b. A hood should be evaluated before use to ensure adequate face velocities, usually 60-125 lfm. As a general rule, use a hood or other local ventilation device when working with any volatile substance with a TLV of less than 50 ppm. There should be no excessive turbulence, which may occur at face velocities higher than 125 lfm. Use some continuous monitoring device for adequate hood performance. It should be checked before a hood is used. Confirm the performance of a hood to be sure it is adequate before use. If the performance of the hood is inadequate for the operation or chemicals involved, do not use it.

c. Keep hoods closed, vertical sashes down, and horizontal sashes closed, except for adjustments. A small face opening of the hood improves its overall performance.

d. The airflow pattern and the performance of a hood depends on such factors as the placement of equipment in the hood, room drafts from open doors and windows, persons walking by, and the presence of the user in front of the hood.

e. Hoods are not intended primarily for storage of chemicals. Materials stored in them should be kept to a minimum. They should not block vents or alter airflow patterns. When possible, store chemicals in vented cabinets.

f. Solid objects and materials such as paper should not enter exhaust ducts.

g. Appropriate actions should be taken in case of ventilation failure or other unexpected occurrences such as fire or explosion in the hood.

h. Energy can be conserved by turning off the hood when not in use if it is confirmed there is adequate general laboratory ventilation and if toxic substances are not stored in the hood.

i. *ONLY USE CHEMICALS FOR WHICH THE VENTILATION SYSTEM IS APPROPRIATE. DO NOT EXCEED THE LIMITATIONS OF THE SYSTEM.*

j. Keep materials six inches or more back from front edge of the sash. Immediately clean up any major spills occurring inside the hood. Use only grounded electrical equipment. Do not block baffle or grille openings, generate large quantities of flammables within the hood, or permit temperature of the sash glass to exceed 160° F.

2. Hood Evaluation

a. Ventilation should be evaluated when it is installed and on a regular basis, at least every three months.

b. It should be re-evaluated whenever there is a change in any aspect of the ventilation system. Thus, changes in the total volume of input air, changes in the locations of air-input ports, or the addition of other auxiliary local ventilation devices, calls for a re-evaluation of all hoods in the laboratory.

c. The measurement of airflow rates requires special instruments and personnel trained to use them. Pitot tubes are used for measuring duct velocities, and anemometers or velometers are used to measure airflow rates within rooms and the faces of input or exhaust ports. The proper calibration and use of these instruments requires specialized training to ensure the accurate collection and evaluation of data.

B. Other Engineering Controls

1. Other engineering controls include special containers and storage equipment for substances with specific hazards.

2. Flammable and combustible liquids should be kept in safe containers designed for that purpose. Quantities greater than one liter should be stored in metal containers or an appropriate storage area. Portable safety cans have spring-loaded spout covers that can open to relieve internal pressure when subjected to a fire and will prevent leakage if tipped over. Some are equipped with a flame arrester in the spout that will prevent flame propagation into the can. Cans must be properly labeled to identify their contents.

3. Small quantities of flammable liquids should be stored in ventilated metal cabinets or in appropriate storage areas. Typical construction is a double-walled configuration of 18-gauge steel with riveted and spot-welded seams. The door is two inches above the floor and the cabinet is liquid tight at this point. It is provided with vapor-venting provisions and can be equipped with a sprinkler system. (Do not store materials that react with water in sprinkler-equipped cabinets.)

4. Materials that are corrosive must be stored in cabinets designed to hold them. Special care must be taken to separate acids from bases by distance or barrier.

5. Special precautions must be followed when handling chemicals that are defined as reactive to prevent mixing with other chemicals, except under controlled conditions. Storage for reactive chemicals must be segregated. Personal protective equipment must be used and other precautions followed.

6. Safety showers shall be provided in areas where chemicals are handled for immediate first aid treatment of chemical splashes and for extinguishing clothing fires. Safety showers shall be tested at least once a year.

7. Eyewash fountains shall provide a soft stream or spray of aerated water for an extended period (15 minutes) and be inspected at least every three months.

8. Work areas should be kept clean and free from obstructions. Clean up should be done at the end of an operation or at the end of each day.

9. Wastes should be deposited in appropriate receptacles.

10. Spills should be cleaned up immediately and disposed of properly.

11. Unlabeled containers and chemical wastes should be disposed of promptly by appropriate means.

12. Floors should be cleaned regularly.

13. Stairways and hallways should NOT be used as storage areas, even for a brief time.

14. Access to exits, emergency equipment, and utility controls MUST ALWAYS BE KEPT CLEAR.

15. Properly store equipment and chemicals.

16. Respirators for routine use should be inspected at least every six months by the laboratory supervisor or designated personnel.

17. Other safety equipment should be inspected at least every six months.

18. Informal inspections should be done continually.

C. Criteria for the Use of Control Measures

1. The use of any engineering control, protective equipment, or hygiene practice will be determined by the chemical(s) being used.

2. The four overriding principles of chemical hygiene are:

   a. Minimize all chemical exposure.
   b. Do not underestimate risk.
   c. Provide adequate ventilation.
   d. Observe Permissible Exposure Limits and Threshold Limit Values.

   These principles provide the general criteria for the use of control measures in the laboratory.

The nature of the hazard presented by the chemical will determine the type of protection. For example, a person handling a corrosive material is required to wear appropriate gloves, eye protection, and a lab coat or other protective clothing. If the material or process might result in toxic fumes or vapors, then ventilation is an important control.

In general, if the Permissible Exposure Limit/Threshold Limit Value of a substance is low or the substance has a high-vapor pressure, ventilation and/or respirator protection should be used.

The severity of the hazard will determine the extent of the control to be used. If the material is slightly corrosive, goggles alone might be enough, but if it is very corrosive, a full-face shield would be in order. If the fumes are slight, working in a hood might be adequate, but if the fumes are likely to be heavy or extremely toxic, then a closed system or respirators might be necessary.

Information on the hazards that will determine the type and extent of control measures can be found in the manufacturer's Material Safety Data Sheets, as well as in information from the Occupational Safety and Health Administration and the American Conference of Governmental Industrial Hygienists.

IV. PROCUREMENT, DISTRIBUTION, AND STORAGE

A. Procurement

Personnel who requisition hazardous substances and those who approve the purchase orders must be aware of the potential hazards involved, determine where there are adequate facilities and trained personnel available to handle such substances, and ensure a safe disposal method.

Contact the manufacturer for a Material Safety Data Sheet and secure other appropriate information.

It may be preferable to order a substance in small container lots to avoid the hazards associated with repackaging.

Personnel receiving a substance must be given the information about proper handling, storage, and disposal before it is received for permanent storage.

No container should be accepted without a label adequately identifying the contents. The label should list at least the following information:

- Identification of the contents of the container.
- Signal word and summary description of any hazards.
- Precaution information (what to do to minimize hazards and prevent an accident).
- First aid in case of an exposure.
- Spill and cleanup procedures.
- If appropriate, special instructions to physicians.

It is preferable to have all substances received in a central location.

Criminalists should be trained in the handling of hazardous substances and be familiar with the following information:

1. The use of proper material handling equipment, protective apparel, and safety equipment.

2. Emergency procedures, including the cleanup of spills and the disposal of broken containers.

3. The dangers of contacting chemicals by skin absorption, inhalation, or ingestion.

4. The meanings of the various DOT labels on shipping packages.

5. The proper methods of material handling and storage, especially the incompatibility of some common substances; the dangers associated with alphabetical storage; the sensitivity of some substances to heat, moisture, and light; and other storage hazards.

6. The special requirements of heat-sensitive materials, including those shipped refrigerated or packed in dry ice.

7. The problems associated with compressed gases.

8. The hazards associated with flammable liquids (especially the danger of their vapors catching fire some distance from the container) and explosives, toxic gases and vapors, and oxygen displacement.

9. Substances that react with water, giving rise to hazardous conditions.

10. The federal and state regulation governing controlled substances such as radioactive materials, drugs, ethyl alcohol, explosives, needles and syringes.

11. Chemicals that have offensive smells.

12. Packages that exhibit evidence that the inside container has broken and leaked its contents.

B. Stockrooms/Storerooms

Toxic substances should be segregated from other substances and stored in a well-identified area that is cool, well-ventilated, and away from light, heat, acids, oxidizing agents, moisture, etc.

Stored chemicals should be examined periodically (at least annually) for replacement, deterioration, and container integrity. Chemicals should be dated when received and when initially opened.

Stockrooms/storerooms should not be used as preparation or repackaging areas.

Incompatible chemicals should not be stored together (See Appendix E).

C. Laboratory Storage

The amounts permitted in storage should be as small as practical. Decisions about amounts should be based on the level of competence of the workers, the level of safety features designed into the facility, the location of the laboratory, the nature of the chemical operations, and the accessibility of the stockroom. In some cases, local regulations or insurance requirements will also be a determining factor.

Every chemical in the laboratory should have a definite storage place and should be returned to that location after each use.

Bulk chemicals should not be stored on bench tops or in hoods.

Storage trays or secondary containers should be used to minimize the distribution of materials should a container break or leak.

Ventilated cabinets located near hoods are desirable.

Flammable liquids should not be stored in laboratory refrigerators unless the unit is an approved, explosion-proof or laboratory-safe type.

All containers in a laboratory refrigerator must be properly labeled including identification of the contents, owner, date of acquisition or preparation, and nature of any potential hazards.

Avoid exposure to heat or direct sunlight.

D. Signs and Labels

Be certain all chemicals are correctly and clearly labeled.

Laboratory areas that have special or unusual hazards should be posted with warning signs. These hazards may be radiation, x-ray, laser operations, flammable materials, biological hazards, or other special situations.

Post prominent signs and labels such as:

- Emergency telephone numbers of emergency personnel/facilities in the event of fire, accident, flood, or hazardous chemical spill.
- Telephone numbers for supervisors and laboratory workers to be contacted in the event of an accident or emergency.
- Identity labels showing contents of containers (including waste receptacles) and associated hazards.
- Location signs for safety showers, eyewash stations, other safety and first aid equipment, and exits.
- Areas where food and beverages may be consumed and stored.

E. Compressed Gases

- Cylinders of compressed gases must be secured at all times.
- Valve safety covers must be in place when cylinders are not in use or when being moved.
- A label with cylinder contents must be attached to the cylinder and clearly visible.
- Cylinders must be transported by hand truck or cart and be secured to these vehicles during movement. Cylinders should not be dragged or rolled.

(See Appendix F)

V. WASTE DISPOSAL

Proper disposal of waste or used substances is everyone's responsibility. Methods of disposal may vary from lab to lab depending on the waste chemicals involved. One principle must always be followed:

- **The disposal method must not harm people or the environment.**

- **Due to small quantities of waste generated by the Bureau of Forensic Services, the Bureau is exempt as a waste generator (EPA-Resource Conservation and Recovery Act).**

The bureau chief and district supervisors shall make sure the layout for each laboratory operation includes plans and training for waste disposal. Avoid hazards to the environment by following accepted waste disposal procedures as per local regulations. Chemical reactions may require traps or scrubbing devices to prevent the escape of toxic substances.

Deposit chemical waste in correctly labeled receptacles and follow all other waste disposal procedures of the Chemical Hygiene and Safety Plan.

Unlabeled containers of chemicals and solutions should undergo prompt disposal; if partially used, they should not be opened. Before a worker's employment in the laboratory ends, chemicals for which that person was responsible should be discarded or returned to storage.

If an experiment creates new disposal consideration, they should be discussed with the laboratory supervisor and, if necessary, the Chemical Hygiene and Safety Officer.

A. Disposal of Chemical Wastes

1. There are procedures for the collection and proper disposal of solid, liquid, and especially hazardous wastes from the laboratories and proper disposal by the facility. Laboratory workers should be responsible for identifying hazards in handling, transporting, storing, and disposing of generated wastes.

2. Chemical and bio-hazardous wastes should be placed in properly labeled containers and disposed of properly:

    a. Acids and bases shall be neutralized, diluted, and washed down the sink with excess running water.

b. Mercury will be converted to an amalgam and be disposed of in a specifically designated mercury waste container, which is then disposed of by a hazardous chemical waste disposal company or be recycled.

c. Compatible liquid wastes should be collected in a waste container and solidified (according to paint filter test, Appendix H - LIQUID WASTE DISPOSAL, paragraph 2) with cement or kitty litter. After it is solidified, it can be taken to a local landfill (providing it meets the landfill's waste acceptance policy).

d. Heavy metals (excluding mercury) will be disposed of in a specifically designated heavy metals (excluding mercury) waste container, which is then disposed of by a hazardous chemical waste disposal company.

e. Ethyl ether and other chemicals which form peroxides or are shock sensitive shall be stored in approved containers in an approved location and disposed of by appropriate qualified disposal personnel. Open containers of ethyl ether older than six months, unopened containers of ethyl ether older than one year, or waste quantities greater than 200 ml shall be disposed of in this manner. Stabilized ethyl ether is exempt from this section.

3. Incompatible materials should be segregated.

4. Laboratory procedures should be used to produce less hazardous substances.

5. Check with the supervisor, safety coordinator, or Chemical Hygiene and Safety Officer about local, state, and federal regulations regarding waste disposal.

6. Frequency of disposal: Waste should be removed from laboratories to a central waste storage area at least once a week, and from the central waste storage area at regular intervals.

B. Considerations for Disposal to the Sewer System

1. Strong acids and bases should be diluted to the pH 6-9 range before being poured into the sewer system. Acids and alkalis should not exceed a rate equivalent to 50 ml of concentrated substance per minute.

2. Highly toxic, malodorous, or lachrymatory chemicals should not be put down the drain. Interconnected drains could create a vapor release from another drain. Substances poured down different drains could come in contact and create problems.

3. Check with the supervisor, safety coordinator, or Chemical Hygiene and Safety Officer about local, state, and federal regulations about waste disposal.

   See Appendix H for waste disposal regulations and restrictions.

VI. EXPOSURE DETERMINATION

It is the responsibility of the bureau chief to determine when exposure monitoring is necessary or appropriate, and the Laboratory worker's responsibility to report concerns to the Chemical Hygiene and Safety Officer, deputy bureau chief or supervisor, and bureau chief.

Regular, routine monitoring of the airborne concentrations of a variety of different toxic materials is generally not required, as long as care is taken to ensure the following:

1. The ventilation system (including the hood) is performing and is being used properly.

2. The laboratory workers are using proper protective equipment and clothing.

3. The laboratory workers are following good hygiene and laboratory safety practices.

However, there are situations where monitoring of individual compounds is appropriate or required:

1. In testing and redesigning hoods and other ventilation devices in the laboratory, air-sampling procedures may be helpful in the evaluation of the new ventilation situation.

2. If a specific substance is highly toxic and regularly used in the laboratory, instrumental monitoring of that substance may be appropriate. This is especially true if a relatively large amount of the material is being stored or used in the laboratory.

3. Measurement of employees' exposure to any substance regulated by a standard which requires monitoring is necessary if there is reason to believe that exposure levels for that substance routinely exceed the action level for the substance (or, in the absence of an action level, the Permissible Exposure Limit [PEL]).

If this monitoring indicates exposure over the action level or PEL, then the employer must immediately comply with the monitoring provisions of the relevant standard.

The agency must notify employees of the results of any monitoring procedures. This notification will be in writing, within 15 days of the receipt of the monitoring.

VII. MEDICAL CONSULTATIONS AND EXAMINATIONS

The Chemical Hygiene and Safety Plan provides the opportunity, under certain circumstances, for all employees who work with hazardous chemicals to receive medical attention, including any follow-up examinations which the examining doctor feels is necessary.

(See Appendix J for Chemical First Aid Actions)

The Bureau of Forensic Services must promptly investigate all complaints to determine risk of employee overexposure to the toxic substances in their work place.

There should be a medical consultation whenever there is reason to believe an employee has been exposed to a hazardous chemical.

All medical examinations and consultations must be performed by (or under the direct supervision of) a licensed physician at no cost to the employee, without loss of pay and at a reasonable time and place. All medical documentation will be placed in the employee's personnel file to be retained 30 years after an employee's termination.

Some examples of circumstances that would indicate the possibility of exposure are:

- The employee had direct skin or eye contact with a chemical substance.
- Odor was noticed, especially if the employee was working with any chemical which has a PEL or TLV below the odor threshold.
- The employee is experiencing health hazard symptoms such as headache, rash, nausea, coughing, tearing, irritation or redness of eyes, irritation of nose or throat, dizziness, loss of motor dexterity or judgement which resemble drunkenness, etc.
- Some or all of the symptoms disappear when the employee is taken away from the chemical area and into fresh air.
- Symptoms previously complained about reappear soon after the employee starts working with chemicals again.
- Complaints are received from more than one person in the same work area.
- When exposure monitoring reveals an exposure level routinely above the action level (or PEL in the absence of an action level).

- Whenever there is a spill, leak, or other release resulting in the likelihood of a hazardous exposure.

The following information must be provided to the physician:

- The identity of the hazardous chemical to which the employee may have been exposed.

- A description of the conditions under which the exposure occurred, including quantitative exposure data if available.

- A description of the signs and symptoms of exposure that the employee is experiencing, if any.

(See Appendix J - Test for Substances in Biological Fluids)

The bureau chief must obtain a written report from the physician which includes:

- The results of the medical examination and any associated tests.

- Any recommendation for further medical follow up.

- Any medical condition which may be revealed which may place the employee at increased risk as a result of a hazardous chemical found in the work place.

- A statement that the employee has been informed by the physician of the results of the examination and any medical condition that may require further examination or treatment.

- A Worker's Compensation report is necessary if the condition is due to or suspected of being job related. Copy of form in Appendix I.

The physician's statement should not include findings unrelated to occupational exposure. A copy of the physician's report should be sent to the district safety officer.

The bureau chief may find it appropriate to conduct an "exposure evaluation" when there is a complaint of a possible hazardous exposure. The basic steps of this evaluation are:

1. Interviewing the person initiating the complaint and the victim if it is not the same person.

2. Listing the essential information about the circumstances of the complaint, including:

   a. Chemical of suspicion.
   b. Other chemical in use by the victim.
   c. Other chemicals being used by others in the immediate area.
   d. Other chemicals stored in that area.
   e. Signs and symptoms being experienced.
   f. Were control measures such as fume hoods and personal protective equipment used and were these control measures functioning properly?
   g. Are any air sampling or monitoring devices in place or available?

3. Air sampling of the area for suspect chemicals.

4. Determining how the signs and symptoms being experienced compare with the information on the Material Safety Data Sheets for the chemicals involved.

5. Deciding whether to send the employee for medical evaluation.

6. Review of the present control measures and safety procedures.

VIII. INFORMATION AND TRAINING

Information and training is a key part of this Chemical Hygiene and Safety Plan. The training and education program must be a regular and ongoing activity. Information should be updated continuously and refresher training in all areas should be conducted twice a year and documented. Safety updates should be conducted quarterly.

A. Information Requirements

The employees of the laboratory must have the information to ensure that they know and understand the hazards of the chemicals in their work area.

This information must be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present, and before assignments involving new exposure situations.

Employees must be informed of:

- The locations, availability, and contents of this written Chemical Hygiene and Safety Plan.
- The location, availability, and contents of the Occupational Exposures to Hazardous Chemicals in Laboratories OSHA Standard (See Appendix G).
- The location and availability of standard reference material on the Permissible Exposure Limits, signs and symptoms associated with exposures to hazardous chemicals used in the laboratory, hazards, safe handling, storage, and disposal of the hazardous chemicals in the laboratory. This reference material includes, but is not limited to, the Material Safety Data Sheets from the manufacturers.

B. Training Requirements

1. Methods and observations that may be used to detect the presence or release of a hazardous chemical, such as:

   a. Monitoring conducted by the employer.
   b. Continuous monitoring devices.
   c. Appearance or odor of hazardous chemicals when released.

2. Training about the physical and health hazards of chemicals in the work area and protection from those hazards.

3. All Bureau of Forensic Services personnel should be trained in the proper use of emergency equipment and procedures.

4. All personnel should know about the hazards of the materials moving into and through their work areas, proper use of handling equipment, protective apparel, and relevant regulations.

5. Location of emergency evacuation routes, exits, showers, eye washes, fire extinguishers, first aid kit, fire blanket, alarms, and other safety devices.

6. The following Safety Orientation Checklist must be taught in Safety Training. The bureau chief is responsible to see that this training is received by all laboratory employees.

   There will be written documentation that this training and information has been received and understood by the Bureau of Forensic Services employee. The original documentation will be on file in the laboratory and a copy will be filed with the district safety officer.

C. Safety Orientation Checklist

1. Location of Safety Equipment and Materials (Appendix A)

   a. Fire extinguishers (different types and proper use).
   b. First aid stations.
   c. Other first aid supplies such as blankets, disposable clothing, ear protection, and respirators.
   d. MSDS files.
   e. Hazardous chemical references.
   f. Spill kits and Spill Control Plan (Appendix B)
   g. Eye washes.
   h. Showers.
   i. Fire blanket.
   j. Fire alarms.
   k. Safety Manual/Chemical Hygiene and Safety Plan.

2. Evacuation Routes, Emergency Exit Plans (Appendix A)

3. Types of Fire Alarms.

   a. Smoke detector.
   b. Building intercom.

c. Horn and flashing lights.

4. Basic Safety Rule Review.

a. No food or drink on lab bench. Use food refrigerator for food storage.

b. **When appropriate, use eye protection (goggles or shields) when handling chemicals or unknown substances.**

c. **When appropriate, wear protective gloves when working with chemicals or unknown substances.**

d. **Wear lab coat in lab, remove it when you leave the lab.**

e. **Don't put your hands blindly into packaging or into evidence clothing pockets.**

f. Use solvents and other volatiles in hoods.

g. Clean up floor spills immediately or identify and protect the spill area until clean up occurs.

h. Limit use of known carcinogens such as benzene and chloroform.

i. Gas tanks.

1) When moving tanks, cap them securely and use proper carts.

2) Always strap tanks securely at their destination whether they are being stored or used.

j. Keep fire escape doors clear; keep aisles clear.

k. **Dispose properly of scalpel blades, syringes, and broken glass.**

l. Chemical storage hazards -- isolation and proper storage of incompatible chemicals.

m. Accidents.

1) Always help someone who may be injured. If the injury is not minor, FIRST call for assistance (i.e., 911 and/or a first aid/CPR trained individual), then provide the assistance which you are able to render.

2) Promptly report all accidents and/or injuries to your supervisor.

n. No smoking in the building.

o. Do not overload bookshelves.

p. Use step stools to reach high places.

q. Know the location of the Safety Bulletin Board.

r. Hood use.

5. Do not enter Firearms Section test firing area while test firing is in progress.

6. Safety Committee.

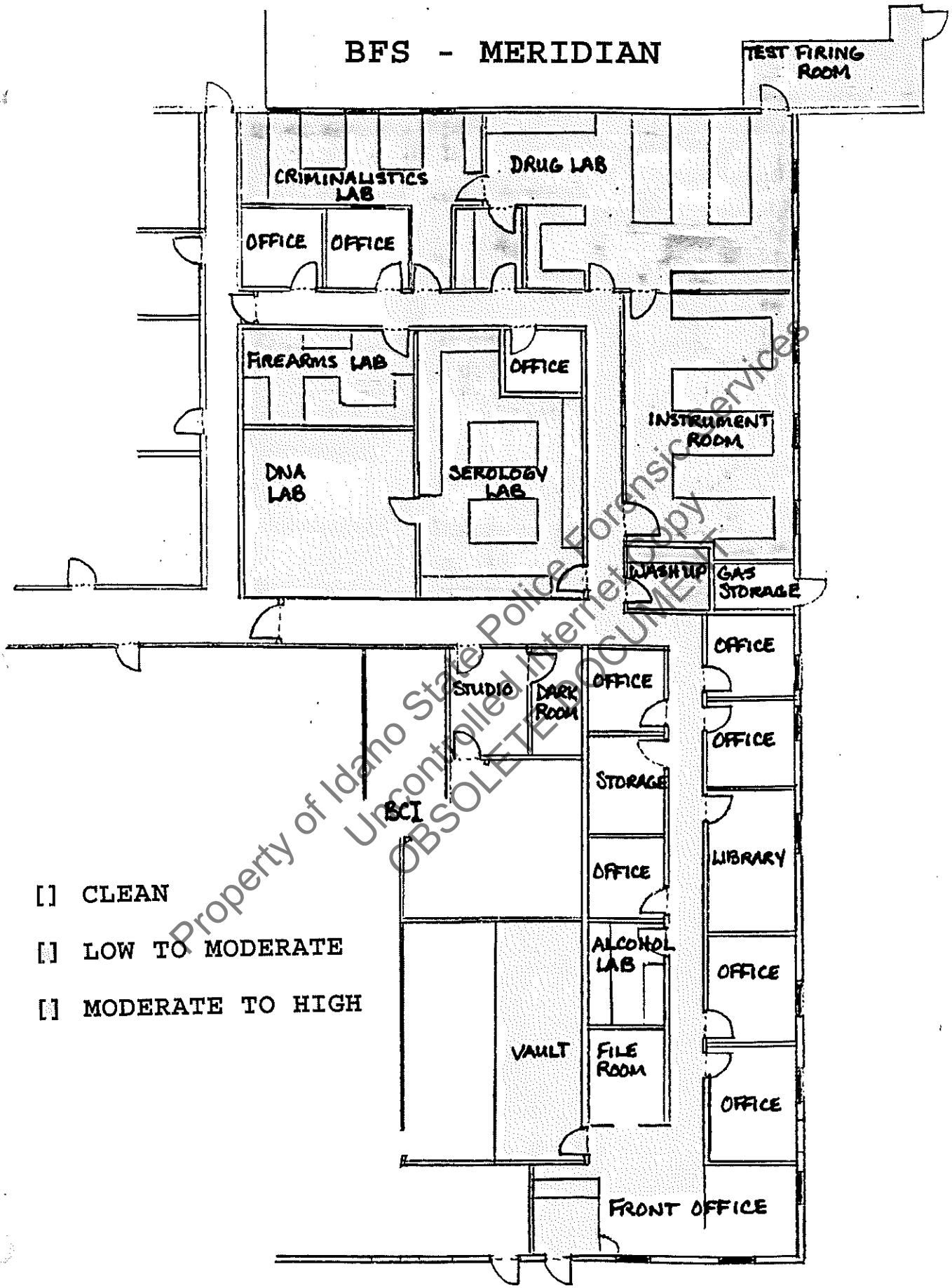
a. Lab Committee - Members.
b. System-wide Committee.
c. Chemical Hygiene and Safety Officer.

