



SAN JUAN COLLEGE

# Laboratory Safety Plan

November 1, 2006

**San Juan College**  
4601 College Blvd, Farmington, NM 87401

**Laboratory Safety Plan**

Updated August 2006

**Chapter 1 - Introduction**

**1. Purpose**

This Laboratory Safety Plan (LSP) describes policies, procedures, equipment, personal protective equipment and work practices that are capable of protecting employees from the health hazards in laboratories. This Plan is intended to meet the requirements of both the federal Laboratory Safety Standard, formally known as "Occupational Exposure to Hazardous Chemicals in Laboratories", a copy of which is found in Appendix A, and the OSHA Employee Right To Know Act.

This LSP is intended to safely limit laboratory workers' exposure to OSHA- regulated substances. Laboratory workers must not be exposed to substances in excess of the permissible exposure limits (PEL) specified in OSHA rule 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances. PELs for regulated substances are provided in Appendix B. PELs refer to airborne concentrations of substances and are averaged over an eight-hour day. A few substances (listed under Individual Chemical Standard in the Federal column in Appendix C) also have "action levels". Action levels are air concentrations below the PEL which nevertheless require that certain actions such as medical surveillance and workplace monitoring take place.

OSHA requires employers to evaluate their workplaces for the presence of hazardous substances, harmful physical agents, and infectious agents and to provide training to employees concerning those substances or agents to which employees may be exposed. Written information on agents must be readily accessible to employees or their representatives. Employees have a conditional right to refuse to work if assigned to work in an unsafe or unhealthful manner with a hazardous substance, harmful physical agent or infectious agent. Labeling requirements for containers of hazardous substances and equipment or work areas that generate harmful physical agents are also included in OSHA Employee Right To Know Act.

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

**2. Scope and Application**

The Laboratory Safety Standard applies where 'laboratory use' of hazardous chemicals occurs. Laboratory use of hazardous chemicals means handling or use of such chemicals in which all of the following conditions are met:

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

At a minimum, this definition covers employees (including student employees, technicians, supervisors, lead researchers and physicians) who use chemicals in teaching, research and clinical laboratories at San Juan College. Certain non-traditional laboratory settings may be included under this standard at the option of individual departments within the College. Also, it is the policy of the College that laboratory students, while not legally covered under this standard, will be given training commensurate with the level

of hazard associated with their laboratory work. The following programs are exempt from this laboratory Safety plan with the provision that they have drafted their own laboratory safety plan specific to their program requirements:

- Dental
- Nursing
- Physical Therapy

**This standard does not apply to laboratories whose function is to produce commercial quantities of material. Also, where the use of hazardous chemicals provides no potential for employee exposure, such as in procedures using chemically impregnated test media and commercially prepared test kits, this standard will not apply.**

### **3. Coordination With Other Standards and Guidelines**

The Laboratory Safety Standard and OSHA address occupational safety issues. Other federal, state and local standards that address use of hazardous chemicals and other materials are listed in Appendix C. Note particularly the listed chemicals with individual standards in the 'Federal' column, since these compounds generally have *action limits* (usually set at half the TLV), *air monitoring requirements*, and *medical monitoring requirements*. If an instructor is using one of these chemicals, or in the unlikely event that there is a conflict between provisions of various standards, the Department of Environmental Health should be contacted.

### **4. Responsibilities**

Implementation of the Laboratory Safety Standard at the College is a shared responsibility. Employees, Supervisors, Safety Officers, Department Heads, Deans, upper Administrative Staff, and staff all have roles to play. These roles are outlined below.

#### **A. President, Vice Presidents**

Upper level administrators are responsible for:

- promoting the importance of safety in all activities;
- promoting the same attitude among all levels of employment at the College;
- supporting a broad-based laboratory safety/chemical hygiene program that will protect San Juan College laboratory employees from health effects associated with hazardous chemical, physical or biological agents; and
- ensuring that deans, directors and department heads provide adequate time and recognition for employees who are given laboratory safety responsibilities.

Performance will be measured by:

- EH's documentation and annual reporting of the level of compliance within each of the reporting units.

