**PURDUE UNIVERSITY**

**Chemical Hygiene Plan and Hazardous Materials Safety Manual**

**Laboratory Specific Plan**

| **This is the Chemical Hygiene Plan specific to the following areas:** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | |
| Building(s): | DRUG | | | | | |
|  | | | | | | |
| Room Number(s): | | | **334, 334A, 340, 318 (hallway), 310 (hallway), 310A, 310B, 310C(cold room), 310D, 310E, 310F (counting room), 310G (radioactive room), 380, 380A, 374A** | | | |
|  | | | | | | |
| Principal Investigator (Supervisor): | | | | | Philip S. Low | |
|  | | | | | | |
| Department: | | Chemistry | | | | |
|  | | | | | | |
| Revised *(Must be reviewed at least annually.)*: | | | | | | October 15, 2014 |
|  | | | |  | | |
|  | | | | | | |
| **Important Telephone Numbers:** | | | | | | |
| 1. 911 for All Emergencies 2. (765) 49-48221 Purdue Police Department (Non-Emergency Line) 3. (765) 49-46919 Purdue Fire Department (Non-Emergency Line) 4. (765) 49-46371 Purdue REM (Do Not Use for an Emergency) | | | | | | |
|  | | | | | | |
|  | | | | | | |
| *All laboratory chemical use areas must maintain a work-area specific Chemical Hygiene Plan which conforms to the requirements of the OSHA Occupational Exposure to Hazardous Chemicals in Laboratories (29 CFR 1910.1450). Purdue University laboratories may use this document as a starting point for creating their work area specific Chemical Hygiene Plan. Minimally, this cover page is to be edited for work area specificity (non-West Lafayette laboratories are to place their own emergency, fire, and police telephone numbers in the space above) and the Purdue Chemical Hygiene Plan Awareness Certification Form must be completed for all lab employees. This instruction and information box should remain. This model Chemical Hygiene Plan is the 2014 version; the most current version can be found on the Forms page at www.purdue.edu/rem.* | | | | | | |

# Appendix A: CHP Training Certification Form

**PURDUE UNIVERSITY**

**Chemical Hygiene Plan and Hazardous Materials Safety Manual**

**Training Certification   
*(Please Type or Print Legibly)***

| **For:** | **Low Lab DRUG 334, 334A, 340, 318(hallway), 310 (hallway), 310A, 310B, 310C(cold room), 310D, 310E, 310F (counting room), 310G (radioactive room), 380, 380A, 374A** | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | ***Principal Investigator, Building, and Room(s)*** | | | | | | | | | | |
|  | | | | | | | | | | | |
| After reading the "Purdue Chemical Hygiene Plan”, complete and return a copy of this form to your principal investigator (supervisor). By signing below you acknowledge that you are aware of the Chemical Hygiene Plan and the policies and procedures applicable to the OSHA Occupational Exposure to Hazardous Chemicals in Laboratories Standard (29 CFR 1910.1450). Your supervisor will provide additional information and training as appropriate. | | | | | | | | | | | |
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|  | | | | | | | | | | | |
| Name: | |  | | | | | | Work Telephone: | | |  |
|  | | | | | | | | | | | |
| Email Address: | | | | |  | | | | | | |
|  | | | | | | | | | | | |
| Department: | | | |  | | | | | | | |
|  | | | | | | | | | | | |
| Job Title: | | |  | | | | | | | | |
|  | | | | | | |  | | | | |
|  | | | | | | | | | | | |
| Employee Signature: | | | | | |  | | | Date: |  | |
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|  | | | | | | | | | | | |
| **Filing:** | | | | | | | | | | | |
| Completed Chemical Hygiene Plan Awareness Certifications are to be filed in a central administrative location within each staff member’s department. These and all other safety training records should be organized in a way that allows original records to be retrieved quickly and efficiently on request by an OSHA inspector or a REM staff member, and to be retrieved for a single staff member or for an entire work group (identified by PI/supervisor). | | | | | | | | | | | |

# Appendix B: OSHA Hazard Class Definitions

1. Physical Hazards
2. Flammable Liquids

Flammable hazards are materials which under standard conditions can generate sufficient vapor to cause a fire in the presence of an ignition source. Flammable liquids (e.g., hexane, ethyl acetate, xylene) are more hazardous at elevated temperatures due to more rapid vaporization. The following definitions are important to understand when evaluating the hazards of flammable liquids:

* **Flammable liquid** is a liquid having a flash point no greater than 93 °C (200 °F).
* **Flash point** is the minimum temperature at which the Flammable Range Figureapplication of an ignition source causes the vapors of a liquid to ignite under specified test conditions.
* **Boiling point** isthe temperature at which the vapor pressure of a liquid equals the atmospheric pressure and the liquid changes into a vapor.
* **Auto ignition temperature** is the minimum temperature at which self-sustained combustion will occur in the absence of an ignition source.
* **Lower explosive limit (LEL)** is the lowest concentration (percentage) of a gas or a vapor in air capable of producing a flash of fire in presence of an ignition source (arc, flame, heat).
* **Upper explosive limit (UEL)** is the highest concentration (percentage) of a gas or a vapor in air capable of producing a flash of fire in presence of an ignition source (arc, flame, heat).

Some organic solvents (e.g., diethyl ether) have the potential to form potentially shock-sensitive organic peroxides. See Appendix 3 for additional information regarding peroxide forming chemicals.

Chapter 5.7.2 of the CHP details flammable liquids storage requirements.

1. Flammable Solids

A flammable solid is a solid which is readily combustible, or may cause or contribute to a fire through friction. Readily combustible solids are powdered, granular, or pasty substances which are dangerous if they can be easily ignited by brief contact with an ignition source. Flammable solids are more hazardous when widely dispersed in a confined space (e.g., finely divided metal powders).

1. Gases under Pressure

Gases under pressure are gases which are contained in a receptacle at a pressure not less than 280 kPA at 20 °C or as a refrigerated liquid. Gases under pressure include the following:

* **Compressed gas** is a gas which when packaged under pressure is entirely gaseous at -50 °C; including all gases with a critical temperature ≤ -50 °C.
* **Liquefied gas** is a gas which when packaged under pressure is partially liquid at temperatures above -50 °C.
* **Refrigerated liquefied gas** is a gas which when packaged is made partially liquid because of its low temperature.
* **Dissolved gas** is a gas which when packaged under pressure is dissolved in a liquid phase solvent.

All compressed gases are hazardous due to the fact they are stored in compressed cylinders, which can explode and act as a projectile if ruptured. Compressed gases also carry the hazards of the chemicals they contain such as asphyxiation (carbon dioxide), toxicity (nitric oxide), flammable (propane), and corrosive (hydrogen chloride).

Chapter 5.7.3 of the CHP details compressed gases storage requirements.

1. Pyrophoric, Self-Heating, and Self-Reactive Materials

**Pyrophoric material** (also called “spontaneously combustible”) is a liquid or solid that even in small quantities and without an external ignition source can ignite after coming in contact with the air.

**Self-heating material** is a solid or liquid, other than a pyrophoric substance, which, by reaction with air and without energy supply, is liable to self-heat. This endpoint differs from a pyrophoric substance in that it will ignite only when in large amounts (kilograms) and after long periods of time (hours or days).

**Self-reactive material** is a thermally unstable liquid or solid liable to undergo a strongly exothermic thermal decomposition even without participation of oxygen (air).

Chapter 5.7.4 of the CHP details the storage requirements for reactive chemicals.

1. Water-Reactive Materials

Label: Dangerous When WetA water-reactive material is a liquid or solid that reacts violently with water to produce a flammable or toxic gas, or other hazardous conditions. Alkali metals (e.g., sodium, potassium) and metal hydrides (e.g., calcium hydride) are common water-reactive materials found in laboratories.

Chapter 5.7.4 of the CHP details the storage requirements for reactive chemicals.

1. Oxidizers

An oxidizing solid/liquid is a solid/liquid which, while in itself is not necessarily combustible, may generally by yielding oxygen, cause or contribute to the combustion of other material. Hydrogen peroxide, nitric acid, and nitrate solutions are examples of oxidizing liquids commonly found in a laboratory. Sodium nitrate, Sodium perchlorate, and Potassium permanganate are examples of oxidizing solids commonly found in a laboratory.

Chapter 5.7.7 of the CHP details oxidizer storage requirements.

1. Organic Peroxides

An organic peroxide is an organic liquid or solid which contains the bivalent -0-0- structure and may be considered a derivative of hydrogen peroxide, where one or both of the hydrogen atoms have been replaced by organic radicals. The term also includes organic peroxide formulations (mixtures). Such substances and mixtures may:

* Be liable to explosive decomposition;
* Burn rapidly;
* Be sensitive to impact or friction; or
* React dangerously with other substances

Chapter 5.7.7 of the CHP details organic peroxide storage requirements.

1. Explosives

****An explosive substance (or mixture) is a solid or liquid substance (or mixture of substances) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed that can cause damage to the surroundings. Pyrotechnic substances are included even when they do not evolve gases. A pyrotechnic substance (or mixture) is designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as the result of non-detonative, self-sustaining, exothermic chemical reactions. An explosive compound that is sometimes found in a laboratory setting is picric acid (2,4,6-trinitrophenol).

If a laboratory plans to work with explosive compounds, contact REM for further instructions before any work occurs.

1. Health Hazards

A chemical is a health hazard if 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. Each health hazard is defined and briefly discussed below.

1. Irritants

Irritants are defined as chemicals that cause reversible inflammatory effects on living tissue by chemical action at the site of contact. A wide variety of organic and inorganic compounds, including many chemicals that are in a powder or crystalline form, are irritants. Symptoms of exposure can include reddening or discomfort of the skin and irritation to respiratory systems.

