



Liability & Property Pool Workers' Compensation Fund

RISK CONTROL SOLUTIONS

A Service of the Michigan Municipal League Liability and Property Pool and
the Michigan Municipal League Workers' Compensation Fund

LABORATORY SAFETY

Basic Rules & Procedures for Working Safely with Chemicals OSHA 1910.14; MIOSHA R325.70101-.70114

General Rules

General safety should be a priority when working in a laboratory. Employees work with potentially hazardous chemicals and equipment. Employees who understand the functional rules for working in and using laboratory space can prevent injury both to themselves and to their fellow lab mates.

Before starting any work in the lab, employees should become familiar with the procedures and equipment they will use. They should work with chemical products only if they know the flammability, reactivity, and toxicity of these products as well as the recommended procedures for handling and storing them. Staff members should also know the appropriate procedures for handling an emergency should one arise.

Management should encourage employees to ask questions if they do not understand or are unclear about something. Employees should always double check chemicals for labels and disposal information. They should never use unmarked or unlabeled chemicals. Employees should clean shelves periodically and make sure that the chemicals currently in stock have not deteriorated in condition.

The following checklist covers the recommended guidelines for working safely in a laboratory:

General Safety Practices

OSHA 1910.1450 Appendix A; MIOSHA R325.70101 - .70114 Appendix A

Yes	No	
_____	_____	Do you require employees to wear lab coats, or other appropriate protective clothing, and safety glasses in laboratories employing chemicals, biohazards, or radioisotopes?
_____	_____	Do you prohibit employees from wearing shorts, sandals, or open-toed shoes in the lab?
_____	_____	Do you require staff to contain dangling jewelry, loose clothing, or long hair that might catch in equipment?
_____	_____	Do you prohibit children and pets from entering the laboratory?
_____	_____	Do you forbid pipetting by mouth?
_____	_____	Do you allow the storage of food and drinks in designated refrigerators only?
_____	_____	Do you prohibit staff from working in lab alone if avoidable?
_____	_____	Do you have a procedure in place for periodically checking on employees who are working alone?
_____	_____	Do you have an alarm or other means of notification available if an employee needs help in an emergency?
_____	_____	To prevent contamination, do you prohibit staff members from wearing lab coats, gloves, or other personal protective clothing out of the lab and into non-lab areas?
_____	_____	Do you require lab staff to tie back or otherwise contain long hair to prevent exposure to flammables?
_____	_____	Do you require staff to wash their hands frequently throughout the day and before leaving the lab?

Personnel Protective Equipment

OSHA 1910.132 and 1910.1450, Appendix A;
MIOSHA Part 33 [R408.13301-13398]; R325.60001-.60013; R325.70001-70018

Protective clothing only protects employees if they wear it. You should consult the Material Safety Data Sheets or other references to determine the type of protective clothing necessary for the particular work your employees perform.

Protective Eyewear

Yes No

_____ _____ Do you provide goggles to protect employees against chemical splashes, vapors, dusts, and mists? Goggles that have indirect vents or are non-vented provide the most protection, but staff may need to apply an anti-fog agent.

_____ _____ Do you provide standard safety glasses (ANSI Z-87.1 Certified) to protect against impact?

_____ _____ If they are using a laser, do you require lab staff to wear safety glasses or goggles that provides protection against the specific wavelength of that laser?

_____ _____ Do you prohibit employees from wearing prescription glasses as safety glasses? Employees may wear protection that fits over standard glasses or they can purchase prescription safety glasses from most opticians.

_____ _____ Do you prohibit employees from wearing contact lenses in the laboratory? If they must wear contacts, do you require them to wear protective goggles all the time they are in the lab? Contacts can trap contaminants behind them and reduce or eliminate the effectiveness of flushing with water from the eyewash. Contact lenses may also increase the amount of chemicals trapped on the surface of the eye and decrease removal of the chemical by tearing.

Protective Gloves

Chemicals can permeate any glove. The rate at which this occurs depends on the composition of the glove, the chemicals present and their concentration, and the exposure time to the glove. If you are not certain which type of glove provides you with the protection you need, contact the manufacturer and ask for specifics on that glove.

