Shared Analytical Services Laboratory

Laboratory Introduction and Safety Walk-Through

Purpose: This document is to be used in conjunction with the initial / annual safety briefing for people working in the Shared Analytical Services Laboratory (SASL). This document gives a description of all of the points that will be discussed during the Laboratory Introduction and Safety Walk-Through. This document is used in conjunction with a "Project Proposal" to ensure the safe operation of the Laboratory. The Laboratory Introduction provides the users with a minimum level of training for safely using the lab. The Project Proposal provides the management of the lab with details of the work to be performed in the lab, allowing he management to ensure the lab is properly equipped to safely and successfully accomplish the project.

During the Introduction you will physically walk-through the lab and the location of each of the safety measures will be pointed out. The last page of this introduction shows a map, indicating the location of the equipment and safety measures. The proper operation of each of the safety measures will also be briefly discussed during the Laboratory Introduction. You should keep this document in your records as a reference to our safety procedures.

Name: The name of the person receiving the briefing. Every person working in the lab should receive a briefing and fill out the checklist.

Advisor: The name of the PI of the project. If you are the PI, write n/a in this space. If you are an external client, write the name of the faculty member acting as the point of contact for the project or work.

Home Department: The name of the department in which the Advisor is rostered. If you are an external client, write the name of your company.

Date: The date of the actual safety walk-through. Do not post or pre-date the form.

Phone: If you have an office on campus, write the extension of the office phone. If you are a student, write the extension of the Advisor of the project. If you are an external client, write the number where you can be reached at your company.

Campus Box: The box number of the Advisor of the project.

Project: The name, or a brief description of the project, to identify which Project Proposal is involved.

Evacuation Plan: Before beginning to work in the lab, you must be aware of the various routes for escaping from the lab and building. The last page of this Laboratory Introduction shows a map of the Lab, including the evacuation routes. In the case of an alarm, or an incident in the laboratory, pause for a moment to determine the location of the alarm (if possible). Once you know the location of the incident, decide on an exit route. There are two primary routes for leaving the building from the lab. You can exit the lab into either the 3000 or 3200 hallways. At each end of both hallways are stairs for exiting the building.

If you are the last person to leave the room, close the doors to the lab as you leave. If the accident is in the SASL, evacuate the building, pulling the fire alarm as you leave the building, and then notify the authorities. Never try to call the authorities from inside the lab where an incident is occurring.

In the event of an alarm triggered elsewhere in the building,, you are required to leave the building if the alarms are flashing in the laboratory.

Laboratory Access: The laboratory must be secured at all times. Your presence in the lab is enough to consider the lab secured, but when you leave the lab, the doors must be closed and locked. The doors o the lab can not be left open without someone in the lab. Leaving the lab unsecured is a valid reason for limiting your access to the lab.

Personal Protective Equipment: Personal Protective Equipment (PPE) is your last defense against your exposure to a

hazard. Please take the use of this equipment seriously. Knowledge is essential in the proper selection of which PPE to use. In order to prevent the non-use of the PPE that develops when it is required all of the time, the Lab has adopted a policy of use when required. This means that you, as the user of the lab, must know what hazards are presented not only by the work you are doing, but that the people around you are doing. If in doubt, always use the Personal Protective Equipment. If you are performing work requiring the use of PPE, and you notice another person in the lab who you believe should be wearing the equipment because of the work you are performing, tell the person what equipment they should be wearing. If they refuse, bring the issue to the attention of the Laboratory Manager.

Routes of Exposure: Four routes are available for chemicals to enter the body: through the eyes, skin, lungs, and mouth. The Personal Protective Equipment described in the rest of this section is designed to eliminate exposure to chemical hazards by eliminating the routes of exposure.

Clothing: Keeping the routes of exposure, and the nature of the hazards you are working with, in mind, appropriate clothing is required. If chemicals are in use in the lab, long pants and closed toe shoes are required. Shorts, skirts, sandals and flip-flops are not acceptable, while working with chemicals.