1. Sensitizers

A sensitizer (allergen) is a substance that causes exposed individuals to develop an allergic reaction in normal tissue after repeated exposure to the substance. Examples of sensitizers include diazomethane, chromium, nickel, formaldehyde, isocyanates, arylhydrazines, benzylic and allylic halides, and many phenol derivatives. Sensitizer exposure can lead to all of the symptoms associated with allergic reactions, or can increase an individual’s existing allergies.

1. Corrosives

Corrosive substances cause destruction of living tissue by chemical corrosion at the site of contact and can be either acidic or caustic (basic). Major classes of corrosive substances include:

* ****Strong acids such as sulfuric, nitric, hydrochloric and hydrofluoric acids
* Strong bases such as sodium hydroxide, potassium hydroxide, and ammonium hydroxide
* Dehydrating agents such sulfuric acid, sodium hydroxide, phosphorus pentoxide and calcium oxide
* Oxidizing agents such as hydrogen peroxide, chlorine, and bromine

Chapter 5.7.6 of the CHP details corrosives storage requirements.

1. Hazardous Substances with Toxic Effects on Specific Organs

Substances with toxic effects on specific organs include:

* Hepatotoxins, which are substances that produce liver damage, such as nitrosamines and carbon tetrachloride.
* Nephrotoxins, which are substances that cause damage to the kidneys, such as certain halogenated hydrocarbons.
* Neurotoxins, which are substances that produce toxic effects on the nervous system, such as mercury, acrylamide, and carbon disulfide.
* Substances that act on the hematopoietic system (e.g., carbon monoxide and cyanides), which decrease hemoglobin function and deprive the body tissues of oxygen.
* Substances that damage lung tissue such as asbestos and silica.

1. Particularly Hazardous Substances

Substances that pose such significant threats to human health are classified as "particularly hazardous substances" (PHSs). The OSHA Laboratory Standard requires that special provisions be established to prevent the harmful exposure of researchers to PHSs, including the establishment of designated areas for their use. Particularly hazardous substances are divided into three primary types:

1. Carcinogens
2. Reproductive Toxins
3. Substances with a High Acute Toxicity
4. Carcinogens

Carcinogens are chemical or physical agents that cause cancer. Generally they are chronically toxic substances; that is, they cause damage after repeated or long-duration exposure, and their effects may only become evident after a long latency period. Chronic toxins are particularly insidious because they may have no immediately apparent harmful effects. These materials are separated into two classes:

1. **Select Carcinogens:** Select carcinogens are materials which have met certain criteria established by the National Toxicology Program or the International Agency for Research on Cancer regarding the risk of cancer via certain exposure routes. It is important to recognize that some substances involved in research laboratories are new compounds and have not been subjected to testing for carcinogenicity.
2. **Regulated Carcinogens:** Regulated carcinogens are more hazardous and have extensive additional requirements associated with them. The use of these agents may require personal exposure sampling based on usage. When working with Regulated Carcinogens, it is particularly important to review and effectively apply engineering and administrative safety controls as the regulatory requirements for laboratories that may exceed long term (8 hour) or short term (15 minutes) threshold values for these chemicals are very extensive.
3. Reproductive Toxins

Reproductive toxins include any chemical that may affect the reproductive capabilities, including chromosomal damage (mutations) and effects on fetuses (teratogens). Reproductive toxins can affect the reproductive health of both men and women if proper procedures and controls are not used. For women, exposure to reproductive toxins during pregnancy can cause adverse effects on the fetus; these effects include embryolethality (death of the fertilized egg, embryo or fetus), malformations (teratogenic effects), and postnatal functional defects. For men, exposure can lead to sterility. Examples of embryotoxins include thalidomide and certain antibiotics such as tetracycline. Women of childbearing potential should note that embryotoxins have the greatest impact during the first trimester of pregnancy. Because a woman often does not know that she is pregnant during this period of high susceptibility, special caution is advised when working with all chemicals, especially those rapidly absorbed through the skin (e.g., formamide).

1. Substances with a High Acute Toxicity

Substances that have a high degree of acute toxicity are materials that may be fatal or cause damage to target organs as the result of a single exposure or exposures of short duration. Acute toxins are quantified by a substance’s lethal dose-50 (LD50) or lethal concentration-50 (LC50), which is the lethal dose of a compound to 50% of a laboratory tested animal population (e.g., rats, rabbits) over a specified time period. High acute toxicity includes any chemical that falls within any of the following OSHA-defined categories:

* A chemical with a median lethal dose (LD50) of 50 mg or less per kg of body weight when administered orally to certain test populations.
* A chemical with an LD50 of 200 mg less per kg of body weight when administered by continuous contact for 24 hours to certain test populations.
* A chemical with a median lethal concentration (LC50) in air of 200 parts per million (ppm) by volume or less of gas or vapor, or 2 mg per liter or less of mist, fume, or dust, when administered to certain test populations by continuous inhalation for one hour, provided such concentration and/or condition are likely to be encountered by humans when the chemical is used in any reasonably foreseeable manner.

Chapter 5.7.5 of the CHP details acutely toxic compounds storage requirements.

**Appendix C:   
  
Peroxide Forming Chemicals**

Autoxidation in common laboratory solvents can lead to unstable and potentially explosive peroxide formation. The reaction can be initiated by exposure to air, heat, light, or contaminants. Most of these solvents are available with inhibitors to slow the peroxide formation. Examples of inhibitors include BHT (2,6-di-tert-butyl-4-methyl phenol) and Hydroquinone. There are three categories of peroxide formers:

**Group A** chemicals are those which form explosive levels of peroxides after prolonged storage, especially after exposure to air without concentration. Test these for peroxide formation before using and discard 3 months after opening.

|  |  |
| --- | --- |
| **Table C.1 – Group A Chemicals** | |
| Butadiene | Isopropyl ether |
| Chloroprene | Tetrafluoroethylene |
| Divinylacetylene | Vinylidine chloride |

**Group B** chemicals form peroxides that are hazardous only on concentration by distillation or evaporation. Test these before distillation and discard after 12 months.

|  |  |  |
| --- | --- | --- |
| **Table C.2 – Group B Chemicals** | | |
| Acetal | Dicyclopentadiene | Methyl isobutyl ketone |
| Acetaldehyde | Diethyl ether | 4-Methyl-2-pentanol |
| Benzyl alcohol | Diethylene glycol dimethyl ether | 2-Pentanol |
| 2-Butanol | Dioxane | 4-Penten-1-ol |
| Cumene | Ethylene glycol dimethyl ether | 1-Phenylethanol |
| Cyclohexanol | 4-Heptanol | 2-Phenylethanol |
| 2-cyclohexen-1-ol | 2-Hexanol | 2-Propanol |
| Cyclohexene | Methylacetylene | Tetrahydrofuran |
| Decahydronaphthalene | 3-Methyl-1-butanol | Tetrahydronaphthalene |
| Diacetylene | Methylcyclopentane | Vinyl ether |

**Group C** chemicals consist of monomers which form peroxides that can initiate explosive polymerization. Inhibited monomers should be tested before use and discarded after 12 months. Uninhibited monomers should be discarded 24 hours after opening.

|  |  |
| --- | --- |
| **Table C.3 – Group C Chemicals** | |
| Acrylic acid | Styrene |
| Acrylonitrile | Tetrafluoroethylene |
| Butadiene | Vinyl acetate |
| Chloroprene | Vinyl acetylene |
| Chlorotrifluoroethylene | Vinyl chloride |
| Methyl methacrylate | Vinyl pyridine |

**General Guidelines**

* Solvents containing inhibitors should be used whenever possible.
* All peroxide forming solvents should be tested prior to distillation.
* Peroxide forming solvents should be purchased in limited quantities.
* Peroxide forming solvents should be marked with the purchase date and the date opened.
* Peroxide forming solvents should be sealed tightly and stored away from light and heat.
* Periodic testing should be done on opened containers and the results marked on the containers.

**Testing**

* Obtain test strips for the range of 0-100 ppm peroxide.
* Record the test results on the bottle.
* If the test results are 100 ppm or greater, contact REM at (765) 494-0121 for proper disposal.

# Tab 1: Specific Standard Operating Procedures

Supervisor: **P.S. Low**

Department: **Chemistry**

Affected buildings/rooms: **DRUG 334, 334A, 340, 318 (hallway), 310 (hallway), 310A, 310B, 310C (cold room), 310D, 310E, 310F (counting room), 310G (radioactive room), 380, 380A, 374A**

If no attachments are necessary, supervisor must print this document and sign below:

Supervisor’s Signature:

Otherwise, list attached programs/plans by title:

**Work with Corrosive, Pyrophoric, and/or Peroxidizable Materials**

**Working with Acrolein**

**Radioactive Materials**

**Proper disposal of sharps**

**Animal Use**

**Working with/handling *Plasmodium falciparum***

**Working with/handling *Influenza Virus***

**Low Lab Standard Operating Procedure for Working with Corrosives:**

Corrosives are materials which can react with the skin causing burns similar to thermal burns, and/or which can react with metal causing deterioration of the metal surface. Acids and bases are corrosives. Observe the following special precautions.

1. Containers and equipment used for storage and processing of corrosive materials should be corrosion re­sistant.
2. Eye protection and rubber gloves should always be used when handling corrosive materials. A face shield, rubber apron, and rubber boots may also be appropriate, depending on the work performed. Inhalation of material should be carefully avoided.
3. When mixing concentrated acids (caustics) with water, add the acid (caustic) slowly to water. Never add water to acid (caustic).
4. Acids and bases should be stored separately from each other. Organic acids should be stored with flammable materials, separate from oxidizers and oxidizing acids.