#### **B. Deans, Directors and Department Heads**

DDD's are responsible for:

- identifying at least one technically-qualified safety officer for the unit. (Colleges or institutes that are made up of a number of large laboratory-based departments are urged to assign safety officers within each department. Large departments may assign one safety officer for each division);
- transmitting the name of the designated research safety officer to San Juan College's Chemical Hygiene Officer;
- ensuring that the designated research safety officer is adequately trained regarding the roles and responsibilities of the position;

- ensuring that the designated research safety officer modifies this generic Laboratory Safety Plan to incorporate location-specific information;
- ensuring that the designated research safety officer reviews and evaluates the tailored LSP at least annually, and submits a copy of the modified plan to the Chemical Hygiene Officer for approval;
- taking appropriate measures to assure that college/department/division activities comply with College and OSHA laboratory safety policies;

Performance will be measured by:

- EH's record of a trained, research safety officer for the unit.
- EH's record of a current, tailored Laboratory Safety Plan for the unit.

#### C. **Environmental Health (EH)**

The Chemical Hygiene Officer for the College is Gary Lee, and the entire EH staff will participate in providing resources for departments in the development of their individual health and safety programs. Environmental Health is responsible for:

- preparing and updating the College's generic Laboratory Safety Plan;
- distributing the Laboratory Safety Plan to departments or other units who will tailor and implement the plan;
- training designated departmental research safety officers regarding compliance with the laboratory safety standard;
- monitoring the progress of departments toward achieving compliance.

Performance will be measured by

- EH's documentation that review and evaluation of the generic LSP occurs at least annually, updates as necessary;
- annual feedback to DDDs regarding EH's records of lab safety officer training and current LSP s within the units;

#### D. **Laboratory Safety Officer**

The LSO is **Dr. Don Hyder**. Briefly, the LSO will:

- serve as liaison between employing department and the Department of Environmental Health;
- know the rules, to help researchers comply with applicable state, federal and College requirements;
- develop and implement a Laboratory Safety Plan for the department;
- coordinate training to ensure all researchers understand their responsibilities and the policies that apply to their research.
- coordinate inspections of laboratories and ensure laboratory supervisors address any noted deficiencies;
- keep records to document compliance with state, federal and College requirements.

Performance will be measured by EH's documentation that:

- review and evaluation of the tailored LSP occurs at least annually;
- the laboratory safety officer's personal training records are current.

#### E. **Supervisors/Principal Investigators**

The immediate supervisor of a laboratory employee is responsible for:

- assuring that potential hazards of specific projects have been identified and addressed before work is started;
- ensuring there are written, laboratory-specific standard operating procedures for the protocols carried out in the laboratory that incorporate directions about how to mitigate the hazards of the procedures.
- informing and training employees regarding the specific hazards in their area and in the work they will be doing;
- scheduling time for the employee to attend designated training sessions;
- enforcing San Juan College safety policies and safe work practices;

- conducting periodic audits of the research space under the supervisors control;
- reporting hazardous conditions to the college or departmental laboratory safety officer;
- investigate laboratory accidents and send an Accident Investigation Worksheet (Appendix N) with recommendations to the departmental research safety officer for review.

Performance will be measured by:

- home department's documentation of current, pertinent safety training for the supervisor and each employee in the supervisor's group;
- home department's documentation of regular audits for laboratory space under the control of the supervisor.

#### F. **Employee**

Employees who have significant responsibility for directing their own laboratory work are responsible for assuring that potential hazards of specific projects have been identified and addressed before work is started. All laboratory employees however, are responsible for:

- attending safety training sessions;
- following safety guidelines applicable to the procedures being carried out;
- assuring that required safety precautions are in place before work is started; and
- reporting hazardous conditions as they are discovered.

Performance will be measured by:

- supervisor's assessment of employee's adherence to topics covered in safety training.

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**Chapter 2 - Standard Operating Procedures**

As noted in Chapter 1, Principal Investigators are responsible for ensuring there are written standard operating procedures (SOPs) for the research protocols conducted in their area. The SOPs must identify the hazards of the protocol, as well as measures to be taken to mitigate those hazards. The references listed below may provide enough detail to serve as the SOPs for some research protocols. Others

**1. Chemical Procedures**

**A. Prudent Practices in the Laboratory**

Laboratory standard operating procedures found in [Prudent Practices in the Laboratory: Handling and Disposal of Chemicals](#) (National Research Council, 1995) are adopted for general use at San Juan College. Departmental Research Safety Officers have hard copies of this text, and the entire contents **are accessible on the web**. Note especially the following topics which are covered in Chapters 5 and 6 of Prudent Practices:

**Chapter 5 Working with Chemicals**

- Introduction
- Prudent Planning
- General Procedures for Working with Hazardous Chemicals
- Working with Substances of High Toxicity
- Working with Biohazardous and Radioactive Materials
- Working with Flammable Chemicals
- Working with Highly Reactive or Explosive Chemicals
- Working with Compressed Gases

**Chapter 6 Working with Laboratory Equipment**

- Introduction
- Working with Water-Cooled Equipment
- Working with Electrically Powered Laboratory Equipment
- Working with Compressed Gases
- Working with High/Low Pressures and Temperatures
- Using Personal Protective, Safety, and Emergency Equipment
- Emergency Procedures

**B. Hazardous Waste Management**

Extensive and detailed policies regarding hazardous waste management are specified in the College's guidebook "Hazardous Waste Management Guide". Please refer to this text for approved waste handling procedures.

**C. Emergency Procedures for Chemical Spills**

The procedures listed below are intended as a resource for your department in preparing for emergencies before they happen. If you are currently experiencing an emergency such as a chemical or blood spill, please contact the Department of Environmental Health at 505-566-3190.

### *Quick Reference Guide*

#### *Evacuate*

- Leave the spill area; alert others in the area and direct/assist them in leaving.
- Call 566-3333
- Without endangering yourself: remove victims to fresh air, remove contaminated clothing and flush contaminated skin and eyes with water for 15 minutes. If anyone has been injured or exposed to toxic chemicals or chemical vapors, call 911 and seek medical attention immediately.

#### *Confine*

- Close doors and isolate the area. Prevent people from entering spill area.

#### *Report*

- From a safe place, call the Department of Environmental Health (EH) (505) 566-3063 during working hours, 911 after hours.
- Report that this is an emergency and give your name, phone and location; location of the spill; the name and amount of material spilled; extent of injuries; safest route to the spill.
- Stay by that phone, EH will advise you as soon as possible.
- EH or the Fire Department will clean up or stabilize spills, which are considered high hazard (fire, health or reactivity hazard). In the case of a small spill and low hazard situation, EH will advise you on what precautions and protective equipment to use.

#### *Security will secure*

- Until emergency response personnel arrive: block off the areas leading to the spill, lock doors, post signs and warning tape, and alert others of the spill.
- Post staff by commonly used entrances to the area to direct people to use other routes.

After an accident, supervisor(s) must complete and fax in reporting forms within 24 hours.

## **2. General Emergency Procedures**

The procedures listed below are intended as a resource for your department in preparing for emergencies before they happen. If you are currently experiencing an emergency such as a chemical or blood spill, please contact the Department of Environmental Health at 505-566-3063.

For College employees who have been exposed to bloodborne or other infectious pathogens, please follow the procedures below under "Needle Stick." For all other emergencies call 911.

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### **Chapter 3 - Criteria for Implementation of Chemical Control Measures**

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

#### **1. Engineering controls**

##### **a) Fume Hoods**

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

Procedures that can generally be carried out safely outside the fume hood include those involving (1) water-based solutions of salts, dilute acids, bases, or other reagents, (2) very low volatility liquids or solids, (3) closed systems that do not allow significant escape to the laboratory environment, and (4) extremely small quantities of otherwise problematic chemicals. The procedure itself must be evaluated for its potential to increase volatility or produce aerosols.

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

##### **b) Safety Shields**

Safety shields, such as the sliding sash of a fume hood, are appropriate when working with highly concentrated acids, bases, oxidizers or reducing agents, all of which have the potential for causing sudden spattering or even explosive release of material. Reactions carried out at non-ambient pressures (vacuum or high pressure) also require safety shields, as do reactions that are carried out for the first time or are significantly scaled up from normal operating conditions.

##### **c) Other Containment Devices**

Other containment devices, such as glove boxes or vented gas cabinets, may be required when it is necessary to provide an inert atmosphere for the chemical procedure taking place, when capture of any chemical emission is desirable, or when the standard laboratory fume hood does not provide adequate assurance that overexposure to a hazardous chemical will not occur. The presence of biological or radioactive materials may also mandate certain special containment devices. High strength barriers coupled with remote handling devices may be necessary for safe use of extremely shock sensitive or reactive chemicals.