Yes No

_____ _____ Do you select gloves that provide adequate protection against the chemicals that staff use?

- Butyl, neoprene, and nitrile gloves are resistant to most chemicals, e.g., alcohols, aldehydes, ketones, most inorganic acids, and most caustics.
- Disposable latex and vinyl gloves protect against some chemicals, most aqueous solutions, and microorganisms and reduce risk of product contamination.
- Leather and some knit gloves will protect against cuts, abrasions, and scratches, but not against chemicals.
- Temperature-resistant gloves protect against cryogenic liquids, flames, and high temperatures.

_____ _____ Do employees replace gloves regularly throughout the day if direct chemical contact occurs?

_____ _____ To prevent the spread of contamination, do employees wash their hands regularly and remove gloves before answering the telephone or opening doors?

_____ _____ Do employees check gloves regularly for cracks, tears, and holes? Do they discard defective gloves promptly?

Note: There is increasing evidence that some people can develop a serious allergic reaction to latex.

Other Protective Clothing

Yes No

_____ _____ Do you provide lab coats, or other appropriate clothing to protect employees against splashes and spills? A lab coat should be nonflammable, where necessary, and should be easy to take off. Many different kinds of lab coats are available.

_____ _____ Do you provide rubber-coated aprons to protect employees against chemical splashes? Employees may wear aprons over lab coats for additional protection.

_____ _____ Do you provide face shields to protect employees against impact, dust, particulates, and chemical splashes for the face, eyes, and throat? Employees should always wear protective eyewear such as goggles underneath a face shield because a face shield only offers additional protection to the eyes. Chemical vapors and splashes can still travel under and around a face shield. Check the window of the face shield frequently for scratches or cracks and replace the window as necessary.

Yes No

When employees are working in the lab, do you require them to wear shoes that fully cover their feet? If employees perform work that includes moving large and heavy objects such as 55-gallon drums, they must wear steel-toed shoes.

Do you hold the lab supervisor responsible for assuring that all individuals, including visitors, wear appropriate personal protective equipment in areas where you handle or store chemicals?

Housekeeping

OSHA 1910.1450, Appendix A and MIOSHA R325.70101-.70114, Appendix A

Yes No

Do employees keep work areas clean and free of unnecessary chemicals? Cleaning should take place throughout the day to aid in maintaining a safe work environment.

Do employees clean equipment, if necessary, after use to avoid the possibility of contaminating the next person who needs to use it?

Do employees keep aisles and walkways in the lab clear and free of debris to provide a safe walking surface and an unobstructed exit?

Do employees keep access to emergency equipment and utility controls unobstructed?

Do you have fire extinguishers checked monthly to maintain quality and safety?

Do you check eyewash stations and showers monthly to ensure that they are clean and work properly? Do you document the inspection?

Hazard Communication

OSHA 1910.1200 [adopted by reference by MIOSHA] and 1910.1450; MIOSHA R325.70107 and R325.70101-.70114, Appendix A

Yes No

Do containers have correct labels?

Are MSDS available to employees that discuss the chemicals they handle?

Do you have a hazard communication program that regulates and conveys all appropriate hazard information?

Does training (computer or non-computer based) inform employees of information sources such as MSDS and labels?

Do you have an on-site written program? The program should outline all aspects of employee exposure and the steps you will take to implement appropriate safety measures. For example, a written plan must list the chemicals on-site, indicate who is responsible for your program, and tell employees where they can obtain written materials.

Do you maintain written documentation of all training sessions?

Accidents and Spills

OSHA 1910.1450, Appendix A and MIOSHA R325.70101-.70114, Appendix A

CONTAINMENT IS ESSENTIAL. Supplies for cleaning up a minor chemical or biological spill should be readily available. In case of release, staff should promptly clean up spills, using appropriate protective clothing and equipment. Staff should cover all spills with appropriate material to prevent the spread of the spill.

Yes No

Have you trained your employees on responding properly to spills?