APPENDIX A

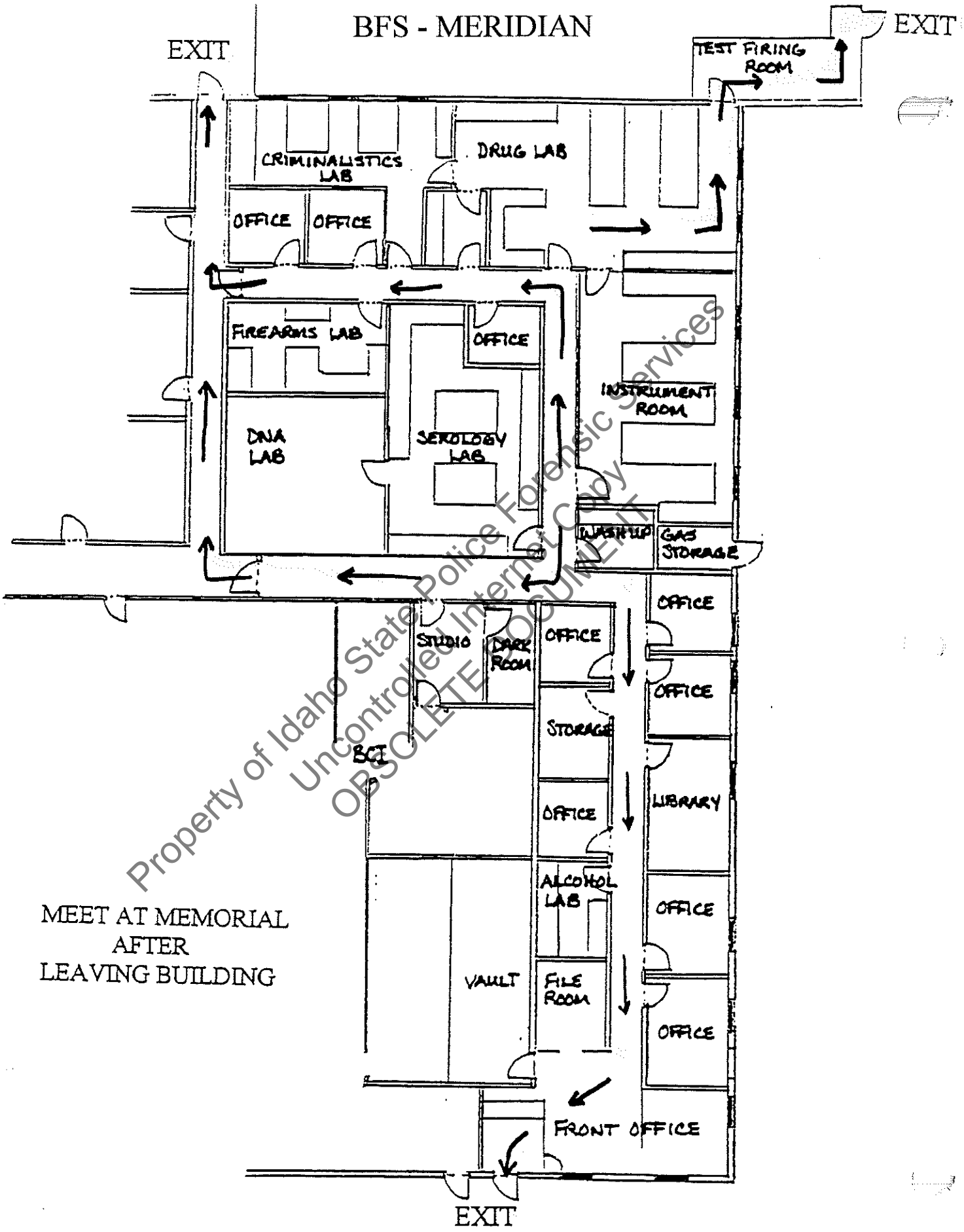
LABORATORY CONTAMINATION ZONES

EMERGENCY EXIT PLAN

SAFETY SUPPLIES INVENTORY AND LOCATION



LABORATORY CONTAMINATION ZONES



MEET AT MEMORIAL
AFTER
LEAVING BUILDING

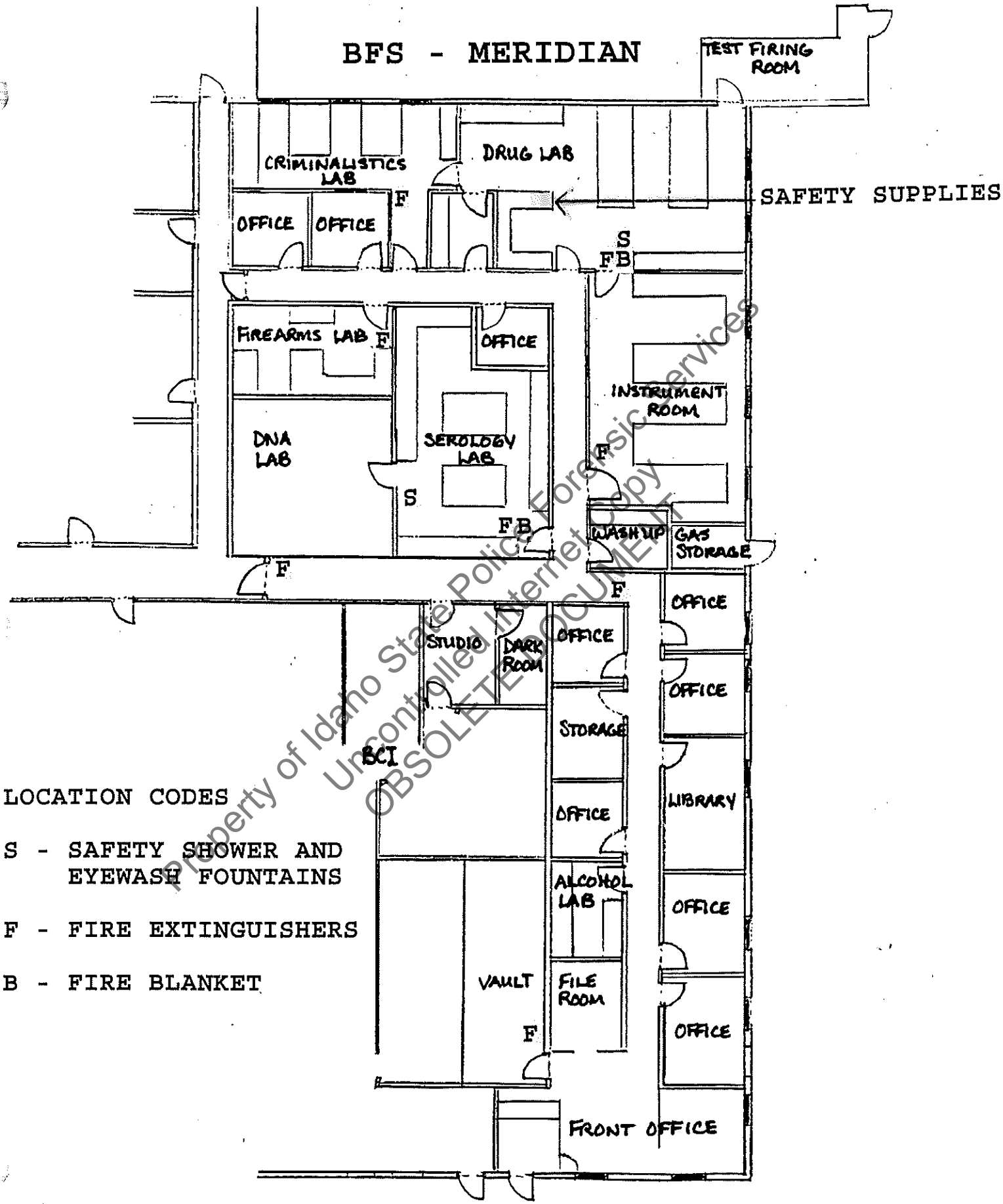
EMERGENCY EXIT PLAN

APPENDIX A - SAFETY SUPPLIES INVENTORY AND LOCATION

Safety Supply Cabinet
Respirators and cartridges
First aid kit
Spill sign
Sodium carbonate
Cat litter absorbent
Goggles
Gloves
Spill pillows
Mercury absorb kit
Dust masks

Location Noted on Map
Fire extinguishers
Safety showers
Eyewash fountains
Fire blankets

Located in Each Hood
Vaneometer air velocity gauge



LOCATION CODES

S - SAFETY SHOWER AND EYEWASH FOUNTAINS

F - FIRE EXTINGUISHERS

B - FIRE BLANKET

SAFETY SUPPLIES LOCATION

APPENDIX B

SPILL CONTROL PLAN

APPENDIX B - SPILL CONTROL PLAN

Spills pose a significant hazard to the health of personnel. Caution must be taken in clean-up to protect all concerned. For chemical spills, proper and effective equipment and protection must be provided. Store safety response equipment away from chemical and reagent storage areas. Periodically check this equipment to ensure it functions properly and that an adequate supply is on hand. The procedures listed below are mainly concerned with clean-up of large chemical spills but should be considered applicable to any clean-up.

A. Acids

Cover the contaminated area with a neutralizing compound such as sodium bicarbonate or soda-ash and slaked lime mixture (50:50), or a spill pillow. When using the neutralizing compounds, it is possible to mix with water and make into a slurry. After application to the spill, it is possible to scoop up the mixture and wash down the sink using an excess of water.

B. Bases or Alkalis

Solids should be swept up, diluted with water, and neutralized with 6M HCl in a large plastic container. After this process is completed, the solution may be washed down the sink using an excess of water. Solutions can be neutralized with acid and mopped up, or absorbed with a spill pillow. Again, the mixed solution may be discarded down the drain using an excess of water. Care should be taken when adding acids to strongly basic solutions as a strong exothermic reaction could occur, resulting in these materials contacting the individual.

C. Flammables and Combustibles

Eliminate all sources of ignition and heat that exist nearby. Clean-up should follow recommended procedures for the compound in question.

Absorb liquid materials onto an inert spill pillow or absorbent, after which the spill pillow or absorbent should be placed into a sealed container. Solid materials should also be placed into a sealed container. If the chemical composition of the material is known, the container should be marked accordingly. Once the material has been appropriately sealed in a container, the container may be disposed of in an acceptable manner. Material Safety Data Sheets (MSDS) provide information regarding clean-up and safety associated with compounds. This reference is a good source of information concerning this and other topics related to the materials in question.

D. Gases

Keep concentration of gas below the explosive range using forced ventilation. If a compressed gas tank is the problem, remove the tank to an open area. Forced ventilation of the contaminated area should be undertaken. Ensure that any tank movement is conducted using safe practices.

E. Mercury - Procedure and Safety Precautions

- Wear an approved vapor mask, gloves, and goggles during clean-up.
- Ensure adequate ventilation.
- Sprinkle mercury absorb powder over spilled mercury.
- Wet powder with water: Mercury will react with powder forming a metal/ mercury amalgam.
- Wipe or sweep wetted powder over all cracks and hard to reach locations to pick up as much mercury as possible.
- Pick up amalgam by conventional means, sweeping, sponging, vacuuming, etc.
- Place in mercury collection container.
- For mercury spills on carpeted areas see special instructions provided along with the mercury absorb powder container.

General Spill Safety Procedures

1. Attend to any persons who may have been contaminated.
2. Notify persons in the immediate area about the spill (post a sign).
3. Evacuate all non-essential personnel from the spill area.
4. If the spilled material is flammable, turn off ignition and heat sources.
5. Avoid breathing vapors of the spilled material. If necessary, use a respirator.
6. Leave on or establish exhaust ventilation if it is safe to do so.
7. Secure supplies to effect clean-up.
8. During clean-up, wear appropriate apparel.

APPENDIX C

RESPIRATOR PROGRAM

APPENDIX C - RESPIRATOR PROGRAM

GUIDELINES FOR THE USE OF RESPIRATORS

All solvents should be handled in a fume hood.

1. Appropriate respirators should be worn in these situations:

   A. The chemical warning label and MSDS says to use a mask or respirator.

   B. When working with a carcinogen or toxin (level 2 or 3).

   C. When weighing or handling large quantities of solid dosage drugs (level 1).

   D. When weighing or handling solid dosage drugs containing an unknown solvent or volatile compound (level 2 or 3).

   E. Clandestine laboratory situations (level 3 or 4) or per clandestine laboratory guidelines.

2. Types of respirators available:

Level	Type
1	Dust mask.
2	1/2 face air purifying respirator (APR) with interchangeable cartridges.
3	Full face air purifying respirator (APR) with interchangeable cartridges.
4	Self contained breathing apparatus (SCBA).

3. If the situation requires use of a dust mask or respirator, to protect co-workers, a fume hood should also be used.

4. Appropriate training should be given to Forensic Services staff on proper use of the various levels of respirators.

APPENDIX D

RESISTANCE TO CHEMICALS OF COMMON GLOVE MATERIALS

RESISTANCE TO CHEMICALS OF COMMON GLOVE MATERIALS

KEY: E = Excellent G = Good F = Fair P = Poor	Latex/ Natural Rubber	Neoprene	Nitrile	Vinyl	Viton
Glycerol	G	G	E	E	-
Hexane	P	E	-	P	-
Hydrobromic acid (40%)	G	E	-	E	-
Hydrochloric acid (conc.)	G	G	G	E	E
Hydrofluoric acid (30%)	G	G	G	E	G
Hydrogen peroxide	G	G	G	E	-
Iodine	G	G	-	G	-
Methylamine	G	G	E	E	E
Methyl Cellosolve	F	E	-	P	-
Methyl chloride[a]	P	E	-	P	-
Methyl ethyl ketone	F	G	G	P	P
Methylene chloride[a]	F	F	G	F	F
Monoethanolamine	F	E	-	E	-
Morpholine	F	E	-	E	-
Naphthalene[a]	G	G	E	G	-
Nitric acid (conc.)	P	P	P	G	G
Perchloric acid	F	G	F	E	-
Phenol	G	E	-	E	E
Phosphoric acid	G	E	-	E	-
Potassium hydroxide (sat)	G	G	G	E	-
Propylene dichloride[a]	P	F	-	P	-
Sodium hydroxide	G	G	G	E	G
Sodium hypochlorite	G	P	F	G	-
Sulfuric acid (conc.)	G	G	F	G	E
Toluene[a]	P	F	G	F	E
Trichloroethylene[a]	P	F	G	F	G
Tricresyl phosphate	P	F	-	F	-
Triethanolamine	F	E	E	E	-
Trinitrotoluene	P	E	-	P	-

(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 D - RESISTANCE TO CHEMICALS OF COMMON GLOVE MATERIALS

RESISTANCE TO CHEMICALS OF COMMON GLOVE MATERIALS

KEY: E = Excellent G = Good F = Fair P = Poor

	Latex/ Natural Rubber	Neoprene	Nitrile	Vinyl	Viton
Acetaldehyde	G	G	E	G	-
Acetic acid	E	E	E	E	-
Acetone	G	G	G	F	P
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	G
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	E
Carbon tetrachloride[a]	P	F	G	F	E
Chlorine	G	G	-	G	-
Chloroacetone	F	E	-	P	-
Chloroform[a]	P	F	G	P	E
Chromic acid	P	F	F	E	-
Cyclohexane	F	E	-	P	E
Dibenzyl ether	F	G	-	P	-
Dibutyl phthalate	F	G	-	P	-
Diethanolamine	F	E	-	E	-
Diethyl ether	F	G	E	P	P
Dimethyl sulfoxide[b]	-	-	-	-	F
Ethyl acetate	F	G	G	F	P
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	E
Formic acid	G	E	E	E	-

APPENDIX E

CHEMICAL INCOMPATIBILITIES

CHEMICALS LISTED IN ANNUAL REPORT ON CARCINOGENS

APPENDIX E - CHEMICAL INCOMPATIBILITIES

CHEMICAL	KEEP OUT OF CONTACT WITH:
Acetic Acid	Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates
Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury
Alkaline	Water, carbon tetrachloride or other chlorinated metals, hydrocarbon, carbon dioxide, the halogens such as powdered aluminum or magnesium, sodium, potassium
Ammonia, anhydrous	Mercury (in manometer, for instance), chlorine, calcium, hypochlorite, iodine, bromine, hydrofluoric acid (anhydrous)
Ammonium nitrate	Acids, metals, powders, flammable liquids, chlorates, nitrites, sulfur, finely divided organic or combustible materials
Aniline	Nitric acid, hydrogen peroxide
Bromine	Same as for chlorine
Carbon, activated	Calcium hypochlorite, all oxidizing agents
Chlorates	Ammonium salts, acids, metals, powders, sulfur, finely divided organic or combustible materials.
Chromic acid	Acetic acid, naphthalene, camphor, glycerin, turpentine, alcohol, flammable liquids in general
Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbide, turpentine, benzene, finely divided metals, phosphine, hydrogen sulfide
Copper	Acetylene, hydrogen peroxide
Cumene	Acids, organic or inorganic hydroperoxide
Flammable liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, the halogens
Fluorine	Isolate from everything
Hydrocarbons (butane, propane, benzene, gasoline, turpentine, etc.)	Fluorine, chlorine, bromine, chromic acid, sodium peroxide
Hydrocyanic acid	Nitric acid, alkali
Hydrofluoric acid, anhydrous	Ammonia, aqueous or anhydrous
Hydrogen	Fuming nitric acid, oxidizing gases
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen
Mercury	Acetylene, ammonia
Nitric Acid (concentrated)	Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids, flammable gases
Oxalic acid	Silver, mercury
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood
Potassium	Carbon tetrachloride, carbon dioxide, water
Potassium chlorate	Sulfuric and other acids
Potassium permanganate	Glycerin, ethylene glycol, benzaldehyde, sulfuric acid
Silver	Acetylene, oxalic acid, tartaric acid, ammonium compounds

APPENDIX E - CHEMICALS LISTED IN ANNUAL REPORT ON CARCINOGENS

Substance Name	CAS No.
2-Acetylaminofluorene	53-96-3
Acrylonitrile	107-13-1
Adriamycin	23214-92-8
Aflatoxins	1402-68-2
1-Amino-2-methylanthraquinone	82-28-0
2-Aminoanthraquinone	117-79-3
4-Aminobiphenyl	92-67-1
Amitrole	61-82-5
0-Anisidine	90-04-0
and o-Anisidine Hydrochloride	134-29-2
Aramite	140-57-8
Arsenic	7440-38-2
and certain arsenic compounds	1327-53-3
Asbestos	1332-21-4
Azathioprine	446-86-6
Benzene	71-43-2
Benzidine	92-87-5
Benzotrichloride	98-07-7
Beryllium and certain beryllium compounds	7440-41-7
N,N-bis (2-chloroethyl)-2-naphthylamine (chlornaphazine)	494-03-1
Bis (chloromethyl) ether and technical grade chloromethyl methyl ether	542-88-1
Bischloroethyl nitro-sourea	154-93-8
1,4-Butanediol dimethy-sulfonate (myleran)	55-98-1
Cadmium and certain cadmium compounds	7440-43-9
Carbon tetrachloride	56-23-5
Chlorambusil	305-03-3
4-Chloro-o-phenylene-diamine	95-83-0
1-(2-Chloroethyl)-3-cyclohexyl-1-nitrosourea (CCNU)	13010-47-4
Chloroform	67-66-3
Chromium and certain chromium compounds	7440-47-3
Coke oven emissions	NA
p-Cresidine	120-71-8
Cupferron	135-20-6
Cycasin	14901-08-7
Cyclophosphamide	50-18-0
Dacarbazine	4342-03-4
DDT	50-29-3
Di (2-ethylhexyl) phthalate	117-81-7
2,4-Diaminoanisole sulfate	391-41-7
2,4-Diaminotoluene	95-80-7
1,2-Dibromi-3-chloropropane	96-12-8
1,2-Dibromoethane (EDB)	106-93-4
3,3'-Dichlorobenzidine	91-94-1
1,2-Dichloroethane	107-06-2
Diepoxybutane	1464-53-5
Diethyl sulfate	64-67-5
Diethylstilbestrol (DES)	56-53-1
3,3'-Dimethoxybenzidine	119-90-4
Dimethyl sulfate	77-78-1
4,Dimethylaminoazobenzene	60-11-7
3,3'-Dimethylbenzidine	119-93-7

Substance Name	CAS No.
Dimethylcarbamoylchloride	79-44-7
1,1-Dimethylhydrazine	57-14-7
1,4-Dioxane	123-91-1
Direct Black 38	1937-37-7
Direct Blue 6	2602-46-2
Epichlorohydrin	106-89-8
Estrogens-conjugated:	50-50-0
a) Estradiol benzoate	
b) Estradiol monopalmitate	
Estrogens-not conjugated:	50-28-2
a) Estradiol 17 beta	
Estrogens-not conjugated:	53-16-7
b) Estrone (metabolite of Estradiol 17 beta)	
Estrogens-not conjugated:	57-63-6
c) Ethinylestradiol	
Estrogens-not conjugated:	72-33-3
d) Mestranol	
Ethylene thiourea	96-45-7
Ethylene oxide	75-21-8
Formaldehyde	50-00-0
Hematite underground mining	NA
Hexachlorobenzene	118-74-1
Hexamethylphosphoramide	680-31-9
Hydrazine &	302-01-2
Hydrazine Sulfate	10043-93-2
Hydrazobenzene	122-66-7
Iron dextran complex	9004-66-4
Isopropyl alcohol manufacture (strong-acid process)	NA
Kepone (Chlordecone)	143-50-0
Lead acetate	301-04-2
Lead phosphate	7446-27-7
Lindane (y-hexachlorocyclohexane)	58-89-9
Lindane (b-Hexachlorocyclohexane)	319-85-7
Lindane (Hexachlorocyclohexane)	608-73-1
Manufacture of auramine	NA
Melphalan	148-82-3
Methoxsalen with ultra-violet A therapy (PUVA)	NA
Methyl iodide	74-88-4
2-Methylazinidine (propyleneimine)	75-55-8
4,4'-Methylenebis (N,N-dimethyl) benzemine (Michler's base)	101-61-1
4,4'-Methylenebis (2-chloroaniline) (MBOCA)	101-14-4
4,4'-Methylenedianiline and its dihydrochloride	101-77-9
Metronidazole	443-48-1
Michler's ketone	90-94-8
Mirex	2385-85-5
Mustard gas	505-60-2
2-Naphthylamine	91-59-8
Nickel and certain nickel compounds	7440-02-0
Nitrilotriacetic acid	139-13-9
Nitrofen	1836-75-5
Nitrogen mustard	55-86-7
5-Nitro-o-anisidine	99-59-2

Appendix E - Chemicals Listed in Annual Report on Carcinogens

Substance Name	CAS No.
2-Nitropropane	79-46-9
N-Nitroso-N-ethylurea	759-73-9
N-Nitroso-N-methylurea	684-93-5
N-Nitrosodi-n-butylamine	924-16-3
N-Nitrosodi-n-propylamine	621-64-7
N-Nitrosodiethanolamine	1116-54-7
N-Nitrosodiethylamine	55-18-5
N-Nitrosodimethylamine	62-75-9
p-Nitrosodiphenylamine	156-10-5
N-Nitrosomethylvinylamine	4549-40-0
N-Nitrosomorpholine	59-89-2
N-Nitrosonornicotine	16543-55-8
N-Nitrosopiperidine	100-75-4
N-Nitrosopyrrolidine	930-55-2
N-Nitrososarcosine	13256-22-9
Norethisterone	68-22-4
Oxymetholone	434-07-1
PAHs:	
a) Benz (a) anthracene	56-55-3
b) Benzo (b) fluoranthene	205-99-2
c) Benzo (a) pyrene	50-32-2
d) Dibenz (a,h) acridine	226-36-8
e) Dibenz (a,j) acridine	226-36-8
f) Dibenz (a,h) anthracene	53-70-3
g) 7H-Dibenzo (c,g) carbazole	194-59-2
h) Dibenzo (a,h) pyrene	189-64-0
i) Dibenzo (a.i) pyrene	189-55-9
j) Indeno (1,2,3-cd) pyrene	193-39-5
Phenactin and analgesic mixtures containing phenacetin	62-44-2
Phenazopyridine hydrochloride	136-40-3
Phenytoin and sodium salt of phenytoin	57-41-0
Polybrominated biphenyls	36355-01-8
Polychlorinated biphenyls	1336-36-3
Procarbazine	671-16-9
Procarbazine Hydrochloride	366-70-1
Progesterone	57-83-0
1,3-Propane sultone	1120-71-4
beta-Propiolactone	57-57-8
Propylthiouracil	51-52-5
Reserpine	50-55-5
Rubber industry (certain occupations)	NA
Saccharin	81-07-2
Safrole	394-59-7
Selenium sulfide	7446-34-6
Soots, tars, and mineral oils	8007-45-2
Streptozotocin	1883-66-4
Sulfallate	95-06-7
2,3,7,8-Tetrachlorodi-benzo-p-dioxin (TCDD)	1746-01-6
Thioacetamide	62-55-5
Thiourea	62-55-5
Thorium dioxide	1314-20-1
Toluene diisocynate	584-84-9
o-Toluidine	95-53-4
o-Toluidine Hydrochloride	636-21-5
Toxaphene	8001-35-2
2,4,6-Trichlorophenol	88-06-2
Tris (2,3-dibromopropyl) phosphate	126-72-7
Tris (1-aziridinyl) phosphine sulfide	52-24-4
Urethane	51-79-6
Vinyl chloride	75-01-4

Appendix E - Chemical Incompatibilities

Classes of Incompatible Chemicals[1]		Specific Chemical Incompatibilities[1]	
A	**B**	**A**	**B**
Acids	Bases	Acetylene and monosubstituted acetylene (R-C≡CH)	Halogens Group IB and IIB metals and their salts
Alkali and alkaline earth metals carbides hydrides hydroxides oxides peroxides	Water Acids Halogenated organic *Oxidizing agents*[2] Chromates, dichromates, CrO_3 Halogens Halogenating agents Hydrogen peroxide and peroxides Nitric acid, nitrates Perchlorates and chlorates Permanganates Persulfates	Ammonia and NH_4OH	Halogens Halogenating agents Silver Mercury
		Carbon, activated	*Oxidizing Agents*[2]
		Hydrogen peroxide	Metals and their salts
Inorganic azides	Acids Heavy metals and their salts *Oxidizing Agents*[2]	Nitric acid	Metals Sulfuric acid Sulfides Nitrites, other reducing agents Chromic acids and chromates Permanganates
Inorganic cyanides	Acids, strong bases	Mercury and its amalgams	Ammonia and NH_4OH Nitric acid Acetylene Sodium azide
Inorganic nitrates	Acids Metals Nitrites Sulfur	Oxalic acid	Silver Mercury
Inorganic nitrites	Acids *Oxidizing Agents*[2]	Phosphorus (yellow)	Oxygen *Oxidizing Agents*[2] Strong bases
Inorganic sulfides	Acids	Phosphorus pentoxide	Water Halogenating agents
Organic compounds Organic acyl halides Organic anhydrides Organic halogen compounds Organic nitro compounds	*Oxidizing Agents*[2] Bases Organic hydroxy compounds Bases Organic hydroxy compounds Aluminum metal Strong bases	Sulfuric Acid	Metals Chlorates Perchlorates Permanganates Nitric Acid
Powdered metals	Acid *Oxidizing Agents*[2]		

1 Chemicals in columns A and B should be kept separate.

2 Oxidizing agents include the types of compounds listed in the entry for alkali and alkaline earth metals, etc.

APPENDIX F

HAZARD DATA FOR COMPRESSED GASES

APPENDIX F - HAZARD DATA FOR COMPRESSED GASES

GAS	THRESHOLD LIMIT VALUES (ppm)	FLAMMABILITY LIMITS IN AIR, % BY VOLUME	MAJOR HAZARDS
Acetylene	Asphyxiant	2.4 - 81.0	Flammable; asphyxiant
Ammonia	25	15 - 28	Toxic
Argon	Asphyxiant	None	Asphyxiant
Boron trifluoride	1	None	Toxic; causes burns
1,3-Butadiene	1,000	2 - 11.5	Flammable; skin irritant
Carbon dioxide	5,000	None	Asphyxiant
Carbon monoxide	35	12.5 - 74.0	Flammable; toxic
Chlorine	1	None	Toxic; severe irritant; causes burns, corrosive
Ethylene	Asphyxiant	3.1 - 32.0	Flammable; asphyxiant
Ethylene oxide	1	3.0 - 100.0	Flammable; toxic; can cause burns when trapped by clothing or shoes
Helium	Asphyxiant	None	Asphyxiant
Hydrogen	Asphyxiant	4.0 - 75.0	Flammable; asphyxiant
Hydrogen bromide	3	None	Toxic; causes burns; corrosive
Hydrogen chloride	5	None	Toxic; causes burns; corrosive
Hydrogen fluoride	3	None	Toxic; causes severe, slow healing burns; corrosive
Hydrogen sulfide	10	4.3 - 45.0	Toxic; flammable; irritant
Methane	Asphyxiant	5.3 - 14.0	Flammable; asphyxiant
Methyl bromide	5	13.5 - 14.5	Toxic; causes burns
Methyl chloride	50	10.7 - 17.4	Toxic; flammable
Methyl mercaptan	0.5	Unknown	Toxic; flammable
Nitrogen	Asphyxiant	None	Asphyxiant
Nitrogen dioxide	3	None	Toxic; corrosive
Oxygen	Non-toxic	None	Highly reactive
Phosgene	0.1	None	Toxic
Propane	Asphyxiant	2.2 - 9.5	Flammable; asphyxiant
Sulfur dioxide	2	None	Toxic; causes burns
Vinyl Chloride	5	4.0 - 22.0	Flammable; causes burns

Source: Manufacturing Chemists Association, Guide for Safety in the Chemical Laboratory (New York, Van Nostrand Reinhold Company, 1972). Copyright 1972 by Manufacturing Chemists Association; reprinted by permission of the publisher.

APPENDIX G

FEDERAL REGISTER PART II (JANUARY 30, 1990)

CHEMICAL HYGIENE STANDARD

NATIONAL RESEARCH COUNCIL RECOMMENDATIONS

REFERENCES

APPENDIX G - CHEMICAL HYGIENE STANDARD

Introduction

The Occupational Exposures to Hazardous Chemicals in Laboratories Standard establishes a wide range of requirements for laboratories to ensure that occupational exposure to hazardous chemicals in the laboratory environment is reduced or eliminated as far as possible.

In the preamble, OSHA summarizes the benefits of the standard:

> "The new standard differs from many OSHA health standards in that it does not establish new exposure limits, but sets other performance provisions designed to protect laboratory workers from potential hazards in their work environment. By permitting a greater degree of flexibility to laboratories in developing and implementing employee safety and health programs, OSHA expects benefits to result from increased worker awareness of potential risks, improved work practices, appropriate use of existing personal protective equipment, and greater use of engineering controls. Given the flexibility to design and implement measures to reduce employee exposure to hazardous substances, employers also will reap rewards in terms of lower insurance premiums, lower property damage costs, lower turnover costs, less absenteeism, and, in general, increased productivity. Finally, the potential decrease in acute and chronic health problems will result in overall benefits to society through the associated reduction in medical and productivity costs.
>
> A substantial amount of evidence in this record indicates that laboratory workers are at risk to serious and even life threatening occupational hazards. Several companies with good work practice programs, however, indicated that these hazards can be overcome through sound safety practices, and submitted evidence of the magnitude of the benefits to be attained from this standard."

This brief quote from the preamble of the standard summarizes the basic goals and approach of this standard. It is primarily a performance standard, giving wide latitude to individual laboratories in how to attain the desired results.

The text of the standard, including the appendices, is incorporated for reference purposes into this Chemical Hygiene and Safety Plan.

Federal Register 29CFR 1910.1450.

Occupational exposure to hazardous chemicals in laboratories.

This section becomes effective May 1, 1990.

Appendix G - Chemical Hygiene Standard

(a) Scope and application

(a)(1) This section shall apply to all employers engaged in the laboratory use of hazardous chemicals as defined below.

(a)(2) Where this section applies, it shall supersede for laboratories the requirements of all other OSHA health standards in 29 CFR part 1910 subpart Z, except as follows:

(a)(2)(i) For any OSHA health standard, only the requirement to limit employee exposure to the specific permissible exposure limit shall apply for laboratories unless that particular standard states otherwise or unless the conditions of paragraph (a)(2)(iii) of this section apply.

(a)(2)(ii) Prohibition of eye and skin contact where specified by any OSHA health standard shall be observed.

(a)(2)(iii) Where the action level (or in the absence of an action level, the permissible exposure limit) is routinely exceeded for an OSHA regulated substance with exposure monitoring and medical surveillance requirements paragraphs (d) and (g)(1)(ii) of this section shall apply.

(a)(3) This section shall not apply to:

(a)(3)(i) Uses of hazardous chemicals which do not meet the definition of laboratory use and in such cases the employer shall comply with the relevant standard in 29 CFR part 1910 subpart Z even if such use occurs in a laboratory.