#### Corrosives must be disposed of properly according to state and federal regulations.

#### All corrosive material should be stored in a cool, dry cabinet away from heat, moisture and other chemicals that are incompatible with the particular material as described in its MSDS.

#### Low Lab Standard Operating Procedure for Working with Pyrophoric Materials:

#### Pyrophoric materials ignite spontaneously upon contact with air. The flame may or may not be visible. Examples include butyllithium, silane, and yellow phosphorous. Store and use all pyrophorics in an inert atmosphere.

All pyrophoric material containers must be kept in a cool, dry, well-ventilated place. Store away from heat and avoid contact with water as well as from any sources of ignition. All equipment containing the material should be grounded. Follow an appropriate protocol for safe removal and use of these materials and do so ONLY in a fume hood.

Do not ingest. Do not breathe gas/fumes/ vapor/spray. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, moisture. Upon completion of your work, dispose remaining unused reagent through hazardous material pickup by REM.

**Low Lab Standard Operating Procedure for Working with Peroxidizables:** Peroxidizables are substances or mixtures which react with oxygen to form peroxides. Some peroxides can explode with impact, heat, or friction such as that caused by removing a lid. Peroxides form inside the containers of some materials even if they have not been opened. Examples include ethyl ether, tetrahydrofuran, liquid paraffins (alkanes), and olefins (alkenes). See Appendix C for additional materials which may form peroxides.

-Date all peroxidizables upon receipt and upon opening. Unless an inhibitor has been added by the manufacturer, materials should be properly disposed of through REM after 18 months from date of receipt or 3 months from date of opening.

-Store container in a segregated area that is cool and well-ventilated. Keep container tightly closed and sealed until ready for use. Prolonged exposure to air and light may form unstable explosive peroxides.

-Do not open any container having obvious crystal formation around the lid.

-Keep away from heat, sources of ignition, and ground all equipment containing the material.

-Keep away from incompatibles such as oxidizing agents.

-Do not ingest. Do not breathe gas/fumes/ vapor/spray. If ingested, seek medical advice immediately and show the container, label, or MSDS. Avoid contact with skin and eyes.

-Wear suitable protective clothing, gloves, lab coat, and goggles.

**Low Lab Standard Operating Procedure**

**Title: Working with/Handling Acrolein (2-Propenal, Acraldehyde, Acrylic aldehyde, Allylaldehyde) CAS #: 107-02-8**

**Updated: November 2011**

Acrolein has a **Health Rating of 4** and is **poisonous**. It can cause eye and skin burns, may cause irritation to respiratory tract and can **be fatal if inhaled.**

The liquid and vapor are also flammable. It is a **suspected human carcinogen.**

**Storage**: Acrolein should be stored in a well ventilated area away from heat, flame, and sparks and any oxidizing agent.

**Use:** When working with acrolein, gloves must be worn at all times (double glove to be safe) as well as a lab coat and goggles. Feet should be covered with relatively impervious shoes or boots and legs should also be covered

Acrolein should be used only in a chemical fume hood. Use spark-proof tool and explosion-proof equipment. Avoid exposure to direct sunlight.

**Disposal of Waste**: Acrolein solutions may be quenched with excess glycine but still must be disposed of as hazardous waste. Place waste in an appropriate and compatible container with an orange waste label describing the components of the waste. Be sure lid is tightly closed and submit a hazardous waste pick-up request to REM for removal.

**In case of spill:**

Do not clean up the spill if acrolein fumes are present in the room. **Evacuate and ventilate area**.

If spilled in a fume hood and it is safe to clean up the spill, wear PPE listed above and use spill pads or paper towels. Double bag and securely fasten spill materials, including gloves. Request collection of spill materials as hazardous waste.

**For large spills, evacuate the** **area, close the door, and call REM.** Post notice on door. During business hours, if there was no exposure and there is no risk of fire, call REM for further instructions. Try to turn off all sources of flame and ignition

If there is risk of fire or anyone was exposed, pull fire alarm and call 911.

**Eyes:** If eyes are exposed to acrolein, call 911 as soon as possible and immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes.

**Skin contact:** If skin is exposed to acrolein, call 911 as soon as possible, remove clothing and rinse for 15 minutes in the safety shower. Remove contaminated clothing, including shoes, after flushing has begun.

When assisting a victim, be sure you are wearing gloves.

**Inhalation**: Immediately remove victim to fresh air and call 911. If breathing is difficult, give oxygen. If breathing has stopped, give artificial respiration.

**Ingestion:** Seek medical attention.

**In any event of exposure, consult a physician.**

**Low Lab Standard Operating Procedure**

**Title: Radioactive Materials**

**Updated: October 15, 2014**

Every individual working with radioactive materials is required to take the radiation safety course offered by REM. Individuals may not begin working with radioactive materials until training is complete.

Work with radioactive materials may only be done in designated areas (DRUG 310F and 310G) and the areas must be clearly marked.

The laboratory is responsible for maintaining a log of the radioactive isotopes in the laboratory and the quantities. The log must be kept on file until that shipment has been used up.

Every researcher who works with radioactivity must wear their survey badge or ring to monitor their exposure to radiation.

During experimentation, individuals need to wear the proper personal protective equipment to minimize exposure. Long pants, closed toes shoes, gloves, a lab coat and lead vest (except for β emitters like 32P) must be worn at **all** times. Remember to change gloves frequently and wear double gloves if desired. Also, all radioactive work should be done in the hood behind a shield when possible.

Use fresh paper to cover all surfaces used during the experiment. Change the paper if any spill occurs. Discard the paper properly at the end of the experiment.

To minimize contamination, use double containment whenever a hot sample is moved across any open space, especially outside of the hot lab.

Radioactive waste must be collected in designated radioactive waste containers. Radioactive waste containers must be labeled with the authorization number, name, date, isotope, and amount. Promptly submit a radioactive waste pickup form to REM for waste removal.

After completion of experiment, researchers need to thoroughly clean the area and conduct a survey which is recorded on the log sheet by the door. Survey should minimally include: bench top, hood, floor, instruments used, self, door, and sink. Any area with counts above background should be repeatedly cleaned with soap and water until counts are at background.

Any radioactive animals or cages need to be properly labeled with the isotope, amount and time of injection. After 5 half lives, the cages may be returned to the proper animal housing facility.

If you have concerns or observe someone doing something unsafely, please discuss it with the involved person and the radiation safety officer.

**Low Lab Standard Operating Procedures**

**Title: Disposal of Sharps**

**Updated: October 15, 2014**

This SOP is to serve as a guide for the proper disposal of various tips and sharps. In this protocol, a ‘sharp’ refers to any object which is rigid and even remotely pointy such that it could pierce through a common garbage bag. This includes but is not limited to pipette tips, serological pipettes (the long, graduated ones), razor blades, glass tubes or bottles (broken or intact), and needles (even with the plastic guard).

**Under no circumstance should a sharp of any kind be placed in a regular trash can.**

**Glass-** Glass may be disposed of in the cardboard broken glass boxes located throughout the labs. No liquids or other solids of any kind should ever be disposed of in these boxes- **ONLY GLASS!** Under no circumstance should needles or razor blades be placed in here and never discard Pasteur pipettes or other sharps contaminated with organic chemicals (even traces) in these boxes as they leave unpleasant odors and may leak and react with other chemicals from improperly disposed of sharps (see sharps contaminated with hazardous chemicals below). Glass boxes should be filled no more than ¾ full, after which the lid should be duct taped securely closed and the box should be set aside for removal by custodial staff.

**Non-hazardous sharps-** Sharpswhich present no real hazard other than being rigid and pointy (e.g. pipette tips used for water or buffer) can be collected in any rigid plastic or cardboard container with an appropriate label such as “Tips” or “Non-Hazardous Sharps”. When full, this container should be closed securely (with tape if necessary) and may be placed in the regular trash. Tips or sharps contaminated with any hazardous chemicals must be disposed of through REM as described below (see sharps contaminated with hazardous chemicals below). For serological (graduated) pipettes, if a large enough box or plastic container is not available, pipettes (even those just used for water or medium) can be disposed of in the biohazard bag next to the biosafety cabinet.

**Biohazardous Sharps-** This could include needles, serological pipettes, pipette tips, and glass (coverslips, tubes, etc) and anything else rigid, pointy, and contaminated with a biohazardous agent.

**Needles-** Needles and other sharps contaminated with human blood or other biohazardous agents can be disposed of in a red plastic sharps box. These boxes are not free so care should be taken to not fill them unnecessarily- trash items like gloves and paper towels should go in the biohazard bags instead. If possible, syringes and needles should be separated as the syringe can be placed in a biohazard bag while the needle must go in the red box or other rigid container. Once a red biohazardous sharps box reaches ¾ full, it should be autoclaved and disposed of as biological waste.

**Tips-** Pipette tips contaminated by human blood or other biohazardous agent can fill a red biohazardous sharps box very quickly. An alternative method is to use any rigid container with a tightly closing lid (empty reagent or medium bottles work well, as do used 50mL centrifuge tubes). The container should be labeled as biohazardous tips and the lid should be kept on when not in use. When the container is full, it should be capped and placed in a biohazardous waste bag for autoclave sterilization (no excess liquid should be added to these containers since they WILL EXPLODE in the autoclave!)