Do you have appropriate protective clothing available?

Do you have the following supplies on hand to clean-up spills:

- Inert absorbent such as kitty litter or vermiculite or a 50/50 mixture of the two?
- A plastic (non-sparking) scoop?
- Plastic bags for the spilled as well as clean-up materials?
- Goggles and heavy gloves?
- Sodium bicarbonate to neutralize acids?
- Do you have paper towels and a fresh 1:10 bleach solution on hand to clean-up biological spills?

Avoidance of "Routine" Exposures
OSHA 1910.1450, Appendix A and MIOSHA R325.70101-.70114, Appendix A

Yes	No	
_____	_____	Do you have procedures for avoiding routine exposures and do you train your employees on them?
_____	_____	Does training and supervision:
_____	_____	▪ Develop and encourage safe habits?
_____	_____	▪ Teach employees to avoid unnecessary exposure to chemicals by any route?
_____	_____	▪ Teach employees that they should not smell or taste chemicals?
_____	_____	Have you installed venting devices that may discharge toxic chemicals? Venting devices include vacuum pumps and distillation columns.
_____	_____	Do employees inspect gloves and test glove boxes before use?
_____	_____	Have you taken steps to prevent the release of toxic substances in cold rooms or warm rooms since these contain re-circulated atmospheres?
_____	_____	Do employees only work with chemicals for which the quality of the available ventilation system is appropriate? Have you determined this?

Glassware and Equipment

Specialists in laboratory safety recommend the following guidelines for the use and care of glassware and other laboratory equipment.

Glassware

Yes	No	
_____	_____	Do employees inspect all glassware before use and repair or discard any broken, cracked, or chipped glassware.
_____	_____	Do employees tape or shield glass vacuum vessels to prevent flying glass in the case of an implosion?
_____	_____	Do employees tape or shield glass vacuum dessicators?
_____	_____	Do you prohibit the use of household-type glass vacuum bottles as substitutes for laboratory Dewar flasks? The walls of household-type glass vacuum bottles are too thin.
_____	_____	Do employees carry all glass chemical containers in rubber or polyethylene bottle carriers?
_____	_____	Do employees fire-polish all cut glass tubing and rods before use?
_____	_____	Do employees take these steps when inserting glass tubes or rods into stoppers:
_____	_____	• Ensure that the diameter of the tube matches the diameter of the stopper?
_____	_____	• Fire-polish the end of the glass tube?
_____	_____	• Lubricate the glass with water or glycerol?
_____	_____	• Wear heavy gloves and hold the glass not more than two inches from the end of the stopper in which they will insert it?
_____	_____	• Insert the glass carefully with a twisting motion, and remove stuck tubes by slitting the stopper with a sharp knife?

Equipment - General

Yes	No	
_____	_____	Do your employees follow these safety practices?
_____	_____	▪ Do they keep work surfaces as uncluttered as possible?
_____	_____	▪ Do they firmly clamp apparatus and set it up away from the edge of the lab bench?
_____	_____	▪ Do they only use equipment that is free from cracks, chips, or other defects?
_____	_____	▪ Do they place a pan, if possible, under a reaction vessel or other container to contain liquid if the glassware breaks?
_____	_____	▪ Do they lubricate glass stopcocks?
_____	_____	▪ Do they support and secure condensers and water hoses properly with clamps and wires? Do they direct the water hoses so that any drips from the hoses do not splash down onto any electrical wires?

Yes No

- _____ Do they position apparatus attached to a ring stand with the center of gravity over the base and not to one side?
- _____ Do they assemble apparatus assembled so they can remove burners or baths quickly?
- _____ Do they use the appropriate vapor trap? Do they confine the setup to a fume hood if there is a possibility that the procedure may create hazardous vapors?
- _____ Do they place the setup in a fume hood if a reaction might result in an implosion or explosion? Do they keep the sash pulled down?
- _____ Do they use a stabilized and secured standing shield if they are unable to use a fume hood?
- _____ Do they always wear a lab coat and proper eye and face protection?