(a)(3)(ii) Laboratory uses of hazardous chemicals which provide no potential for employee exposure. Examples of such conditions might include:

(a)(3)(ii)(A) Procedures using chemically-impregnated test media such as Dip-and-Read tests where a reagent strip is dipped into the specimen to be tested and the results are interpreted by comparing the color reaction to a color chart supplied by the manufacturer of the test strip; and

(a)(3)(ii)(B) Commercially prepared kits such as those used in performing pregnancy tests in which all of the reagents needed to conduct the test are contained in the kit.

(b) Definitions

"Action level" means a concentration designated in 29 CFR part 1910 for a specific substance calculated as an eight (8) hour time weighted average which initiates certain required activities such as exposure monitoring and medical surveillance.

"Assistant Secretary" means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

"Carcinogen" (see "select carcinogen").

"Chemical Hygiene Officer" means an employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene and Safety Plan. This definition is not intended to place limitations on the position description or job classification that the designated individual shall hold within the employer's organizational structure.

"Chemical Hygiene and Safety Plan" means a written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment, and work practices that:

(i) are capable of protection employees from the health hazards presented by hazardous chemicals used in that particular work place; and

(ii) meets the requirements of paragraph (e) of this section.

"Combustible liquid" means any liquid having a flashpoint at or above 100 F (37.8 C), but below 200 F (93.3 C), except any mixture having components with flashpoints of 200 F (93.3 C) or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

"Compressed gas" means:

(i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 F (21.1 C); or

(ii) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 F (54.4 C) regardless of the pressure at 70 F (21.1 C); or

(iii) A liquid having a vapor pressure exceeding 40 psi at 100 F (37.8 C) as determined by ASTM D-323-72.

"Designated area" means an area which may be used for work with "select carcinogens", reproductive toxins, or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory, or a device such as a laboratory hood.

"Emergency" means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment which results in an uncontrolled release of a hazardous chemical into the work place.

"Employee" means an individual employed in a laboratory work place who may be exposed to hazardous chemicals in the course of his or her assignments.

"Explosive" means a chemical that causes a sudden, almost instantaneous, release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

"Flammable" means a chemical that falls into one of the following categories:

(i) "Aerosol, flammable" means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame protection exceeding 18 inches at full valve opening or a flashback (a flame extending back to the valve) at any degree of valve opening.

(ii) "Gas flammable" means:

(ii)(A) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less; or

(ii)(B) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12 percent by volume regardless of the lower limit.

(iii) "Liquid flammable" means any liquid having a flashpoint below 100 F (37.8 C) except any mixture having components with flashpoints of 100 F (37.8 C) or higher, the total of which make up 99 percent or more of the total volume of the mixture.

(iv) "Solid, flammable" means a solid other than a blasting agent or explosive as defined in 1910.109(a) that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

"Flashpoint" means the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignited when tested as follows:

(i) Tagliabue Closed Tester -- see American National Standard Method of Test for Flash Point by Tag Closed Tester, Z-11.24-1979 (ASTM D 56-79) for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100 F (37.8 C) that do not contain suspended solids and do not have a tendency to form a surface film under test; or

(ii) Pensky-Martens Closed Tester -- See American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester, Z11.7-1979 (ASTM D 93-79) for liquids with a viscosity equal to or greater than 45 SUS at 100 F (37.8 C) or that contain suspended solids or that have a tendency to form a surface film under test; or

(iii) Setaflash Closed Tester -- See American National Standard Method of Test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78).

Organic peroxides which undergo auto-accelerating thermal decomposition are excluded from any of the flashpoint determination methods specified above.

"Hazardous chemical" means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes.

Appendices A and B of the Hazard Communication Standard (29 CFR 1910.1200) provide further guidance in defining the scope of health hazards and determining whether or not a chemical is to be considered hazardous for purposes of this standard.

"Laboratory" means a facility where the "laboratory use of hazardous chemicals" occurs. It is a work place where relatively small quantities of hazardous chemicals are used on a non-production basis.

"Laboratory scale" means work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safety manipulated by one person.

"Laboratory scale" excludes those work places whose function is to produce commercial quantities of materials.

"Laboratory-type hood" means a device, located in a laboratory, enclosed on five sides with a moveable sash or fixed partial enclosed on the remaining side; constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of air contaminants into the laboratory; and allows chemical manipulations to be conducted in the enclosure without insertion of any portion of the employee's body other than hands and arms. Walk-in hoods with adjustable sashes meet the above definition provided that the sashes are adjusted during use so that the airflow and the exhaust of air contaminants are not compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.

"Laboratory use of hazardous chemicals" means handling or use of such chemicals in which all of the following conditions are met:

(i) Chemical manipulations are carried out on a "laboratory scale";

(ii) Multiple chemical procedures or chemicals are used;

(iii) The procedures involved are not part of a production process, or in any way simulate a production process; and

(iv) "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

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

"Organic peroxide" means an organic compound that contains the bivalent -O-O- structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

"Oxidizer" means a chemical other than a blasting agent or explosive, as defined in 1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

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

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

"Reproductive toxins" means chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

"Select carcinogen" means any substance which meets one of the following criteria:

(i) It is regulated by OSHA as a carcinogen; or

(ii) It is listed under the category "known to be carcinogens" in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or

(iii) It is listed under Group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC) (latest editions); or

(iv) It is listed in either Group 2A or 2B by IARC or under the category "reasonably anticipated to be carcinogens" by NTP and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:

(iv)(A) After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m^X3;

(iv)(B) After repeated skin application of less than 300 (mg/kg of body weight) per week; or

(iv)(C) After oral dosages of less than 50 mg/kg of body weight per day.

"Unstable (reactive)" means a chemical which in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure, or temperature.

"Water-reactive" means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

(c) Permissible exposure limits

For laboratory uses of OSHA regulated substances, the employer shall assure that laboratory employees' exposures to such substances do not exceed the permissible exposure limits specified in 29 CFR part 1910 subpart Z.

(d) Employee exposure determination

(d)(1) Initial monitoring. The employer shall measure the employee's exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the action level (or in the absence of an action level, the PEL).

(d)(2) Periodic monitoring. If the initial monitoring prescribed by paragraph (d)(1) of this section discloses employee exposure over the action level (or in the absence of an action level, the PEL) the employer shall immediately comply with the exposure monitoring provisions of the relevant standard.

(d)(3) Termination of monitoring. Monitoring may be terminated in accordance with the relevant standard.

(d)(4) Employee notification of monitoring results. The employer shall, within 15 working days after the receipt of any monitoring results, notify the employee of these results in writing, either individually or by posing results in an appropriate location that is accessible to employees.

(e) Chemical hygiene plan

General (Appendix A of this section is non-mandatory but provides guidance to assist employers in the development of the Chemical Hygiene and Safety Plan).

(e)(1) Where hazardous chemicals as defined by this standard are used in the work place, the employer shall develop and carry out the provisions of a written Chemical Hygiene and Safety Plan which is:

(e)(1)(i) Capable of protecting employees from health hazards associated with hazardous chemicals in that laboratory; and

(e)(1)(ii) Capable of keeping exposures below the limits specified in paragraph (c) of this section.

(e)(2) The Chemical Hygiene and Safety Plan shall be readily available to employees and employee representatives and upon request to the Assistant Secretary.

(e)(3) The Chemical Hygiene and Safety Plan shall include each of the following elements and shall indicate specific measures that the employer will take to ensure laboratory employee protection:

(e)(3)(i) Standard operating procedures relevant to safety and health consideration to be followed when laboratory work involves the use of hazardous chemicals;

(e)(3)(ii) Criteria that the employer will use to determine and implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, the use of personal protective equipment, and hygiene practices. Particular attention shall be given to the selection of control measures for chemicals that are known to be extremely hazardous;

(e)(3)(iii) A requirement that fume hoods and other protective equipment are functioning properly and specific measures that shall be taken to ensure proper and adequate performance of such equipment;

(e)(3)(iv) Provisions for employee information and training as prescribed in paragraph (f) of this section;

(e)(3)(v) The circumstances under which a particular laboratory operation, procedure, or activity shall require prior approval from the employer or the employer's designee before implementation;

(e)(3)(vi) Provisions for medical consultation and medical examinations in accordance with paragraph (g) of this section;

(e)(3)(vii) Designation of personnel responsible for implementation of the Chemical Hygiene and Safety Plan including the assignment of a Chemical Hygiene Officer and, if appropriate, establishment of a Chemical Hygiene Committee; and

(e)(3)(viii) Provisions for additional employee protection for work with particularly hazardous substances. These include select carcinogens, reproductive toxins, and substances which have a high degree of acute toxicity. Specific consideration shall be given to the following provisions which shall be included where appropriate:

(e)(3)(viii)(A) Establishment of a designated area;

(e)(3)(viii)(B) Use of containment devices such as fume hoods or glove boxes;

(e)(3)(viii)(C) Procedures for safe removal of contaminated waste; and

(e)(4) The employer shall review and evaluate the effectiveness of the Chemical Hygiene and Safety Plan at least annually and update it as necessary.

(f) Employee information and training

(f)(1) The employer shall provide employees with information and training to ensure that they are appraised of the hazards of chemicals present in their work area.

(f)(2) Such information shall be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. The frequency of refresher information and training shall be determined by the employer.

(f)(3) Information. Employees shall be informed of:

(f)(3)(i) The contents of this standard and its appendices which shall be made available to employees;

(f)(3)(ii) The location and availability of the employer's Chemical Hygiene and Safety Plan;

(f)(3)(iii) The permissible exposure limits for OSHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable OSHA standard;

(f)(3)(iv) Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory; and

(f)(3)(v) The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, Material Safety Data Sheets received from the chemical supplier.

(f)(4) Training.

(f)(4)(i) Employee training shall include:

(f)(4)(i)(A) Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance, or odor of hazardous chemicals when being released, etc.);

(f)(4)(i)(B) The physical and health hazards of chemicals in the work area; and

(f)(4)(i)(C) The measures employees can take to protect themselves from these hazards including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals such as appropriate work practices, emergency procedures, and personal protective equipment to be used.

(f)(4)(ii) The employee shall be trained on the applicable details of the employer's written Chemical Hygiene and Safety Plan.

(g) Medical consultation and medical examinations.

(g)(1) The employer shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow up examinations which the examining physician determines to be necessary, under the following circumstances:

(g)(1)(i) Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee shall be provided an opportunity to receive an appropriate medical examination;

(g)(1)(ii) 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 of which there are exposure monitoring and medical surveillance requirements, medical surveillance shall be established for the affected employee as prescribed by the particular standard;

(g)(1)(iii) 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 affected employee shall be provided an opportunity for a medical consultation. Such consultation shall be for the purpose of determining the need for a medical examination.

(g)(2) All medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician and shall be provided without cost to the employee without loss of pay and at a reasonable time and place.

(g)(3) Information provided to the physician. The employer shall provide the following information to the physician:

(g)(3)(i) The identity of the hazardous chemical(s) to which the employee may have been exposed.

(g)(3)(ii) A description of the conditions under which the exposure occurred, including quantitative exposure date if available; and

(g)(3)(iii) A description of the signs and symptoms of exposure that the employee is experiencing, if any.

(g)(4) Physician's written opinion.

(g)(4)(i) For examination or consultation required under this standard, the employer shall obtain a written opinion from the examining physician which shall include the following:

(g)(4)(i)(A) Any recommendation for further medical follow-up;

(g)(4)(i)(B) The results of the medical examination and any associated tests;

(g)(4)(i)(C) 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 work place; and

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

(g)(4)(ii) The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.

(h) Hazard identification

(h)(1) With respect to labels and material safety data sheets:

(h)(1)(i) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced;

(h)(1)(ii) Employers shall maintain any material safety data sheets that are received with incoming shipments of hazardous chemicals and ensure that they are readily accessible to laboratory employees.

(h)(2) The following provisions shall apply to chemical substances developed in the laboratory:

(h)(2)(i) If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the employer shall determine if it is a hazardous chemical as defined in paragraph (b) of this section. If the chemical is determined to be hazardous, the employer shall provide appropriate training as required under paragraph (f) of this section.

(h)(2)(ii) If the chemical produced is a byproduct whose composition is not known, the employer shall assume that all substance is hazardous and shall implement paragraph (e) of this section.

(h)(2)(iii) If the chemical substance is produced for another user outside of the laboratory, the employer shall comply with the Hazard Communication Standard (29 CFR 1910.1200) including the requirements for preparation of material safety data sheets and labeling.

(i) Use of respirators

Where the use of respirators is necessary to maintain exposure below permissible exposure limits, the employer shall provide (at no cost to the employee) the proper respiratory equipment. Respirators shall be selected and used in accordance with the requirements of 29 CFR 1910.134.

(j) Record keeping

(j)(1) The employer shall establish and maintain for each employee an accurate record of any measurements taken to monitor employee exposures and any medical consultation and examinations, including tests or written opinions, required by this standard.

(j)(2) The employer shall assure that such records are kept, transferred, and made available in accordance with 29 CFR 1910.20.

(k) Dates

(k)(1) Effective date. This section shall become effective May 1, 1990.

(k)(2) Start-up dates.

(k)(2)(i) Employers shall have developed and implemented a written Chemical Hygiene and Safety Plan no later than January 31, 1991.

(k)(2)(ii) Paragraph (a)(2) of this section shall not take effect until the employer has developed and implemented a written Chemical Hygiene and Safety Plan.

(l) Appendices. The information contained in the appendices is not intended, by itself, to create any additional obligations not otherwise imposed or to detract from any existing obligation.

APPENDIX G - NATIONAL RESEARCH COUNCIL RECOMMENDATIONS

29 CFR 1910 1450 A Appendix A to 1910 1450

National Research Council Recommendations Concerning Chemical Hygiene in Laboratories (Non-Mandatory).

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FOREWORD

As guidance for each employer's development of an appropriate laboratory Chemical Hygiene and Safety Plan, the following non-mandatory recommendations are provided. They were extracted from Prudent Practices for Handling Hazardous Chemicals in Laboratories (referred to below as Prudent Practices), which was published in 1981 by the National Research Council and is available from the National Academy Press, 2101 Constitution Avenue NW, Washington, DC 20418.

Prudent Practices is cited because of its wide distribution and acceptance and because of its preparation by members of the laboratory community through the sponsorship of the National Research Council. However, none of the recommendations given here will modify any requirements of the laboratory standard. This Appendix merely presents pertinent recommendations from Prudent Practices organized into a form convenient for quick reference during operation of a laboratory facility and during development and application of a Chemical Hygiene and Safety Plan. Users of this appendix should consult Prudent Practices for a more extended presentation and justification for each recommendation.

Prudent Practices deals with both safety and chemical hazards while the laboratory standard is concerned primarily with chemical hazards. Therefore, only those recommendations directed primarily toward control of toxic exposures are cited in this appendix, with the term "chemical hygiene" being substituted for the word "safety." However, since conditions producing or threatening physical injury often post toxic risks as well, page references concerning major categories of safety hazards in the laboratory are given in Section F.

Appendix G - National Research Council Recommendations

The recommendations from Prudent Practices have been paraphrases, combined, or otherwise reorganized, and headings have been added. However, their sense has not been changed.

CORRESPONDING SECTIONS OF THE STANDARD AND THIS APPENDIX

The following table is given for the convenience of those who are developing a Chemical Hygiene and Safety Plan which will satisfy the requirements of paragraph (e) of the standard. It indicates those sections of this appendix which are most pertinent to each of the sections of paragraph (3) and related paragraphs.

Paragraph	Topic in Laboratory Standard	Relevant Appendix Section
(e)(3)(i)	Standard operating procedures for handling toxic chemicals	C,D,E
(e)(3)(ii)	Criteria to be used for implementation of measures to reduce exposures	D
(e)(3)(iii)	Fume hood performance	C4b
(e)(3)(iv)	Employee information and training (including emergency procedures)	D10,D9
(e)(3)(v)	Requirements for prior approval of laboratory activities	E2b,E4b
(e)(3)(vi)	Medical consultation and medical examinations	D5,E4f
(e)(3)(vii)	Chemical hygiene responsibilities	B
(e)(3)(viii)	Special precautions for work with particularly hazardous substances	E2,E3,E4

In this appendix, those recommendations directed primarily at administrators and supervisors are given in sections A-D. Those recommendations of primary concern to employees who are actually handling laboratory chemicals are given in section E. (Reference to page numbers in Prudent Practices are given in parentheses.)

A. General Principles for Work with Laboratory Chemicals

In addition to the more detailed recommendations listed below in sections B-E, Prudent Practices expresses certain principles including the following:

A.1 It is prudent to minimize all chemical exposures. Because few laboratory chemicals are without hazards, general precautions for handling all laboratory chemicals should be adopted, rather than specific guidelines for particular chemicals (2, 10). Skin contact with chemicals should be avoided as a cardinal rule (198).

A.2 Avoid underestimation of risk. Even for substances of no known significant hazard, exposure should be minimized; for work with substances which present special hazards, special precautions should be taken (10, 37, 38). One should assume that any mixture will be more toxic than its most toxic component (30, 103) and that all substances of unknown toxicity are toxic (3, 34).

A.3 Provide adequate ventilation. The best way to prevent exposure to airborne substances is to prevent their escape into the working atmosphere by use of hoods and other ventilation devices (32, 198).

A.4 Institute a chemical hygiene program. A mandatory chemical hygiene program designed to minimize exposures is needed; it should be a regular continuing effort, not merely a standby or short-term activity (6, 11). Its recommendations should be followed in academic teaching laboratories as well as by full-time laboratory workers.

A.5 Observe the PEL's, TLV's. The Permissible Exposure Limits of OSHA and the Threshold Limit Values of the American Conference of Governmental Industrial Hygienists should not be exceeded (13).

B. Chemical Hygiene Responsibilities

Responsibility for chemical hygiene rests at all levels (6, 11, 21) including the:

B.1 Chief executive officer, who has ultimate responsibility for chemical hygiene within the institution and must, with other administrators, provide continuing support for institutional chemical hygiene (7, 11).

B.2 Supervisor of the department or other administrative unit, who is responsible for chemical hygiene in that unit (7).

B.3 Chemical hygiene officer(s), whose appointment is essential (7) and who must:

B.3(a) Work with administrators and other employees to develop and implement appropriate chemical hygiene policies and practices (7);

B.3(b) Monitor procurement, use, and disposal of chemicals used in the lab (8);

B.3(c) See that appropriate audits are maintained (8);

B.3(d) Help project directors develop precautions and adequate facilities (10);

B.3(e) Know the current legal requirements concerning regulated substances (50);

B.3(f) Seek ways to improve the chemical hygiene program (8, 11).

B.4 Laboratory supervisor, who has overall responsibility for chemical hygiene in the laboratory (21) including responsibility to:

B.4(a) Ensure that workers know and follow the chemical hygiene rules, that protective equipment is available and in working order, and that appropriate training has been provided (21, 22);

B.4(b) Provide regular formal chemical hygiene and housekeeping inspections, including routine inspections of emergency equipment (21, 171);

B.4(c) Know the current legal requirements concerning regulated substances (50, 231);

B.4(d) Determine the required levels of protective apparel and equipment (156, 160, 162);

B.4(e) Ensure that facilities and training for use of any material being ordered are adequate (215).

B.5 Project director or director of other specific operation, who has primary responsibility for chemical hygiene procedures for that operation (7).

B.6 Laboratory worker, who is responsible for:

B.6(a) Planning and conducting each operation in accordance with the institutional chemical hygiene procedures (7, 21, 22, 230);

B.6(b) Developing good personal chemical hygiene habits (22).

C. The Laboratory Facility

C.1 Design. The laboratory facility should have:

C.1(a) An appropriate general ventilation system (see C4 below) with air intakes and exhausts located so as to avoid intake of contaminated air (194);

C.1(b) Adequate, well-ventilated stockrooms/storerooms (218, 219);

C.1(c) Laboratory hoods and sinks (12, 162);

C.1(d) Other safety equipment including eyewash fountains and drench showers.

C.1(e) Arrangements for waste disposal (12, 240).

C.2 Maintenance. Chemical hygiene-related equipment (hoods, incinerator, etc.) should undergo continuing appraisal and be modified if inadequate (11, 12).

C.3 Usage. The work conducted (10) and its scale (12) must be appropriate to the physical facilities available and, especially, to the quality of ventilation (13).

C.4 Ventilation

C.4(a) *General laboratory ventilation.* This system should: provide a source of air for breathing and for input to local ventilation devices (199); it should not be relied on for protection from toxic substances released into the laboratory (196); it should ensure that laboratory air is continually replace, preventing increase of air concentrations of toxic substances during the working day (194); it should direct air flow into the laboratory from non-laboratory areas and out to the exterior of the building (194).

C.4(b) *Hoods.* A laboratory hood with 2.5 linear feet of hood space per person should be provided for every 2 workers if they spend most of their time working with chemicals (199); each hood should have a continuous monitoring device to allow convenient confirmation of adequate hood performance before use (200, 209). If this is not possible, work with substances of unknown toxicity should be avoided (13) or other types of local ventilation devices should be provided (199). See pp. 201-206 for a discussion of hood design, construction and evaluation.

C.4(c) *Other local ventilation devices.* Ventilated storage cabinets, canopy hoods, snorkels, etc. should be provided as needed (199). Each canopy hood and snorkel should have a separate exhaust duct (207).

C.4(d) *Special ventilation areas.* Exhaust air from glove boxes and isolation rooms should be passed through scrubbers or other treatment before release into the regular exhaust system (208). Cold rooms and warm rooms should have provisions for rapid escape and for escape in the event of electrical failure (209).

C.4(e) *Modifications.* Any alteration of the ventilation system should be made only if thorough testing indicates that worker protection from airborne toxic substances will continue to be adequate (12, 193, 204).

C.4(f) *Performance.* Rate: 4-12 room air changes/hour is normally adequate general ventilation if local exhaust systems such as hoods are used as the primary method of control (194).

C.4(g) *Quality.* General air flow should not be turbulent and should be relatively uniform throughout the laboratory, with no high velocity or static areas (194, 195); airflow into and within the hood should not be excessively turbulent (200); hood face velocity should be adequate (typically 60-100 fm)(200-204).

C.4(h) *Evaluation.* Quality and quantity of ventilation should be evaluated on installation (202), regularly monitored (at least every 3 months) (6, 12, 14, 195), and reevaluated whenever a change in local ventilation devices is made (12, 195, 207). See pp. 195-198 for methods of evaluation and for calculation of estimated airborne contaminant concentrations.

D. Components of the Chemical Hygiene and Safety Plan

D.1 Basic Rules and Procedures. Recommendations for these are given in section E below.

D.2 Chemical Procurement, Distribution, and Storage.

D.2(a) *Procurement.* Before a substance is received, information on proper handling, storage, and disposal should be known to those who will be involved (215, 216). No container should be accepted without an adequate identifying label (216). Preferably, all substances should be received in a central location (216).

D.2(b) *Stockrooms/Storerooms.* Toxic substances should be segregated in a well identified area with local exhaust ventilation (221). Chemicals which are highly toxic (227) or other chemicals whose containers have been opened should be in unbreakable secondary containers (219). Stored chemicals should be examined periodically (at least annually) for replacement, deterioration, and container integrity (218-219). Stockrooms/storerooms should not be used as preparation or repackaging areas, should be open during normal working hours, and should be controlled by one person (219).

D.2(c) *Distribution.* When chemicals are hand carried, the container should be placed in an outside container or bucket. Freight-only elevators should be used if possible (223).

D.2(d) *Laboratory Storage.* Amounts permitted should be as small as practical. Storage on bench tops and in hoods is inadvisable. Exposure to heat or direct sunlight should be avoided. Periodic inventories should be conducted, with unneeded items being discarded or returned to the storeroom/stockroom (225-226, 229).

D.3 Environmental Monitoring. Regular instrumental monitoring of airborne concentrations is not usually justified or practical in laboratories but may be appropriate when testing or redesigning hoods or other ventilation devices (12) or when a highly toxic substance is stored or used regularly (i.e., 3 times/week)(13).

D.4 Housekeeping, Maintenance, and Inspections

D.4(a) *Cleaning.* Floors should be cleaned regularly (24).

D.4(b) *Inspections.* Formal housekeeping and chemical hygiene inspections should be held at least quarterly (6, 21) for units which have frequent personnel changes and semi-annually for others; informal inspections should be continual (21).

D.4(c) *Maintenance.* Eye wash fountains should be inspected at intervals of not less than 3 months (6). Respirators for routine use should be inspected periodically by the laboratory supervisor (169). Safety showers should be tested routinely (169). Other safety equipment should be inspected regularly (i.e, every 3-6 months)(6, 24, 171). Procedures to prevent restarting of out-of-service equipment should be established (25).

D.4(d) *Passageways.* Stairways and hallways should not be used as storage areas (24). Access to exists, emergency equipment, and utility controls should never be blocked (24).

D.5 Medical Program.

D.5(a) *Compliance with regulations.* Regular medical surveillance should be established to the extent required by regulations (12).

D.5(b) *Routine surveillance.* Anyone whose work involves regular and frequent handling of toxicology significant quantities of a chemical should consult a qualified physician to determine on an individual bases whether a regular schedule of medical surveillance is desirable (11, 50).

D.5(c) *First Aid.* Personnel trained in first aid should be available during working hours and an emergency room with medical personnel should be nearby (173). See pp. 176-178 for description of some emergency first aid procedures.

D.6 Protective Apparel and Equipment. These should include for each laboratory:

D.6(a) Protective apparel compatible with the required degree of protection for substances being handled (158-161);

D.6(b) An easily accessible drench-type safety shower (162, 169);

D.6(c) An eyewash fountain (162);

D.6(d) A fire extinguisher (162-164);

D.6(e) Respirator protection (164-9), fire alarm and telephone for emergency use (162) should be available nearby, and

D.6(f) Other items designated by the laboratory supervisor (156, 160).

D.7 Records.

D.7(a) Accident records should be written and retained (174).

D.7(b) Chemical Hygiene Plan records should document that the facilities and precautions were compatible with current knowledge and regulations (7).

D.7(c) Inventory and usage records for high risk substances should be kept as specified in sections E.3(e) below.

D.7(d) Medical records should be retained by the institution in accordance with the requirements of state and federal regulations (12).

D.8 Signs and Labels.

Prominent signs and labels of the following types should be posted:

D.8(a) Emergency telephone numbers of emergency personnel/facilities, supervisors, and laboratory workers (28);

D.8(b) Identity labels showing contents of containers (including waste receptacles) and associated hazards (27, 48);

D.8(c) Location signs for safety showers, eyewash stations, other safety and first aid equipment, exits (27), and areas where food and beverage consumptions and storage are permitted (25); and

D.8(d) Warnings at areas or equipment where special or unusual hazards exist (27).

D.9 Spills and Accidents.

D.9(a) A written emergency plan should be established and communicated to all personnel. It should include procedures for ventilation failure (200), evacuation, medical care, reporting, and drills (172).

D.9(b) There should be an alarm system to alert people in all parts of the facility, including isolation areas such as cold rooms (172).

D.9(c) A spill control policy should be developed and should include consideration of prevention, containment, cleanup, and reporting (175).

D.9(d) All accidents or near accidents should be carefully analyzed with the results distributed to all who might benefit (8,28).

D.10 Information and Training Program.

D.10(a) Aim: To assure that all individuals at risk are adequately informed about the work in the laboratory, its risks, and what to do if an accident occurs (5, 15).

D.10(b) Emergency and Personal Protection Training: Every laboratory worker should know the location and proper use of available protective apparel and equipment (154, 169). Some of the full-time personnel of the laboratory should be trained in the proper use of emergency equipment and procedures (6). Such training, as well as first aid instruction, should be available to (154) and encouraged for (176) everyone who might need it.

D.10(c) Receiving and stockroom/storeroom personnel should know about hazards, handling equipment, protective apparel, and relevant regulations (217).

D.10(d) Frequency of Training: The training and education program should be a regular continuing activity -- not simply an annual presentation (15).

D.10(e) Literature/Consultation: Literature and consulting advice concerning chemical hygiene should be readily available to laboratory personnel, who should be encouraged to use these information resources (14).

D.11 Waste Disposal Program.

D.11(a) Aim: To assure that minimal harm to people, other organisms, and the environment will result from the disposal of waste laboratory chemicals (5).

D.11(b) Content (14, 232, 233, 240): The waste disposal program should specify how waste is to be collected, segregated, stored, and transported, and include consideration of what materials can be incinerated. Transport from the institution must be in accordance with DOT regulations (244).

D.11(c) Discarding Chemical Stocks: Unlabeled containers of chemicals and solutions should undergo prompt disposal. If partially used, they should not be opened (24, 27). Before a worker's employment in the laboratory ends, chemicals for which that person was responsible should be discarded or returned to storage (226).

D.11(d) Frequency of Disposal: Waste should be removed from laboratories to a central waste storage area at least once per week and from the central waste storage area at regular intervals (14).

D.11(e) Method of Disposal: Incineration in an environmentally acceptable manner is the most practical disposal method for combustible laboratory waste (14, 238, 241). Indiscriminate disposal by pouring waste chemicals down the drain (14, 231, 242) or adding them to mixed refuse for landfill burial is unacceptable (14). Hoods should not be used as a means of disposal for volatile chemicals (40, 200). Disposal by recycling (233, 243) or chemical decontamination (40, 230) should be used when possible.

E. Basic Rules and Procedures for Working with Chemicals

The Chemical Hygiene Plan should require that laboratory workers know and follow its rules and procedures. In addition to the procedures of the subprograms mentioned above, these should include the rules listed below.

E.1 General Rules. The following general rules should be used for essentially all laboratory work with chemicals.