Eye Protection: If there is a chance of a spill or a splash, eye protection must be used. Eye protection must meet ANSI 87.1 with side shield protection. Goggles and glasses meeting this requirement are available at the front of the lab. Even if you personally are not working with chemicals, if someone else in the lab is, a chance of a splash still exists. It is your responsibility to check if any of the other people working in the lab are working with chemicals. If there is no chance for a splash, it is permissible to be in the lab without eye protection. Any guests or friends in the lab must also follow these guidelines.

Face Shield: Face shields are available at the front of the lab at the safety goggle station. Use the face shield if you are working with a significant hazard. A significant hazard would include concentrated acids or bases, explosion hazards, energetic reactions, etc. Again, if in doubt wear the face shield.

Blast Shield: A blast shield is kept at the back corner of the lab next to the hood and balance table. The blast shield should be used whenever there is a chance of a reaction exploding, proceeding at an uncontrolled rate, or a pressure vessel bursting.

Lab Coats: To avoid the dermal exposure to a chemical, a variety of lab coats are available. Cloth lab coats will prevent exposure to a solid, or grease. When liquids are being used, Tyvek coats and aprons are available.

Gloves: Several types of gloves are available, and the proper selection and use of gloves is essential to your safety in the lab. A glove selection guide can be found in the Chemical Hygiene Plan, and posted on the chemical storage cabinets. Thin rubber, plastic, or vinyl gloves can be used for routine laboratory protection. The lab has a limited selection of the gloves on hand. If a glove is required that the lab does not have, you will need to supply it. Thick rubber gloves are found underneath the sinks. Thick rubber gloves are used for more hazardous tasks like mixing acids, or pouring bulk chemicals. Thermal gloves are available at the area of use. Thermal gloves are located on top of the drying ovens, and the cryogenic gloves can be found on top of (or close proximity to) the liquid nitrogen dewar.

Right-to-Know: As a user of the SASL, you have a “Right-to-Know” all of the potential risks and hazards to which you might be exposed to while working in the lab. This knowledge, combined with planning and careful thought, are your most important tools for the safe use of the lab. A collection of material, selected to give you this knowledge, is located in an area called the “Right-to-Know Station” This station is located at the front entrance to the lab, over the microwave and coffee maker. Additional information is available in the Lab Managers office.

Phone: A phone is available in the lab. In the case of an emergency, call for the appropriate help. The relevant numbers are posted on the wall behind the phone. If there is any question, and an emergency exists, dial “911". This number will contact you with the Campus Security Office, who will call, dispatch, and guide the emergency responders to the proper location.

Material Safety Data Sheets: A Material Safety Data Sheet (MSDS) is required to be on file for all of the chemicals brought into the lab. MSDSs are on file for all of the chemicals currently in the Lab, but MSDSs must be ordered, and on file, for chemicals brought into the Lab by either ordering or adopting the chemical. The MSDSs are kept on file in the “Right-to-Know Station” in the laboratory. They should be consulted before using the chemical, and if appropriate

(as in the case of Particularly Hazardous Chemicals) a copy of the MSDS should be kept at your work area.

Safety Library: If you have questions about using the lab, a couple of safety books are located in the Right-to-know station.

Chemical Hygiene Plan: All of the standard practices for the SASL are collected in a document called the Chemical Hygiene Plan (CHP). The CHP provides all of the information for the safe operation of the lab, and is located in a red binder in the Right-to Know Station. A copy of the CHP is also available on the labs web page.

Chemical Hygiene: The proper acquisition, labeling, storage, use, and disposal of chemicals is essential to the safe operation of the lab. The procedures involved in training users, ordering, receiving, storing, using, and disposing of chemicals, and preparing for accidents is referred to as "Chemical Hygiene". This section describes several aspects of Chemical Hygiene in the SASL.