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

## **2. Personal Protective Equipment**

Bare feet, sandals and open-toed shoes are not permitted in any laboratory. Short pants and short skirts are not permitted in any laboratory, unless covered by a lab coat. Lab coats are strongly encouraged as routine equipment for all laboratory workers. Lab coats are also required when working with select carcinogens, reproductive toxins, substances which have a high degree of acute toxicity, strong acids and bases, and any substance on the OSHA PEL list carrying a "skin" notation. See Appendix B for chemical listings.

Eye protection is required for all personnel and any visitors whose eyes may be exposed to chemical or physical hazards. Side shields on safety spectacles provide some protection against flying particles, but goggles or face shields are necessary when there is a greater than average danger of eye contact with liquids. A higher than average risk exists when working with highly reactive chemicals, concentrated corrosives, or with vacuum or pressurized glassware systems. Contact lenses may be worn under safety glasses, goggles or other eye and face protection. Experts currently believe the benefits of consistent use of eye protection outweigh potential risks of contact lenses interfering with eye flushing in case of emergency.

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

Since no single glove material is impermeable to all chemicals, gloves should be carefully selected using guides from the manufacturers. General selection criteria are outlined in Prudent Practices, p. 132, and glove selection guides are available on the web . However, glove-resistance to various chemicals materials will vary with the manufacturer, model and thickness. Therefore, review a glove-resistance chart from the manufacturer you intend to buy from before purchasing gloves. When guidance on glove selection for a particular chemical is lacking, double glove using two different materials, or purchase a multi-layered laminated glove such as a Silvershield or a 4H.

Respiratory protection is generally not necessary in the laboratory setting and must not be used as a substitute for adequate engineering controls. Availability of respiratory protection for emergency situations may be required when working with chemicals that are highly toxic and highly volatile or gaseous. If an experimental protocol requires exposure above the action level (or PEL) that cannot be reduced, respiratory protection will be required. Rarely, an experimental situation may potentially involve IDLH (immediately dangerous to life or health) concentrations of chemicals, which will require use of respiratory protection.

## **3. Hygiene Practices**

Eating, drinking and chewing gum are all strictly prohibited in any laboratory with chemical, biological or radioactive materials. Researchers must also be careful to restrict other actions (such as applying lip balm or rubbing eyes) which could inadvertently cause exposure to materials. Consuming alcohol or taking illegal drugs in a research laboratory are strictly prohibited, as such actions potentially endanger

the health and safety of not only the user, but everyone in the building. Infractions will be met with serious disciplinary action.

Before leaving the laboratory, remove personal protective equipment/clothing (labcoat and gloves) and wash hands thoroughly. Do NOT wear laboratory gloves in public spaces such as hallways and elevators.

#### **4. Administrative Controls**

Researchers are strongly encouraged to prioritize research so that work with hazardous chemical, biological or physical agents occurs only during working hours (8 am – 5 pm, Monday through Friday). **After-hours work (on nights and weekends) should be restricted to non hazardous activities such as data analysis and report writing. If hazardous materials must be used at nights or on weekends, ensure that at least one other person is within sight and ear-shot to provide help in an emergency.**

Supervisors shall consider the hazards involved in their research, and designate areas, activities, and tasks that require specific types of personal protective equipment as described above.

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# **Chapter 4 - Management of Chemical Fume Hoods and Other Protective Equipment**

### **1. Monitoring Safety Equipment**

Fume hoods must be monitored daily by the user to ensure that air is moving into the hood. Any malfunctions must be reported immediately to the Environmental Health office. The hood should have a continuous reading device, such as a pressure gauge, to indicate that air is moving correctly. Users of older hoods without continuous reading devices should attach a strip of tissue or yarn to the bottom of the vertical sliding sash. The user must ensure the hood and baffles are not blocked by equipment and bottles, as air velocity through the face may be decreased. EH staff will measure the average face velocity of each fume hood annually with a velometer or a thermoanemometer. A record of monitoring results will be made.

Eye washes must be flushed weekly by the user. This will ensure that the eye wash is working, and that the water is clean, should emergency use become necessary. The user should coordinate with Environmental Health 566-3063 to ensure that emergency showers and eye washes are checked annually. Fire extinguishers will be checked annually by a College contractor. The user is responsible for checking regularly to ensure that other protective equipment is functioning properly. Environmental Health staff can assist with these evaluations, should assistance be necessary.