E.1(a) Accidents and spills.

Eye Contact: Promptly flush eyes with water for a prolonged period (15 minutes) and seek medical attention (33, 172).

Ingestion: Encourage the victim to drink large amounts of water (178).

Skin Contact: Promptly flush the affected area with water (33, 172, 178) and remove any contaminated clothing (172, 178). If symptoms persist after washing, seek medical attention.

Clean up: Promptly clean up spills, using appropriate protective apparel and equipment and proper disposal (24, 33). See pp. 233-237 for specific cleanup recommendations.

E.1(b) Avoidance of "routine" exposure: Develop and encourage safe habitats (23); avoid unnecessary exposure to chemicals by any route (23); do not smell or taste chemicals (32). Vent apparatus which may discharge toxic chemicals (vacuum pumps, distillation columns, etc.) into local exhaust devices (199). Inspect gloves (157) and test glove boxes (208) before use. Do not allow release of toxic substances in cold rooms and warm rooms since these have contained recirculated atmospheres (209).

E.1(c) Choice of Chemicals: Use only those chemicals for which the quality of the available ventilation system is appropriate (913).

E.1(d) Eating, smoking, etc.: Avoid eating, drinking, smoking, gum chewing, or application of cosmetics in areas where laboratory chemicals are present (22, 24, 32, 40); wash hands before conducting these activities (23, 24). Avoid storage, handling or consumption of food or beverages in storage areas, refrigerators, glassware or utensils which are also used for laboratory operations (23, 24, 226).

E.1(e) Equipment and Glassware: Handle and store laboratory glassware with care to avoid damage; do not use damaged glassware (25). Use extra care with Dewar flasks and other evacuated glass apparatus; shield or wrap them to contain chemicals and fragments should implosion occur (25). Use equipment only for its designed purpose (23, 26).

E.1(f) Exiting: Wash areas of exposed skin well before leaving the laboratory (23).

E.1(g) Horseplay: Avoid practical jokes or other behavior which might confuse, startle, or distract another worker (23).

E.1(h) Mouth suction: Do not use mouth suction for pipetting or starting a siphon (23, 32).

E.1(i) Personal apparel: Confine long hair and loose clothing (23, 158). Wear shoes at all times in the laboratory but do not wear sandals, perforated shoes, or sneakers.

E.1(j) Personal Housekeeping: Keep the work area clean and uncluttered, with chemicals and equipment being properly labeled and stored; clean up the work area on completion of an operation or at the end of each day (24).

E.1(k) Personal Protection: Assure that appropriate eye protection (154-156) is worn by all persons, including visitors, where chemicals are stored or handled (22, 23, 33, 154).

Wear appropriate gloves when the potential for contact with toxic materials exists (157); inspect the gloves before each use, wash them before removal, and replace them periodically (157). (A table of resistance to chemicals of common glove materials is given p. 159).

Use appropriate (164-168) respiratory equipment when air contaminant concentrations are not sufficiently restricted by engineering controls (164-5), inspecting the respirator before use (169).

Use any other protective and emergency apparel and equipment as appropriate (22, 157-162).

Avoid use of contact lenses in the laboratory unless necessary; if they are used, inform supervisor so special precautions can be taken (155).

Remove laboratory coats immediately on significant contamination (161).

E.1(l) Planning: Seek information and advice about hazards (7), plan appropriate protective procedures, and plan positioning of equipment before beginning any new operation (22, 23).

E.1(m) Unattended Operations: Leave lights on, place an appropriate sign on the door, and provide for containment of toxic substances in the event of failure of a utility service (such as cooling water) to an unattended operation (27, 128).

E.1(n) Use of Hood: Use the hood for operations which might result in release of toxic chemical vapors or dust (198-9).

As a rule of thumb, use a hood or other local ventilation device when working with any appreciably volatile substance with a TLV of less than 50 ppm (13). Confirm adequate hood performance before use; keep hood closed at all times except when adjustments within the hood are being made (200); keep materials stored in hoods to a minimum and do not allow them to block vents or air flow (200). Leave the hood "on" when it is not in active use if toxic substances are stored in it or if it is uncertain whether adequate general laboratory ventilation will be maintained when it is "off" (200).

E.1(o) Vigilance: Be alert to unsafe conditions and see that they are corrected when detected (22).

E.1(p) Waste Disposal: Assure that the plan for each laboratory operation includes plans and training for waste disposal (230).

Deposit chemical waste in appropriately labeled receptacles and follow all other waste disposal procedures of the Chemical Hygiene Plan (22, 24).

Do not discharge to the sewer concentrated acids or bases (231); highly toxic, malodorous, or lachrymatory substances 9231); or any substances which might interfere with the biological activity of waste water treatment plants, create fire or explosion hazards, cause structural damage or obstruct flow (242).

E.1(q) Working alone: Avoid working alone in a building; do not work alone in a laboratory if the procedures being conducted are hazardous (28).

E.2 Working with Allergens and Embryotoxins

E.2(a) Allergens (examples: diazomethane, isocyanates, bichromates): Wear suitable gloves to prevent hand contact with allergens or substances of unknown allergenic activity (35).

E.2(b) Embryotoxins (34-5) (examples: organomercurials, lead compounds, formamide): If you are a women of childbearing age, handle these substances only in a hood whose satisfactory performance has been confirmed using appropriate protective apparel (especially gloves) to prevent skin contact.

Review each use of these materials with the research supervisor and review continuing uses annually or whenever a procedural change is made. Store these substances, properly labeled, in an adequately ventilated area in an unbreakable secondary container.

Notify supervisors of all incidents of exposure or spills; consult a qualified physician when appropriate.

E.3 Work with Chemicals of Moderate Chronic or High Acute Toxicity

Examples: diisopropylfluorophosphate (41), hydrofluoric acid (43), hydrogen cyanide (45). Supplemental rules to follow in addition to those mentioned above (Procedure B of Prudent Practices, pp. 39-41):

E.3(a) Aim: To minimize exposure to these toxic substances by any route using all reasonable precautions (39).

E.3(b) Applicability: These precautions are appropriate for substances with moderate chronic or high acute toxicity used in significant quantities (39).

E.3(c) Location: Use and store these substances only in areas of restricted access with special warning signs (40, 229).

Always use a hood (previously evaluated to confirm adequate performance with a face velocity of at least 60 linear feet per minute) (40) or other containment device for procedures which may result in a generation of aerosols or vapors containing the substance (39); trap released vapors to prevent their discharge with the hood exhaust (40).

E.3(d) Personal Protection: Always avoid skin contact by use of gloves and long sleeves (and other protective apparel as appropriate) (39). Always wash hands and arms immediately after working with these materials (40).

E.3(e) Records: Maintain records of the amount of these materials on hand, amounts used, and the names of the workers involved (40, 229).

E.3(f) Prevention of Spills and Accident: Be prepared for accidents and spills (41).

Assure that at least 2 people are present at all times if a compound in use is highly toxic or of unknown toxicity (39).

Store breakable containers of these substances in chemically resistant trays; also work and mount apparatus above such trays or cover work and storage surfaces with removable, absorbent, plastic backed paper (40). If a major spill occurs outside the hood, evacuate the area; assure that clean up personnel wear suitable protective apparel and equipment (41).

E.3(g) Waste: Thoroughly decontaminate or incinerate contaminated clothing or shoes (41). If possible, chemically decontaminate by chemical conversion (40). Store contaminated waste in closed, suitably labeled, impervious containers (for liquids, in glass or plastic bottles half-filled with vermiculite) (40).

E.4 Work with Chemicals of High Chronic Toxicity

[Examples: dimethylmercury and nickel carbonyl (48), benzo-a-pyrene (51), N-nitrosodiethylamine (54), other human carcinogens or substances with high carcinogenic potency in animals (38)].

Further supplemental rules to be followed, in addition to all these mentioned above, for work with substances of known high chronic toxicity (in quantities above a few milligrams to a few grams, depending on the substance) (47). (Procedure A of Prudent Practices pp. 47-50).

E.4(a) Access: Conduct all transfers and work with these substances in a "controlled area": a restricted access hood, glove box, or portion of a lab, designated for use of highly toxic substances, for which all people with access are aware of the substances being used and necessary precautions (48).

E.4(b) Approvals: Prepare a plan for use and disposal of these materials and obtain the approval of the laboratory supervisor (48).

E.4(c) Non-contamination/Decontamination: Protect vacuum pumps against contamination by scrubbers or HEPA filters and vent them into the hood (49). Decontaminate vacuum pumps or other contaminated equipment, including glassware, in the hood before removing them from the controlled area (49, 50).

Decontaminate the controlled area before normal work is resumed there (50).

E.4(d) Exiting: On leaving a controlled area, remove any protective apparel (placing it in an appropriate, labeled container) and thoroughly wash hands, forearms, face, and neck (49).

E.4(e) Housekeeping: Use a wet mop or a vacuum cleaner equipped with a HEPA filter instead of dry sweeping if the toxic substance was a dry powder (50).

E.4(f) Medical Surveillance: If using toxicologically significant quantities of such a substance on a regular basis (i.e. 3 times per week), consult a qualified physician concerning desirability of regular medical surveillance (50).

E.4(g) Records: Keep accurate records of the amounts of these substances stored (229) and used, the dates of use, and names of users (48).

E.4(h) Signs and Labels: Assure that the controlled area is conspicuously marked with warning and restricted access signs (49) and that all containers of these substances are appropriately labeled with identity and warning labels (48).

E.4(i) Spills: Assure that contingency plans, equipment, and materials to minimize exposure of people and property in case of accident are available (233-4).

E.4(j) Storage: Store containers of these chemicals only in a ventilated, limited access (48, 227, 229) area in appropriately labeled unbreakable, chemically resistant, secondary containers (48, 229).

E.4(k) Glove boxes: For a negative pressure glove box, ventilation rate must be at least 2 volume changes/hour and pressure at least 0.5 inches of water (48). For a positive pressure glove box, thoroughly check for leaks before each use (49). In either case, trap the exit gases or filter them through a HEPA filter and then release them into the hood (49).

E.4(l) Waste: Use chemical decontamination whenever possible; ensure that containers of contaminated waste (including washings from contaminated flasks) are transferred from the controlled area in a secondary container under the supervision of authorized personnel (49, 50, 233).

E.5 Animal Work with Chemicals of High Chronic Toxicity

E.5(a) Access: For large scale studies, special facilities with restricted access are preferable (56).

E.5(b) Administration of the Toxic Substance: When possible, administer the substance by injection or gavage instead of in the diet. If administration is in the diet, use a caging system under negative pressure or under laminar air flow directed toward HEPA filters (56).

E.5(c) Aerosol Suppression: Devise procedures which minimize formation and dispersal of contaminated aerosols, including those from food, urine, and feces (i.e., use HEPA filtered vacuum equipment for cleaning, moisten contaminated bedding before removal from the cage, mix diets in closed containers in a hood) (55, 56).

E.5(d) Personal Protection: When working in the animal room, wear plastic or rubber gloves, fully buttoned laboratory coat or jump suit and, if needed because of incomplete suppression of aerosols, other apparel and equipment (shoe and head coverings, respirator) (56).

E.5(e) Waste Disposal: Dispose of contaminated animal tissues and excreta by incineration if the available incinerator can convert the contaminant to non-toxic products (238); otherwise, package the waste appropriately for burial in an EPA-approved site (239).

F. Safety Recommendations

The above recommendations from Prudent Practices do not include those which are directed primarily toward prevention of physical injury rather than toxic exposure. However, failure of precautions against injury will often have the secondary effect of causing toxic exposures. Therefore, we list below page references for recommendations concerning some of the major categories of safety hazards which also have implications to chemical hygiene:

F.1 Corrosive agents: (35-6).
F.2 Electrically powered laboratory apparatus: (179-92).
F.3 Fires, explosions (26, 57-74, 162-4, 174-5, 219-20, 226-7).
F.4 Low temperature procedures (26, 88).
F.5 Pressurized and vacuum operations (including use of compressed gas cylinders): (27, 75-101).

G. Material Safety Data Sheets

Medical safety data sheets are presented in Prudent Practices for the chemicals listed below. (Asterisks denote that comprehensive material safety data sheets are provided).

*Acetyl peroxide (105)
*Acrolein (106)
*Acrylonitrile (107)
Ammonia (anhydrous) (91)
*Aniline
*Benzene (110)
*Benzo(a)pyrene (112)
*Bis(chloromethyl) ether (113)
Boron trichloride (91)
Boron trifluoride (92)
Bromine (114)
*Tert-butyl hydroperoxide (148)
*Carbon disulfide (116)
Carbon monoxide (92)
*Carbon tetrachloride (118)
*Chlorine (119)
Chlorine trifluoride (94)
*Chloroform (121)
Chloromethane (93)
*Diethyl ether (122)
Diisopropylfluorosphosphate (41)
*Dimethylformamide (123)
*Dimethyl Sulfate (125)
*Dioxane (126)
*Ethylene dibromide (128)
*Fluorine (95)
*Formaldehyde (130)
*Hydrazine and salts (132)
Hydrofluoric acid (43)
Hydrogen bromide (98)
Hydrogen chloride (98)
*Hydrogen cyanide 133)
*Hydrogen sulfide (135)
Mercury and compounds (52)
*Methanol (137)
*Morpholine (138)
*Nickel carbonyl (99)
*Nitrobenzene (139)
Nitrogen dioxide (100)
N-nitrosodiethylamine (54)
*Peracetic acid (141)
*Phenol (142)
*Phosgene (143)
*Pyridine (144)
*Sodium azide (145)
*Sodium cyanide (147)
Sulfur dioxide (101)
*Trichloroethylene (149)
*Vinyl chloride (150)

APPENDIX G - REFERENCES

29 CFR 1910.145OB Appendix B to 1910.1450

The following references are provided to assist the employer in the development of a Chemical Hygiene and Safety Plan. The materials listed below are offered as non-mandatory guidance. References listed here do not imply specific endorsement of a book, opinion, technique, policy, or a specific solution for a safety or health problem. Other references not listed here may better meet the needs of a specific laboratory.

(a) Materials for the development of the Chemical Hygiene and Safety Plan:

(a)1 American Chemical Society, Safety in Academic Chemistry Laboratories, 4th edition, 1985.

(a)2 Fawcett, H.H. and W.S. Wood, Safety and Accident Prevention in Chemical Operations, 2nd edition, Wiley-Interscience, New York, 1982.

(a)3 Flury, Patricia A., Environmental Health and Safety in the Hospital Laboratory, Charles C. Thomas, Publisher, Springfield, IL, 1978.

(a)4 Green, Michael E. and Turk, Amos, Safety in Working with Chemicals, Macmillan Publishing Co., NY, 1978.

(a)5 Kaufman, James A., Laboratory Safety Guidelines, Dow Chemical Co., Box 1713, Midland, MI 48640, 1977.

(a)6 National Institutes of Health, NIH Guidelines for the Laboratory use of Chemical Carcinogens, NIH Pub. No. 81-2385, GPO, Washington, DC 20402, 1981.

(a)7 National Research Council, Prudent Practices for Disposal of Chemicals from Laboratories, National Academy Press, Washington, DC, 1983.

(a)8 National Research Council, Prudent Practices for Handling Hazardous Chemicals in Laboratories, National Academy Press, Washington, DC, 1981.

(a)9 Renfrew, Malcolm, Ed., Safety in the Chemical Laboratory, Vol. IV., J. Chem. ED., American Chemical Society, Easlon, PA, 1981.

(a)10 Steere, Norman V., ED., Safety in the Chemical Laboratory, J. Chem. Ed., American Chemical Society, Easlon, PA 18042, Vol. I 1967, Vol. II 1971, Vol. III 1974.

(a)11 Steere, Norman, V., Handbook of Laboratory Safety, The Chemical Rubber Company, Cleveland, OH, 1971.

(a)12 Young, Jay A., Ed., Improving Safety in the Chemical Laboratory, John Wiley & Sons, Inc., New York, 1987.

(b) Hazardous Substances Information:

(b)1 American Conference of Governmental Industrial Hygienists Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes, P.O. Box 1937, Cincinnati, OH 45201 (latest edition).

(b)2 Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service, U.S. Government Printing Office, Washington, DC (latest edition).

(b)3 Best Company, Best Safety Directory, Vols. I and II, Oldwick, N.J., 1981.

(b)4 Bretherick, L., Handbook of Reactive Chemical Hazards, 2nd edition, Butterworths, London, 1979.

(b)5 Bretherick, L., Hazards in the Chemical Laboratory, 3rd edition, Royal Society of Chemistry, London, 1986.

(b)6 Code of Federal Regulations, 29 CFR part 1910 subpart Z, U.S. Government Printing Office, Washington, DC 20402 (latest edition).

(b)7 IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, World Health Organization Publications Center, 49 Sheridan Avenue, Albany, NY 12210 (latest edition).

(b)8 NIOSH/OSHA Pocket Guide to Chemical Hazards, NIOSH Pub. No. 85-114, U.S. Government Printing Office, Washington, DC, 1985 (or latest edition).

(b)9 Occupational Health Guidelines, NIOSH/OSHA NIOSH Publ. No. 81-123, U.S. Government Printing Office, Washington, DC, 1981.

(b)10 Patty, F.A., Industrial Hygiene and Toxicology, John Wiley & Sons, Inc., New York, NY (five volumes).

(b)11 Registry of Toxic Effects of Chemical Substances, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health (Revised Annually) for sale from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(b)12 The Merck Index: An Encyclopedia of Chemicals and Drugs, Merck and Company, Inc., Rahway, NJ, 1976 (or latest edition).

(b)13 Sax, N.I., Dangerous Properties of Industrial Materials, 5th edition. Van Nostrand, Reinhold, NY, 1979, Sittig, Marshall, Handbook of Toxic and Chemicals, Noyes Publications, Park Ridge, NJ, 1981.

(c) Information of Ventilation:

(c)1 American Conference of Governmental Industrial Hygienists Industrial Ventilation, 16th edition, Lansing, MI, 1980.

(c)2 American National Standards Institute, Inc., American National Standards Fundamentals Governing the Design and Operation of Local Exhaust Systems, ANSI Z 9.2-1979 American National Standards Institute, NY, 1979.

(c)3 Imad, A.P. and Watson, C.L., Ventilation Index: An Easy Way to Decide about Hazardous Liquids, Professional Safety pp 15-18, April 1980.

(c)4 National Fire Protection Association, Fire Protection for Laboratories Using Chemicals, NFPA-45, 1982; Safety Standards for Laboratories in Health Related Institutions, NFPA 56c; 1980 Fire Protection Guide on Hazardous Materials, 7th edition, 1978; National Fire Protection Association, Batterymarch Park,, Quincy, MA 02269.

(c)5 Scientific Apparatus Makers Association (SAMA), Standards for Laboratory Fume Hoods, SAMA LF7-1980, 1101 16th Street, NW, Washington, DC 20036.

(d) Information on Availability of Referenced Material:

(d)1 American National Standards Institute (ANSI), 1430 Broadway, New York, NY 10018.

(d)2 American Society for Testing Materials (ASTM), 1916 Race Street, Philadelphia, PA 19103.

(Approved by the Office of Management and Budget under Control Number 1218-0131).

APPENDIX H

WASTE DISPOSAL REGULATIONS AND RESTRICTIONS

MERCURY RECYCLERS

Bethlehem Apparatus Co. 890 Front St. Frank Yasunas
Pennsylvania Hellertown, PA
(~~215~~) 838-7034 18055
610

~~Quicksilver Products~~
~~California~~
~~(415) 468-2000~~

Chapter 6
Liquid Waste Disposal

The EPA prohibits the disposal of bulk or noncontainerized liquid wastes in MSWLF's except when: 1) the waste is household waste (other than septic waste); and 2) the waste is leachate or gas condensate from the landfill and the landfill is equipped with a composite liner and leachate collection system. Containers holding liquid waste are not placed in the landfill unless: 1) the container is a small container similar in size to that normally found in household waste; or 2) the waste is a household waste (40 CFR §258.28). The restriction of bulk or noncontainerized liquids is intended to control a source of liquids that may become a source of leachate generation.

Liquid waste refers to any waste material that is determined to contain free liquids as defined by SW-846 Method 9095–Paint Filter Liquids Test. The paint filter test is performed by placing a 100 milliliter sample of waste on a conical, 400 micron paint filter. The waste is considered a liquid if it passes through the filter within 5 minutes. The apparatus used for performing the paint filter test is illustrated in Figure 6-1.

The ban on containerized free liquids reduces the problem of subsidence and possible damage to the final cover upon possible deterioration of the waste container.

No liquid wastes are accepted at the Hidden Hollow Landfill except for small quantities of household wastes, recyclable oil, and paint. These wastes are inspected and separated as described in the Incoming Waste Evaluation Program section of this manual.

Paint cans containing solvent-based paints are emptied into 55-gallon drums and eventually hauled to a permitted hazardous waste disposal facility. Latex-based paints are hauled to another portion of the landfill where the cans are opened and the liquid (water) is allowed to evaporate. The cans containing the paint solids are later collected and landfilled. Used motor oil is collected in a holding tank and periodically taken offsite by a contractor for recycling.

One common waste stream that may contain a significant quantity of liquid is sludge. Sludge is a mixture of water and solids that has been concentrated from, and produced

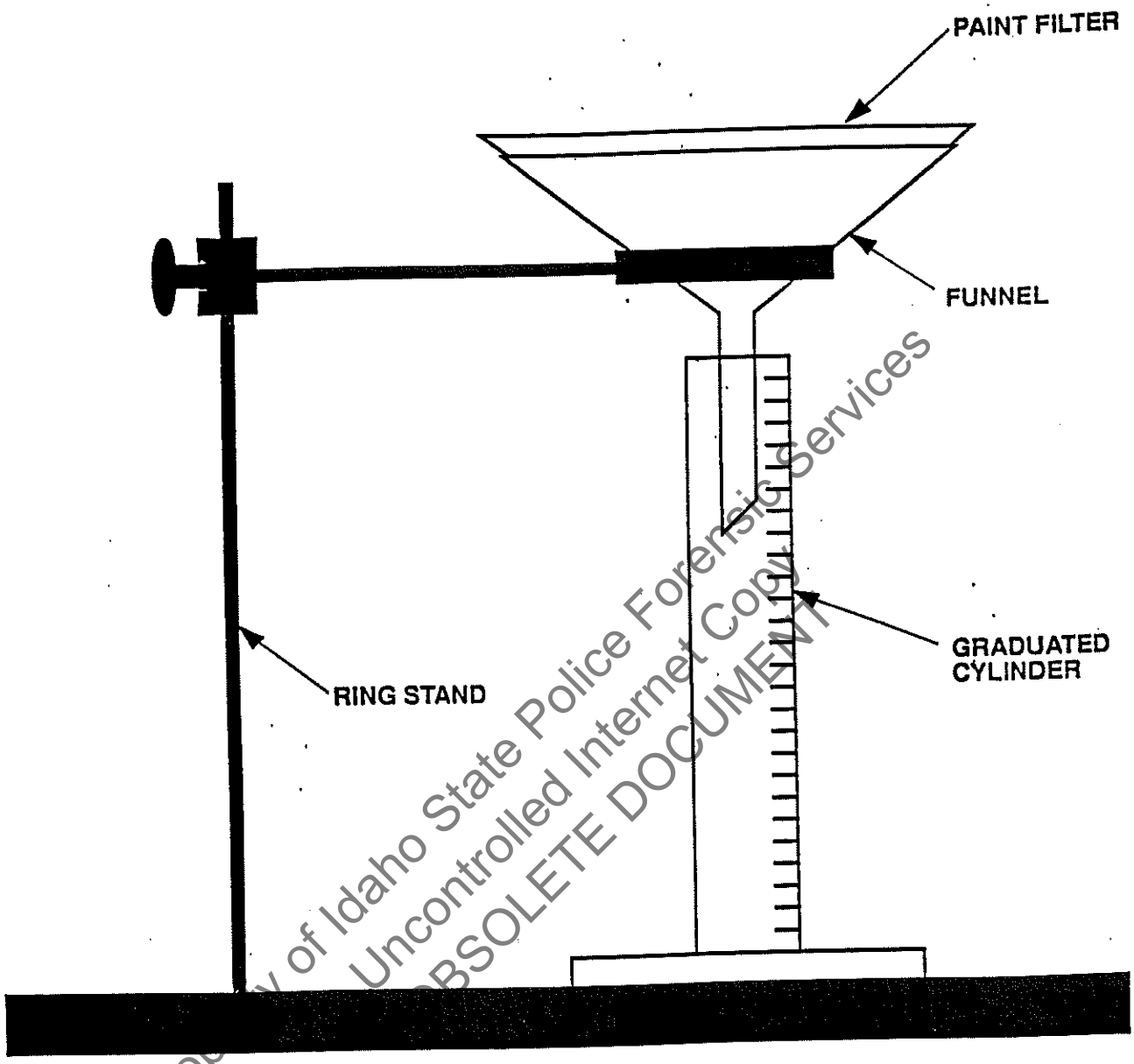

FIGURE 6-1
PAINT FILTER TEST APPARATUS
HIDDEN HOLLOW LANDFILL
OPERATION PLAN

during, water and wastewater treatment. Sludges may be produced as a result of providing municipal services (e.g., storm drain maintenance) or commercial or industrial operations. Sludge disposal (except domestic sewage sludge) is acceptable, provided the sludge is non-hazardous and passes the paint filter test.

Appendix D
Lists of Hazardous Wastes
(40 CFR 261 Subpart D)

B. RCRA SCREENING REQUIREMENTS

On October 9, 1991 EPA published new regulations to improve the safety of existing and future landfills. The rule establishes standards for the location, design, and operation of such landfills. This course will address that portion of the regulations which requires the owner or operator of a landfill to implement procedures to detect and prevent the disposal of hazardous waste and polychlorinated biphenyl (PCB) waste in its landfill. At a minimum, these procedures must include random inspection of incoming loads; appropriate record- keeping; training of landfill personnel; and state notification if hazardous waste or PCB's are discovered. Also, even though the regulations address screening for landfills, transfer stations and "dirty MRF's" are often more logical points of waste screening before the waste is sent to a landfill.

The Federal operating criteria for excluding hazardous waste from municipal facilities can be found in The Code of Federal Regulations (CFR), Part 258, Subpart C, Section 258.20 The effective date of this regulation is October 9, 1993. Household hazardous waste and hazardous waste generated by a conditionally exempt generator as defined in 40 CFR 261.5 are excluded from from regulation as hazardous waste and are acceptable for disposal at a MSWLF. RCRA 40 CFR 258.20 is as follows:

(a) *Owners or operators of all MSWLF units must implement a program at the facility for detecting and preventing the disposal of regulated hazardous wastes as defined in part 261 of this chapter and polychlorinated biphenyls (PCB) wastes as defined in part 761 of this chapter. This program must include, at a minimum:*

Random inspections of incoming loads unless the owner or operator takes other steps to ensure that incoming loads do not contain regulated hazardous wastes or PCB wastes:

Records of any inspections:

Training of facility personnel to recognize regulated hazardous waste and PCB wastes; and

Notification of State Director of authorized States under Subtitle C of RCRA or the EPA Regional Administrator if in an unauthorized State if a regulated hazardous waste or PCB waste is discovered at the facility.

(b) *For the purposes of this section, regulated hazardous waste means a solid waste that is a hazardous waste as defined in 40 CFR 261.3, that is not excluded from regulation as a hazardous waste under 40 CFR 261.4(b) or was not generated by a conditionally exempt generator as defined in paragraph 261.5 of this chapter.*

C. HAZARDOUS WASTE REGULATIONS AND MANAGEMENT

In the United States, hazardous waste is regulated under RCRA, Subtitle C. A waste is hazardous if it is listed as a hazardous waste by the Administrator of the Environmental Protection Agency (EPA) in the Code of Federal Regulations, Title 40, Part 261, or if it meets one or more of the hazardous waste criteria as defined by EPA. These criteria are:

- **Ignitability**
- **Corrosivity**
- **Reactivity**
- **TCLP Toxicity**

1. Ignitability

Ignitable waste is a waste that burns readily, causes a fire by friction under normal circumstances, or is an oxidizer. Any waste having a flash point of 140 F. or less falls in this category. Flash point is that temperature at which a liquid gives off vapors that will ignite when an open flame is applied. Under Department of Transportation (DOT) definitions, a flammable liquid has a flash point of less than 100 F. A combustible liquid has a flash point between 100 and 200 F. Therefore, a flammable liquid is always hazardous while a combustible liquid may or may not be hazardous depending upon its flash point. Methyl alcohol is an example of a flammable liquid.

2. Corrosivity

A corrosive waste is one having a very high or a very low pH. The pH of a liquid is a measure of how acidic or basic (alkaline) the material is. The pH scale ranges from 0 to 14. High numbers are basic and low numbers are acidic. A substance having a pH below 2.0 or above 12.5 is defined as hazardous under RCRA. One example of corrosive waste is spent pickle liquor from metals cleaning operations.

3. Reactivity

A waste is reactive if it is normally unstable; reacts violently with water; forms an explosive mixture with water; contains quantities of cyanide or sulfur that could be released to the air; or can easily be detonated or exploded. These wastes may fall into any one of several DOT categories. Wastes from electroplating operations and wastewater sludge from munitions manufacturers are examples of reactive wastes.

4. TCLP Toxicity

The characteristic of TCLP toxicity is determined by the toxicity characteristic Leaching Procedure (TCLP) laboratory test. The waste under investigation is subjected to a specified acid wash. This is supposed to simulate the acidic conditions found in most landfills. The acid solution containing the material it has extracted from the waste is tested for a number of constituents.

There are 41 different elements and compounds regulated under TCLP. They fall into three general categories: heavy metals, pesticides, organic solvents.