**Sharps contaminated with hazardous chemicals-** Sharps such as needles used with organic reagents which have trace amounts of hazardous chemicals should be collected separately and disposed of as hazardous waste through REM. These can be collected along with solid waste (or separate if appropriate) in a rigid, leak-proof plastic container- if a red biohazardous sharps box is used, the biohazard symbol must be covered, defaced, or otherwise removed. Care should be taken to track what has been added to this waste box so that an accurate description can be given at the time of removal. Disposal of any hazardous materials should be in accordance with REM’s **CHEMICAL HANDLING**

**AND DISPOSAL GUIDELINES** and any EPA regulated waste must be noted, even in trace amounts (see Tables below V and VI in the **CHEMICAL HANDLING AND DISPOSAL GUIDELINES** shown below or the REM website: <http://www.purdue.edu/rem/hmm/chemwast.htm>).





**Standard Operating Procedure**

**Title: Animal Use**

**Updated October 15, 2014**

1. All incoming students/post-docs working with animals must be properly trained to provide adequate care to the animals. Required training is listed in the Low Animal Inventory and Training (LAIT) binder. See Dr. Low’s administrative assistant, Patti Cauble, to obtain this list.
2. During experimentation, individuals are required to wear proper personal protective equipment as determined by department rules and protocols.
3. All individuals are expected to read and follow all procedures in the protocol they are working under. Animal use and handling must occur only in approved areas and only in the time limits allowed for each protocol.
4. All approved protocols and amendments are kept in the Low Animal Protocol binder with Patti Cauble, Dr. Low’s administrative assistant.
5. When bringing animals to the DRUG building, the individual must follow the Standard Operating Procedures (SOP) for Housing Animals in Low Lab (DRUG building). They must check in with the Lab Animal Supervisors: Dr. Low’s administrative assistant, Patti Cauble and the designated Laboratory Animal Supervisor, Sakkarapalayam Mahalingam. They must also register their animals in the ‘Low Lab Experimental Animal Inventory’ available in the LAIT binder.
6. No animals will be kept in DRUG unless approved by PACUC in a protocol. Also, no animals will be housed in DRUG over the weekend as the Lab Animal Supervisors are not around to help monitor animal care.
7. Each individual keeping mice in DRUG for more than 12 hours is required to fill out the ‘Animal Observation/Room care Record’ form and keep it with the cages. Once experimental procedures are done and the animals have either been terminated or removed from the lab, the supervisors have to be informed and the daily observation sheets must be turned in.
8. All cages must be returned immediately following the completion of an experiment unless they have been contaminated with radioactive material.
9. If experimental procedures involve radioactivity, animal cages will be labeled with the radioactive agent name, date and time of injection. Radioactive cages will then be returned 3 days after injections to allow for radioactive material to decay.
10. A daily inspection will be made by one of the Lab Animal Supervisors to ensure that no unapproved animals are being housed at DRUG. Once the inspection is complete it will be recorded on the Low Lab Experimental Animal Inventory form located in the LAIT binder.
11. If the anesthesia machine is used, each user is required to weigh and record the canister’s final weight. If a canister weighs more than 50g its original mass, it should be replaced immediately. At this time, the initial weight of the new canister will be recorded on the canister. The Lab Animal Supervisors will be responsible for ensuring the anesthesia machine is serviced and inspected each year.
12. Before transporting animals all researchers must read and follow the ‘Guidelines for transportation of animals in areas outside Animal facilities’ and the ‘Policy for adequate animal care in animal study areas’.
13. Any violations to approved protocols or SOPs will be reported to Dr. Low and will result in loss of animal use for 6 months.
14. To ensure sustainability, Patti Cauble will oversee all animal activities along with the Student Animal Supervisor who will be replaced each year. The animal student supervisor’s information will be given to PACUC each year.
15. If you as the researcher have any questions or concerns please contact LAP (494-9163). If you observe someone not following procedures please discuss it with involved person and the Lab Animal Supervisors.

**Low Lab Standard Operating Procedure**

**Title: Working with/Handling *Plasmodium falciparum***

**Updated: March 2014**

*Plasmodium* falciparum is an obligate protozoan parasite that causes malaria. Symptoms can occur between 7-14 days afer exposure. These include fever, chills, sweats, cough, diarrhea, respiratory distress, and headach, shock, renal and liver failure, coma, death. Infection is possible if the person is punctured by any malaria infected human blood**.**

**Transmission Routes:** Sharps and exposure to abraded skin. Rarely through inhalation by aerosols.

**Containment and Storage**: The *Plasmodium falciparum* cultures will be stored in a Biosafety level 2 labeled incubator. The cultures will be manipulated in a Biosafety cabinet approved for use of Biosafety level 2 agents. Cultures will also be stored in a -80 deg. C freezer for short term storage or in liquid nitrogen for long term storage.

**PPE Recommended**: Laboratory coat, gloves (double gloves to be safe), and eye shields/protection. Feet should be covered with shoes or boots and legs should be covered. Hair should be tied in a pony tail if appropriate. Good personal hygiene and frequent handwashing is essential. The use of a Biosafety Cabinet and/or respiratory protection (fit-tested respirator or N-95 mask) is recommended if aerosols are possible.

**Decontamination methods/materials:** *P. falciparum* and human blood contaminated waste items will be decontaminated with 10% bleach solution prior to disposal in an autoclavable waste bag. Reusable items will be decontaminated with a 70% ethanol solution after contamination. A 70% ethanol solution will be used to decontaminate surfaces associated with the cultures. All waste material will be autoclaved and a hazardous waste pick-up request to REM will be promptly submitted for removal of waste.

**In case of spill**: The *P. falciparum* contaminated area will be decontaminated with a 10% bleach or 70% EtOH solution when appropriate (do not use bleach on stainless steel as it will rush). For a large spill, the area will be wiped up using paper towels which will be disposed of in an autoclavable waste bag. The remaining contaminated area will be decontaminated as described above for small spills. Thoroughly wash hands, arms, face, and any other exposed body part with soap and water.

**Training Requirements**: Laboratory staff are made aware of the disease potential and handling requirements for this bio-agent. Review the Purdue University Biosafety Manual concerning Biosafety Level 2 handling techniques as well as the REM Biological Safety Powerpoint. Staff is required to participate in sharps handling awareness training, participate in the Purdue University Bloodborne Pathogens and Exposure training and certification, complete the Purdue Biological Safety Awareness Certification, and participate in the Purdue University Biological Exposure Occupational Health Program.

**Accidents/Exposure: (procedures)** Seek medical attention and contact REM.

**Low Lab Standard Operating Procedure**

**Title: Working with/Handling *Influenza Virus***

**Date: 03/29/2014**

[*Orthomyxoviridae*, Influenzavirus A](https://www.atcc.org/en/Search_Results.aspx?searchTerms=Orthomyxoviridae,%20Influenzavirus%20A)(H1N1) is the subtype of [influenza A virus](http://en.wikipedia.org/wiki/Influenza_A_virus) that was the most common cause of human [influenza](http://en.wikipedia.org/wiki/Influenza) (flu) in 2009.

**Signs and Symptoms:** The symptoms of H1N1 flu virus in people include fever, cough, sore throat, runny or stuffy nose, body aches, headache, chills and fatigue. Some people may have vomiting and diarrhea.

**Storage**: The *H1N1 Virus* will be stored in sealed containers, labeled, and secured to ensure restricted access; refrigerators and other storage containers will be clearly labeled and will provide contact information for trained, responsible laboratory staff.

**PPE Recommended:** Including Eye Protection, Chemical Resistant Gloves, appropriate clothing to prevent skin exposure and respiratory protection .The use and storage of this material requires user to maintain and make available appropriate eyewash and safety shower facilities. Use fume hood or other appropriate ventilation method to keep airborne concentrations a low as possible.

**Appropriate disinfectants**

Several chemical disinfectants, including chlorine, alcohols, peroxygen, detergents, iodophors, quaternary ammonium and phenolic compounds, are effective against human influenza viruses if used at the correct concentration for the appropriate contact time as specified in the manufacturer’s recommendations.

Work surfaces and equipment should be decontaminated as soon as possible after specimens are processed. Studies have shown that influenza viruses can survive on environmental surfaces and can infect a person for up to 2–8 hours after being deposited on the surface.

**Disposal of Waste:**

All biohazardous waste disposal procedures will be followed as outlined in the facility standard laboratory operating procedures.  Steam autoclaving is the preferred method for all decontamination processes.  Place waste in an appropriate and compatible container with an orange waste label describing the components of the waste. Be sure lid is tightly closed and submit a hazardous waste pick-up request to REM for removal.

**In case of accidental spill:**

1. Evacuate the room immediately, close doors, remove all contaminated clothing, and decontaminate body surfaces.
2. Allow enough time (at least 30 minutes) for droplets to settle and aerosols to be reduced by the ventilation system before entering.
3. Don protective clothing and approved respiratory protective equipment.
4. Decontaminate the spill with an appropriate disinfectant (e.g., 1:10 solution of household bleach in water).
5. Decontaminate and dispose of contaminated items.
6. Following cleanup, responders will wash or shower with a germicidal soap.

**Occupational Health**

All personnel should self monitor for fever and other symptoms and any influenza-like illness should be reported to our supervisor immediately. Personnel who have had an occupational exposure to 2009-H1N1 influenza A, should immediately inform the supervisor or manager.  Antiviral chemoprophylaxis is available and should be considered.

# Tab 2: Lab-Specific Protocols, Requirements, Rules

Example of a Room Rules document poster outside laboratory doors:

Room Rules

In this room: DRUG 310A

Faculty or senior staff in charge: 05/01/2014

signature date

A. eye protection: safety glasses or splash goggles

at hood and at bench

B. working alone with hazards:

Never

C. footwear required:

Complete foot covered

D. clothing required:

Clothing covered to ankle and lab coat (flame proof if working with flammable chemicals) over the top layer of clothing. Gloves to be worn during all experimental procedures.