General laboratory conditions must be monitored periodically by the users. A generic laboratory audit form is included in Appendix G, and may be tailored for use by individual laboratories. The departmental Research Safety Officer or the College's Chemical Hygiene Officer may also use this form for spot-checks of the laboratories.

### **2. Acceptable Operating Range**

The acceptable operating range for fume hoods is 80 to 150 linear feet per minute, at the designated sash opening (usually 18 inches). If, during the annual check, a hood is operating outside of this range, EH staff may request that you check to ensure the baffles are adjusted properly, and that the exhaust slots are not blocked by bottles and equipment. If these adjustments do not help, EH staff will assist with getting the fume hoods serviced.

### **3. Maintenance**

During maintenance of fume hoods, laboratories must clean out and if necessary, decontaminate the fume hood and restrict use of chemicals to ensure the safety of maintenance personnel.

### **4. Training**

Training in the appropriate use and care of fume hood systems, showers, eyewashes and other safety equipment must be included in the initial and update training described in Section 5.

## **5. New Systems**

When new ventilation systems, such as variable air volume exhaust, are installed in College facilities, specific policies for their use will be developed by the Department of Environmental Health and employees will be promptly trained on use of the new equipment.

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**Chapter 5 - Employee Information and Training**

**1. Information**

It is essential that laboratory employees have access to information on the hazards of chemicals and procedures for working safely. Supervisors must ensure that laboratory employees are informed about and have access to the following information sources:

The contents of the OSHA Laboratory Safety Standard

"Occupational Exposure to Hazardous Chemicals in Laboratories" and its appendices (29 CFR 1910.1450). A copy of this federal standard can be found in Appendix A of this Laboratory Safety Plan.

San Juan College's Laboratory Safety Plan

This generic LSP is available to all employees on the Department of Environmental Health's web site ([www.sjc.edu](http://www.sjc.edu))

The Permissible Exposure Limits (PELs)

PELs for OSHA regulated substances can be found in Appendix B. Also included in Appendix B are the ACGIH Threshold Limit Value (TLV) list, a list of OSHA health hazard definitions, lists of "select carcinogens" and reproductive toxins, and chemicals having a high degree of acute toxicity.

Signs and symptoms associated with exposures to hazardous chemicals. <http://www.sjc.edu>

Laboratory Chemical Safety Summaries (LCSSs) are included on pages 235-413 of the 1995 edition of Prudent Practices. LCSSs are similar to Material Safety Data Sheets (MSDS), but are tailored to the hazards of laboratory use of those chemicals. The LCSSs include toxicity information, and signs and symptoms of exposure to the chemicals.

Material Safety Data Sheets (MSDSs)

MSDSs are available online through links from the Department of Environmental Health's web site. Hard copies of MSDS for many laboratory chemicals are also available from EH or departmental safety offices. Individual researchers are encouraged to keep hard copies in an easily accessible location for materials that are used in large quantities, which are used frequently, or which are particularly toxic.

Information on chemical waste disposal and spill response

The San Juan College guidebook, Hazardous Waste Management Guide provides detailed information on proper waste handling procedures.

**2. Training**

Each laboratory supervisor is responsible for ensuring that laboratory employees are provided with training about the hazards of chemicals present in their laboratory work area, and methods to control exposure to such chemicals. Such training must be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new potential exposure situations. Refresher training must be provided annually.

Colleges and non-academic departments that engage in the laboratory use of hazardous chemicals are responsible for identifying employees who require training and for developing and delivering training programs for such employees. However, laboratory supervisors must provide additional training on laboratory-specific hazards to ensure all the OSHA-required training topics have been adequately addressed.

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

Methods of detecting the presence of hazardous chemicals;

Method include visual observation, odor, real-time air monitoring, time-weighted air sampling, etc.).

Basic toxicological principles;

Principles include toxicity, hazard, exposure, routes of entry, acute and chronic effects, dose-response relationship, LD50, threshold limit values and permissible exposure limits, exposure time, and health hazards related to classes of chemicals.

Prudent laboratory practices;

Prudent laboratory practices include general techniques designed to reduce personal exposure and to control physical hazards, as well as specific protective mechanisms and warning systems used in individual laboratories. Appropriate use of fume hoods is to be specifically addressed.