Equipment -- Centrifuges

Yes No

- _____ Do your employees follow these safety practices?
- _____ Do they securely anchor tabletop centrifuges and locate them where the vibration will not cause bottles to fall off the bench?
 - _____ Do they keep the centrifuge lid closed while operating it and monitor the centrifuge until they are certain it is running safely without vibration?
 - _____ Do they stop the centrifuge and check load balances if the centrifuge starts vibrating?
 - _____ Do they regularly clean rotors and buckets with a non-corrosive cleaning solution?
 - _____ Do they use sealed safety cups while centrifuging hazardous materials/

Equipment -- Ultraviolet Lamps

Yes No

- _____ Do your employees follow these safety practices?
- _____ Do they wear ultraviolet absorbing protective safety glasses while working with ultraviolet light?
 - _____ Do they protect their skin from potential burns due to ultraviolet light?
 - _____ Do they shield any experiment in which they use ultraviolet light to prevent the direct beam or radiation from escaping?

Equipment -- Lasers

Yes No

- _____ Do your employees follow these safety practices?
- _____ Do they always wear goggles that protect against the specific wavelength of the laser?
 - _____ Do they avoid looking directly at the beam?
 - _____ Do they prevent any reflective materials from getting in or along the beam?
 - _____ Have you hung warning signs in all laser areas?
- _____ If possible, use a flashing light at the lab entrance to indicate when a laser is in use.

Equipment -- Separatory Funnels

Yes No

- _____ Do your employees follow these safety practices?
- _____ Do they use extreme caution if the temperature of the materials is elevated?
 - _____ When they are using a volatile solvent, do they swirl the unstopped separatory funnel first to allow some solvent to vaporize and to release pressure?
 - _____ Do they close the funnel and invert it with the stopper held in place, then immediately open the stopcock to release pressure?
 - _____ Do they avoid venting the separatory funnel near a flame or any other ignition source and avoid pointing it at a co-worker or equipment? It is best to vent the separatory funnel into a fume hood.
 - _____ Do they close the stopcock, swirl the funnel, and then immediately open the stopcock with the funnel in an inverted position to vent the vapors again?

Equipment -- Cooling Baths and Cold Traps

- | Yes | No | |
|-------|-------|---|
| _____ | _____ | Do your employees follow these safety practices? |
| _____ | _____ | ▪ Do they always use caution when working with cryogenic coolants? |
| _____ | _____ | ▪ Do they use temperature resistant gloves and a faceshield while they slowly immerse an object that needs cooling? |
| _____ | _____ | ▪ Are they careful to avoid pouring cold liquid onto the edge of a glass Dewar flask when filling it because the flask may break and implode? |
| _____ | _____ | ▪ Avoid lowering their heads into a dry ice chest? There is no oxygen present. |
| _____ | _____ | ▪ Do they wear temperature resistant gloves while handling dry ice? Severe burns can result if an employee does not use protection. |

Equipment -- Vacuum Pumps

- | Yes | No | |
|-------|-------|---|
| _____ | _____ | Do your employees follow these safety practices? |
| _____ | _____ | ▪ Do they vent vacuum pump exhaust into a fume hood if possible? |
| _____ | _____ | ▪ Do they ensure that belt-driven vacuum pumps have guards to prevent hands or loose clothing from being caught in the belt pulley? |
| _____ | _____ | ▪ Do they place a trap between the vacuum pump and the apparatus? |
| _____ | _____ | ▪ Do they lubricate pump regularly if possible? |
| _____ | _____ | ▪ Check belt conditions? |