E. eating in room allowed:

NO

F. further rules for PPE and behavior at:

Emergency Contact Information

Philip S. Low Lab

DRUG 3rd Floor

1. Staff member associated with room:

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| Name: Patricia A. Cauble |
| Work phone: 494-5283 |
| Emergency phone: 765-586-4632 |

1. Faculty member associated with work in room:

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| Name: Philip S. Low |
| Work phone: 494-5273 |
| Emergency phone: 765-743-0539 |

1. Safety Representative:

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| Name: Achini Bandara |
| Work phone: 494-5476 |
| Emergency phone: 803-665-4515 |

1. Other emergency contacts:

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| Name: Kristina Kesely |
| Work phone: 494-5476 |
| Emergency phone: 219-201-0996 |

1. Location of MSDSs:

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| Room: DRUG 310A |
| Location: |
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# Tab 3: Lab-Specific Hazard Assessments

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| Supervisor (print): Philip S. Low | Assessment Date(s): May 2014 |
| Signature: | Location(s) posted: DRUG 310 |

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| 1. **Hazards** | **Task:** hands-on work or being within reach(a) of potential hazards of described activity/items: | **Minimum Requirements** |
| Frostbite, eye impact | Dry ice, very cold frozen solids. | Safety glasses, insulated gloves, skin cover to elbows/knees/throat, closed shoe w/ socks |

1. ***NOTES***

(a) Being within reach of potential hazards: "within reach" varies widely depending on scale and conditions of work and will be judged by affected staff in each room.

(b) Unshielded: not behind a drawn hood sash or blast shield.

(c) Corrosive: pH ≥ 12 or pH ≤ 2.5

(d) Toxic: having any poisonous or irritating effects to human tissue or human health.

(e) Chemical resistant gloves: glove thickness, length, and material must be chosen carefully and will be specific to the chemicals/mixtures used and the process conditions.

(f) Hood: 100% exhaust to outside, current approval for "all work" and functioning properly.

(g) Chemicals requiring designated areas: full list is at <http://www.purdue.edu//rem/home/booklets/crdalist.pdf>

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| Supervisor (print):Philip S. Low | Assessment Date(s): May 2014 |
| Signature: | Location(s) posted: DRUG 310A |

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| 1. **Hazards** | **Task:** hands-on work or being within reach(a) of potential hazards of described activity/items: | **Minimum Requirements** |
| Skin/eye damage, poisoning, inhalation of vapor or aerosol | Volume > 10 mL any unshielded(b) corrosive(c) liquids, organic liquids or liquid mixtures, or toxic(d) inorganic liquids/mixtures | Splash goggles, chemical resistant gloves(e), lab coat, skin cover to knees/elbows/throat, closed shoes with socks. Work in hood(f). Shower and eyewash must be available in work area. |
| Volume > 1 L | Same, but cover to ankles/wrists/throat |
| Volume > 5 L | Add face shield covering chin |
| Skin/eye damage | Cryogenic liquids | Splash goggles, skin cover to elbows/knees/throat, closed shoe easily removed, socks. Cryogloves for dispensing. |
| Volume > 1 L | Skin cover to throat/wrists/ankles |
| Skin/eye damage, asphyxiation, body injury, frostbite, | Transport of liquid nitrogen in hallways and elevators | See cryogenic liquids; also all wheeled vessels or carts must restrain Dewar and have wheels large enough to safely traverse elevator door and scales gap. |
| Self pressurizing vessels weighing > 100 lb gross | Plus skin cover to wrists/throat/ankles, always position blow-off valve away from body |
| Dispensing from main bulk tank | All above and hearing protection |
| Frostbite, eye impact | Dry ice, very cold frozen solids. | Safety glasses, insulated gloves, skin cover to elbows/knees/throat, closed shoe w/ socks |
| Skin/eye damage | Hot liquid (rxn mixture, water bath, oil bath, autoclave, still...) | Splash goggles, insulated gloves, skin cover to knees/elbows/throat, closed shoe w/ socks |
| Volume > 1 L | Skin cover to throat/wrists/ankles, emergency shower available in work area |
| Eye damage, Erythema | UV radiation | UV blocking goggles, skin cover on all potentially exposed areas |
| Potential face UV exposure | UV face shield |

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| **Hazards** | **Task:** (hands-on work or being within reach(a) of potential hazards of described activity/items | **Minimum Requirements** |
| Infectious disease | Human blood, cells, tissue, body fluids or materials derived from same | Safety glasses, "exam" gloves, skin cover on all potentially exposed areas, shoes/socks, work at Biosafety Level II. |
| Liquid with vol > 1 mL | Same, but splash goggles, skin cover to throat/wrists/ankles |
| Skin/eye damage, poisoning, inhalation of airborne dust | Hazardous solids | Safety glasses, goggles for large quantities, chemical resistant gloves, skin cover to elbows/knees/throat, closed shoes/socks |
| > 100 g any hazardous solid, or  > 1 g "chemical requiring designated area," (list at REM web site(g)) or  High potential for airborne particles | Same, except skin cover to wrists/ankles, and only work in hood |

1. ***NOTES***

(a) Being within reach of potential hazards: "within reach" varies widely depending on scale and conditions of work and will be judged by affected staff in each room.

(b) Unshielded: not behind a drawn hood sash or blast shield.

(c) Corrosive: pH ≥ 12 or pH ≤ 2.5

(d) Toxic: having any poisonous or irritating effects to human tissue or human health.

(e) Chemical resistant gloves: glove thickness, length, and material must be chosen carefully and will be specific to the chemicals/mixtures used and the process conditions.

(f) Hood: 100% exhaust to outside, current approval for "all work" and functioning properly.

(g) Chemicals requiring designated areas: full list is at <http://www.purdue.edu//rem/home/booklets/crdalist.pdf>

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| Supervisor (print):Philip S. Low | Assessment Date(s): May 2014 |
| Signature: | Location(s) posted: DRUG 310B |

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| 1. **Hazards** | **Task:** hands-on work or being within reach(a) of potential hazards of described activity/items: | **Minimum Requirements** |
| Skin/eye damage, poisoning, inhalation of vapor or aerosol | Volume > 10 mL any unshielded(b) corrosive(c) liquids, organic liquids or liquid mixtures, or toxic(d) inorganic liquids/mixtures | Splash goggles, chemical resistant gloves(e), lab coat, skin cover to ankles/elbows/throat, closed shoes with socks. Work in hood(f). Shower and eyewash must be available in work area. |
| Volume > 1 L | Same, but cover to ankles/wrists/throat |
| Volume > 5 L | Add face shield covering chin |
| Skin/eye damage | Cryogenic liquids | Splash goggles, skin cover to elbows/knees/throat, closed shoe easily removed, socks. Cryogloves for dispensing. |
| Volume > 1 L | Skin cover to throat/wrists/ankles |
| Skin/eye damage, asphyxiation, body injury, frostbite, | Transport of liquid nitrogen in hallways and elevators | See cryogenic liquids; also all wheeled vessels or carts must restrain Dewar and have wheels large enough to safely traverse elevator door and scales gap. |
| Self pressurizing vessels weighing > 100 lb gross | Plus skin cover to wrists/throat/ankles, always position blow-off valve away from body |
| Dispensing from main bulk tank | All above and hearing protection |
| Frostbite, eye impact | Dry ice, very cold frozen solids. | Safety glasses, insulated gloves, skin cover to elbows/knees/throat, closed shoe w/ socks |
| Skin/eye damage | Hot liquid (rxn mixture, water bath, oil bath, autoclave, still...) | Splash goggles, insulated gloves, skin cover to knees/elbows/throat, closed shoe w/ socks |
| Volume > 1 L | Skin cover to throat/wrists/ankles, emergency shower available in work area |
| Eye damage, Erythema | UV radiation | UV blocking goggles, skin cover on all potentially exposed areas |
| Potential face UV exposure | UV face shield |

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| **Hazards** | **Task:** (hands-on work or being within reach(a) of potential hazards of described activity/items | **Minimum Requirements** |
| Infectious disease | Human blood, cells, tissue, body fluids or materials derived from same | Safety glasses, "exam" gloves, skin cover on all potentially exposed areas, shoes/socks, work at Biosafety Level II. |
| Liquid with vol > 1 mL | Same, but splash goggles, skin cover to throat/wrists/ankles |
| Skin/eye damage, poisoning, inhalation of airborne dust | Hazardous solids | Safety glasses, goggles for large quantities, chemical resistant gloves, skin cover to elbows/knees/throat, closed shoes/socks |
| > 100 g any hazardous solid, or  > 1 g "chemical requiring designated area," (list at REM web site(g)) or  High potential for airborne particles | Same, except skin cover to wrists/ankles, and only work in hood |

1. ***NOTES***

(a) Being within reach of potential hazards: "within reach" varies widely depending on scale and conditions of work and will be judged by affected staff in each room.

(b) Unshielded: not behind a drawn hood sash or blast shield.

(c) Corrosive: pH ≥ 12 or pH ≤ 2.5

(d) Toxic: having any poisonous or irritating effects to human tissue or human health.

(e) Chemical resistant gloves: glove thickness, length, and material must be chosen carefully and will be specific to the chemicals/mixtures used and the process conditions.

(f) Hood: 100% exhaust to outside, current approval for "all work" and functioning properly.