Storage: The storage of chemicals in the lab is based on the concept of "compatibility classes". This means that only chemicals that are compatible with one another may be stored together. There are 7 classes of chemicals in the SASL chemical storage scheme. These classes are Acids, Bases, Oxidizing Agents, Reducing Agents, Inorganics, Organics, and Secure. Chemicals must be stored according to this scheme. A written copy of this scheme is posted on the door to the chemical storage cabinets, and in the Chemical Hygiene Plan. If you need to use a chemical that does not fit into this scheme, check with the Lab Manager. Chemicals must not be stored on the bench top, drawers or cabinets, or on the shelves above the benches.

Labeling: All containers (bottles, reaction vessels, flasks, etc.) must be properly labeled. The label should include the name and concentration of the chemical, your name, and the date (including the year). Do not use acronyms or abbreviations for the name of the chemical.

Hoods: If the chemical or process you are using poses any kind of an inhalation hazard, you must use the chemical or perform the process in one of the fume hoods. The hoods are located in the back corner of the lab. The hoods are communal property, so chemicals, bottles, equipment, or trash should not be stored in the hoods. Placing too many things in the back of the hood will disrupt the air flow, preventing the proper operation of the hood. The hoods will not operate correctly if the sash is opened completely. An arrow is located on the side of the hood indicating the highest the sash should be opened.

Ordering: Check with the Lab manager before bringing any chemicals into the SASL lab. The laboratory must be equipped for the safe and proper use of the chemical. Before receiving a chemical, an MSDS for the chemical must be on file in the book of MSDSs in the Right-to-Know station. Do not order more of the chemical than you need for your procedure. A small quantity of the chemical may cost as much as a larger amount, but you might have to pay for the disposal of the left-over chemical. Disposal costs can be much greater than the initial cost of the chemical.

Disposal: Chemicals must be disposed of in a safe and environmentally conscious manner. There are several aspects you need to keep in mind for the disposal of chemicals. First, procedures for the disposal of all of your spent chemicals and reaction products must be addressed (in your Project Proposal) before ordering any chemicals or beginning any work in the lab. Second, just as with the storage of chemicals, if wastes are combined, they must only be combined with compatible chemicals. If a large amount of waste is to be produced, a bottle should be made just for your process. If possible, minimize the amount of waste by blowing off the water (as long as no organics or other waste products will be released at the same time). Also, if possible, minimize the hazardous characteristic by processing the waste. The Laboratory Manager can give assistance in designing your waste collection and disposal scheme.

Adoption: You must be careful when "adopting" chemicals. Adoption is the bringing of chemicals (either used or not) into the lab from another lab on campus or off-campus facility. The same rules used for ordering chemicals apply to the adoption of chemicals. In addition, you must make certain the chemical is properly labeled and the quality of the chemical has not degraded to the point where it can not be used. Donated chemicals should not be accepted unless you are sure you will use them in a timely manner.

Hazard Response Equipment: The SASL is equipped with several pieces of equipment to mitigate the effects of foreseeable accidents in the laboratory. If you are unsure of your ability to use the equipment properly, or of what the effectiveness of the

mitigation action will be, be safe: evacuate the laboratory and call the emergency response officials.

Shower: The emergency shower should be used if a significant portion of your body has been exposed to a chemical. A "significant portion" is any amount of your body that can not fit easily into a sink to be washed. The emergency shower only releases water while the handle is pulled. If you can not pull the handle and wash your body at the same time, you should have someone help you. If the spill involves areas covered by clothes, the clothes must be removed. To preserve modesty, cover yourself with the fire blanket, located below the shower. Avoid contaminating the fire blanket (and thus prolonging your exposure) by ensuring all of the chemical is rinsed off before wrapping up in the fire blanket. Do not worry about the puddle that will be forming. Ensure your safety at all costs. **Transport to a medical care facility.**

Eye Wash Station: Two specially designed eye-wash bottles are available in case a chemical gets in your eye. Place the bottle on the table next to the eye wash station. Holding the eyelid open, gently squeeze the bottle to rinse the eye. Repeat this process with the second bottle. After both bottles have been used, go to the sink in the bathroom and continue to rinse your eye. Do not use the sprayers located in the sinks. **Transport to the medical care facility.**

Fire Extinguishers: Three types of fire extinguishers are located in the lab. The decision on the type of extinguisher to use is based on the type of combustible material involved. Remember to direct the extinguisher to the base of the blaze (where the fuel is located). It is important to note: If you have any concerns about your ability to fight the fire, don't try: evacuate the building and call the fire department. Even if you successfully put out the fire, it is still important to evacuate the building and call the fire department.