The regulated heavy metals are arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. Due to their presence throughout our society, many people believe that heavy metals are the most common hazardous waste found in municipal solid waste. The following table shows all

T.C.L.P. CONSTITUENTS & REGULATORY LEVELS (mg/l)

CONSTITUENT	REGULATORY LEVEL	CONSTITUENT	REGULATORY LEVEL
Arsenic	5.0	Hexachlorobenzene	0.13
Barium	100	Hexachloro-1,3-butadiene	0.5
Benzene	0.5	Hexachloroethane	3.0
Cadmium	1.0	Lead	5.0
Carbon Tetrachloride	0.5	Lindane	0.4
Chlordane	0.03	Mercury	0.2
Chlorobenzene	100	Methoxychlor	10.0
Chloroform	6.0	Methyl ethyl ketone	200
Chromium	5.0	Nitrobenzene	2.0
m-Cresol	200	Pentachlorophenol	100
o-Cresol	200	Pyridine	5.0
p-Cresol	200	Selenium	1.0
Cresol	200	Silver	5.0
1,4-Dichlorobenzene	10.0	Tetrachloroethylene	0.7
1,2-Dichloroethane	.7.5	Toxaphene	0.5
1,1-Dichloroethylene	0.5	Trichloroethylene	0.5
2,4-Dichlorophenooxycetic acid	0.7	2,4,5-Trichlorophenol	400
2,4-Dinitrotoluene	0.13	2,4,6-Trichlorophenol	2.0
Endrin	0.02	2,4,5-TP (Silvex)	1.0
Heptachlor (and its hydroxide)	0.008	Vinyl Chloride	0.2

of the TCLP constituents and their regulatory levels:

5. Disposal Requirements

Except in certain specified circumstances, regulated quantities of hazardous waste must be disposed of at a permitted hazardous waste disposal facility. Any material contaminated by a hazardous waste is also deemed to be a hazardous waste and must be managed as such.

7–518: **USE OF THE PUBLIC SEWERS:** The use of the public sewers of the City shall be in accordance with the following regulations:

(A) No person shall discharge or cause to be discharged from any connection any stormwater, surface water, groundwater, roof runoff, subsurface drainage, uncontaminated cooling water or unpolluted industrial process waters to any sanitary sewer.

(B) Stormwater and all other unpolluted drainage shall be discharged to such sewers as are specifically designated as storm sewers, or to a natural outlet approved by the City. Industrial cooling water or unpolluted process waters may be discharged, complying with the requirements of Section 308 of the Act and on approval of the City, to a storm sewer or natural outlet.

(C) No person shall discharge or cause to be discharged any of the following described waters or wastes to any public sewers:

1. Any gasoline, benzene, naphtha, fuel oil or other flammable or explosive liquid, solid or gas.

2. Any waters or wastes containing toxic or poisonous solids, liquids or gases in sufficient quantity, either singly or by interaction with other wastes, to injure or interfere with any sewage treatment process, constitute a hazard to humans or animals, create a public nuisance or create any hazard in the receiving waters of the sewage treatment plant, including but not limited to cyanides in excess of two-tenths (0.2) mg/l as CN in the wastes as discharged to the public sewer.

3. Any waters or wastes having a pH lower than 5.5 or having any other corrosive property capable of causing damage or hazard to structures, equipment and personnel of the sewage works; and,

4. Solid or viscous substances in quantities or of such size capable of causing obstruction to the flow in sewers, or other interference with the proper operation of the sewage works such as, but not limited to, ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastics, wood, unground garbage, whole blood, paunch manure, hair and fleshings, entrails and paper dishes, cups, milk containers, etc. either whole or ground by garbage grinders.

(D) No person shall discharge or cause to be discharged the following described substances, materials, waters or wastes if it appears likely in the opinion of the City that such wastes can harm either the sewers, sewage treatment process or equipment, have an adverse effect on the receiving stream or can otherwise endanger life, limb, public property or constitute a nuisance. In forming its opinion as to the acceptability of these wastes, the City will give consideration to such factors as the quantities of subject wastes in relation to flows and velocities in the sewers, materials of construction of the sewers, nature of the sewage treatment process, capacity of the sewage treatment plant, degree of treatability of wastes in the sewage treatment plant and other pertinent factors. The substances prohibited are:

D) 1. Any liquid or vapor having a temperature higher than one hundred fifty degrees Fahrenheit (150° F [65° C]).

2. Any water or waste containing fats, wax, grease or oils, whether emulsified or not, in excess of one hundred (100) mg/l or containing substances which may solidify or become viscous at temperatures between thirty two and one hundred fifty degrees Fahrenheit (32° and 150° F, [0° and 65° C]).

3. Any garbage that has not been properly shredded. The installation and operation of any garbage grinder equipped with a motor of three-fourths (3/4) horsepower or greater shall be subject to the review and approval of the City.

4. Any waters or wastes containing strong acid iron pickling wastes or concentrated plating solutions whether neutralized or not.

5. Any waters or wastes containing iron, chromium, copper, zinc, and similar objectionable or toxic substances; or wastes exerting any excessive chlorine requirement to such degree that any such material received in the composite sewage at the sewage treatment works exceeds the limits established by the City for such materials.

6. Any waters or wastes containing phenols or other taste or odor-producing substances in such concentrations exceeding limits which may be established by the City as necessary, after treatment of the composite sewage, to meet the requirements of the State, Federal or other public agencies of jurisdiction for such discharge to the receiving waters.

7. Any radioactive wastes or isotopes of such half-life or concentration as may exceed limits established by the City in compliance with applicable State or Federal regulations.

8. Any waters or wastes having a pH in excess of 9.5.

9. Materials which exert or cause:

(a) Unusual concentrations of inert suspended solids (such as, but not limited to, Fullers earth, lime slurries, and lime residues) or of dissolved solids (such as, but not limited to, sodium chloride and sodium sulfate).

(b) Excessive discoloration (such as, but not limited to, dye wastes and vegetable tanning solutions).

(c) Unusual BOD, chemical oxygen demand or chlorine requirements in such quantities as to constitute a significat load on the sewage treatment works; and

D,9) (d) Unusual volume of flow or concentration of wastes constituting "slugs" as defined herein; and,

10. Waters or wastes containing substances which are not amenable to treatment or reduction by the sewage treatment processes employed, or are amenable to treatment only to such degree that the sewage treatment plant effluent cannot meet the requirements of other agencies having jurisdiction over discharge to the receiving waters.

(E) If any waters or wastes are discharged, or are proposed to be discharged to the public sewers, which waters contain the substances or possess the characteristics enumerated in Section 7-518D of this Chapter, and which in the judgment of the City, may have a deleterious effect upon the sewage works, processes, equipment or receiving waters, or which otherwise create a hazard to life or constitute a public nuisance, the City may:

1. Reject the wastes.

2. Require pretreatment to an acceptable condition for discharge to the public sewers.

3. Require control over the quantities and rates of discharge, and/or

4. Require payment to cover the added cost of handling and treating the wastes not covered by existing taxes or sewer charges under the provisions of Section 7–530 of this Chapter.

If the City permits the pretreatment or equalization of waste flows, the design and installation of the plants and equipment shall be subject to the review and approval of the City and subject to the requirements of all applicable codes, ordinances and laws.

(F) Grease, oil and sand interceptors shall be provided when, in the opinion of the City, they are necessary for the proper handling of liquid wastes containing grease in excessive amounts or any flammable wastes, sand or other harmful ingredients; except that such interceptors shall not be required for private living quarters or dwelling units. All interceptors shall be of a type and capacity approved by the City and shall be located as to be readily and easily accessible for cleaning and inspection. These interceptors shall be adequately maintained and are subject to periodic inspection by the City.

(G) Where preliminary treatment or flow-equalizing facilities are provided for any waters or wastes, they shall be maintained continuously in satisfactory and effective operation by the owner at his expense.

(H) When required by the City, the owner of any property serviced by a building sewer carrying industrial wastes shall install a suitable control manhole together with such necessary meters and other appurtenances in the building sewer to facilitate observation, sampling and measurement of the wastes. Such manhole, when required shall be accessibly and safely located, and shall be constructed in accordance with plans approved by the City. The manhole shall be installed by the owner at his expense, and shall be maintained by him so as to be safe and accessible at all times.

(I) All measurements, tests and analyses of the characteristics of waters and wastes to which reference is made in this Chapter shall be determined in accordance with the latest edition of "Standard Methods for the Examination of Water and Wastewater", published by the American Public Health Association, and shall be determined at the control manhole provided or upon suitable samples taken at said control manhole. In the event that no special manhole has been required, the control manhole shall be considered to be the nearest downstream manhole in the public sewer to the point at which the building sewer is connected. Sampling shall be carried out by customarily accepted methods to reflect the effect of constituents upon the sewage works and to determine the existence of hazards to life, limb and property.

(J) No statement contained in this Chapter shall be construed as preventing any special agreement or arrangement between the City and any industrial concern whereby an industrial waste of unusual strength or character may be accepted by the City for treatment, subject to payment therefore, by the industrial concern; and.

(K) Any property owner or sewer user violating the provisions of this Section shall upon notice by the City immediately install such preliminary treatment through separators, traps and/or chemical, physical or biochemical processes as will make and assure that the sewage contributed from such property or premises will meet the requirements of this Chapter.

APPENDIX I

REPORT FORMS

APPENDIX I

REPORT FORMS

Idaho Department of Law Enforcement
MISHAP REPORT

IDEN-TIFIERS

Date of occurrence: _____ Time: _____ ☐ AM ☐ PM Report date: _____

Department _____ Exact location _____

Report prepared by: _____ Title: _____

ACCIDENT

Employee name: _____ Job title: _____

Department: _____ How long on job? _____

Task in progress _____

Nature of injury _____ Body part _____ Injury source _____

Lost time? _____ Date expected back _____ Date of last injury _____

Property damaged _____

Nature of damage _____ Source _____

Repair/replacement cost: Estimated _____ Actual _____

NEAR-ACCID.

Employee most directly involved _____

Title _____ Department _____

DESCRIPTION

Step-by-step description of mishap:

_____

_____

_____

_____

_____

CAUSES

Causes:

_____

_____

_____

_____

_____

FOLLOW-UP

Corrective actions	Scheduled	Completed

DISTRIBUTION: BOTH THE FRONT AND REAR OF THIS FORM TO BE TOTALLY FILLED OUT AND FORWARDED TO THE PERSONNEL BUREAU AT DLE HEADQUARTERS. INJURY OR DAMAGE DOES NOT HAVE TO OCCUR.

DLE/SSB FORM 010-REVISED 5/93

MAIL: White copy – Industrial Commission
317 Main, Boise, ID 83720
Yellow copy – State Insurance Fund
Statehouse Mail, Boise, ID 83720
Pink copy – Employer file

NOTICE OF INJURY AND CLAIM FOR BENEFITS

Organizational Code ☐ ☐ Location Code

Notice

Every work injury to an employee (including disease or infection in respect to such injury) which requires medical services other than first-aid treatment, must be reported within **TEN days** after the employer has knowledge of the injury. FILING OF THIS REPORT IS NOT AN ADMISSION OF LIABILITY. This report shall not be evidence of any fact stated here in any proceeding in respect of the injury or death on account of which this report is made.

Employer

(1) Name of Employer (business name-DBA)	(2) Phone No.	(3) Type of Business (state major activity, goods handled, work done, type of mine and ore extracted, products manufactured, etc.)	(3a) Is Employer - ☐ Corporation ☐ Individual ☐ Partnership ☐ Public ☐ Other

(4) Address (Box or Street No.)	City or Town	State	Zip Code

(5) Location (if different from mail address)	(6) Name of Insurance Carrier	(6a) State Insurance Fund Policy No.
	STATE INS FUND	

Injured or Ill Employee

(7) Name (First) (Middle) (Last)	(8) Social Security No.	(8a) Is injured worker a corp officer; partner or sole proprietor of the employer? ☐ Yes ☐ No

(9) Address (Box or Street No.)	City or Town	State	Zip Code

(10) Phone No.	(11) Date of Birth	(12) Sex ☐ Male ☐ Female	(13) Marital Status ☐ Single ☐ Married ☐ Divorced	(14) No. of children	(14a) If business is sole proprietorship, is injured worker a household family member of the owner? ☐ Yes ☐ No

(15) Hours Worked Per Day Per Week	(16) No. of days worked per week	(17) Wages Per ☐ Hour ☐ Day ☐ Week ☐ Month ☐ Piece Work

(18) If board, lodging, or other advantages furnished in addition to wages, give est. value: Per Week	(19) If gratuities (tips, etc.) were received in the course of employment, give est. value: Per Week

Accident or Exposure To Occupational Illness

(20) Occupation	(21) Date of Hire	(22) Department regularly employed in	(22a) Under what class code on your policy were worker's wages reported?

(23) Place of accident or exposure (Box or Street No.)	City or Town	State	County

(24) Was place of accident or exposure on employer's premises? ☐ Yes ☐ No	(25) Date of accident, exposure or initial diagnosis	(26) If accident, give time ☐ A.M. ☐ P.M.

(27) Date employer learned of accident	(27a) Injury reported to (person)	(28) Did injury result in time loss beyond date of accident? ☐ Yes ☐ No	(29) If yes, give date last worked

(30) Was injured paid in full for this day? ☐ Yes ☐ No	(31) Has employee returned to work? ☐ Yes ☐ No	(32) If yes, give date	(33) At what wage? $ Per

Cause of Accident

(34) What was employee doing when accident occurred? (Describe briefly, such as loading truck, shoveling dirt, walking down stairs, etc.)

(35) How did the accident happen? (Describe fully, stating whether the injured person fell, was struck, etc.; give all factors contributing to accident. Use reverse side for additional space.)

(36) What machine, tool, substance, or object was most closely connected with the accident? (Name the specific tool, machine, appliance, gas, liquid, etc., involved.)

(37) If mechanical apparatus or vehicle, what part of it? (Gears, pulley, blade, motor, etc.)	(37a) If accident was caused by any person or business other than the injured worker, co-worker, or the employer, please identify

(38) Was accident caused by failure of a machine or product? (If yes, explain) ☐ Yes ☐ No	(38a) Were mechanical guards, or other safeguards provided? ☐ Yes ☐ No	(39) Was injured using them? ☐ Yes ☐ No

Injury or Occupational Illness

(40) Describe the injury or illness in detail. (For example: amputation of right index finger at second joint, fracture of ribs, lead poisoning, dermatitis of left hand, etc.)

(40a) Indicate body part affected ☐ Left ☐ Right	(40b) Was this part of body injured before? ☐ Yes ☐ No	(40c) Write brief description of treatment(s) given

(40d) Were other workers injured in this accident? ☐ Yes ☐ No (If yes, please list other workers names)

(41) Name and address of physician

(42) Name and address of hospital

(43) ☐ In Patient ☐ Out Patient	(44) Did employee die ☐ Yes ☐ No	(45) If yes, give date	(46) In case of death, give name and address of nearest relative

Employee hereby expressly authorizes the State Insurance Fund and the Industrial Commission to exchange all records necessary for the administration of this claim, including medical records relative to employee's physical or mental condition, both prior to and after injury listed.

Signature of Employer _____ Signature of Employee _____

Prepared by _____ Official Position _____ Date of Report _____

PSD-52 HAZARD ASSESSMENT AND RECOGNITION PLAN *(INSTRUCTIONS)*

GENERAL: Prepare an Original for retention in case file. Copy for IBN-HQ. Complete legibly by hand.

SECTION INSTRUCTIONS:

SECTION A – FILE INFORMATION – Self-explanatory.

SECTION B – LABORATORY TYPE AND HAZARDS

Laboratory Type. Check the appropriate box for known or suspected lab type. Write in the production method if known or suspected (example: methamphetamine via red phosphorus/hydriodic acid).

Potential Chemical Hazards. Check all boxes indicating known or suspected hazards. List any specific high hazard chemicals known or suspected of being present (example: ether, thionyl chloride, red phosphorus, etc.).

Other Potential Hazards. Check all boxes indicating known or suspected hazards. List any other hazards known or suspected of being present (example: low overhead, unstable container storage, booby traps, etc.).

SECTION C – SITE DESCRIPTION

Laboratory Address. Self-explanatory.

Site Location and Description. Description and location of lab at the address. (example: detached garage 10 yards from house, outside storage shed near rear door of main building).

Structure Description. Physical description, i.e., size, shape, type, condition, etc., (example: 10 x 10 wood barn, no windows; small warehouse, fire damaged with opposing roll up doors).

Weather Conditions. Enter the best estimate of conditions at anticipated time of entry/seizure.

Estimated Time. Enter the estimated duration of each phase of the lab seizure (entry, assessment, processing).

Estimated Lab Size. Check appropriate box based on best estimate of size.

SECTION D – OTHER AGENCY FIELD SUPPORT – Self-explanatory.

SECTION E – TEAM MEMBER ASSIGNMENTS – Self-explanatory.

SECTION F – EQUIPMENT CHECKLIST – Check inventory of safety equipment available for use at lab site. List any additional equipment needed.

SECTION G – STAGES OF RAID – For each stage of the raid note the following information:

Primary Hazard: Example: Flammable atmosphere, cyanide gas, etc.

Duration: The actual time of work. (example: assessment – 15 minutes).

Personnel: Enter the numbers corresponding to team members in Section C.

Level of Protection: Write in the letter designation. Example: "B" (i.e., Level B Protection).

Equipment Requirements: For each stage of the raid, mark all required (R) and standby (S) equipment specified by the Site Safety Officer. (Example: Entry – SCBA (S); Nomex Suit (R); Field Boots (R); Goggles (R)).

SECTION H – INVENTORY OF EQUIPMENT USED. List the total number of disposable items used at the conclusion of the raid. (Example: tyvek suit – 8).

SECTION I – HAZARD ASSESSMENT FINDINGS. During initial assessment, measure and record findings as indicated.

LEL – (lower explosive level), (example: 1%, 15%, etc.)

% Oxygen – (percent oxygen), (example: 21%, 18%, etc.)

PPM – (parts per million), (example: 100 ppm, 350 ppm)

Location in the lab – Describe each location where a series of three measurements were taken (Example: front door; southeast corner of bathroom, etc.).

Air-Sampling Tubes – See the Clandestine Laboratory Hazard Assessment Protection Guide (CLHAP) to determine which sampling tubes to use/test.

Check name of each tube to be used/tested.

After the Test, circle + for color change, and circle — for no color change.

Describe color change. (example: dark brown, etc.)

Record the ppm level calculated following the manufacturer's instructions for each individual tube.

Write in the conversion factor if listed in the CLHAP Guide for the individual sampling tubes specified by lab type and production method. (example: 2, 3, 4)

Calculate an adjusted reading, i.e., ppm x conversion factor, (example: 100 ppm x 2 = 200 ppm)

Compare the adjusted reading to the maximum value listed in the CLHAP Guide for individual sampling tubes specified by lab type and production method.

SECTION J – COMMENTS. Include new hazards observed, injuries/near misses, equipment failures, recommendations, etc.

HAZARD ASSESSMENT AND RECOGNITION PLAN

A. FILE INFORMATION

BUREAU	REGION	DATE SEIZED	CASE NO.

SITE SAFETY OFFICER (Name) | AFFILIATION (If other than DLE, enter Agency name)

CHEMIST (Name) | AFFILIATION (If other than DLE, enter Agency name)

B. LABORATORY TYPE AND HAZARDS

LABORATORY TYPE (Check)

- ☐ Methamphetamine
- ☐ Amphetamine
- ☐ Cocaine
- ☐ Fentanyl
- ☐ P2P
- ☐ PCP
- ☐ LSD
- ☐ Other (Specify) _____

Production Method: _____

POTENTIAL CHEMICAL HAZARDS (Check)

- ☐ Respiratory Tox.
- ☐ Systemic Tox.
- ☐ External Tox.
- ☐ Carcinogens
- ☐ Corosives
- ☐ Flammables
- ☐ Explosives
- ☐ Oxidizers
- ☐ Pyrophorics
- ☐ Water Reactives

Specific High Hazard Chemical: _____

OTHER POTENTIAL HAZARDS (Check)

- ☐ Comp. Gas Cylinder
- ☐ Heat Stress
- ☐ Cold Stress
- ☐ Confined Space
- ☐ Limited Egress
- ☐ Poor Visibility
- ☐ Slip/Trip/Fall Hazard
- ☐ Electrical Shock
- ☐ Burn Hazard
- ☐ Leaking containers
- ☐ Damaged Structure
- ☐ Excavation

Other: _____

C. SITE DESCRIPTION

LAB ADDRESS

SITE LOCATION & DESCRIPTION

STRUCTURE DESCRIPTION

WEATHER CONDITIONS:

Wind Direction & Velocity | Temperature | ____ Rain ____ Snow | Humidity

ESTIMATED TIME:

Entry _____ Sec./Min. | Assessment _____ Min./Hr. | Processing _____ Min./Hr.

ESTIMATED LAB SIZE

____ Small ____ Med. ____ Large

D. OTHER AGENCY FIELD SUPPORT

FIELD SUPPORT	NAME (Include jurisdiction by City, State or County)	TELEPHONE NUMBER	STANDBY LOCATION	OFFICIAL CONTACTED (Name)	NOTIFIED Date / Time
Fire Dept.		( ) —			/
Ambulance		( ) —			/
Medivac Helicopter		( ) —			/
Health Dept.		( ) —			/
Hospital Emergency Room		( ) —	Address		/
Disposal Company		( ) —			/
Other		( ) —			/

E. TEAM MEMBER ASSIGNMENTS

TEAM MEMBERS (Include Name, Affiliation & check Assignment box: E = Entry, A = Assessment, P = Processing)	E	A	P	TEAM MEMBERS (Include Name, Affiliation & check Assignment box: E = Entry, A = Assessment, P = Processing)	E	A	P
1.				6.			
2.				7.			
3.				8.			
4.				9.			
5.				10.			

CLANDESTINE LABORATORY EXPOSURE REPORT

DLE personnel who have entered a clandestine laboratory will submit the original of this form (front and back completed) for each laboratory entered. This form will be submitted within 5 days after laboratory raid completion to: Safety Manager, IBN Headquarters.

EMPLOYEE INFORMATION	NAME (Last, First, Middle Initial)		DATE OF BIRTH
	DIVISION and OFFICE	LABORATORY	JOB SERIES
INCIDENT DATA	DATE OF LABORATORY RAID	CASE NO./OTHER AGENCY NO.	
	TYPE OF DRUG LABORATORY (Methamphetamine, LSD, PCP, Cocaine conversion, etc.)		
LAB ASSESSMENT	RESULTS OF SAMPLING TUBES (Hydrocarbons, Cyanide, etc.)	RESULTS OF GASTECH 1314 _____ % oxygen _____ % combustible gases	
	PERSONAL PROTECTIVE EQUIPMENT USED FOR EACH ACTIVITY LISTED (Nomex suit, gloves, boots, etc.)		
	A. Undercover	B. Entry	
	C. Assessment	D. Evidence Collection	
	E. Disposal	F. After Raid Completion	
MEDICAL TREATMENT	PROVIDER AND DESCRIPTION OF TREATMENT (emergency room – stitches in finger, etc.)		
	DATE FIRST AID TREATMENT RECEIVED		

NOTE: Refer to Policy Manual 5.9.2 for form submission.

PRIVACY ACT

PURPOSE: To provide safety and health support for DLE employees exposed to hazardous chemicals.

ROUTINE USES: Records are maintained for internal DLE use. Information disclosed outside the agency only when authorized by the subject.

EFFECT: Failure to provide information will result in inadequate health and safety recommendations.

Employee's Signature	Date	Supervisor's Typed Name and Signature	Date

Continue on Reverse

APPENDIX J

CHEMICAL FIRST AID ACTIONS

TESTS FOR SUBSTANCES IN BIOLOGICAL FLUIDS

APPENDIX J - CHEMICAL FIRST AID ACTIONS

INHALATION

1. Remove to fresh air.
2. Loosen clothing.
3. Maintain airway.
4. Avoid unnecessary movement (of victim).
5. For particulate exposure, have victim blow nose, discourage sniffing.
6. Lay victim down.
7. Treat for shock.
8. Call for help.
9. Monitor pulse and respiration if unconscious.

INGESTION

1. Remove from contaminated area.
2. If conscious, rinse mouth with water.

    a) **Induce vomiting only if conscious and ingested chemical will not cause burning or reabsorption.**

3. Loosen clothing.
4. If unconscious:

    a) Lay victim down.
    b) Prevent aspiration of vomitus.
    c) Monitor pulse and respiration.

5. Treat for shock.
6. Call for help.

SKIN EXPOSURE

1. Remove from contaminated area.
2. Remove contaminated clothing immediately.
3. Wash with water for 15 minutes or longer (30 minutes for caustic exposures) avoiding harsh sprays.
4. Lay victim down.
5. Treat for shock.
6. Call for help.
7. Monitor pulse and respiration if unconscious.

APPENDIX J - TESTS FOR SUBSTANCES IN BIOLOGICAL FLUIDS

A. Tests for Specific Chemical:

1. Ethyl Ether (blood)
2. Acetone (urine, blood, breath)
3. Acetaldehyde (blood)
4. Thallium (urine)
5. Methanol (urine)
6. Mercuric chloride (mercury in urine)

B. Tests for Metabolite:

1. Benzene (urinary phenol)
2. Xylene (urinary methyl hippuric acid)
3. Toluene (urinary hippuric acid)
4. Pyridine (urinary metabolites)
5. Dimethyl Formamide (urinary methyl formamide)
6. Methylene Chloride (blood carbon monoxide)
7. Methanol (urinary formic acid)
8. Cyanides or acetonitrile (blood cyanide or urinary thiocyanate)
9. Aniline (blood methemoglobin or urinary para-aminophenol)
10. Orthotoluidine (blood methemoglobin)

APPENDIX K

CLANDESTINE LABORATORY SAFETY

APPENDIX K - CLANDESTINE LABORATORY SAFETY

Goals and Objectives

The safest possible investigation of clandestine laboratories is achieved by avoiding or reducing chemical exposure to known acceptable levels of risk. Safe clandestine laboratory investigations are accomplished through phased investigatory procedures, information gathering and evaluation, and proper selection and use of personal protective equipment.

Successful prosecution of illicit drug manufacturers and the safety of the Department of Law Enforcement personnel require a coordinated effort by the Bureau of Narcotics, the Bureau of Forensic Services, and the Bureau of Criminal Identification.

This policy is provided to all involved employees as required by OSHA regulations 1910.120(b).

Definitions

Bureau of Criminal Identification (BCI) - A bureau within the Department of Law Enforcement which is primarily responsible for state-wide telecommunications, criminal record-keeping, and latent print collection and identification.

Bureau of Forensic Services (BFS) - A bureau within the Department of Law Enforcement which identifies, collects, analyzes, and interprets physical evidence of criminal activity.

Bureau of Narcotics (IBN) - A bureau within the Department of Law Enforcement which enforces Idaho's Uniform Controlled Substances Act as authorized by Idaho Code 37-2740(4)(b).

Case Agent - A peace officer in charge of the investigation, and the person responsible for execution of the search warrant.

Clandestine Laboratory - An illicit operation consisting of a sufficient combination of apparatus and chemicals that either have been or could be used in the manufacture and/or synthesis of controlled substances.

Clandestine Laboratory Supervisor - The IBN Special Operations Supervisor is responsible for the clandestine laboratory program in IBN and acts as IBN's safety coordinator.

Clandestine Laboratory Safety

Criminalist - A BFS chemist, or Drug Enforcement Administration chemist who is trained in chemical and comparative analysis of physical evidence. Criminalists assigned to clandestine laboratory investigations have specialized training and/or experience in illicit drug manufacture.

Department of Law Enforcement (DLE) - An executive department of Idaho state government created under Idaho Code, Section 67-2901.

Hazard Appraisal Recognition Plan (HARP) - A pre-printed package of forms used to document information during the course of phased investigatory procedures.

Hazardous Waste Facility or Site - Any property, structure, or ancillary equipment intended or used for the transportation, treatment, storage, or disposal of hazardous wastes. Idaho Health and Safety Code 39-4403(9).

Health and Safety Code - That part of Idaho law administered by the Department of Health and Welfare. Title 39 Chapter 44 deals with Hazardous Waste Management.

Idaho Code (IC) - Specifically that part of Idaho law administered by the criminal justice system.

Industrial Hygienist - An individual trained in the practice of industrial safety including hazard recognition, measurement, evaluation, and methods of personal protection.

Lab Teams - Idaho Department of Law Enforcement, DEA, and local law enforcement personnel who have received all specialized training necessary to implement and follow the procedures and policies required by this chapter.

On-Call Industrial Hygienist - An individual employed by or contracted to

Health and Welfare to provide industrial hygiene information to lab teams.

Phased Investigatory Procedures - Discrete stages of an investigation with specific procedures that are completed in the following order: PLANNING, ENTRY, ASSESSMENT, AND PROCESSING.

Safety Officer - An IBN employee assigned specific unit safety related tasks in addition to other job duties.

Search Warrant - A written order, in the name of the State of Idaho, signed by a magistrate, judge, or justice directed to an officer or officers named therein, or other officer authorized by law to execute search warrants, directing the officer to search for and seize property or intangibles. IC 19-4401.

Clandestine Laboratory Safety

Site Safety Officer (SSO) - A lab team member assigned by the Case Agent to act as the safety officer for a particular clandestine laboratory investigation. This will frequently be a Special Agent-In-Charge.

Unit - An individual IBN section, office or facility having assigned personnel who use or maintain safety equipment utilized at clandestine laboratory site investigations.

IC 19-4408 Execution - A search warrant may be served by any of the officers mentioned in its directions, but no other person unless the officer requires assistance. The officer(s) named in the warrant must be present and act in its execution.