Description of available chemical information;

Container labels, Material Safety Data Sheets, etc.

Emergency response actions appropriate to individual laboratories;

Lists of emergency phone numbers, location of fire extinguishers, deluge showers, eyewashes, etc.

Applicable details of the departmental Laboratory Safety Plan;

Details should include general and laboratory-specific Standard Operating Procedures.

An introduction to the Hazardous Waste Management guidebook.

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**Chapter 6 - Additional Employee Protection  
for Work with Particularly Hazardous  
Substances**

Additional employee protection will be considered for work with particularly hazardous substances. These include select carcinogens, reproductive toxins and substances that have a high degree of acute toxicity (see Appendix B). Pp. 90-93 of the 1995 edition of Prudent Practices provides detailed recommendations for work with particularly hazardous substances. These pages may be accessed from EH's web site at [www..](http://www..) Also, EH has hard copies of the entire 1995 edition available for departmental Research Safety Officers. Laboratory supervisors and principal investigators are responsible for assuring that laboratory procedures involving particularly hazardous chemicals have been evaluated for the level of employee protection required. Specific consideration will be given to the need for inclusion of the following provisions:

- 1.Planning;
- 2.Establishment of a designated area;
- 3.Access control
- 4.Special precautions such as:
  - use of containment devices such as fume hoods or glove boxes;
  - use of personal protective equipment;
  - isolation of contaminated equipment;
  - practicing good laboratory hygiene; and
  - prudent transportation of very toxic chemicals.
- 5.Planning for accidents and spills; and
- 6.Special storage and waste disposal practices.

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### **Chapter 7 - Record Keeping, Review and Update of Laboratory Safety Plan**

#### **1. Record Keeping**

##### Exposure evaluation

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

##### Medical consultation and examination

Results of medical consultations and examinations will be kept by the San Juan College, Human Resource Office for a length of time specified by the appropriate medical records standard. This time will be at least the term of employment plus 30 years as required by OSHA.

##### Fume hood monitoring

Data on annual fume hood monitoring will be kept in the Department of Environmental Health. Fume hood monitoring data are considered maintenance records and as such the raw data will be kept for one year and summary data for 5 years.

#### **B. Review and Update of Laboratory Safety Plan**

On an annual basis, this Laboratory Safety Plan will be reviewed and evaluated for effectiveness by the Department of Environmental Health and updated as necessary. Any changes in the Laboratory Safety Plan will be transmitted to college and departmental laboratory safety officers, who are responsible for carrying out a similar review and modification of their plans, and submitting a revised copy to the Chemical Hygiene Officer.

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**Table 1 - Poisonous Gases**

The gases on this list are either on the Department of Transportation's Category 1 list, or the Linde Specialty Gases company's Group 6 – Very Poisonous list. These chemicals are highly toxic gases at ambient temperature and pressure. They have an extremely high potential for causing significant harm if not adequately controlled.

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

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

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## Table 2 - Shock Sensitive Chemicals

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

- Acetylenic compounds, especially polyacetylenes, haloacetylenes, and heavy metal salts of acetylenes (copper, silver, and mercury salts are particularly sensitive)
- Acyl nitrates
- Alkyl nitrates, particularly polyol nitrates such as nitrocellulose and nitroglycerine
- Alkyl and acyl nitrites
- Amminmetal oxosalts: metal compounds with coordinated and hydrazine, or similar nitrogenous donors and ionic perchlorate, nitrate, permanganate, or other oxidizing group
- Azides, including metal, nonmetal, and organic azides
- Chlorite salts of metals, such as  $\text{AgClO}_2$  and  $\text{Hg}(\text{ClO}_2)_2$
- Diazo compounds such as  $\text{CH}_2\text{N}_2$
- Diazonium salts, when dry
- Fulminates such as mercury fulminate ( $\text{Hg}(\text{CNO})_2$ )
- Hydrogen peroxide (which becomes increasingly treacherous as the concentration rises above 30%, forming explosive mixtures with organic materials and decomposing violently in the presence of traces of transition metals)
- N-Halogen compounds such as difluoroamino compounds and halogen azides
- N-Nitro compounds such as N-nitromethylamine, nitrourea, nitroguanidine, and nitric amide
- Oxo salts of nitrogenous bases: perchlorates, dichromates, nitrates, iodates, chlorites, chlorates, and permanganates of ammonia, amines, hydroxylamine, guanidine, etc.
- Perchlorate salts (which can form when perchloric acid mists dry in fume hoods or associated duct work. Most metal, nonmetal, and amine perchlorates can be detonated and may undergo violent reaction in contact with combustible materials)
- Peroxides and hydroperoxides, organic
- Peroxides (solid) that crystallize from or are left from evaporation of peroxidizable solvents (see the following Section 3)
- Peroxides, transition-metal salts
- Picrates, especially salts of transition and heavy metals, such as Ni, Pb, Hg, Cu, and Zn
- Polynitroalkyl compounds such as tetranitromethane and dinitroacetonitrile
- Polynitroaromatic compounds especially polynitrohydrocarbons, phenols, and amines (e.g., dinitrotoluene, trinitrotoluene, and picric acid)