Carbon Dioxide: The CO_2 fire extinguisher works by displacing the oxygen required for combustion. CO_2 extinguishers do not react chemically with the fuel or cool the fuel appreciably, so the possibility of re-ignition exists when the CO_2 is dissipated. CO_2 extinguishers work best on electrical fires where conductivity of the extinguishing media is a concern. CO_2 extinguishers are not well-suited for wood, paper, liquids, or other combustibles.

Dry Powder: The dry powder extinguishers are the most generic in their application. Dry powder extinguishers work by chemically interfering with the mechanisms of flame formation, and by displacing the oxygen required for the combustion. The powder is non-toxic and non-conductive. Dry powder extinguishers are suited for wood, paper, oils, greases, and other combustible materials. Dry powder extinguisher will work on electrical fires, but the powder may damage delicate equipment. If you are in doubt, use the dry powder extinguishers.

Active Metal: The lab has one extinguisher designed for use on fires involving active metals. None of the other extinguishing systems will work on the active metal fires, and water based systems will make the fire much worse. Your Project Proposal should note any potential use of active metals and you should familiarize yourself with the extinguisher at that time.

Spill Control Station: Small, wet chemical spills should be cleaned up using the wipes or pillows in the spill control station. The station contains different sizes of wipes depending on the size of the spill. The wipes in the station are specially designed to absorb but not react with chemicals. Once the spill has been cleaned up, the spill control wipes or pillows must be disposed of according to SASL procedures. The used wipes or pillows can be placed into plastic bags, found in the Spill Control Station, to await disposal at a more convenient time. If the spill is to large to be controlled with a couple of the larger pillows, evacuate the building and call the fire department. Dry spills can be swept up and disposed of according to the SASL procedures.

Fire Blanket: In the event of a fire on a person or their clothes, use the fire blanket to smother the flames. Lay down and roll to put out the fire. Do not stand up and wrap the blanket around you, because this will create a chimney effect, potentially making the fire worse. Call for medical assistance in the event of a fire.

Broken Glass Waste: Any broken or sharp glass should be disposed of in the two containers designed for that purpose. Any thin glass that is easily breakable should also be disposed of in the containers. Only clean glass should be placed in the containers. If the glass is contaminated with chemicals, rinse the glass with an appropriate solvent, place the glass in the container, and then dispose of the rinse solution as described in the section on the disposal of chemicals.

Gas Shutoff: The laboratory natural gas supply to the lab is controlled with a shutoff valve. The valve is turned off by pushing in the lighted button. The valve for the natural gas should be off when the gas is not being used. If safety

permits, during an evacuation, shut off the valve if you are using the gas.

Behavior: The most important aspect in the safe operation of the lab is the knowledge and behavior of the users of the lab. The safe operation of the lab requires the complete understanding of the experiment you are about to perform: the hazards involved, the possible accidents that are likely to occur, and the appropriate responses to the possible accidents. In addition to the proper planning of the experiment, there are several practices that will help to ensure your safe use of the Laboratory.

Unauthorized Work: Only the experiments that have been approved in the Project Proposal may be performed in the SASL. If, during the course of a series of experiments, the scope or direction of a project changes significantly, a new Project Proposal must be completed and approved, before continuing with the new research.

Radios / Headphones: Radios distract you and others from the work you are performing. Radios can also cover the sounds of a accident occurring. No radios, personal tape or CD players, MP3 players, etc. may be used in the laboratory. No headphones may be used in the Laboratory.