Electrical

OSHA 1910.331-.335; MIOSHA R408.14001-.14009

- | Yes | No | |
|-------|-------|--|
| _____ | _____ | Do your employees follow these safety practices? |
| _____ | _____ | • Do they examine all electrical cords periodically for signs of wear and damage? If they discover damaged electrical cords, do they unplug the equipment and report the problem, so that the responsible person can send it off for repair? |
| _____ | _____ | • Do they only use properly grounded electrical equipment? |
| _____ | _____ | • If employees notice sparks while plugging or unplugging equipment or if the cord feels hot, do they take the equipment out of service until an electrician repairs it? |
| _____ | _____ | ▪ Do you prohibit employees from running electrical cords along the floor where they will be a tripping hazard and be subject to wear? If employees must run a cord along the floor, make sure they protect it with a cord cover. |
| _____ | _____ | ▪ Do you prohibit the running of electrical cords above the ceiling? Cords should be visible at all times to ensure they are in good condition. |
| _____ | _____ | ▪ Do you ensure that employees do not plug too many items into a single outlet? You should not use cords that allow them to plug in more than one item at a time. You can use multi-plug strips if they have a circuit breaker and if employees do not overuse them. |
| _____ | _____ | ▪ Do you prohibit employees from using extension cords for permanent wiring? If you must use extension cords throughout the lab, then it is time to have additional outlets installed. |

Use of Hoods

OSHA 1910.1450; MIOSHA R325.70101-.70114

Employees should use the hood for all procedures that might result in the release of hazardous chemical vapors of dust. Confirm that the hood is working before use by lightweight paper up to the opening of the hood. Employees should pull the paper inward. Employees should leave the hood "on" when it is not in active use if toxic substances are stored inside or they are not certain whether adequate general laboratory ventilation will be maintained when it is "off."

Proper Use of Fume Hoods

Yes	No	
_____	_____	Do your employees follow these safety practices?
_____	_____	▪ Do they place equipment and other materials at least six inches behind the sash? This will reduce the exposure of personnel to chemical vapors that may escape into the lab due to air turbulence.
_____	_____	▪ Do they pull the sash all the way down when they are not using the hood?
_____	_____	▪ Do they pull down the sash as far as is practical while they are working at the hood? The sash is your protection against fires, explosions, chemical splashes, and projectiles.
_____	_____	▪ Do they remove loose papers, paper towels, and tissues from the hood? These materials can be drawn into the blower and adversely affect the performance of the hood.
_____	_____	▪ Do employees store chemicals in the proper storage location, not in the fume hood? Excessive storage of chemicals and other items will disrupt the designed airflow in the hood. In particular, do not store chemicals against the baffle at the back of the hood, because this will interfere with the laminar airflow across the hood.
_____	_____	▪ Do employees raise the fume hood 1.5 inches off the work surface to allow air to flow underneath it if they must keep large equipment in the fume hood? This dramatically reduces the turbulence within the hood and increases its efficiency.
_____	_____	▪ Prevent disruption of airflow and the drawing out of contaminants from the hood by not placing objects directly in front of a fume hood (such as refrigerators or lab coats hanging on the manual controls)?
_____	_____	▪ Do you prohibit employees from modifying a fume hood system, e.g., adding a snorkel? Such modifications can render the entire system ineffective.
_____	_____	▪ Do employees minimize the amount of foot traffic immediately in front of a hood? Walking past hoods causes turbulence. This can result in contaminants being drawn out of the hood and into the room.

Unattended Operations

Yes	No	
_____	_____	Do your employees follow these safety practices?
_____	_____	▪ Do they leave lights on and place an <i>appropriate</i> sign on the door?
_____	_____	▪ Provide for containment of toxic substances in case a utility service (such as cooling water) to an unattended operation fails?

CONCLUSION

It is easy for employees to forget appropriate safety procedures when they are rushing to meet deadlines. However, if employees follow safety procedures, they can prevent serious injury or damage from occurring. With proper preparation and planning, you can maintain safety without sacrificing efficiency. Most importantly, the laboratory supervisor and lab staff should always seek information and advice about hazards, develop and follow appropriate protective procedures, and plan the positioning of equipment before beginning any new operation.

If you need help or more information about laboratory safety, contact MML Risk Management Services or the League's Loss Control Services.



Important Telephone Numbers

MML Risk Management Services	800/653-2483 or 734/662-3246
Loss Control Services	800/482-0626

Note:

This document is not intended to be legal advice. It does not identify all the issues surrounding the particular topic. Public agencies are encouraged to review their procedures with an expert or attorney knowledgeable about the topic.