IC 19-4409 Service of Warrant/Breaking Open Doors - The officer may break open any outer or inner door or window of a house, or any part of a house, or any thing therein, to execute the warrant if, after notice of his authority and purpose, he is refused admittance.

IC 19-4411 Service of Warrant at Night - The magistrate must insert a direction in the warrant that it be served in the daytime. If the affidavits are positive that the property is on the person or in the place to be searched, the judge may insert that the warrant can be served at any time, day or night.

IC 19-4412 - Time for Executing Warrant - A search warrant must be executed and returned to the magistrate who issued it within ten (10) days after its date. Unless it is executed, the warrant is void after this time has expired.

IC 19-4413 Receipt for Property Taken - When the officer takes property under the warrant, he must give a receipt for that property to the person from whom it was taken or in whose possession it was found. The receipt must specify the property. If no person is present, the officer must leave a receipt in the place where he found the property.

NOTE The agent who applies for a search warrant should also obtain an order from the issuing judge authorizing the destruction of any toxic or dangerous chemicals, contaminated glassware, and equipment found at the site. This order may be included in the search warrant or may be a separate document.

Personnel Duties

1. Idaho Bureau of Narcotics (IBN)

   Safety Officer - Duties shall include, at least, these areas of clandestine laboratory concern:

   A. Performs minor maintenance of all personal protective equipment.

   B. Ensures that adequate supplies of disposable personal protective equipment are available.

   C. Conducts and documents monthly checks of personal protective equipment (rubber boots, respirators, raid gear, etc.) for defects.

   D. Makes recommendations to Clandestine Laboratory Supervisor involving safety.

   E. Acts as a "conduit" of safety information between unit employees and their respective bureaus.

   F. Reports and/or documents employee non-compliance of the instructions and procedures described in this manual. Non-compliance shall be reported to the Case Agent and employee's supervisor if it occurs in the "field". Non-compliance shall be documented and provided to the employee's supervisor if it occurs at the "office".

2. Case Agent

   A. Assigns and directs a Site Safety Officer for the particular investigation.

   B. Initiates and develops the PLANNING phase of the clandestine laboratory investigation.

C. Directs the ENTRY phase.

D. Assists the Criminalist(s) or chemist during the ASSESSMENT phase and directs the overall evidence gathering by clandestine laboratory response teams.

E. Ensures that the provisions of the manual are adhered to during the PLANNING, ENTRY, ASSESSMENT, and PROCESSING phases; and the disposal of contaminated wastes at the clandestine laboratory site.

G. Documents employee non-compliance to the instructions and procedures described in this manual as personally observed or reported by the Site Safety Officer. Attaches reports of employee non-compliance to the Hazard Appraisal Recognition Plan (HARP) that will be submitted to the Clandestine Laboratory Supervisor.

H. Assigns photographers who shall not photograph any clandestine laboratory site or storage facility containing clandestine laboratory apparatus or chemicals unless a Criminalist or chemist experienced in clandestine laboratory techniques as described in the Bureau of Forensic Services section is present.

3. Site Safety Officer

The Case Agent shall appoint one lab team member to act as a Site Safety Officer (SSO) for each clandestine laboratory raid. The duties of the SSO shall include:

A. Transports the monitoring equipment to the site.

B. Compiles HARP PLANNING documentation including pre-raid intelligence information, the emergency evacuation and medical treatment plan. Briefs involved personnel on all known hazards associated with the particular clandestine laboratory, prior to the service of a search warrant.

C. Continues compilation of HARP documentation subsequent to the ENTRY phase and briefs the ASSESSMENT Team of observations made during entry.

D. Ensures that at least one individual with full protective clothing and Self-Contained Breathing Apparatus (SCBA) is standing by and prepared to enter the scene in an emergency.

E. Coordinates and implements the emergency evacuation plan for the particular site in accordance with the written PLANNING phase. The SSO may modify the emergency evacuation and medical treatment plan after consultation with the Case Agent and the Criminalist.

F. Insures that emergency first aid equipment and replacement personal safety equipment are available for immediate use. This includes first aid kit, eye wash, respirator cartridges, protective clothing and decontamination gear.

G. Continues compilation of HARP documentation subsequent to the ASSESSMENT phase. Records chemicals and processes indicated at the site. Briefs the PROCESSING team and waste hauler with available chemical information.

H. Insures that the personnel using respirators (air-supplied or air-purified) have received training in the use of that equipment and that the equipment is being used in accordance with the investigatory phased procedures described in Personal Protective Equipment section. Reports employee (individual) refusal to follow prescribed protocol and/or use of personal protective equipment to the Case Agent. The SSO may document non-compliance if directed to by the Case Agent.

I. Insures that contaminated disposal equipment is provided to the waste hauler and that non-disposable equipment is decontaminated or packaged for transfer to another site for decontamination.

J. Directs all involved employees to comply with established decontamination procedures.

K. Continues compilation of HARP documentation during the evidence PROCESSING phase. The SSO should record unusual incidents, accidents or other relevant information called to his/her attention by the Case Agent, Criminalist, or other lab team personnel.

L. Subsequent to field investigations, insures that all original documentation for the Hazardous Appraisal and Recognition Plan (HARP) is completed and submitted to the Clandestine Laboratory Supervisor. **Only copies** of the general documentation (See Exposure Records and Recording section) are forwarded to the records section for participating units within IBN and BFS.

4. Bureau of Forensic Service (BFS)

A. Criminalist

1) A Bureau of Forensic Services Criminalist shall respond to a clandestine laboratory location. He/she shall be versed in chemical procedures, common synthetic processes for the region, and potential safety hazards associated with illicit drug manufacturing and the handling of chemical reagents.

2) The Criminalist shall coordinate with the Case Agent *and* the SSO before dismantling or sampling controlled substances and hazardous materials.

3) The Criminalist shall, in consultation with the Case Agent and/or the SSO, make evaluation of the health and safety hazards of the clandestine laboratory site and recommend downgrading from the ASSESSMENT phase to the PROCESSING

phase, including the selection of proper personal protective equipment and the necessary and appropriate chemical safety procedures to be used at the clandestine laboratory site.

5. Bureau of Criminal Identification (BCI)

A. Latent Print Examiner

1) If the situation warrants, the Latent Print Examiner shall be responsible for the processing of the clandestine laboratory scene for the latent prints during the PROCESSING phase.

2) The Latent Print Examiner shall not process any clandestine laboratory scene or storage facility unless a Criminalist or chemist experienced in clandestine laboratory techniques as described in the Bureau of Forensic Services section is present.

Personal Protective Equipment

Personal protective equipment shall be provided to the IBN lab team personnel. Equipment identified as the minimum level of protection for ENTRY and ASSESSMENT phases shall be provided and worn at all times during that phase. The PROCESSING phase may be "downgraded" from the requirement of the minimum level of protection as described in the paragraph below.

Respirators shall be worn by all personnel during the ASSESSMENT and PROCESSING phases whenever "bulk" or otherwise unprocessed chemicals are on site other than the small volume samples collected and stored as evidence. If and when the ASSESSMENT team determines that air purifying respirators are not necessary for the PROCESSING team, the logical basis for that conclusion shall be documented as part of the HARP.

Protective clothing shall be worn by all personnel handling, processing or physically near the area the chemicals are stored, being moved or processed. The test for the removal of protective clothing is: "If and when there is no

longer a potential of contact exposure as the result of accidental breakage, spillage or trace contamination from the site and personnel will never return into the lab".

All lab team members who may respond to clandestine laboratory investigations shall receive training on the use, limitations of use, maintenance and sanitation of respirators.

1. Clothing Restriction

   No synthetic clothing will be worn under the exposure suit by any personnel involved in a clandestine laboratory crime scene investigation, other than Nomex cover-alls.

2. Minimum Personal Safety Equipment for the ENTRY Team

   A. Eye protection:

      1) Non-vented, non-fogging goggle; or
      2) Plastic "flip-up/down" face shield.

   B. Nylon belt, holster, ammunition holders and handcuff cases.

   C. Law enforcement identification clothing patches.

   D. Emergency egress package with a minimum 5 minute escape air supply.

   E. Protective ballistic vests.

3. Optional Personal Safety Equipment for the ENTRY Team

   A. Hand protection: Gloves or chemical-resistant hand cream.

   B. Respiratory protection: Air-purifying respirators.

   C. Foot protection: Disposable boot covers with a tread sole bottom.

D. Body protection: Sarnex-coated tyvek material, full coverage cover-all suits.

E. Voice amplification communicator, if using respirators.

The Case Agent and Clandestine Laboratory Supervisor have the authority to require the use of one or more of the Optional Personal Safety Equipment items as needed in a particular raid.

4. Minimum Personal Safety Equipment for the ASSESSMENT Team

A. Self-contained breathing apparatus (SCBA).

B. Body protection: Sarnex-coated tyvek material, full coverage cover-all suits.

C. Foot protection:

1) Chemical resistant rubber boots; or

2) Disposable boot covers with a tread sole bottom.

D. Hand protection: Chemical-resistant neoprene or nitrile-coated gloves.

5. Optional Personal Safety Equipment for the ASSESSMENT Team

A. Voice-amplification communicator.

B. Nomex cover-alls worn under Sarnex exposure suits.

6. Minimum Personal Safety Equipment for the PROCESSING Team

A. Eye protection: Full face air purifying respirators.

B. Body protection: Sarnex coated tyvek material, full coverage cover-all suits.

C. Foot protection:

1) Chemical resistant rubber boots, or

2) Disposable boot covers with a tread sole bottom.

D. Hand protection: Chemical resistant neoprene or nitrile coated gloves.

E. Respiratory protection: Full-face air purifying respirators.

Securing of Clandestine Laboratory Crime Scene

1. Planning Responsibilities

While an IBN agent or local officer may have developed sufficient investigatory information for an enforcement action, the IBN lab team shall coordinate and/or oversee the enforcement aspects of the investigation.

A. This is the initial phase of a clandestine laboratory enforcement action. This phase specifically involves documenting intelligence information relating to chemical safety issues, development of the emergency evacuation and medical treatment plan, and the commensurate resource management and coordination of personnel and material.

B. The Case Agent has overall enforcement and chemical safety responsibility for responding personnel. The Case Agent shall coordinate service of the search warrant, notification of allied agencies, initiate HARP documentation, and insure participants are briefed regarding issues of safety and procedures.

2. ENTRY Team and Responsibilities

A. The entry team will be comprised of IBN agents and/or a combination of IBN and Federal/Local officers who are properly trained and equipped.

B. To secure the clandestine laboratory scene, arrest and remove suspects to an uncontaminated location.

C. To report any scene observations that were made during the 3-5 minutes of ENTRY regarding chemicals, processing equipment, stages of process, odors, etc. to the SSO for documentation, evaluation, and to appraise the ASSESSMENT team of conditions.

D. Personal protective safety equipment should not hamper mobility, restrict or reduce breathing efficiency, speech, or reduce dexterity needed for effective firearm usage. The choice of personal safety equipment shall be made based on individualized case information. Minimum protective eye and body equipment (goggles and exposure suits with police identification patches and boot covers), and an escape egress package shall be worn.

E. If a local agency SWAT or DLE CRT Team is used for ENTRY, the Case Agent and SSO shall debrief the team members for the information described in "C" above.

3. <u>ASSESSMENT Team and Responsibilities</u>

A. The ASSESSMENT team will be comprised of one qualified Criminalist or chemist and one agent (preferably the Case Agent).

B. To determine the explosivity limits, common toxic gases or vapors, and the oxygen levels by utilizing an explosivity/oxygen meter and sampling detector tubes. And, to report measured levels of gases monitored to the SSO.

C. To deactivate and ventilate the laboratory as needed.

D. To inform the SSO (and the Case Agent if he/she was not part of the ASSESSMENT team) of all known chemicals and observed hazards associated with the clandestine laboratory

scene.

E. To determine when the evidence PROCESSING team may begin. To select the appropriate air purifying cartridge for use by the PROCESSING team if chemicals are on site.

F. To determine when the minimum level of personal protective equipment for the PROCESSING phase may be further reduced and to document the logic for that further reduction.

PROCESSING team responsibilities are detailed in the Evidence Handling and Storage Procedures section.

Laboratory Dismantling Procedures

1. Dismantling is intended to be part of the PROCESSING phase. The ASSESSMENT team shall attempt to reduce chemical vapor levels by deactivating active chemical synthesis processes and ventilation.

2. Photographs of the inside of the clandestine laboratory site should be taken prior to dismantling. If the site cannot be "downgraded" in the use of personal safety equipment from SCBA to air-purifying respirators, photographs shall be taken by the ASSESSMENT team.

3. Necessary items of evidence shall be removed to a well ventilated area for photography and latent print examination if the laboratory environment cannot be "downgraded" to the use of air-purifying respirators.

4. Dismantling the chemical synthesis process shall be done at the direction of the Criminalist or chemist.

Evidence Handling and Storage Procedures

1. Processing Team and Responsibilities

A. The PROCESSING team is comprised of lab team personnel who have been trained in the use of respirators. Because use

of SCBA equipment increases metabolic stress, and the duration of this investigatory phase averages between 8-13 hours, air-purifying respirators are intended to be used after the ASSESSMENT phase whenever possible.

B. To identify, document and collect evidence of criminal activity.

2. Handling and Storage Procedures

A. The Criminalist(s) or chemist(s) shall be responsible for sampling controlled substances and hazardous chemicals.

1. All sampling shall be conducted under environmental conditions conducive to safety and with adequate personal protection against toxic exposure.

2. Under no circumstances shall lab team personnel use the sense of smell to identify hazardous materials during ASSESSMENT and PROCESSING phases.

3. Samples shall be placed in suitable sealed containers (such as glass bottles with teflon-lined caps) and sealed in impervious containers (such as Kapak bags). All containers will be labeled with "Hazardous Evidence" warning stickers.

B. Photographs shall be taken of all samples with the original containers and numbered as such for evidence.

C. All chemically contaminated evidence shall be sealed in Kapak bags at the scene and marked with **CAUTION/WARNING** labels (i.e., Hazardous Material, Clandestine Laboratory Evidence, etc.).

D. Chemically contaminated evidence shall not be transported in the passenger compartment of a vehicle, stored in an "evidence vault" or submitted as evidence for analysis unless sealed in Kapak bags.

E. Latent Print Examiners shall not process any contaminated surfaces or items that are covered with residue. Latent Print Examiners should not process any leaking containers or any open containers which do not have a secured lid.

F. All latent print lift cards or any other items to be submitted to the latent print laboratory shall be sealed in Kapak bags or other appropriate containers at the scene.

G. Photographs shall be taken of any evidence items to be removed from the laboratory scene.

H. Photographs should be taken of any item from which latent prints were lifted.

Air Monitoring Equipment

Air monitoring equipment shall consist of two separate instruments. First, a combination meter capable of detecting and warning of explosive levels of organic vapors and providing a quantitative measurement of oxygen. The second instrument is a hand-held pump with selected sample tubes for detection and quantitative measurement of specific vaporous chemicals.

Exposure Records and Reporting (See Appendix I - Report Forms)

1. Site General Documentation

Site General Documentation is provided via the written Hazard Appraisal and Recognition Plan (HARP) which provides a chronological compilation of hazardous and chemical information as it is developed through the course of the investigation.

The HARP lists the chemical process believed to be possible or operational, names of chemicals found, quantitative measurements from monitoring and the logical basis for any variations in the level of personal protective equipment defined by this manual of instruction and procedures. The HARP also includes written documentation of unusual incidents, and employee safety concerns and resolution.

HARP documentation serves two primary purposes. First, it provides generalized chemical information that may be provided to Health and Welfare to assist them in a determination of designating the clandestine laboratory site as hazardous waste property. Secondly, it documents the employee's work duties for the particular site. The information may become useful for future medical evaluation and/or epidemiologic research.

A HARP documentation package shall be generated for each clandestine laboratory investigation. The original HARP documentation shall be maintained in the case file. Send a copy to the Clandestine Laboratory Supervisor. Because the HARP documentation contains on-site chemical information and identifies employees involved in the particular investigatory phase, the completed packages shall be maintained for the length of employment of the employees plus 30 years. The employee shall have full access to his/her Site Specific Information (defined immediately below) and the generalized HARP information.

2. Site Specific Information

Site Specific Information is provided via the Clandestine Laboratory Exposure Report (CLER). A CLER is completed for each laboratory entered. IC Form 1 SIF, Notice of any incidents of exposures to chemical vapors or physical body (tissue) contact which results in perceived or observed abnormal health reactions. Without perceived or observed abnormal health reactions, there is no specific need to complete the IC Form 1 SIF. Both forms are submitted to the Special Agent-In-Charge.

A. The CLER shall be completed by the SSO in the field. The Case Agent shall attempt to verify the actual basis of the conditions that resulted in the chemical exposure, or to report the conditions as he/she knew them to be, and to co-sign the report. The role of the SSO and Case Agent is fact-finding and reporting information as accurately as possible.

1) If significant abnormal health reactions occur in the field

that require the attention of a physician, a CLER shall be completed and provided to the attending physician as information. The physician may retain a copy of the CLER as part of the patient's medical records. The original CLER shall be provided to the employee's supervisor to help complete the IC Form 1 SIF.

2) If significant abnormal health reactions occur in the office after the field investigation, both reports (CLER and IC Form 1 SIF) shall be completed by the employee's supervisor. Information regarding the extent of an injury and its cause is the responsibility of the supervisor who may interview the injured employee or any other witnesses, if any.

B. IC Form 1 SIF, Notice of Injury and Claim for Benefits is the statewide application for any occupational injury or illness or other serious injury. It is completed by the employee and submitted to the Special Agent-In-Charge.

C. Forward exposure reports (CLER and IC Form 1 SIF) to the Clandestine Laboratory Supervisor. Where exposure is believed to have occurred, CLERs that have not been reviewed and co-signed by the Case Agent will be returned to he Case Agent for verification of the reported factual basis. Exposure reports are reviewed by the Clandestine Laboratory Supervisor to determine if the reported exposures were preventable, and to recommend action, as necessary, to avoid future similar exposures. A copy of the CLER is attached to and remains part of the original HARP documentation package. All information (name, social security number, addresses, etc.) that identifies the exposed employee shall be removed from the copy of the CLER before inclusion as part of the HARP documentation.

D. Original exposure reports (CLER And IC Form 1 SIF) shall be forwarded to the Clandestine Laboratory Supervisor, then to the DLE Administrative Services Division, Personnel Section for

processing and storage.

3. Sick Leave Reporting and Prompt Medical Treatment

The PLANNING phase of the investigation details specific procedures for prompt medical attention in the field. However, by the nature of some chemical exposures, delayed effects may be felt or observed several days after initial exposure. In the office, the employee's supervisor is responsible for assuring prompt medical treatment and the reporting of sick leave.

A. If abnormal health effects are reported or observed at the employee's unit subsequent to field operations, the employee's supervisor shall authorize sick leave. Refer to Department Policy #87-308 for the Worker's Compensation concerning leave and finances.

B. If the employee(s) believes that the illness resulted from a prior chemical exposure at a clandestine laboratory investigation and requests a medical examination or treatment, the supervisor shall determine if the employee wishes to be seen by his/her designated physician or the departmentally-contracted physician.

1) If the departmentally-contracted physician is selected, the supervisor shall immediately advise the clandestine Laboratory Supervisor to arrange for the examination.

2) If the employee elects to be seen by his/her personal physician, the supervisor shall insure that the physician is provided with the following documents:

a) A copy of the CLER prepared by the supervisor.

b) A copy of this Clandestine Laboratory Policy.

c) Send the Medical Test Results (defined in the Medical Test Results section to:

d) An employee selecting to use a personal physician shall make full payment of all associated medical costs. The employee shall forward all medical bills to the DLE Personnel Section.

3) If the supervisor determines that the employee's medical need requires urgent medical care, he/she shall obtain transportation for the employee(s).

4. Medical Test Results

Detailed test results are confidential and privileged between the employee and the medical staff. Federal regulations [29 CFR Part 1910.120(f)] require the employer to obtain and furnish the employee with a copy of a written opinion from the examining physician containing the following:

A. The results of the medical examination and tests.

B. The physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health.

C. The physician's recommended limitations upon the employee's assigned work.

D. A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further examination or treatment.

A copy of the written physician's opinion sent directly to the Personnel office by the employee's personal or urgent care physician shall be provided to the employee's bureau safety coordinator who shall provide the copy to the employee.

5. The Official Toxic Exposure Record

The Official Toxic Exposure Record is a separate and distinguishable record folder from the employee's official personnel record folder. The employee's official toxic exposure record is a folder containing restricted access information, for individual employee, that is managed and maintained by the DLE Administrative Services Division, Personnel Section. The folder shall include at least the following information:

A. Name and social security number of the employee.

B. Original documentation of site specific exposure information.

C. Original physician's written opinions.

D. A copy of this Clandestine Laboratory Policy.

Hazardous Waste Disposal

1. All chemicals not retained as evidence and other toxic waste shall be packaged, hauled, and stored by a licensed hazardous waste hauler in accordance with all applicable federal, state and local regulations, i.e., U.S. Toxic Substances Control Act, and Idaho Code, Title 39, Chapter 44 and Title 49, Chapter 25.

2. All Hazardous materials and disposable equipment including protective clothing, respirator cartridges, used sampling tubes, fingerprint brushes and powder shall be provided to the waste hauler at the site.

3. Non-disposable equipment should be decontaminated at the site. Waste water will be provided to the waste hauler. Equipment items that cannot be decontaminated at the site shall be placed in a plastic bag and sealed. Decontamination shall be performed by the user of the equipment as soon as possible.

4. A contracted hazardous waste hauler shall be notified as soon as possible as to the type of clandestine laboratory and the amount and

nature of hazardous waste to be disposed.

5. The Case Agent shall assign a special agent to maintain scene security and the personal protection of non-employees until all items to be disposed of are packaged and the waste hauler is ready to leave the crime scene.

Assisting Other Agencies

This policy provides for a coordinated response by IBN and BFS to meet the needs of law enforcement agencies in the safe investigation and handling of clandestine laboratories. When assisting local and/or federal agencies, the policies and procedures set forth in this manual shall be strictly adhered to by all Idaho DLE personnel.

Law Enforcement requests for BFS and/or BCI services **only** shall be addressed as follows:

1. BCI latent print examiners may respond to local and/or federal law enforcement agency requests for assistance, where a DEA-chemist or non-BFS Criminalist has been asked to participate, without referral or notification to the regional IBN lab team. The agency requesting latent print assistance shall be informed that all "field" operational requirements in Sections 5.3.3 and 5.7.2 of this policy shall be followed, and that any variation from this protocol is cause to halt any processing and return to the "home" office.

2. BFS employees are specifically directed **not** to provide "field" instruction, personal safety equipment or advice that would reduce or substitute the requirements of this policy such that "field" operations could continue. Local law enforcement agencies requesting assistance from BFS criminalistic laboratories shall be referred to the regional IBN lab team. It is the responsibility of the local and/or federal agency to be conversant with and adhere to this requirements in this policy.

Notification of Toxic Waste Hazards

1. Written notification to responsible parties for potential nuisance abatement (clean-up) shall be provided by the Special Agent Supervisor who has regional jurisdiction over the clandestine laboratory investigation. The communication shall notify parties of:

   A. The criminal investigation and subsequent enforcement action.

   B. Observations made incident to the enforcement actions "indicating the transfer, storage and/or disposal of hazardous chemicals" at the investigation site.

   C. Governmental seizure and removal of "bulk" chemicals and other hazardous materials has occurred.

   D. Because there may still be significant chemical contamination at the property, copies of this notification are being sent to local and/or state authorities concerned with environmental toxic contaminations.

   - If the investigation site is on privately owned land, the notification letter shall be addressed to the property owner on record and copies sent to the local County Commissioners and the local Health District. Local authorities must be notified within 72 hours.

   - If the investigation site is on public land owned by a city, county, or state agency, the notification letter shall be addressed to the Department of Health and Welfare. Copies of the notification letter shall be sent to local County Commissioners and the local Health District.

   - If the investigation site is on privately owned land where there is reasonable cause to believe that chemical contamination has occurred onto adjoining privately owned property, through a public sewage system or onto public land, the notification letter shall be addressed to the property owner of record where the source of chemical contamination originated. Copies will be sent to the local County Commissioners, the local Health

District and the Department of Health and Welfare.

- Notification must be sent to the Director's Office at the appropriate local Health District office:

Boundary, Bonner, Kootenai, Benewah, and Shoshone counties:

Health District I
2195 Ironwood Court
Coeur d'Alene, Idaho 83814

Latah, Clearwater, Nez Perce, Lewis, and Idaho counties:

Health District II
1221 F Street
Lewiston, Idaho 83501

Adams, Washington, Payette, Gem, Canyon, and Owyhee counties:

Health District III
920 Main, P.O. Box 489
Caldwell, Idaho 83606-0489

Valley, Boise, Ada, and Elmore counties:

Health District IV
1445 North Orchard
Boise, Idaho 83706

Camas, Blaine, Gooding, Lincoln, Jerome, Minidoka, Twin Falls, and Cassia counties:

Health District V
324 2nd Street East
P.O. Box 547
Twin Falls, Idaho 83303-0547

Power, Oneida, Bannock, Franklin, Caribou, Bear Lake, Bingham, and Butte counties:

Health District VI
465 Memorial Drive
Pocatello, Idaho 83201

Lemhi, Custer, Clark, Jefferson, Bonneville, Teton, Madison, and Fremont counties:

Health District VII
254 E Street
Idaho Falls, Idaho 83402

Prisoner Handling

1. The following personal protective safety equipment shall be provided to a suspect in the event the clothing is deemed to have been contaminated:

   A. Paper coverall suits.
   B. Paper booties.

2. Correctional facility and transporting officers shall be notified of any prisoners who are contaminated.

   A. Decontaminate suspects in the field, if possible.

Medical Surveillance

Medical surveillance is a departmentally-sponsored program in which employees will participate. Three services are provided:

1. The basic medical service or "base-line" includes a review of the patient's medical history and chemical testing of blood and urine to establish clinical parameters that can be monitored through time for abnormal variation. Blood and urine testing is performed yearly.

2. The determination of respiratory fitness is a medical evaluation that is performed yearly.

3. A personal examination by the departmentally contracted physician(s) may be requested by the employer and/or employee upon failure of "base-line" respiratory fitness determination or subsequent to field chemical exposure.

Training

1. Department and local agency personnel assigned to clandestine laboratory investigations shall be provided training in:

   A. Hazard recognition.
   B. Clandestine Laboratory Manual of Instruction and Procedure.
   C. HARP documentation.

2. Training shall be provided through a coordinated effort between IBN and BFS technical experts, Support Services Bureau, and the Drug Enforcement Administration.

3. Specialized training in the use of monitoring equipment shall be provided to employees assigned to the ASSESSMENT team.

EXPECTED YIELDS FROM CHEMICALS FOUND IN LABORATORIES

PHENCYCLIDINE

Chemical	Quantity	PCP Base (Juice)	PCP HCL (Dust)
Cyclohexanone	1 gallon	11.5 pounds	13.2 pounds
Piperidine	1 gallon	3.5 pounds	3.96 pounds
Monobromobenzene	1 gallon	2.5 pounds	2.9 pounds
Cyanide Salt	1 pound	2.1 pounds	2.2 pounds
Magnesium Metal	1 pound	7.4 pounds	8.5 pounds
PCC	1 pound	1.2 pounds	1.4 pounds

(75%/75% yield scheme)

AMPHETAMINE AND METHAMPHETAMINE

Chemical	Quantity	Amphetamine	Methamphetamine
Phenylacetic Acid	1 pound	0.95 pounds	0.76 pounds
P-2-P	1 pound	1.3 pounds	1.1 pounds
Methylamine	1 pint	0	1.0 pounds
Benzyl Chloride	1 pint	1.1 pounds	0.8 pounds
Acetonitrile	1 pint	3.4 pounds	2.7 pounds
Acetaldehyde	1 pint	3.1 pounds	2.4 pounds
Formamide	1 pound	0	0
Ephedrine	1 pound	0	0.8 pounds
Hydriodic Acid	1 gallon	0	2 pounds
Red Phosphorous	330 grams	0	1 pound
Thionyl Chloride	1 gallon	0	1.65 pounds

MDA

Chemical	Quantity	Product
Isosafrole	1 pound	0.8 pounds
Formamide	1 pint	3.1 pounds
Piperonal	1 pint	0.9 pounds
Ammonium Acetate	1 pound	1.7 pounds

MESCALINE*

Chemical	Quantity	Product

Gallic Acid	1 pound	0.2 pounds
Dimethyl Sulfide	1 pound	0.3 pounds

*The synthesis route for the manufacture of Mescaline is difficult and not very yield effective. Amount based on a final yield from starting material of 15%.

PRECURSORS
LIMITED OR NO LEGITIMATE USE IN INDUSTRY - NO LEGITIMATE HOME/HOBBY USE

Chemical	Description	Packaging	Hazards
Ephedrine	White crystalline material. No odor.	Fiber drums or bags.	Toxic.
Phenyl-2-Propanone	Colorless to yellow oily liquid. Characteristic odor.	Any liquid holding container.	Toxic.
Phenylacetic Acid	White crystals/dissolved liquid. Pungent vinegar/nauseating odor.	Any type of container.	Toxic, irritating.
Benzyl Cyanide	Clear oily liquid or crystals. Occasional faint almond or aromatic odor.	Bottles or cans.	Highly toxic.
Piperidine	Colorless, watery liquid. Pepper-like odor.	Small bottles or cans.	Toxic, irritating.