Eating / Drinking: Eating and drinking are not allowed in the experimental portions of the laboratory. A yellow and black stripped line is on the floor behind the student carrels. No chemicals, glassware, or any other apparatus that may be contaminated with chemicals is allowed on the carrels side of the line. This rule definitely applies to gloves. Wearing your contaminated gloves into an uncontaminated area is a common way to inadvertently expose yourself and others to the chemicals. No food or drink is allowed on the laboratory side of the line. This rule is for your safety and will not be bent.

Working Alone: If you are performing an experiment, or a portion of a experiment, where a significant hazard exists, the work should be performed in the presence of another person. This person is referred to as a "buddy". Your buddy will be able to render assistance in the case of an accident. All of the Laboratory rules and regulations applying to you as the user of the Lab also apply to your buddy. It is important that you honestly evaluate the hazards of the experiment. If you are only working on the computer, or are working with stable and benign chemicals, it is appropriate to work alone. If the experiment involves the use of cryogens, Particularly Hazardous Chemicals, or the chance of electrical shock, you must have someone to provide assistance in the case of an accident.

Playing: It is reasonable to have a good time in the Lab, as long as your concentration remains where it belongs: on the experiment you are performing. Any conversation or playing that distracts you from your experiment should be avoided. If the distraction can not be avoided, the experiment should be delayed until it can receive your full attention.

Housekeeping: Besides providing sources of error in your experiment, a messy work area invites accidents. Strive to keep the area around your experiment cleared of chemicals and equipment that are not being used. Put chemicals back into storage between usage. Keep the benches clean to avoid contamination and possible exposure.

Mouth Pipetting: Pipetting by mouth is prohibited. No matter what solution you are pipetting, the pipettes may be contaminated from previous work, allowing exposure to a variety of chemicals. Mouth pipetting is grounds for being barred from the lab.

Additional Checks: This walk-through and associated check-list only covers the items required for the general use of the SASL. There are a series of briefings covering special hazards that are required only if your experimental procedure involves the special hazards. The Laboratory Manager will help you determine which, if any, of the additional checklists you will be required to fill out.

Compressed Gases: You will be required to fill out the "Compressed Gas Checklist" if your project requires you to receive, move, connect, or change cylinders of compressed gases. If your project requires you to turn on and off a cylinder of compressed gas, you will not need to go through the briefing.

Cryogens: If your experiment involves the use of liquified gases (nitrogen or argon) or dry ice, you will need to fill out the "Cryogens Checklist". You will need to go through the briefing even if the gases stay in the tank, and only pass through an instrument or piece of equipment.

Particularly Hazardous Compounds: Some chemicals are particularly hazardous. Among these are those listed by the

EPA as producing "P-Type" wastes. These chemicals are hazardous enough to warrant special training. Using your Project Proposal, the Laboratory Manager will assist you in determining if your project involves any Particularly Hazardous Compounds.

Biological: As of this writing, the SASL is not equipped to handle undigested biological materials. This means that any fluid or tissue samples must be digested before being brought to the lab. Exceptions to this rule are provided on a project-by-project basis though consultation with the Laboratory Manager. When this restriction is removed, a checklist will be required before any biological material may be brought into the lab.

Radiation: As of this writing, the SASL is not certified with the Radiological Safety Department in Boulder for the use of radiological materials. This means that no radiological materials may be used in the SASL. When the SASL receives certification for the use of radiological materials, a checklist will be required before any materials may be brought into, or used in the lab.

Electrical: If your project involves the construction or repair of equipment where the chance of encountering high power is present, you will be required to complete an electrical safety briefing.

Machine Shop: Before using any of the equipment in the machine shop, you will be required to take the "Machine Shop Safety Briefing".

This Introduction has been reviewed and approved for use in the Shared Analytical Services Laboratory.

Written By: Reviewed By:

_____ _____

Jeffery A. Boon Date Dr. John A. Lanning Date

Need to discuss project proposal more. Maybe in the Unauthorized Work section?