(g) Chemicals requiring designated areas: full list is at <http://www.purdue.edu//rem/home/booklets/crdalist.pdf>

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| Supervisor (print):Philip S. Low | Assessment Date(s): May 2014 |
| Signature: | Location(s) posted: DRUG 310C |

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| 1. **Hazards** | **Task:** hands-on work or being within reach(a) of potential hazards of described activity/items: | **Minimum Requirements** |
| Skin/eye damage, poisoning, inhalation of vapor or aerosol | Volume > 10 mL any unshielded(b) corrosive(c) liquids, organic liquids or liquid mixtures, or toxic(d) inorganic liquids/mixtures | Splash goggles, chemical resistant gloves(e), lab coat, skin cover to ankles/elbows/throat, closed shoes with socks. Work in hood(f). Shower and eyewash must be available in work area. |
| Volume > 1 L | Same, but cover to ankles/wrists/throat |
| Volume > 5 L | Add face shield covering chin |
| Skin/eye damage | Cryogenic liquids | Splash goggles, skin cover to elbows/knees/throat, closed shoe easily removed, socks. Cryogloves for dispensing. |
| Volume > 1 L | Skin cover to throat/wrists/ankles |
| Skin/eye damage, asphyxiation, body injury, frostbite, | Transport of liquid nitrogen in hallways and elevators | See cryogenic liquids; also all wheeled vessels or carts must restrain Dewar and have wheels large enough to safely traverse elevator door and scales gap. |
| Self pressurizing vessels weighing > 100 lb gross | Plus skin cover to wrists/throat/ankles, always position blow-off valve away from body |
| Dispensing from main bulk tank | All above and hearing protection |
| Frostbite, eye impact | Dry ice, very cold frozen solids. | Safety glasses, insulated gloves, skin cover to elbows/knees/throat, closed shoe w/ socks |
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| Eye damage, Erythema | UV radiation | UV blocking goggles, skin cover on all potentially exposed areas |
| Potential face UV exposure | UV face shield |

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| **Hazards** | **Task:** (hands-on work or being within reach(a) of potential hazards of described activity/items | **Minimum Requirements** |
| Infectious disease | Human blood, cells, tissue, body fluids or materials derived from same | Safety glasses, "exam" gloves, skin cover on all potentially exposed areas, shoes/socks, work at Biosafety Level II. |
| Liquid with vol > 1 mL | Same, but splash goggles, skin cover to throat/wrists/ankles |
| Skin/eye damage, poisoning, inhalation of airborne dust | Hazardous solids | Safety glasses, goggles for large quantities, chemical resistant gloves, skin cover to elbows/knees/throat, closed shoes/socks |
| > 100 g any hazardous solid, or  > 1 g "chemical requiring designated area," (list at REM web site(g)) or  High potential for airborne particles | Same, except skin cover to wrists/ankles, and only work in hood |

1. ***NOTES***

(a) Being within reach of potential hazards: "within reach" varies widely depending on scale and conditions of work and will be judged by affected staff in each room.

(b) Unshielded: not behind a drawn hood sash or blast shield.

(c) Corrosive: pH ≥ 12 or pH ≤ 2.5

(d) Toxic: having any poisonous or irritating effects to human tissue or human health.

(e) Chemical resistant gloves: glove thickness, length, and material must be chosen carefully and will be specific to the chemicals/mixtures used and the process conditions.

(f) Hood: 100% exhaust to outside, current approval for "all work" and functioning properly.

(g) Chemicals requiring designated areas: full list is at <http://www.purdue.edu//rem/home/booklets/crdalist.pdf>

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| Supervisor (print):Philip S. Low | Assessment Date(s): May 2014 |
| Signature: | Location(s) posted: DRUG 310D |

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| 1. **Hazards** | **Task:** hands-on work or being within reach(a) of potential hazards of described activity/items: | **Minimum Requirements** |
| Skin/eye damage, poisoning, inhalation of vapor or aerosol | Volume > 10 mL any unshielded(b) corrosive(c) liquids, organic liquids or liquid mixtures, or toxic(d) inorganic liquids/mixtures | Splash goggles, chemical resistant gloves(e), lab coat, skin cover to ankles/elbows/throat, closed shoes with socks. Work in hood(f). Shower and eyewash must be available in work area. |
| Volume > 1 L | Same, but cover to ankles/wrists/throat |
| Volume > 5 L | Add face shield covering chin |
| Volume > 1 L | Skin cover to throat/wrists/ankles |
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| Skin/eye damage, poisoning, inhalation of airborne dust | Hazardous solids | Safety glasses, goggles for large quantities, chemical resistant gloves, skin cover to elbows/knees/throat, closed shoes/socks |
| > 100 g any hazardous solid, or  > 1 g "chemical requiring designated area," (list at REM web site(g)) or  High potential for airborne particles | Same, except skin cover to wrists/ankles, and only work in hood |

1. ***NOTES***

(a) Being within reach of potential hazards: "within reach" varies widely depending on scale and conditions of work and will be judged by affected staff in each room.

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(d) Toxic: having any poisonous or irritating effects to human tissue or human health.

(e) Chemical resistant gloves: glove thickness, length, and material must be chosen carefully and will be specific to the chemicals/mixtures used and the process conditions.

(f) Hood: 100% exhaust to outside, current approval for "all work" and functioning properly.

(g) Chemicals requiring designated areas: full list is at <http://www.purdue.edu//rem/home/booklets/crdalist.pdf>

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| Supervisor (print): Philip S. Low | Assessment Date(s): May 2014 |
| Signature: | Location(s) posted: DRUG 310F |

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| 1. **Hazards** | **Task:** hands-on work or being within reach(a) of potential hazards of described activity/items: | **Minimum Requirements** |
| Skin/eye damage, poisoning, inhalation of vapor or aerosol | Volume > 10 mL any unshielded(b) corrosive(c) liquids, organic liquids or liquid mixtures, or toxic(d) inorganic liquids/mixtures | Splash goggles, chemical resistant gloves(e), lab coat, skin cover to knees/elbows/throat, closed shoes with socks. Work in hood(f). Shower and eyewash must be available in work area. |
| Volume > 1 L | Same, but cover to ankles/wrists/throat |
| Volume > 5 L | Add face shield covering chin |
| Skin/eye damage | Cryogenic liquids | Splash goggles, skin cover to elbows/knees/throat, closed shoe easily removed, socks. Cryogloves for dispensing. |
| Volume > 1 L | Skin cover to throat/wrists/ankles |
| Volume > 1 L | Skin cover to throat/wrists/ankles, emergency shower available in work area |

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| **Hazards** | **Task:** (hands-on work or being within reach(a) of potential hazards of described activity/items | **Minimum Requirements** |
| Infectious disease | Human blood, cells, tissue, body fluids or materials derived from same | Safety glasses, "exam" gloves, skin cover on all potentially exposed areas, shoes/socks, work at Biosafety Level II. |
| Liquid with vol > 1 mL | Same, but splash goggles, skin cover to throat/wrists/ankles |
| Skin/eye damage, poisoning, inhalation of airborne dust | Hazardous solids | Safety glasses, goggles for large quantities, chemical resistant gloves, skin cover to elbows/knees/throat, closed shoes/socks |
| > 100 g any hazardous solid, or  > 1 g "chemical requiring designated area," (list at REM web site(g)) or  High potential for airborne particles | Same, except skin cover to wrists/ankles, and only work in hood |
| Cell damage, area contamination | Radioactive materials | Shielding and badging requirements prescribed in specific isotope SOP, use all appropriate chemical and/or biological safety personal protection |

1. ***NOTES***

(a) Being within reach of potential hazards: "within reach" varies widely depending on scale and conditions of work and will be judged by affected staff in each room.

(b) Unshielded: not behind a drawn hood sash or blast shield.

(c) Corrosive: pH ≥ 12 or pH ≤ 2.5

(d) Toxic: having any poisonous or irritating effects to human tissue or human health.

(e) Chemical resistant gloves: glove thickness, length, and material must be chosen carefully and will be specific to the chemicals/mixtures used and the process conditions.

(f) Hood: 100% exhaust to outside, current approval for "all work" and functioning properly.

(g) Chemicals requiring designated areas: full list is at http://www.purdue.edu//rem/home/booklets/crdalist.pdf

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| Supervisor (print):Philip S. Low | Assessment Date(s): May 2014 |
| Signature: | Location(s) posted: DRUG 310E |

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| 1. **Hazards** | **Task:** hands-on work or being within reach(a) of potential hazards of described activity/items: | **Minimum Requirements** |
| Skin/eye damage, poisoning, inhalation of vapor or aerosol | Volume > 10 mL any unshielded(b) corrosive(c) liquids, organic liquids or liquid mixtures, or toxic(d) inorganic liquids/mixtures | Splash goggles, chemical resistant gloves(e), lab coat, skin cover to knees/elbows/throat, closed shoes with socks. Work in hood(f). Shower and eyewash must be available in work area. |
| Infectious disease | Human blood, cells, tissue, body fluids or materials derived from same | Safety glasses, "exam" gloves, skin cover on all potentially exposed areas, shoes/socks, work at Biosafety Level II. |
| Liquid with vol > 1 mL | Same, but splash goggles, skin cover to throat/wrists/ankles |
| Skin/eye damage, poisoning, inhalation of airborne dust | Hazardous solids | Safety glasses, goggles for large quantities, chemical resistant gloves, skin cover to elbows/knees/throat, closed shoes/socks |
| > 100 g any hazardous solid, or  > 1 g "chemical requiring designated area," (list at REM web site(g)) or  High potential for airborne particles | Same, except skin cover to wrists/ankles, and only work in hood |
| Cell damage, area contamination | Radioactive materials | Shielding and badging requirements prescribed in specific isotope SOP, use all appropriate chemical and/or biological safety personal protection |

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(a) Being within reach of potential hazards: "within reach" varies widely depending on scale and conditions of work and will be judged by affected staff in each room.