REAGENTS/SOLVENTS
COMMON AND LEGITIMATE USE IN INDUSTRY - MAY HAVE LEGITIMATE HOME/HOBBY USE

Chemical	Description	Packaging	Hazards
Perchloroethylene	Carpet cleaner. Fabric spot remover.	Small cans only.	Toxic, combustible.
Hydrochloric acid	Pool chlorine, tile wash.	1 gallon plastic jugs.	Corrosive.
Sodium hydroxide	Sink/toilet bowl drain cleaner.	Small cans only.	Corrosive.
Methanol	Model airplane fuel, parts cleaner, fuel additive.	Small cans only.	Flammable, toxic.
Isopropyl alcohol	Antiseptic (rubbing alcohol).	Small poly bottles.	Flammable, toxic.
Ethyl ether	Engine starting fluid, carburetor cleaner.	Small aerosol cans only.	Explosive, flammable, toxic.
Acetone	Solvent and cleaner.	Small cans only.	Flammable, toxic.
Petroleum ether	Paint and varnish solvent.	1 gallon or 1 pint cans.	Flammable, toxic.

REAGENTS/SOLVENTS
NO LEGITIMATE HOME/HOBBY USE

Chemical	Description	Packaging	Hazards
ed Phosphorous	Red powder; no odor.	Cans, drums or bags.	Reactive
Hydriodic acid	Red/yellow liquid; intensely irritating vapors.	Amber or clear bottles. 1 to 5 gallon poly containers.	Highly corrosive; Highly toxic
Hydrogen chloride gas	Colorless gas; intensely irritating.	Small lecture size to free-standing compressed gas cylinders.	Corrosive
Thionyl chloride	Yellow to red fuming liquid; intensely irritating vapors.	1 pint amber glass bottle.	Corrosive; Irritating Toxic
Acids (Hydrochloric, Sulfuric, Acetic, Nitric, Phosphoric, or Perchloric)	Usually clear liquids; intensely irritating odor.	Gallon clear glass bottles.	Corrosive
Chloroform	Colorless liquid; sweet odor.	Usually 1 gallon or 1 pint amber bottles.	Toxic; Flammable
Palladium black	Black powder; no odor.	Small air tight cans.	Reactive Highly Toxic
Mercuric chloride	White powder; no odor.	Small jars, bottles or cans.	Toxic; Flammable
omatic solvents (Benzene, Toluene)	Clear, water liquids. Characteristic solvent odor; slightly sweet.	1 gallon or 1 pint amber bottles.	Highly Toxic
Acetic anhydride	Clear, water liquid; intensely pungent; irritating vinegar odor.	1 gallon clear glass bottles.	Reactive
Sodium metal	Grey, white soft metal. Small pieces, chunks or bricks.	In kerosene or diesel fuel.	Reactive Reactive; Toxic
Magnesium turnings	Dull to shiny metal shavings.	Small jars or cans.	
Lithium aluminum hydride	White powder; no odor.	Small bottles or water tight cans.	Highly Toxic Highly Toxic
Nitroethane	Clear liquid; irritating odor.	Bottles or small caps.	Toxic
Lead acetate	White powder; no odor.	Bottles or small caps.	
Cyanide salt (Sodium or Potassium cyanide)	White crystals or lumps; no odor.	Small bottles to 5 gallon cans.	Flammable; Toxic Corrosive; Toxic
Cyclohexanone	White to pale yellow liquid; peppermint odor.	1 gallon glass bottles to 5 gallon cans.	
Bromobenzene	Clear, heavy liquid; pungent odor.	Usually 1 gallon glass bottles to 5 gallon cans.	Toxic; Reactive
Raney nickel	Dark grey powder or crystal; no odor.	Small bottles/air tight cans.	

Clandestine Laboratory Safety

READ BEFORE USE

The following table lists various clandestine laboratory production methods and specific chemicals, equipment and hazards that are characteristically associated with each type.

WARNING: This table does not list all lab types that may be encountered.

WARNING: This table does not list all chemicals or hazards associated with each production table.

CAUTION: The purpose of this table is to provide a quick reference for field investigative personnel to help in the determination of a laboratory production method and associated hazards, based on observations of chemicals and equipment characteristic to that production method.

LAB TYPE IDENTIFICATION TABLE

Lab Type	Characteristic Chemical	Characteristic Equipment	Characteristic Hazards
METHAMPHETAMINE PRODUCTION			
Hydriodic Acid Method	Hydriodic Acid	Triple neck flask	Acutely corrosive and toxic atmosphere.
	Hydrogen Chloride gas	Heat source	Flammable, explosive, 0_2 deficient atmosphere.
	Red Phosphorous	Reflux column	
	Exposure to phosphine gas.		
Thionyl Chloride Method	Thionyl chloride	Round bottom flask	Acutely corrosive atmosphere.
	Hydrogen gas	Vacuum filtration	Catalyst induced explosions.
	Palladium black	Pressure vessel (hydrogenator)	Flammable atmospheres.
Phenyl-2-Propanone Method	Phenyl-2-Propanone	Triple neck flask	Flammable, explosive atmospheres.
	Aluminum foil	Heat source	Acute toxic chemical exposure.
	Mercuric chloride	Condenser column	Acutely corrosive atmospheres.
PHENYL-2-PROPANONE PRODUCTION			
Phenyl Acetic Acid Method	Phenyl acetic acid	Triple neck flask	Flammable atmosphere.
	Acetic anhydride	Heat source	Acute toxic chemical exposure.
	Sodium acetate	Condenser column	May involve exposure to suspect carcinogens.
Benzyl Cyanide Method	Benzyl cyanide	Flask (reactor vessel)	Waste reactive metal (fire, explosion).
	Sodium metal	Vacuum filtration	Flammable atmospheres.
	Ethyl acetate	Ice bath	Acutely corrosive atmospheres.
			Exposure to ammonia.
Benzaldehyde Method	Benzaldehyde	Flask, container or buckets	Flammable and explosive atmosphere.
	Nitroethane	Filtration	Exposure to strong corrosives.
	Iron fillings	Heat source	Exposure to highly toxic amine compounds.
			Exposure to suspect carcinogen.
Lead Acetate Method	Lead acetate	Flask	Exposure to suspect carcinogen.
		Distillation columns	
		Heat source	
PHENYLACETIC ACID PRODUCTION			
Benzyl Cyanide Method	Benzyl cyanide	Round bottom flask	Exposure to hydrogen cyanide gas.
	Sulfuric acid	Reflux column	Acutely corrosive atmosphere.
		Filtration	Exposure to toxic substances.
BENZYL CYANIDE PRODUCTION			
Benzyl Chloride Method	Benzyl chloride	Round bottom flask	Exposure to cyanide.
	Cyanide salt	Filtration	Flammable atmosphere.

) PRODUCTION

PCC/Grignard Method	Magnesium turnings Cyanide salt Bromobenzene	Buckets Stirrers	Water reactive metal (fire, explosion). Exposure to cyanide and hydrogen cyanide gas. Acute flammable, explosive atmosphere.

INTEGRITY CHECKS

Signs and Symptoms of Chemical Exposure and Heat Stress Which Indicate Potential Medical Emergencies

Type of Hazard	Signs and Symptoms
Chemical Hazard	Behavioral changes Breathing difficulties Changes in complexion or skin color Coordination difficulties Coughing Dizziness Drooling Diarrhea Fatigue and/or weakness Irritability Irritation of eyes, nose, respiratory tract, skin, or throat. Headache Light-headiness Nausea Sneezing Sweating Tearing Tightness in the chest
Heat Exhaustion	Clammy skin Confusion Dizziness Fainting Heat rash Light-headiness Nausea Profuse sweating Slurred speech Weak pulse
Heat Stroke (May be Fatal)	Confusion Convulsions Hot skin, high temperature (yet may feel chilled) Incoherent speech Staggering gait Unconsciousness

Signs: You can observe conditions in another person.
Symptoms: Experienced by victim but not observable by others.
Integrity Checks: Co-workers routinely "checking" on each other during an operation.
Warning: Some signs and symptoms may not be observed or recognized by the victim. Therefore, the victim becomes dependent on his/her buddy for help.

TESTS FOR SUBSTANCES IN BIOLOGICAL FLUIDS

A. Tests for Specific Chemical:

1. Ethyl Ether (blood)
2. Acetone (urine, blood, breath)
3. Acetaldehyde (blood)
4. Thallium (urine)
5. Methanol (urine)
6. Mercuric chloride (mercury in urine)

B. Tests for Metabolite:

1. Benzene (urinary phenol)
2. Xylene (urinary methyl hippuric acid)
3. Toluene (urinary hippuric acid)
4. Pyridine (urinary metabolites)
5. Dimethyl Formamide (urinary methyl formamide)
6. Methylene Chloride (blood carbon monoxide)
7. Methanol (urinary formic acid)
8. Cyanides or acetonitrile (blood cyanide or urinary thiocyanate)
9. Aniline (blood methemoglobin or urinary para-aminophenol)
10. Orthotoluidine (blood methemoglobin)

PSD-52 HAZARD ASSESSMENT AND RECOGNITION PLAN *(INSTRUCTIONS)*

GENERAL: Prepare an Original for retention in case file. Copy for IBN-HQ. Complete legibly by hand.

SECTION INSTRUCTIONS:

SECTION A – FILE INFORMATION – Self-explanatory.

SECTION B – LABORATORY TYPE AND HAZARDS

Laboratory Type. Check the appropriate box for known or suspected lab type. Write in the production method if known or suspected (example: methamphetamine via red phosphorus/hydriodic acid).

Potential Chemical Hazards. Check all boxes indicating known or suspected hazards. List any specific high hazard chemicals known or suspected of being present (example: ether, thionyl chloride, red phosphorus, etc.).

Other Potential Hazards. Check all boxes indicating known or suspected hazards. List any other hazards known or suspected of being present (example: low overhead, unstable container storage, booby traps, etc.).

SECTION C – SITE DESCRIPTION

Laboratory Address. Self-explanatory.

Site Location and Description. Description and location of lab at the address. (example: detached garage 10 yards from house, outside storage shed near rear door of main building).

Structure Description. Physical description, i.e., size, shape, type, condition, etc., (example: 10 x 10 wood barn, no windows; small warehouse, fire damaged with opposing roll up doors).

Weather Conditions. Enter the best estimate of conditions at anticipated time of entry/seizure.

Estimated Time. Enter the estimated duration of each phase of the lab seizure (entry, assessment, processing).

Estimated Lab Size. Check appropriate box based on best estimate of size.

SECTION D – OTHER AGENCY FIELD SUPPORT – Self-explanatory.

SECTION E – TEAM MEMBER ASSIGNMENTS – Self-explanatory.

SECTION F – EQUIPMENT CHECKLIST – Check inventory of safety equipment available for use at lab site. List any additional equipment needed.

SECTION G – STAGES OF RAID – For each stage of the raid note the following information:

Primary Hazard: Example: Flammable atmosphere, cyanide gas, etc.

Duration: The actual time of work. (example: assessment – 15 minutes).

Personnel: Enter the numbers corresponding to team members in Section C.

Level of Protection: Write in the letter designation. Example: "B" (i.e., Level B Protection).

Equipment Requirements: For each stage of the raid, mark all required (R) and standby (S) equipment specified by the Site Safety Officer. (Example: Entry – SCBA (S); Nomex Suit (R); Field Boots (R); Goggles (R)).

SECTION H – INVENTORY OF EQUIPMENT USED. List the total number of disposable items used at the conclusion of the raid. (Example: tyvek suit – 8).

SECTION I – HAZARD ASSESSMENT FINDINGS. During initial assessment, measure and record findings as indicated.

LEL – (lower explosive level), (example: 1%, 15%, etc.)

% Oxygen – (percent oxygen), (example: 21%, 18%, etc.)

PPM – (parts per million), (example: 100 ppm, 350 ppm)

Location in the lab – Describe each location where a series of three measurements were taken (Example: front door; southeast corner of bathroom, etc.).

Air-Sampling Tubes – See the Clandestine Laboratory Hazard Assessment Protection Guide (CLHAP) to determine which sampling tubes to use/test.

Check name of each tube to be used/tested.

After the Test, circle + for color change, and circle — for no color change.

Describe color change. (example: dark brown, etc.)

Record the ppm level calculated following the manufacturer's instructions for each individual tube.

Write in the conversion factor if listed in the CLHAP Guide for the individual sampling tubes specified by lab type and production method. (example: 2, 3, 4)

Calculate an adjusted reading, i.e., ppm x conversion factor, (example: 100 ppm x 2 = 200 ppm)

Compare the adjusted reading to the maximum value listed in the CLHAP Guide for individual sampling tubes specified by lab type and production method.

SECTION J – COMMENTS. Include new hazards observed, injuries/near misses, equipment failures, recommendations, etc.

HAZARD ASSESSMENT AND RECOGNITION PLAN

A. FILE INFORMATION

BUREAU	REGION	DATE SEIZED	CASE NO.

SITE SAFETY OFFICER (Name) | AFFILIATION (If other than DLE, enter Agency name)

CHEMIST (Name) | AFFILIATION (If other than DLE, enter Agency name)

B. LABORATORY TYPE AND HAZARDS

LABORATORY TYPE (Check)

- ☐ Methamphetamine
- ☐ Amphetamine
- ☐ Cocaine
- ☐ Fentanyl
- ☐ P2P
- ☐ PCP
- ☐ LSD
- ☐ Other (Specify)

Production Method: _____

POTENTIAL CHEMICAL HAZARDS (Check)

- ☐ Respiratory Tox.
- ☐ Flammables
- ☐ Systemic Tox.
- ☐ Explosives
- ☐ External Tox.
- ☐ Oxidizers
- ☐ Carcinogens
- ☐ Pyrophorics
- ☐ Corosives
- ☐ Water Reactives

Specific High Hazard Chemical:

OTHER POTENTIAL HAZARDS (Check)

- ☐ Comp. Gas Cylinder
- ☐ Slip/Trip/Fall Hazard
- ☐ Heat Stress
- ☐ Electrical Shock
- ☐ Cold Stress
- ☐ Burn Hazard
- ☐ Confined Space
- ☐ Leaking containers
- ☐ Limited Egress
- ☐ Damaged Structure
- ☐ Poor Visibility
- ☐ Excavation

Other:

C. SITE DESCRIPTION

LAB ADDRESS

SITE LOCATION & DESCRIPTION

STRUCTURE DESCRIPTION

WEATHER CONDITIONS:

Wind Direction & Velocity | Temperature | ____ Rain ____ Snow | Humidity

ESTIMATED TIME:

____ Sec./Min. | Assessment ____ Min./Hr. | Processing ____ Min./Hr.

ESTIMATED LAB SIZE

____ Small ____ Med. ____ Large

D. OTHER AGENCY FIELD SUPPORT

FIELD SUPPORT	NAME (Include jurisdiction by City, State or County)	TELEPHONE NUMBER	STANDBY LOCATION	OFFICIAL CONTACTED (Name)	NOTIFIED Date / Time
Fire Dept.		( ) —			/
Ambulance		( ) —			/
Medivac Helicopter		( ) —			/
Health Dept.		( ) —			/
Hospital Emergency Room		( ) —	Address		/
Disposal Company		( ) —			/
Other		( ) —			/

E. TEAM MEMBER ASSIGNMENTS

TEAM MEMBERS (Include Name, Affiliation & check Assignment box: E = Entry, A = Assessment, P = Processing)	E	A	P	TEAM MEMBERS (Include Name, Affiliation & check Assignment box: E = Entry, A = Assessment, P = Processing)	E	A	P
1.				6.			
2.				7.			
3.				8.			
4.				9.			
5.				10.			

CLANDESTINE LABORATORY EXPOSURE REPORT

DLE personnel who have entered a clandestine laboratory will submit the original of this form (front and back completed) for each laboratory entered. This form will be submitted within 5 days after laboratory raid completion to: Safety Manager, IBN Headquarters.

EMPLOYEE INFORMATION	NAME (Last, First, Middle Initial)		DATE OF BIRTH
	DIVISION and OFFICE	LABORATORY	JOB SERIES
INCIDENT DATA	DATE OF LABORATORY RAID	CASE NO./OTHER AGENCY NO.	
	TYPE OF DRUG LABORATORY (Methamphetamine, LSD, PCP, Cocaine conversion, etc.)		
LAB ASSESSMENT	RESULTS OF SAMPLING TUBES (Hydrocarbons, Cyanide, etc.)	RESULTS OF GASTECH 1314 _____ % oxygen _____ % combustible gases	
	PERSONAL PROTECTIVE EQUIPMENT USED FOR EACH ACTIVITY LISTED (Nomex suit, gloves, boots, etc.) A. Undercover	B. Entry	
	C. Assessment	D. Evidence Collection	
	E. Disposal	F. After Raid Completion	
MEDICAL TREATMENT	PROVIDER AND DESCRIPTION OF TREATMENT (emergency room – stitches in finger, etc.)		
	DATE FIRST AID TREATMENT RECEIVED		

NOTE: Refer to Policy Manual 5.9.2 for form submission.

PRIVACY ACT

PURPOSE: To provide safety and health support for DLE employees exposed to hazardous chemicals.

ROUTINE USES: Records are maintained for internal DLE use. Information disclosed outside the agency only when authorized by the subject.

EFFECT: Failure to provide information will result in inadequate health and safety recommendations.

Employee's Signature	Date	Supervisor's Typed Name and Signature	Date

Continue on Reverse

APPENDIX K

CLANDESTINE LABORATORY SAFETY

APPENDIX K - CLANDESTINE LABORATORY SAFETY

Goals and Objectives

The safest possible investigation of clandestine laboratories is achieved by avoiding or reducing chemical exposure to known acceptable levels of risk. Safe clandestine laboratory investigations are accomplished through phased investigatory procedures, information gathering and evaluation, and proper selection and use of personal protective equipment.

Successful prosecution of illicit drug manufacturers and the safety of the Department of Law Enforcement personnel require a coordinated effort by the Bureau of Narcotics, the Bureau of Forensic Services, and the Bureau of Criminal Identification.

This policy is provided to all involved employees as required by OSHA regulations 1910.120(b).

Definitions

Bureau of Criminal Identification (BCI) - A bureau within the Department of Law Enforcement which is primarily responsible for state-wide telecommunications, criminal record-keeping, and latent print collection and identification.

Bureau of Forensic Services (BFS) - A bureau within the Department of Law Enforcement which identifies, collects, analyzes, and interprets physical evidence of criminal activity.

Bureau of Narcotics (IBN) - A bureau within the Department of Law Enforcement which enforces Idaho's Uniform Controlled Substances Act as authorized by Idaho Code 37-2740(4)(b).

Case Agent - A peace officer in charge of the investigation, and the person responsible for execution of the search warrant.

Clandestine Laboratory - An illicit operation consisting of a sufficient combination of apparatus and chemicals that either have been or could be used in the manufacture and/or synthesis of controlled substances.

Clandestine Laboratory Supervisor - The IBN Special Operations Supervisor is responsible for the clandestine laboratory program in IBN and acts as IBN's safety coordinator.

Clandestine Laboratory Safety

Criminalist - A BFS chemist, or Drug Enforcement Administration chemist who is trained in chemical and comparative analysis of physical evidence. Criminalists assigned to clandestine laboratory investigations have specialized training and/or experience in illicit drug manufacture.

Department of Law Enforcement (DLE) - An executive department of Idaho state government created under Idaho Code, Section 67-2901.

Hazard Appraisal Recognition Plan (HARP) - A pre-printed package of forms used to document information during the course of phased investigatory procedures.

Hazardous Waste Facility or Site - Any property, structure, or ancillary equipment intended or used for the transportation, treatment, storage, or disposal of hazardous wastes. Idaho Health and Safety Code 39-4403(9).

Health and Safety Code - That part of Idaho law administered by the Department of Health and Welfare. Title 39 Chapter 44 deals with Hazardous Waste Management.

Idaho Code (IC) - Specifically that part of Idaho law administered by the criminal justice system.

Industrial Hygienist - An individual trained in the practice of industrial safety including hazard recognition, measurement, evaluation, and methods of personal protection.

Lab Teams - Idaho Department of Law Enforcement, DEA, and local law enforcement personnel who have received all specialized training necessary to implement and follow the procedures and policies required by this chapter.

On-Call Industrial Hygienist - An individual employed by or contracted to

Health and Welfare to provide industrial hygiene information to lab teams.

Phased Investigatory Procedures - Discrete stages of an investigation with specific procedures that are completed in the following order: PLANNING, ENTRY, ASSESSMENT, AND PROCESSING.

Safety Officer - An IBN employee assigned specific unit safety related tasks in addition to other job duties.

Search Warrant - A written order, in the name of the State of Idaho, signed by a magistrate, judge, or justice directed to an officer or officers named therein, or other officer authorized by law to execute search warrants, directing the officer to search for and seize property or intangibles. IC 19-4401.

Clandestine Laboratory Safety

Site Safety Officer (SSO) - A lab team member assigned by the Case Agent to act as the safety officer for a particular clandestine laboratory investigation. This will frequently be a Special Agent-In-Charge.

Unit - An individual IBN section, office or facility having assigned personnel who use or maintain safety equipment utilized at clandestine laboratory site investigations.

IC 19-4408 Execution - A search warrant may be served by any of the officers mentioned in its directions, but no other person unless the officer requires assistance. The officer(s) named in the warrant must be present and act in its execution.

IC 19-4409 Service of Warrant/Breaking Open Doors - The officer may break open any outer or inner door or window of a house, or any part of a house, or any thing therein, to execute the warrant if, after notice of his authority and purpose, he is refused admittance.

IC 19-4411 Service of Warrant at Night - The magistrate must insert a direction in the warrant that it be served in the daytime. If the affidavits are positive that the property is on the person or in the place to be searched, the judge may insert that the warrant can be served at any time, day or night.

IC 19-4412 - Time for Executing Warrant - A search warrant must be executed and returned to the magistrate who issued it within ten (10) days after its date. Unless it is executed, the warrant is void after this time has expired.

IC 19-4413 Receipt for Property Taken - When the officer takes property under the warrant, he must give a receipt for that property to the person from whom it was taken or in whose possession it was found. The receipt must specify the property. If no person is present, the officer must leave a receipt in the place where he found the property.

NOTE The agent who applies for a search warrant should also obtain an order from the issuing judge authorizing the destruction of any toxic or dangerous chemicals, contaminated glassware, and equipment found at the site. This order may be included in the search warrant or may be a separate document.

Personnel Duties

1. Idaho Bureau of Narcotics (IBN)

   Safety Officer - Duties shall include, at least, these areas of clandestine laboratory concern:

   A. Performs minor maintenance of all personal protective equipment.

   B. Ensures that adequate supplies of disposable personal protective equipment are available.

   C. Conducts and documents monthly checks of personal protective equipment (rubber boots, respirators, raid gear, etc.) for defects.

   D. Makes recommendations to Clandestine Laboratory Supervisor involving safety.

   E. Acts as a "conduit" of safety information between unit employees and their respective bureaus.

   F. Reports and/or documents employee non-compliance of the instructions and procedures described in this manual. Non-compliance shall be reported to the Case Agent and employee's supervisor if it occurs in the "field". Non-compliance shall be documented and provided to the employee's supervisor if it occurs at the "office".

2. Case Agent

   A. Assigns and directs a Site Safety Officer for the particular investigation.

   B. Initiates and develops the PLANNING phase of the clandestine laboratory investigation.

C. Directs the ENTRY phase.

D. Assists the Criminalist(s) or chemist during the ASSESSMENT phase and directs the overall evidence gathering by clandestine laboratory response teams.

E. Ensures that the provisions of the manual are adhered to during the PLANNING, ENTRY, ASSESSMENT, and PROCESSING phases; and the disposal of contaminated wastes at the clandestine laboratory site.

G. Documents employee non-compliance to the instructions and procedures described in this manual as personally observed or reported by the Site Safety Officer. Attaches reports of employee non-compliance to the Hazard Appraisal Recognition Plan (HARP) that will be submitted to the Clandestine Laboratory Supervisor.

H. Assigns photographers who shall not photograph any clandestine laboratory site or storage facility containing clandestine laboratory apparatus or chemicals unless a Criminalist or chemist experienced in clandestine laboratory techniques as described in the Bureau of Forensic Services section is present.

3. Site Safety Officer

The Case Agent shall appoint one lab team member to act as a Site Safety Officer (SSO) for each clandestine laboratory raid. The duties of the SSO shall include:

A. Transports the monitoring equipment to the site.

B. Compiles HARP PLANNING documentation including pre-raid intelligence information, the emergency evacuation and medical treatment plan. Briefs involved personnel on all known hazards associated with the particular clandestine laboratory, prior to the service of a search warrant.

C. Continues compilation of HARP documentation subsequent to the ENTRY phase and briefs the ASSESSMENT Team of observations made during entry.

D. Ensures that at least one individual with full protective clothing and Self-Contained Breathing Apparatus (SCBA) is standing by and prepared to enter the scene in an emergency.

E. Coordinates and implements the emergency evacuation plan for the particular site in accordance with the written PLANNING phase. The SSO may modify the emergency evacuation and medical treatment plan after consultation with the Case Agent and the Criminalist.

F. Insures that emergency first aid equipment and replacement personal safety equipment are available for immediate use. This includes first aid kit, eye wash, respirator cartridges, protective clothing and decontamination gear.

G. Continues compilation of HARP documentation subsequent to the ASSESSMENT phase. Records chemicals and processes indicated at the site. Briefs the PROCESSING team and waste hauler with available chemical information.

H. Insures that the personnel using respirators (air-supplied or air-purified) have received training in the use of that equipment and that the equipment is being used in accordance with the investigatory phased procedures described in Personal Protective Equipment section. Reports employee (individual) refusal to follow prescribed protocol and/or use of personal protective equipment to the Case Agent. The SSO may document non-compliance if directed to by the Case Agent.

I. Insures that contaminated disposal equipment is provided to the waste hauler and that non-disposable equipment is decontaminated or packaged for transfer to another site for decontamination.

J. Directs all involved employees to comply with established decontamination procedures.

K. Continues compilation of HARP documentation during the evidence PROCESSING phase. The SSO should record unusual incidents, accidents or other relevant information called to his/her attention by the Case Agent, Criminalist, or other lab team personnel.

L. Subsequent to field investigations, insures that all original documentation for the Hazardous Appraisal and Recognition Plan (HARP) is completed and submitted to the Clandestine Laboratory Supervisor. **Only copies** of the general documentation (See Exposure Records and Recording section) are forwarded to the records section for participating units within IBN and BFS.

4. Bureau of Forensic Service (BFS)

A. Criminalist

1) A Bureau of Forensic Services Criminalist shall respond to a clandestine laboratory location. He/she shall be versed in chemical procedures, common synthetic processes for the region, and potential safety hazards associated with illicit drug manufacturing and the handling of chemical reagents.

2) The Criminalist shall coordinate with the Case Agent *and* the SSO before dismantling or sampling controlled substances and hazardous materials.

3) The Criminalist shall, in consultation with the Case Agent and/or the SSO, make evaluation of the health and safety hazards of the clandestine laboratory site and recommend downgrading from the ASSESSMENT phase to the PROCESSING

phase, including the selection of proper personal protective equipment and the necessary and appropriate chemical safety procedures to be used at the clandestine laboratory site.

5. Bureau of Criminal Identification (BCI)

A. Latent Print Examiner

1) If the situation warrants, the Latent Print Examiner shall be responsible for the processing of the clandestine laboratory scene for the latent prints during the PROCESSING phase.

2) The Latent Print Examiner shall not process any clandestine laboratory scene or storage facility unless a Criminalist or chemist experienced in clandestine laboratory techniques as described in the Bureau of Forensic Services section is present.

Personal Protective Equipment

Personal protective equipment shall be provided to the IBN lab team personnel. Equipment identified as the minimum level of protection for ENTRY and ASSESSMENT phases shall be provided and worn at all times during that phase. The PROCESSING phase may be "downgraded" from the requirement of the minimum level of protection as described in the paragraph below.

Respirators shall be worn by all personnel during the ASSESSMENT and PROCESSING phases whenever "bulk" or otherwise unprocessed chemicals are on site other than the small volume samples collected and stored as evidence. If and when the ASSESSMENT team determines that air purifying respirators are not necessary for the PROCESSING team, the logical basis for that conclusion shall be documented as part of the HARP.

Protective clothing shall be worn by all personnel handling, processing or physically near the area the chemicals are stored, being moved or processed. The test for the removal of protective clothing is: "If and when there is no

longer a potential of contact exposure as the result of accidental breakage, spillage or trace contamination from the site and personnel will never return into the lab".

All lab team members who may respond to clandestine laboratory investigations shall receive training on the use, limitations of use, maintenance and sanitation of respirators.

1. Clothing Restriction

   No synthetic clothing will be worn under the exposure suit by any personnel involved in a clandestine laboratory crime scene investigation, other than Nomex cover-alls.

2. Minimum Personal Safety Equipment for the ENTRY Team

   A. Eye protection:

      1) Non-vented, non-fogging goggle; or
      2) Plastic "flip-up/down" face shield.

   B. Nylon belt, holster, ammunition holders and handcuff cases.

   C. Law enforcement identification clothing patches.

   D. Emergency egress package with a minimum 5 minute escape air supply.

   E. Protective ballistic vests.

3. Optional Personal Safety Equipment for the ENTRY Team

   A. Hand protection: Gloves or chemical-resistant hand cream.

   B. Respiratory protection: Air-purifying respirators.

   C. Foot protection: Disposable boot covers with a tread sole bottom.

D. Body protection: Sarnex-coated tyvek material, full coverage cover-all suits.

E. Voice amplification communicator, if using respirators.

The Case Agent and Clandestine Laboratory Supervisor have the authority to require the use of one or more of the Optional Personal Safety Equipment items as needed in a particular raid.

4. Minimum Personal Safety Equipment for the ASSESSMENT Team

A. Self-contained breathing apparatus (SCBA).

B. Body protection: Sarnex-coated tyvek material, full coverage cover-all suits.

C. Foot protection:

1) Chemical resistant rubber boots; or

2) Disposable boot covers with a tread sole bottom.