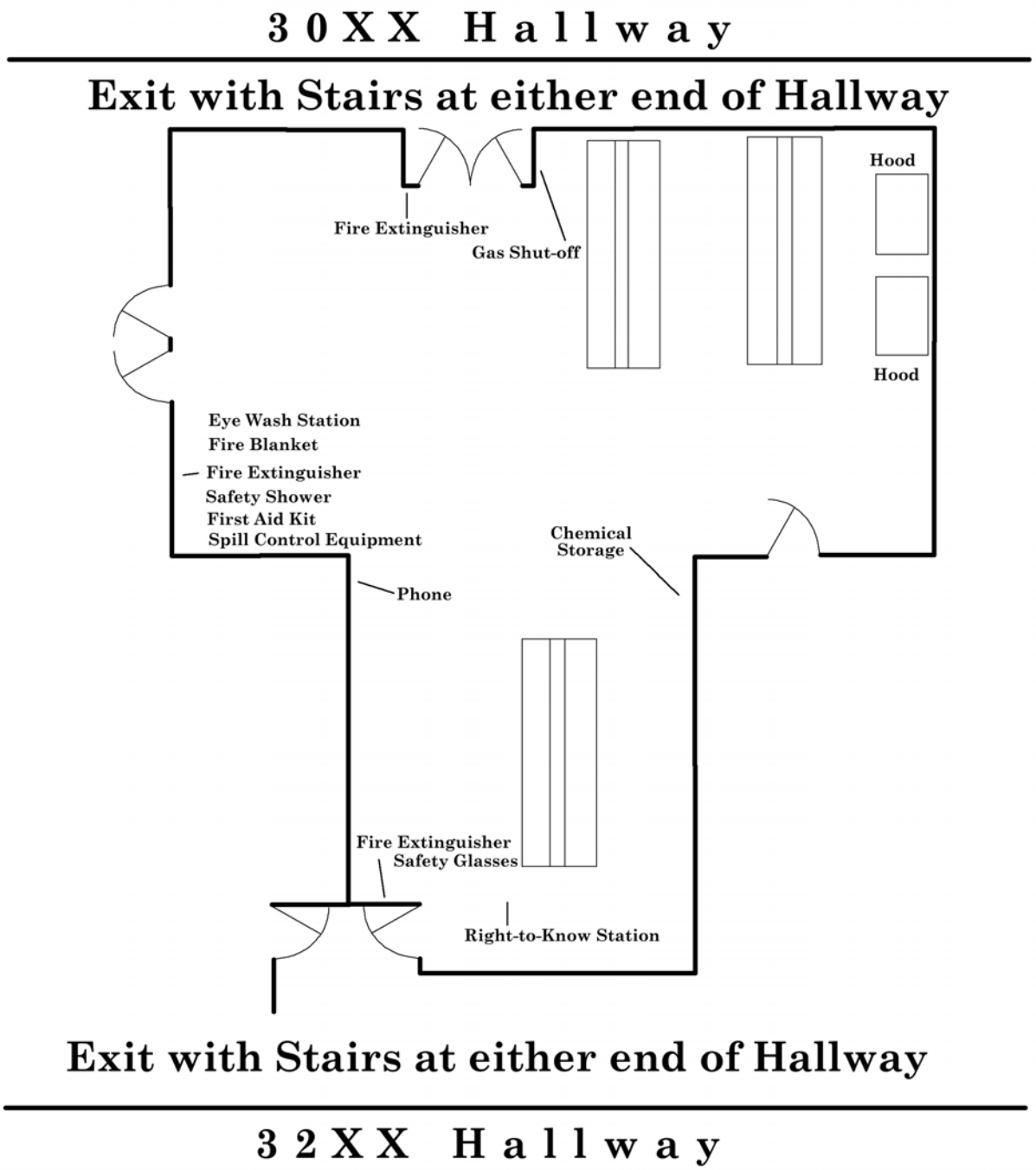

Figure 1 - Layout of the Shared Analytical Service Laboratory, including evacuation routes and the locations of the safety equipment.