Note: Perchloric acid must be used only in specially-designed perchloric acid fume hoods that have built-in wash down systems to remove shock-sensitive deposits. Before purchasing this acid, laboratory supervisors must arrange for use of an approved perchloric acid hood.

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**Table 3 - Pyrophoric Chemicals**

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

- Grignard reagents, RMgX
- Metal alkyls and aryls, such as RLi, RNa, R<sub>3</sub>Al, R<sub>2</sub>Zn
- Metal carbonyls such as Ni(CO)<sub>4</sub>, Fe(CO)<sub>5</sub>, Co<sub>2</sub>(CO)<sub>8</sub>
- Alkali metals such as Na, K
- Metal powders, such as Al, Co, Fe, Mg, Mn, Pd, Pt, Ti, Sn, Zn, Zr
- Metal hydrides such as NaH, LiAlH<sub>4</sub>
- Nonmetal hydrides, such as B<sub>2</sub>H<sub>6</sub> and other boranes, PH<sub>3</sub>, AsH<sub>3</sub>
- Nonmetal alkyls, such as R<sub>3</sub>B, R<sub>3</sub>P, R<sub>3</sub>As
- Phosphorus (white)

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## Table 4 - Peroxide-Forming Chemicals

The chemicals listed below can form explosive peroxide crystals on exposure to air, and therefore require special handling procedures after the container is opened. Some of the chemicals form peroxides that are violently explosive in concentrated solution or as solids, and therefore should never be evaporated to dryness. Others are polymerizable unsaturated compounds and can initiate a runaway, explosive polymerization reaction. All peroxidizable compounds should be stored away from heat and light. They should be protected from physical damage and ignition sources. A warning label should be affixed to all peroxidizable materials to indicate the date of receipt and the date the container was first opened. Due to these special handling requirements, users must have the appropriate laboratory equipment, information, knowledge and training to use these compounds safely.

**A. Severe Peroxide Hazard with Exposure to Air** (discard within 3 months from opening)

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

**B. Peroxide Hazard on Concentration**

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

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

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

Liquids (discard or test for peroxides after 6 months)

Chloroprene (2-chloro-1, 3-butadiene)

- vinyl acetate
- styrene
- vinylpyridine

Gases (discard after 12 months)

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

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**Table 5 - Carcinogens, Reproductive Toxins  
or Highly Toxic Chemicals**

The chemicals listed below are extremely hazardous. Workers must have knowledge of the dangers of these chemicals prior to use, and documentation of training in safe working procedures.

Biologically active compounds

- protease inhibitors (e.g. PMSF, Aprotin, Pepstatin A, Leupeptin);
- protein synthesis inhibitors (e.g. cycloheximide, Puromycin);
- transcriptional inhibitors (e.g.  $\alpha$ -amanitin and actinomycin D);
- DNA synthesis inhibitors (e.g. hydroxyurea, nucleotide analogs (i.e. dideoxy nucleotides), actinomycin D, acidicolin);
- phosphatase inhibitors (e.g. okadaic acid);
- respiratory chain inhibitors (e.g. sodium azide);
- kinase inhibitors (e.g. NaF);
- mitogenic inhibitors (e.g. colcemid); and
- mitogenic compounds (e.g. concanavalin A).

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

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

Jaquurity bean lectin (*Abrus precatorius*)

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

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

Retinoids: potential human teratogens

Streptozotocin: potential human carcinogen

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