D. Hand protection: Chemical-resistant neoprene or nitrile-coated gloves.

5. Optional Personal Safety Equipment for the ASSESSMENT Team

A. Voice-amplification communicator.

B. Nomex cover-alls worn under Sarnex exposure suits.

6. Minimum Personal Safety Equipment for the PROCESSING Team

A. Eye protection: Full face air purifying respirators.

B. Body protection: Sarnex coated tyvek material, full coverage cover-all suits.

C. Foot protection:

1) Chemical resistant rubber boots, or

2) Disposable boot covers with a tread sole bottom.

D. Hand protection: Chemical resistant neoprene or nitrile coated gloves.

E. Respiratory protection: Full-face air purifying respirators.

Securing of Clandestine Laboratory Crime Scene

1. Planning Responsibilities

While an IBN agent or local officer may have developed sufficient investigatory information for an enforcement action, the IBN lab team shall coordinate and/or oversee the enforcement aspects of the investigation.

A. This is the initial phase of a clandestine laboratory enforcement action. This phase specifically involves documenting intelligence information relating to chemical safety issues, development of the emergency evacuation and medical treatment plan, and the commensurate resource management and coordination of personnel and material.

B. The Case Agent has overall enforcement and chemical safety responsibility for responding personnel. The Case Agent shall coordinate service of the search warrant, notification of allied agencies, initiate HARP documentation, and insure participants are briefed regarding issues of safety and procedures.

2. ENTRY Team and Responsibilities

A. The entry team will be comprised of IBN agents and/or a combination of IBN and Federal/Local officers who are properly trained and equipped.

B. To secure the clandestine laboratory scene, arrest and remove suspects to an uncontaminated location.

C. To report any scene observations that were made during the 3-5 minutes of ENTRY regarding chemicals, processing equipment, stages of process, odors, etc. to the SSO for documentation, evaluation, and to appraise the ASSESSMENT team of conditions.

D. Personal protective safety equipment should not hamper mobility, restrict or reduce breathing efficiency, speech, or reduce dexterity needed for effective firearm usage. The choice of personal safety equipment shall be made based on individualized case information. Minimum protective eye and body equipment (goggles and exposure suits with police identification patches and boot covers), and an escape egress package shall be worn.

E. If a local agency SWAT or DLE CRT Team is used for ENTRY, the Case Agent and SSO shall debrief the team members for the information described in "C" above.

3. <u>ASSESSMENT Team and Responsibilities</u>

A. The ASSESSMENT team will be comprised of one qualified Criminalist or chemist and one agent (preferably the Case Agent).

B. To determine the explosivity limits, common toxic gases or vapors, and the oxygen levels by utilizing an explosivity/oxygen meter and sampling detector tubes. And, to report measured levels of gases monitored to the SSO.

C. To deactivate and ventilate the laboratory as needed.

D. To inform the SSO (and the Case Agent if he/she was not part of the ASSESSMENT team) of all known chemicals and observed hazards associated with the clandestine laboratory

scene.

E. To determine when the evidence PROCESSING team may begin. To select the appropriate air purifying cartridge for use by the PROCESSING team if chemicals are on site.

F. To determine when the minimum level of personal protective equipment for the PROCESSING phase may be further reduced and to document the logic for that further reduction.

PROCESSING team responsibilities are detailed in the Evidence Handling and Storage Procedures section.

Laboratory Dismantling Procedures

1. Dismantling is intended to be part of the PROCESSING phase. The ASSESSMENT team shall attempt to reduce chemical vapor levels by deactivating active chemical synthesis processes and ventilation.

2. Photographs of the inside of the clandestine laboratory site should be taken prior to dismantling. If the site cannot be "downgraded" in the use of personal safety equipment from SCBA to air-purifying respirators, photographs shall be taken by the ASSESSMENT team.

3. Necessary items of evidence shall be removed to a well ventilated area for photography and latent print examination if the laboratory environment cannot be "downgraded" to the use of air-purifying respirators.

4. Dismantling the chemical synthesis process shall be done at the direction of the Criminalist or chemist.

Evidence Handling and Storage Procedures

1. Processing Team and Responsibilities

A. The PROCESSING team is comprised of lab team personnel who have been trained in the use of respirators. Because use

of SCBA equipment increases metabolic stress, and the duration of this investigatory phase averages between 8-13 hours, air-purifying respirators are intended to be used after the ASSESSMENT phase whenever possible.

B. To identify, document and collect evidence of criminal activity.

2. Handling and Storage Procedures

A. The Criminalist(s) or chemist(s) shall be responsible for sampling controlled substances and hazardous chemicals.

1. All sampling shall be conducted under environmental conditions conducive to safety and with adequate personal protection against toxic exposure.

2. Under no circumstances shall lab team personnel use the sense of smell to identify hazardous materials during ASSESSMENT and PROCESSING phases.

3. Samples shall be placed in suitable sealed containers (such as glass bottles with teflon-lined caps) and sealed in impervious containers (such as Kapak bags). All containers will be labeled with "Hazardous Evidence" warning stickers.

B. Photographs shall be taken of all samples with the original containers and numbered as such for evidence.

C. All chemically contaminated evidence shall be sealed in Kapak bags at the scene and marked with **CAUTION/WARNING** labels (i.e., Hazardous Material, Clandestine Laboratory Evidence, etc.).

D. Chemically contaminated evidence shall not be transported in the passenger compartment of a vehicle, stored in an "evidence vault" or submitted as evidence for analysis unless sealed in Kapak bags.

E. Latent Print Examiners shall not process any contaminated surfaces or items that are covered with residue. Latent Print Examiners should not process any leaking containers or any open containers which do not have a secured lid.

F. All latent print lift cards or any other items to be submitted to the latent print laboratory shall be sealed in Kapak bags or other appropriate containers at the scene.

G. Photographs shall be taken of any evidence items to be removed from the laboratory scene.

H. Photographs should be taken of any item from which latent prints were lifted.

Air Monitoring Equipment

Air monitoring equipment shall consist of two separate instruments. First, a combination meter capable of detecting and warning of explosive levels of organic vapors and providing a quantitative measurement of oxygen. The second instrument is a hand-held pump with selected sample tubes for detection and quantitative measurement of specific vaporous chemicals.

Exposure Records and Reporting (See Appendix I - Report Forms)

1. Site General Documentation

Site General Documentation is provided via the written Hazard Appraisal and Recognition Plan (HARP) which provides a chronological compilation of hazardous and chemical information as it is developed through the course of the investigation.

The HARP lists the chemical process believed to be possible or operational, names of chemicals found, quantitative measurements from monitoring and the logical basis for any variations in the level of personal protective equipment defined by this manual of instruction and procedures. The HARP also includes written documentation of unusual incidents, and employee safety concerns and resolution.

HARP documentation serves two primary purposes. First, it provides generalized chemical information that may be provided to Health and Welfare to assist them in a determination of designating the clandestine laboratory site as hazardous waste property. Secondly, it documents the employee's work duties for the particular site. The information may become useful for future medical evaluation and/or epidemiologic research.

A HARP documentation package shall be generated for each clandestine laboratory investigation. The original HARP documentation shall be maintained in the case file. Send a copy to the Clandestine Laboratory Supervisor. Because the HARP documentation contains on-site chemical information and identifies employees involved in the particular investigatory phase, the completed packages shall be maintained for the length of employment of the employees plus 30 years. The employee shall have full access to his/her Site Specific Information (defined immediately below) and the generalized HARP information.

2. Site Specific Information

Site Specific Information is provided via the Clandestine Laboratory Exposure Report (CLER). A CLER is completed for each laboratory entered. IC Form 1 SIF, Notice of any incidents of exposures to chemical vapors or physical body (tissue) contact which results in perceived or observed abnormal health reactions. Without perceived or observed abnormal health reactions, there is no specific need to complete the IC Form 1 SIF. Both forms are submitted to the Special Agent-In-Charge.

A. The CLER shall be completed by the SSO in the field. The Case Agent shall attempt to verify the actual basis of the conditions that resulted in the chemical exposure, or to report the conditions as he/she knew them to be, and to co-sign the report. The role of the SSO and Case Agent is fact-finding and reporting information as accurately as possible.

1) If significant abnormal health reactions occur in the field

that require the attention of a physician, a CLER shall be completed and provided to the attending physician as information. The physician may retain a copy of the CLER as part of the patient's medical records. The original CLER shall be provided to the employee's supervisor to help complete the IC Form 1 SIF.

2) If significant abnormal health reactions occur in the office after the field investigation, both reports (CLER and IC Form 1 SIF) shall be completed by the employee's supervisor. Information regarding the extent of an injury and its cause is the responsibility of the supervisor who may interview the injured employee or any other witnesses, if any.

B. IC Form 1 SIF, Notice of Injury and Claim for Benefits is the statewide application for any occupational injury or illness or other serious injury. It is completed by the employee and submitted to the Special Agent-In-Charge.

C. Forward exposure reports (CLER and IC Form 1 SIF) to the Clandestine Laboratory Supervisor. Where exposure is believed to have occurred, CLERs that have not been reviewed and co-signed by the Case Agent will be returned to he Case Agent for verification of the reported factual basis. Exposure reports are reviewed by the Clandestine Laboratory Supervisor to determine if the reported exposures were preventable, and to recommend action, as necessary, to avoid future similar exposures. A copy of the CLER is attached to and remains part of the original HARP documentation package. All information (name, social security number, addresses, etc.) that identifies the exposed employee shall be removed from the copy of the CLER before inclusion as part of the HARP documentation.

D. Original exposure reports (CLER And IC Form 1 SIF) shall be forwarded to the Clandestine Laboratory Supervisor, then to the DLE Administrative Services Division, Personnel Section for

processing and storage.

3. Sick Leave Reporting and Prompt Medical Treatment

The PLANNING phase of the investigation details specific procedures for prompt medical attention in the field. However, by the nature of some chemical exposures, delayed effects may be felt or observed several days after initial exposure. In the office, the employee's supervisor is responsible for assuring prompt medical treatment and the reporting of sick leave.

A. If abnormal health effects are reported or observed at the employee's unit subsequent to field operations, the employee's supervisor shall authorize sick leave. Refer to Department Policy #87-308 for the Worker's Compensation concerning leave and finances.

B. If the employee(s) believes that the illness resulted from a prior chemical exposure at a clandestine laboratory investigation and requests a medical examination or treatment, the supervisor shall determine if the employee wishes to be seen by his/her designated physician or the departmentally-contracted physician.

1) If the departmentally-contracted physician is selected, the supervisor shall immediately advise the clandestine Laboratory Supervisor to arrange for the examination.

2) If the employee elects to be seen by his/her personal physician, the supervisor shall insure that the physician is provided with the following documents:

a) A copy of the CLER prepared by the supervisor.

b) A copy of this Clandestine Laboratory Policy.

c) Send the Medical Test Results (defined in the Medical Test Results section to:

d) An employee selecting to use a personal physician shall make full payment of all associated medical costs. The employee shall forward all medical bills to the DLE Personnel Section.

3) If the supervisor determines that the employee's medical need requires urgent medical care, he/she shall obtain transportation for the employee(s).

4. Medical Test Results

Detailed test results are confidential and privileged between the employee and the medical staff. Federal regulations [29 CFR Part 1910.120(f)] require the employer to obtain and furnish the employee with a copy of a written opinion from the examining physician containing the following:

A. The results of the medical examination and tests.

B. The physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health.

C. The physician's recommended limitations upon the employee's assigned work.

D. A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further examination or treatment.

A copy of the written physician's opinion sent directly to the Personnel office by the employee's personal or urgent care physician shall be provided to the employee's bureau safety coordinator who shall provide the copy to the employee.

5. The Official Toxic Exposure Record

The Official Toxic Exposure Record is a separate and distinguishable record folder from the employee's official personnel record folder. The employee's official toxic exposure record is a folder containing restricted access information, for individual employee, that is managed and maintained by the DLE Administrative Services Division, Personnel Section. The folder shall include at least the following information:

A. Name and social security number of the employee.

B. Original documentation of site specific exposure information.

C. Original physician's written opinions.

D. A copy of this Clandestine Laboratory Policy.

Hazardous Waste Disposal

1. All chemicals not retained as evidence and other toxic waste shall be packaged, hauled, and stored by a licensed hazardous waste hauler in accordance with all applicable federal, state and local regulations, i.e., U.S. Toxic Substances Control Act, and Idaho Code, Title 39, Chapter 44 and Title 49, Chapter 25.

2. All Hazardous materials and disposable equipment including protective clothing, respirator cartridges, used sampling tubes, fingerprint brushes and powder shall be provided to the waste hauler at the site.

3. Non-disposable equipment should be decontaminated at the site. Waste water will be provided to the waste hauler. Equipment items that cannot be decontaminated at the site shall be placed in a plastic bag and sealed. Decontamination shall be performed by the user of the equipment as soon as possible.

4. A contracted hazardous waste hauler shall be notified as soon as possible as to the type of clandestine laboratory and the amount and

nature of hazardous waste to be disposed.

5. The Case Agent shall assign a special agent to maintain scene security and the personal protection of non-employees until all items to be disposed of are packaged and the waste hauler is ready to leave the crime scene.

Assisting Other Agencies

This policy provides for a coordinated response by IBN and BFS to meet the needs of law enforcement agencies in the safe investigation and handling of clandestine laboratories. When assisting local and/or federal agencies, the policies and procedures set forth in this manual shall be strictly adhered to by all Idaho DLE personnel.

Law Enforcement requests for BFS and/or BCI services **only** shall be addressed as follows:

1. BCI latent print examiners may respond to local and/or federal law enforcement agency requests for assistance, where a DEA-chemist or non-BFS Criminalist has been asked to participate, without referral or notification to the regional IBN lab team. The agency requesting latent print assistance shall be informed that all "field" operational requirements in Sections 5.3.3 and 5.7.2 of this policy shall be followed, and that any variation from this protocol is cause to halt any processing and return to the "home" office.

2. BFS employees are specifically directed **not** to provide "field" instruction, personal safety equipment or advice that would reduce or substitute the requirements of this policy such that "field" operations could continue. Local law enforcement agencies requesting assistance from BFS criminalistic laboratories shall be referred to the regional IBN lab team. It is the responsibility of the local and/or federal agency to be conversant with and adhere to this requirements in this policy.

Notification of Toxic Waste Hazards

Clandestine Laboratory Safety

1. Written notification to responsible parties for potential nuisance abatement (clean-up) shall be provided by the Special Agent Supervisor who has regional jurisdiction over the clandestine laboratory investigation. The communication shall notify parties of:

   A. The criminal investigation and subsequent enforcement action.

   B. Observations made incident to the enforcement actions "indicating the transfer, storage and/or disposal of hazardous chemicals" at the investigation site.

   C. Governmental seizure and removal of "bulk" chemicals and other hazardous materials has occurred.

   D. Because there may still be significant chemical contamination at the property, copies of this notification are being sent to local and/or state authorities concerned with environmental toxic contaminations.

   - If the investigation site is on privately owned land, the notification letter shall be addressed to the property owner on record and copies sent to the local County Commissioners and the local Health District. Local authorities must be notified within 72 hours.

   - If the investigation site is on public land owned by a city, county, or state agency, the notification letter shall be addressed to the Department of Health and Welfare. Copies of the notification letter shall be sent to local County Commissioners and the local Health District.

   - If the investigation site is on privately owned land where there is reasonable cause to believe that chemical contamination has occurred onto adjoining privately owned property, through a public sewage system or onto public land, the notification letter shall be addressed to the property owner of record where the source of chemical contamination originated. Copies will be sent to the local County Commissioners, the local Health

District and the Department of Health and Welfare.

- Notification must be sent to the Director's Office at the appropriate local Health District office:

Boundary, Bonner, Kootenai, Benewah, and Shoshone counties:

Health District I
2195 Ironwood Court
Coeur d'Alene, Idaho 83814

Latah, Clearwater, Nez Perce, Lewis, and Idaho counties:

Health District II
1221 F Street
Lewiston, Idaho 83501

Adams, Washington, Payette, Gem, Canyon, and Owyhee counties:

Health District III
920 Main, P.O. Box 489
Caldwell, Idaho 83606-0489

Valley, Boise, Ada, and Elmore counties:

Health District IV
1445 North Orchard
Boise, Idaho 83706

Camas, Blaine, Gooding, Lincoln, Jerome, Minidoka, Twin Falls, and Cassia counties:

Health District V
324 2nd Street East
P.O. Box 547
Twin Falls, Idaho 83303-0547

Power, Oneida, Bannock, Franklin, Caribou, Bear Lake, Bingham, and Butte counties:

Health District VI
465 Memorial Drive
Pocatello, Idaho 83201

Lemhi, Custer, Clark, Jefferson, Bonneville, Teton, Madison, and Fremont counties:

Health District VII
254 E Street
Idaho Falls, Idaho 83402

Prisoner Handling

1. The following personal protective safety equipment shall be provided to a suspect in the event the clothing is deemed to have been contaminated:

   A. Paper coverall suits.
   B. Paper booties.

2. Correctional facility and transporting officers shall be notified of any prisoners who are contaminated.

   A. Decontaminate suspects in the field, if possible.

Medical Surveillance

Medical surveillance is a departmentally-sponsored program in which employees will participate. Three services are provided:

1. The basic medical service or "base-line" includes a review of the patient's medical history and chemical testing of blood and urine to establish clinical parameters that can be monitored through time for abnormal variation. Blood and urine testing is performed yearly.

2. The determination of respiratory fitness is a medical evaluation that is performed yearly.

3. A personal examination by the departmentally contracted physician(s) may be requested by the employer and/or employee upon failure of "base-line" respiratory fitness determination or subsequent to field chemical exposure.

Training

1. Department and local agency personnel assigned to clandestine laboratory investigations shall be provided training in:

   A. Hazard recognition.
   B. Clandestine Laboratory Manual of Instruction and Procedure.
   C. HARP documentation.

2. Training shall be provided through a coordinated effort between IBN and BFS technical experts, Support Services Bureau, and the Drug Enforcement Administration.

3. Specialized training in the use of monitoring equipment shall be provided to employees assigned to the ASSESSMENT team.

EXPECTED YIELDS FROM CHEMICALS FOUND IN LABORATORIES

PHENCYCLIDINE

Chemical	Quantity	PCP Base (Juice)	PCP HCL (Dust)
Cyclohexanone	1 gallon	11.5 pounds	13.2 pounds
Piperidine	1 gallon	3.5 pounds	3.96 pounds
Monobromobenzene	1 gallon	2.5 pounds	2.9 pounds
Cyanide Salt	1 pound	2.1 pounds	2.2 pounds
Magnesium Metal	1 pound	7.4 pounds	8.5 pounds
PCC	1 pound	1.2 pounds	1.4 pounds

(75%/75% yield scheme)

AMPHETAMINE AND METHAMPHETAMINE

Chemical	Quantity	Amphetamine	Methamphetamine
Phenylacetic Acid	1 pound	0.95 pounds	0.76 pounds
P-2-P	1 pound	1.3 pounds	1.1 pounds
Methylamine	1 pint	0	1.0 pounds
Benzyl Chloride	1 pint	1.1 pounds	0.8 pounds
Acetonitrile	1 pint	3.4 pounds	2.7 pounds
Acetaldehyde	1 pint	3.1 pounds	2.4 pounds
Formamide	1 pound	0	0
Ephedrine	1 pound	0	0.8 pounds
Hydriodic Acid	1 gallon	0	2 pounds
Red Phosphorous	330 grams	0	1 pound
Thionyl Chloride	1 gallon	0	1.65 pounds

MDA

Chemical	Quantity	Product
Isosafrole	1 pound	0.8 pounds
Formamide	1 pint	3.1 pounds
Piperonal	1 pint	0.9 pounds
Ammonium Acetate	1 pound	1.7 pounds

MESCALINE*

Chemical	Quantity	Product

Gallic Acid	1 pound	0.2 pounds
Dimethyl Sulfide	1 pound	0.3 pounds

*The synthesis route for the manufacture of Mescaline is difficult and not very yield effective. Amount based on a final yield from starting material of 15%.

PRECURSORS
LIMITED OR NO LEGITIMATE USE IN INDUSTRY - NO LEGITIMATE HOME/HOBBY USE

Chemical	Description	Packaging	Hazards
Ephedrine	White crystalline material. No odor.	Fiber drums or bags.	Toxic.
Phenyl-2-Propanone	Colorless to yellow oily liquid. Characteristic odor.	Any liquid holding container.	Toxic.
Phenylacetic Acid	White crystals/dissolved liquid. Pungent vinegar/nauseating odor.	Any type of container.	Toxic, irritating.
Benzyl Cyanide	Clear oily liquid or crystals. Occasional faint almond or aromatic odor.	Bottles or cans.	Highly toxic.
Piperidine	Colorless, watery liquid. Pepper-like odor.	Small bottles or cans.	Toxic, irritating.

REAGENTS/SOLVENTS
COMMON AND LEGITIMATE USE IN INDUSTRY - MAY HAVE LEGITIMATE HOME/HOBBY USE

Chemical	Description	Packaging	Hazards
Perchloroethylene	Carpet cleaner. Fabric spot remover.	Small cans only.	Toxic, combustible.
Hydrochloric acid	Pool chlorine, tile wash.	1 gallon plastic jugs.	Corrosive.
Sodium hydroxide	Sink/toilet bowl drain cleaner.	Small cans only.	Corrosive.
Methanol	Model airplane fuel, parts cleaner, fuel additive.	Small cans only.	Flammable, toxic.
Isopropyl alcohol	Antiseptic (rubbing alcohol).	Small poly bottles.	Flammable, toxic.
Ethyl ether	Engine starting fluid, carburetor cleaner.	Small aerosol cans only.	Explosive, flammable, toxic.
Acetone	Solvent and cleaner.	Small cans only.	Flammable, toxic.
Petroleum ether	Paint and varnish solvent.	1 gallon or 1 pint cans.	Flammable, toxic.

REAGENTS/SOLVENTS
NO LEGITIMATE HOME/HOBBY USE

Chemical	Description	Packaging	Hazards
Phosphorous	Red powder; no odor.	Cans, drums or bags.	Reactive
Hydriodic acid	Red/yellow liquid; intensely irritating vapors.	Amber or clear bottles. 1 to 5 gallon poly containers.	Highly corrosive; Highly toxic
Hydrogen chloride gas	Colorless gas; intensely irritating.	Small lecture size to free-standing compressed gas cylinders.	Corrosive
Thionyl chloride	Yellow to red fuming liquid; intensely irritating vapors.	1 pint amber glass bottle.	Corrosive; Irritating Toxic
Acids (Hydrochloric, Sulfuric, Acetic, Nitric, Phosphoric, or Perchloric)	Usually clear liquids; intensely irritating odor.	Gallon clear glass bottles.	Corrosive
Chloroform	Colorless liquid; sweet odor.	Usually 1 gallon or 1 pint amber bottles.	Toxic; Flammable
Palladium black	Black powder; no odor.	Small air tight cans.	Reactive Highly Toxic
Mercuric chloride	White powder; no odor.	Small jars, bottles or cans.	Toxic; Flammable
matic solvents (Benzene, Toluene)	Clear, water liquids. Characteristic solvent odor; slightly sweet.	1 gallon or 1 pint amber bottles.	Highly Toxic
Acetic anhydride	Clear, water liquid; intensely pungent; irritating vinegar odor.	1 gallon clear glass bottles.	Reactive
Sodium metal	Grey, white soft metal. Small pieces, chunks or bricks.	In kerosene or diesel fuel.	Reactive Reactive; Toxic
Magnesium turnings	Dull to shiny metal shavings.	Small jars or cans.	
Lithium aluminum hydride	White powder; no odor.	Small bottles or water tight cans.	Highly Toxic Highly Toxic
Nitroethane	Clear liquid; irritating odor.	Bottles or small caps.	Toxic
Lead acetate	White powder; no odor.	Bottles or small caps.	
Cyanide salt (Sodium or Potassium cyanide)	White crystals or lumps; no odor.	Small bottles to 5 gallon cans.	Flammable; Toxic Corrosive; Toxic
Cyclohexanone	White to pale yellow liquid; peppermint odor.	1 gallon glass bottles to 5 gallon cans.	
Bromobenzene	Clear, heavy liquid; pungent odor.	Usually 1 gallon glass bottles to 5 gallon cans.	Toxic; Reactive
Raney nickel	Dark grey powder or crystal; no odor.	Small bottles/air tight cans.	

Clandestine Laboratory Safety

READ BEFORE USE

The following table lists various clandestine laboratory production methods and specific chemicals, equipment and hazards that are characteristically associated with each type.

WARNING: This table does not list all lab types that may be encountered.

WARNING: This table does not list all chemicals or hazards associated with each production table.

CAUTION: The purpose of this table is to provide a quick reference for field investigative personnel to help in the determination of a laboratory production method and associated hazards, based on observations of chemicals and equipment characteristic to that production method.

LAB TYPE IDENTIFICATION TABLE

Lab Type	Characteristic Chemical	Characteristic Equipment	Characteristic Hazards
METHAMPHETAMINE PRODUCTION			
Hydriodic Acid Method	Hydriodic Acid	Triple neck flask	Acutely corrosive and toxic atmosphere.
	Hydrogen Chloride gas	Heat source	Flammable, explosive, 0_2 deficient atmosphere.
	Red Phosphorous	Reflux column	
	Exposure to phosphine gas.		
Thionyl Chloride Method	Thionyl chloride	Round bottom flask	Acutely corrosive atmosphere.
	Hydrogen gas	Vacuum filtration	Catalyst induced explosions.
	Palladium black	Pressure vessel (hydrogenator)	Flammable atmospheres.
Phenyl-2-Propanone Method	Phenyl-2-Propanone	Triple neck flask	Flammable, explosive atmospheres.
	Aluminum foil	Heat source	Acute toxic chemical exposure.
	Mercuric chloride	Condenser column	Acutely corrosive atmospheres.
[illegible]/L-2-PROPANONE PRODUCTION			
Phenyl Acetic Acid Method	Phenyl acetic acid	Triple neck flask	Flammable atmosphere.
	Acetic anhydride	Heat source	Acute toxic chemical exposure.
	Sodium acetate	Condenser column	May involve exposure to suspect carcinogens.
Benzyl Cyanide Method	Benzyl cyanide	Flask (reactor vessel)	Waste reactive metal (fire, explosion).
	Sodium metal	Vacuum filtration	Flammable atmospheres.
	Ethyl acetate	Ice bath	Acutely corrosive atmospheres.
			Exposure to ammonia.
Benzaldehyde Method	Benzaldehyde	Flask, container or buckets	Flammable and explosive atmosphere.
	Nitroethane	Filtration	Exposure to strong corrosives.
	Iron fillings	Heat source	Exposure to highly toxic amine compounds.
			Exposure to suspect carcinogen.
Lead Acetate Method	Lead acetate	Flask	Exposure to suspect carcinogen.
		Distillation columns	
		Heat source	
PHENYLACETIC ACID PRODUCTION			
Benzyl Cyanide Method	Benzyl cyanide	Round bottom flask	Exposure to hydrogen cyanide gas.
	Sulfuric acid	Reflux column	Acutely corrosive atmosphere.
		Filtration	Exposure to toxic substances.
BENZYL CYANIDE PRODUCTION			
Benzyl Chloride Method	Benzyl chloride	Round bottom flask	Exposure to cyanide.
	Cyanide salt	Filtration	Flammable atmosphere.

PRODUCTION

PCC/Grignard Method	Magnesium turnings	Buckets	Water reactive metal (fire, explosion).
	Cyanide salt		StirrersExposure to cyanide and hydrogen cyanide gas.
	Bromobenzene		Acute flammable, explosive atmosphere.

INTEGRITY CHECKS.

Signs and Symptoms of Chemical Exposure and Heat Stress Which Indicate Potential Medical Emergencies

Type of Hazard	Signs and Symptoms
Chemical Hazard	Behavioral changes Breathing difficulties Changes in complexion or skin color Coordination difficulties Coughing Dizziness Drooling Diarrhea Fatigue and/or weakness Irritability Irritation of eyes, nose, respiratory tract, skin, or throat. Headache Light-headiness Nausea Sneezing Sweating Tearing Tightness in the chest
Heat Exhaustion	Clammy skin Confusion Dizziness Fainting Heat rash Light-headiness Nausea Profuse sweating Slurred speech Weak pulse
Heat Stroke (May be Fatal)	Confusion Convulsions Hot skin, high temperature (yet may feel chilled) Incoherent speech Staggering gait Unconsciousness

Signs: You can observe conditions in another person.
Symptoms: Experienced by victim but not observable by others.
Integrity Checks: Co-workers routinely "checking" on each other during an operation.
Warning: Some signs and symptoms may not be observed or recognized by the victim. Therefore, the victim becomes dependent on his/her buddy for help.

TESTS FOR SUBSTANCES IN BIOLOGICAL FLUIDS

A. Tests for Specific Chemical:

1. Ethyl Ether (blood)
2. Acetone (urine, blood, breath)
3. Acetaldehyde (blood)
4. Thallium (urine)
5. Methanol (urine)
6. Mercuric chloride (mercury in urine)

B. Tests for Metabolite:

1. Benzene (urinary phenol)
2. Xylene (urinary methyl hippuric acid)
3. Toluene (urinary hippuric acid)
4. Pyridine (urinary metabolites)
5. Dimethyl Formamide (urinary methyl formamide)
6. Methylene Chloride (blood carbon monoxide)
7. Methanol (urinary formic acid)
8. Cyanides or acetonitrile (blood cyanide or urinary thiocyanate)
9. Aniline (blood methemoglobin or urinary para-aminophenol)
10. Orthotoluidine (blood methemoglobin)