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(e) Chemical resistant gloves: glove thickness, length, and material must be chosen carefully and will be specific to the chemicals/mixtures used and the process conditions.

(f) Hood: 100% exhaust to outside, current approval for "all work" and functioning properly.

(g) Chemicals requiring designated areas: full list is at http://www.purdue.edu//rem/home/booklets/crdalist.pd

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| Supervisor (print): Philip S. Low | Assessment Date(s): May 2014 |
| Signature: | Location(s) posted: DRUG 380 |

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| 1. **Hazards** | **Task:** hands-on work or being within reach(a) of potential hazards of described activity/items: | **Minimum Requirements** |
| Skin/eye damage, poisoning, inhalation of vapor or aerosol | Volume > 10 mL any unshielded(b) corrosive(c) liquids, organic liquids or liquid mixtures, or toxic(d) inorganic liquids/mixtures | Splash goggles, chemical resistant gloves(e), lab coat, skin cover to knees/elbows/throat, closed shoes with socks. Work in hood(f). Shower and eyewash must be available in work area. |
| Volume > 1 L | Same, but cover to ankles/wrists/throat |
| Volume > 5 L | Add face shield covering chin |
| Skin/eye damage | Cryogenic liquids | Splash goggles, skin cover to elbows/knees/throat, closed shoe easily removed, socks. Cryogloves for dispensing. |
| Frostbite, eye impact | Dry ice, very cold frozen solids. | Safety glasses, insulated gloves, skin cover to elbows/knees/throat, closed shoe w/ socks |
| Skin/eye damage | Hot liquid (rxn mixture, water bath, oil bath, autoclave, still...) | Splash goggles, insulated gloves, skin cover to knees/elbows/throat, closed shoe w/ socks |
| Volume > 1 L | Skin cover to throat/wrists/ankles, emergency shower available in work area |
| Eye damage, Erythema | UV radiation | UV blocking goggles, skin cover on all potentially exposed areas |
| Potential face UV exposure | UV face shield |
| Skin/eye damage | Laser radiation | Goggles appropriate to beam parameters, closed shoe, no jewelry/reflective items |
| Class 3b and 4 lasers | Skin cover on all potentially exposed areas |
| Infectious disease | Human blood, cells, tissue, body fluids or materials derived from same | Safety glasses, "exam" gloves, skin cover on all potentially exposed areas, shoes/socks, work at Biosafety Level II. |
| Liquid with vol > 1 mL | Same, but splash goggles, skin cover to throat/wrists/ankles |
| Skin/eye damage, poisoning, inhalation of airborne dust | Hazardous solids | Safety glasses, goggles for large quantities, chemical resistant gloves, skin cover to elbows/knees/throat, closed shoes/socks |
| > 100 g any hazardous solid, or  > 1 g "chemical requiring designated area," (list at REM web site(g)) or  High potential for airborne particles | Same, except skin cover to wrists/ankles, and only work in hood |

1. ***NOTES***

(a) Being within reach of potential hazards: "within reach" varies widely depending on scale and conditions of work and will be judged by affected staff in each room.

(b) Unshielded: not behind a drawn hood sash or blast shield.

(c) Corrosive: pH ≥ 12 or pH ≤ 2.5

(d) Toxic: having any poisonous or irritating effects to human tissue or human health.

(e) Chemical resistant gloves: glove thickness, length, and material must be chosen carefully and will be specific to the chemicals/mixtures used and the process conditions.

(f) Hood: 100% exhaust to outside, current approval for "all work" and functioning properly.

(g) Chemicals requiring designated areas: full list is at <http://www.purdue.edu//rem/home/booklets/crdalist.pdf>

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| Supervisor (print):Philip S. Low | Assessment Date(s): May 2014 |
| Signature: | Location(s) posted: DRUG 380A |

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| 1. **Hazards** | **Task:** hands-on work or being within reach(a) of potential hazards of described activity/items: | **Minimum Requirements** |
| Skin/eye damage, poisoning, inhalation of vapor or aerosol | Volume > 10 mL any unshielded(b) corrosive(c) liquids, organic liquids or liquid mixtures, or toxic(d) inorganic liquids/mixtures | Splash goggles, chemical resistant gloves(e), lab coat, skin cover to knees/elbows/throat, closed shoes with socks. Work in hood(f). Shower and eyewash must be available in work area. |
| Frostbite, eye impact | Dry ice, very cold frozen solids. | Safety glasses, insulated gloves, skin cover to elbows/knees/throat, closed shoe w/ socks |
| Infectious disease | Human blood, cells, tissue, body fluids or materials derived from same | Safety glasses, "exam" gloves, skin cover on all potentially exposed areas, shoes/socks, work at Biosafety Level II. |
| Liquid with vol > 1 mL | Same, but splash goggles, skin cover to throat/wrists/ankles |
| Skin/eye damage, poisoning, inhalation of airborne dust | Hazardous solids | Safety glasses, goggles for large quantities, chemical resistant gloves, skin cover to elbows/knees/throat, closed shoes/socks |
| > 100 g any hazardous solid, or  > 1 g "chemical requiring designated area," (list at REM web site(g)) or  High potential for airborne particles | Same, except skin cover to wrists/ankles, and only work in hood |

1. ***NOTES***

(a) Being within reach of potential hazards: "within reach" varies widely depending on scale and conditions of work and will be judged by affected staff in each room.

(b) Unshielded: not behind a drawn hood sash or blast shield.

(c) Corrosive: pH ≥ 12 or pH ≤ 2.5

(d) Toxic: having any poisonous or irritating effects to human tissue or human health.

(e) Chemical resistant gloves: glove thickness, length, and material must be chosen carefully and will be specific to the chemicals/mixtures used and the process conditions.

(f) Hood: 100% exhaust to outside, current approval for "all work" and functioning properly.

(g) Chemicals requiring designated areas: full list is at <http://www.purdue.edu//rem/home/booklets/crdalist.pdf>

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| Supervisor (print): Philip S. Low | Assessment Date(s): 05/01/2014 |
| Signature: | Location(s) posted: DRUG 310G |

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| 1. **Hazards** | **Task:** hands-on work or being within reach(a) of potential hazards of described activity/items: | **Minimum Requirements** |
| Skin/eye damage, poisoning, inhalation of vapor or aerosol | Volume > 10 mL any unshielded(b) corrosive(c) liquids, organic liquids or liquid mixtures, or toxic(d) inorganic liquids/mixtures | Splash goggles, chemical resistant gloves(e), lab coat, skin cover to knees/elbows/throat, closed shoes with socks. Work in hood(f). Shower and eyewash must be available in work area. |
| Volume > 1 L | Same, but cover to ankles/wrists/throat |
| Volume > 5 L | Add face shield covering chin |
| Skin/eye damage | Cryogenic liquids | Splash goggles, skin cover to elbows/knees/throat, closed shoe easily removed, socks. Cryogloves for dispensing. |
| Volume > 1 L | Skin cover to throat/wrists/ankles |
| Infectious disease | Human blood, cells, tissue, body fluids or materials derived from same | Safety glasses, "exam" gloves, skin cover on all potentially exposed areas, shoes/socks, work at Biosafety Level II. |
| Liquid with vol > 1 mL | Same, but splash goggles, skin cover to throat/wrists/ankles |
| Skin/eye damage | Hot liquid (rxn mixture, water bath, oil bath, autoclave, still...) | Splash goggles, insulated gloves, skin cover to knees/elbows/throat, closed shoe w/ socks |
| Volume > 1 L | Skin cover to throat/wrists/ankles, emergency shower available in work area |
| Cell damage, area contamination | Radioactive materials | Shielding and badging requirements prescribed in specific isotope SOP, use all appropriate chemical and/or biological safety personal protection |

1. ***NOTES***

(a) Being within reach of potential hazards: "within reach" varies widely depending on scale and conditions of work and will be judged by affected staff in each room.

(b) Unshielded: not behind a drawn hood sash or blast shield.

(c) Corrosive: pH ≥ 12 or pH ≤ 2.5

(d) Toxic: having any poisonous or irritating effects to human tissue or human health.

(e) Chemical resistant gloves: glove thickness, length, and material must be chosen carefully and will be specific to the chemicals/mixtures used and the process conditions.

(f) Hood: 100% exhaust to outside, current approval for "all work" and functioning properly.

(g) Chemicals requiring designated areas: full list is at <http://www.purdue.edu//rem/home/booklets/crdalist.pdf>

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| Supervisor (print): Philip S. Low | Assessment Date(s): 05/01/2014 |
| Signature: | Location(s) posted: DRUG 318 Lab Entry |

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| 1. **Hazards** | **Task:** hands-on work or being within reach(a) of potential hazards of described activity/items: | **Minimum Requirements** |
| Skin/eye damage, poisoning, inhalation of vapor or aerosol | Volume > 10 mL any unshielded(b) corrosive(c) liquids, organic liquids or liquid mixtures, or toxic(d) inorganic liquids/mixtures | Splash goggles, chemical resistant gloves(e), lab coat, skin cover to knees/elbows/throat, closed shoes with socks. Work in hood(f). Shower and eyewash must be available in work area. |
| Volume > 1 L | Same, but cover to ankles/wrists/throat |
| Volume > 5 L | Add face shield covering chin |
| Skin/eye damage | Cryogenic liquids | Splash goggles, skin cover to elbows/knees/throat, closed shoe easily removed, socks. Cryogloves for dispensing. |
| Volume > 1 L | Skin cover to throat/wrists/ankles |
| Infectious disease | Human blood, cells, tissue, body fluids or materials derived from same | Safety glasses, "exam" gloves, skin cover on all potentially exposed areas, shoes/socks, work at Biosafety Level II. |
| Liquid with vol > 1 mL | Same, but splash goggles, skin cover to throat/wrists/ankles |
| Skin/eye damage | Hot liquid (rxn mixture, water bath, oil bath, autoclave, still...) | Splash goggles, insulated gloves, skin cover to knees/elbows/throat, closed shoe w/ socks |
| Volume > 1 L | Skin cover to throat/wrists/ankles, emergency shower available in work area |
| Cell damage, area contamination | Radioactive materials | Shielding and badging requirements prescribed in specific isotope SOP, use all appropriate chemical and/or biological safety personal protection |

1. ***NOTES***

(a) Being within reach of potential hazards: "within reach" varies widely depending on scale and conditions of work and will be judged by affected staff in each room.

(b) Unshielded: not behind a drawn hood sash or blast shield.

(c) Corrosive: pH ≥ 12 or pH ≤ 2.5

(d) Toxic: having any poisonous or irritating effects to human tissue or human health.

(e) Chemical resistant gloves: glove thickness, length, and material must be chosen carefully and will be specific to the chemicals/mixtures used and the process conditions.

(f) Hood: 100% exhaust to outside, current approval for "all work" and functioning properly.

(g) Chemicals requiring designated areas: full list is at <http://www.purdue.edu//rem/home/booklets/crdalist.pdf>

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| Supervisor (print): Philip S. Low | Assessment Date(s): 05/01/2014 |
| Signature: | Location(s) posted: DRUG 334A |

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| 1. **Hazards** | **Task:** hands-on work or being within reach(a) of potential hazards of described activity/items: | **Minimum Requirements** |
| Cataracts, flash burns to cornea | Work with infrared emitting equipment (glass blowing) | Appropriate shaded goggles Lab coat, closed shoe, pants |
| Conjunctivitis, corneal damage, erythema | Arc/TIG welding | Appropriate shaded goggles Working gloves |
| Skin/eye damage | Cryogenic liquids | Splash goggles, skin cover to elbows/knees/throat, closed shoe easily removed, socks. Cryogloves for dispensing. |
| Volume > 1 L | Skin cover to throat/wrists/ankles |
| Skin/eye damage, asphyxiation, body injury, frostbite, | Transport of liquid nitrogen in hallways and elevators | See cryogenic liquids; also all wheeled vessels or carts must restrain Dewar and have wheels large enough to safely traverse elevator door and scales gap. |
| Self pressurizing vessels weighing > 100 lb gross | Plus skin cover to wrists/throat/ankles, always position blow-off valve away from body |
| Dispensing from main bulk tank | All above and hearing protection |
| Eye damage, Erythema | UV radiation | UV blocking goggles, skin cover on all potentially exposed areas |
| Potential face UV exposure | UV face shield |
| Skin/eye damage | Laser radiation | Goggles appropriate to beam parameters, closed shoe, no jewelry/reflective items |
| Class 3b and 4 lasers | Skin cover on all potentially exposed areas |

1. ***NOTES***

(a) Being within reach of potential hazards: "within reach" varies widely depending on scale and conditions of work and will be judged by affected staff in each room.

(b) Unshielded: not behind a drawn hood sash or blast shield.

(c) Corrosive: pH ≥ 12 or pH ≤ 2.5

(d) Toxic: having any poisonous or irritating effects to human tissue or human health.

(e) Chemical resistant gloves: glove thickness, length, and material must be chosen carefully and will be specific to the chemicals/mixtures used and the process conditions.

(f) Hood: 100% exhaust to outside, current approval for "all work" and functioning properly.

(g) Chemicals requiring designated areas: full list is at <http://www.purdue.edu//rem/home/booklets/crdalist.pdf>

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| Supervisor (print): Philip S. Low | Assessment Date(s): 05/01/2014 |
| Signature: | Location(s) posted: DRUG 334 |

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| 1. **Hazards** | **Task:** hands-on work or being within reach(a) of potential hazards of described activity/items: | **Minimum Requirements** |
| Skin/eye damage, poisoning, inhalation of vapor or aerosol | Volume > 10 mL any unshielded(b) corrosive(c) liquids, organic liquids or liquid mixtures, or toxic(d) inorganic liquids/mixtures | Splash goggles, chemical resistant gloves(e), lab coat, skin cover to knees/elbows/throat, closed shoes with socks. Work in hood(f). Shower and eyewash must be available in work area. |
| Volume > 1 L | Same, but cover to ankles/wrists/throat |
| Volume > 5 L | Add face shield covering chin |
| Skin/limb injury | Machine operation activities likely to catch clothing, hair, or jewelry | Bind vulnerable clothing/hair, remove jewelry |
| Skin/eye damage | Cryogenic liquids | Splash goggles, skin cover to elbows/knees/throat, closed shoe easily removed, socks. Cryogloves for dispensing. |
| Volume > 1 L | Skin cover to throat/wrists/ankles |
| Skin/eye damage, asphyxiation, body injury, frostbite, | Transport of liquid nitrogen in hallways and elevators | See cryogenic liquids; also all wheeled vessels or carts must restrain Dewar and have wheels large enough to safely traverse elevator door and scales gap. |
| Self pressurizing vessels weighing > 100 lb gross | Plus skin cover to wrists/throat/ankles, always position blow-off valve away from body |
| Dispensing from main bulk tank | All above and hearing protection |
| Frostbite, eye impact | Dry ice, very cold frozen solids. | Safety glasses, insulated gloves, skin cover to elbows/knees/throat, closed shoe w/ socks |
| Skin/eye damage | Hot liquid (rxn mixture, water bath, oil bath, autoclave, still...) | Splash goggles, insulated gloves, skin cover to knees/elbows/throat, closed shoe w/ socks |
| Volume > 1 L | Skin cover to throat/wrists/ankles, emergency shower available in work area |
| Eye damage, Erythema | UV radiation | UV blocking goggles, skin cover on all potentially exposed areas |
| Potential face UV exposure | UV face shield |
| Skin/eye damage, poisoning, inhalation of airborne dust | Hazardous solids | Safety glasses, goggles for large quantities, chemical resistant gloves, skin cover to elbows/knees/throat, closed shoes/socks |
| > 100 g any hazardous solid, or  > 1 g "chemical requiring designated area," (list at REM web site(g)) or  High potential for airborne particles | Same, except skin cover to wrists/ankles, and only work in hood |

1. ***NOTES***

(a) Being within reach of potential hazards: "within reach" varies widely depending on scale and conditions of work and will be judged by affected staff in each room.

(b) Unshielded: not behind a drawn hood sash or blast shield.

(c) Corrosive: pH ≥ 12 or pH ≤ 2.5

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(e) Chemical resistant gloves: glove thickness, length, and material must be chosen carefully and will be specific to the chemicals/mixtures used and the process conditions.

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| Supervisor (print): Philip S. Low | Assessment Date(s): 05/01/2014 |
| Signature: | Location(s) posted: DRUG 340 |

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| 1. **Hazards** | **Task:** hands-on work or being within reach(a) of potential hazards of described activity/items: | **Minimum Requirements** |
| Skin/eye damage, poisoning, inhalation of vapor or aerosol | Volume > 10 mL any unshielded(b) corrosive(c) liquids, organic liquids or liquid mixtures, or toxic(d) inorganic liquids/mixtures | Splash goggles, chemical resistant gloves(e), lab coat, skin cover to knees/elbows/throat, closed shoes with socks. Work in hood(f). Shower and eyewash must be available in work area. |
| Volume > 1 L | Same, but cover to ankles/wrists/throat |
| Volume > 5 L | Add face shield covering chin |
| Skin/limb injury | Machine operation activities likely to catch clothing, hair, or jewelry | Bind vulnerable clothing/hair, remove jewelry |
| Skin/eye damage | Cryogenic liquids | Splash goggles, skin cover to elbows/knees/throat, closed shoe easily removed, socks. Cryogloves for dispensing. |
| Volume > 1 L | Skin cover to throat/wrists/ankles |
| Skin/eye damage, asphyxiation, body injury, frostbite, | Transport of liquid nitrogen in hallways and elevators | See cryogenic liquids; also all wheeled vessels or carts must restrain Dewar and have wheels large enough to safely traverse elevator door and scales gap. |
| Self pressurizing vessels weighing > 100 lb gross | Plus skin cover to wrists/throat/ankles, always position blow-off valve away from body |
| Dispensing from main bulk tank | All above and hearing protection |
| Frostbite, eye impact | Dry ice, very cold frozen solids. | Safety glasses, insulated gloves, skin cover to elbows/knees/throat, closed shoe w/ socks |
| Skin/eye damage | Hot liquid (rxn mixture, water bath, oil bath, autoclave, still...) | Splash goggles, insulated gloves, skin cover to knees/elbows/throat, closed shoe w/ socks |
| Volume > 1 L | Skin cover to throat/wrists/ankles, emergency shower available in work area |
| Eye damage, Erythema | UV radiation | UV blocking goggles, skin cover on all potentially exposed areas |
| Potential face UV exposure | UV face shield |
| Skin/eye damage, poisoning, inhalation of airborne dust | Hazardous solids | Safety glasses, goggles for large quantities, chemical resistant gloves, skin cover to elbows/knees/throat, closed shoes/socks |
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1. ***NOTES***

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(f) Hood: 100% exhaust to outside, current approval for "all work" and functioning properly.

(g) Chemicals requiring designated areas: full list is at <http://www.purdue.edu//rem/home/booklets/crdalist.pdf>