# Franklin Township Municipal Sanitary Authority

# Laboratory Safety Manual

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Approving Signatures: Name_____ Date_____

Title_____

Name_____ Date_____

Title_____

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# 1. Introduction to Laboratory Safety

## Preparing for laboratory work

Before starting to work in a laboratory, familiarize yourself with the following:

- the hazards of the materials in the lab, as well as appropriate safe handling, storage and emergency protocols. Read labels and material safety data sheets (MSDSs) before moving, handling or opening chemicals. Never use a product from an unlabeled container, and report missing labels to your supervisor.
- the agents, processes and equipment in the laboratory. If you are unsure of any aspect of a procedure, check with your supervisor before proceeding.
- the location and operation of safety and emergency equipment such as fire extinguishers, eye wash and shower, first aid and spill response kits, telephone and emergency exits.
- emergency spill response procedures for the materials you will handle.
- emergency telephone numbers.
- designated and alternate escape routes.

## During laboratory work

Restrict laboratory access to authorized persons only. Only essential employees should be in the laboratory.

Smoking; eating; drinking; storing food, beverages or tobacco; applying cosmetics or lip balm and handling contact lenses are not permitted in laboratories.

Wear uniforms/lab coats and safety glasses in laboratories employing chemicals. Open shoes (such as sandals), and shorts should never be worn in the lab.

Tie back or otherwise restrain long hair when working with chemicals or moving machinery.

Keep work places clean and free of unwanted chemicals and idle equipment. Avoid leaving reagent bottles, empty or full, on the floor.

Work only with materials once you know their flammability, reactivity, toxicity, safe handling and storage and emergency procedures.

Consult material safety data sheets (MSDS) before working with hazardous chemicals or infectious material. Keep updated MSDS.

Prepare and maintain a chemical inventory for the lab.

Never pipette by mouth; use mechanical transfer devices.

Walk, do not run, in the lab.

Keep exits and passageways clear at all times.

Ensure that access to emergency equipment (eyewashes, safety showers and fire extinguishers) is not blocked.

Report accidents and dangerous incidents ("near-misses") promptly to your supervisor.

Wash your hands thoroughly before leaving the laboratory.

Conduct procedures involving the release of volatile toxic or flammable materials in a chemical fume hood.

## Cleaning up before leaving

Perform a safety check at the end of each experiment and before leaving the lab. Make sure to:

- Turn off gas, water, electricity, vacuum and compression lines and heating apparatus.
- Return unused materials, equipment and apparatus to their proper storage locations.
- Label, package and dispose of all waste material properly.
- Remove defective or damaged equipment immediately, and arrange to have it repaired or replaced.
- Decontaminate any equipment or work areas that may have been in contact with hazardous materials.
- Close and lock the door to the laboratory if you are the last one to leave.

## Evaluating laboratory hazards, an ongoing process

There are many categories of hazards that might be encountered in a laboratory setting, and situations can change frequently. Even after you have identified and controlled all current risks, it is critical that you remain open to the possibility that new unexpected dangers can arise.

Carry out weekly inspections on the condition of:

- fire extinguishers

emergency wash devices such as eyewashes and drench hoses (run these for several minutes and update inspection tags

first aid kit contents

fume hood and other ventilation devices

tubing for circulating water, vacuum, gases

chemical storage compartments

Also, ensure that fire extinguishers and emergency showers are inspected, tested and tagged annually.

Among potential laboratory hazards, be alert for the following:

**Chemical products**

flammable

toxic

oxidizing

reactive

corrosive

**Physical or mechanical hazards**

electrical

poor equipment design or work organization (ergonomic hazards)

tripping hazards

excessive noise or heat

## 2. Workplace Hazardous Materials Information

### Requirements: labels, material safety data sheets, training

Below you will find a summary of the type of information that is covered by labels, MSDSs and training.

**Labels** for hazardous materials must alert people to the dangers of the product and basic safety precautions.

**MSDS**s provide more details than the labels. They are technical bulletins that provide chemical, physical, and toxicological information about each controlled product, as well as information on precautionary and emergency procedures. They must be readily accessible to anyone who works with, or who may otherwise be exposed to, controlled products.

**Training** provides more detailed instruction on the specific procedures necessary to carry out work safely. Basic training, referred to as core training, provides instruction on the content, purpose and interpretation of information found on labels and in MSDSs for controlled products.

Hazard-specific or job-specific training refers to instruction in the procedures for the safe handling and storage of the controlled products that are unique to each laboratory. Hazard-specific training also covers spill or leak remediation; waste disposal; and basic first aid instructions.

## General "Housekeeping"

In the laboratory and elsewhere, keeping things clean and neat generally leads to a safer environment.

*Safety Guidelines:*

1. Keep aisles and floors free of any unnecessary boxes, chemicals, cylinders, etc. Avoid slipping hazards by keeping the floor clear of ice, stoppers, glass rods, other small items, and spilled liquids.

2. Have only those materials in the work area that are necessary for the job.

3. Return any equipment, tools, or chemicals to their proper storage area.

# 3. BUILDING SAFETY

## General Storage

*Safety Guidelines:*

1. Put tools back in their storage area if not in use.

2. Return any chemicals which are not being used to their proper storage area.

3. Paper, cloth, or other solids, if soaked with a flammable or combustible material, should be placed in a recognized disposal container.

4. Store chemicals and combustible materials away from flame. Flammable chemicals should

be stored in an approved flammable storage cabinet.

5. Never block routes of egress.

## Fire Extinguishers

Fire extinguishers provided are--at best--first aid instruments to be used in the initial stages of a fire. All personnel are requested to know the location and types of extinguishers in the area and be familiar with their method of operation. Reviewing the fire extinguisher classification system will aid you in selecting the right extinguisher during an emergency situation.

*TYPES OF FIRES:*

Class A Fire: Wood, paper, textiles, other ordinary combustibles.

Class B Fire: Flammable liquids, oils, solvents, paint, grease, etc.

Class C Fire: Electrical--live or energized electric wires or equipment.

Class D Fire: Metals (sodium, calcium, potassium, magnesium, etc.)

*TYPES OF EXTINGUISHERS:*

Water: To be used on Class A fires only.

Cartridge Operated--water supplied to nozzle by inverting cylinder, bumping on floor, or breaking the seal on a carbon dioxide cartridge.

Stored Pressure--water supplied to nozzle by pressure tank. Pull pin and squeeze handle.

**DO NOT USE WATER ON ELECTRICAL FIRES!**

Dry Chemical: (purpose, monoammonium phosphate) To be used on Class A, B, or C fires.

Cartridge Operated--puncture carbon dioxide cartridge located on the side. Squeeze handle, use with a side to side motion directing at the base of the fire.

Stored Pressure--Chemical discharges from nozzle due to stored (air) pressure. Use with side to side motion.

Dry Chemical: (regular, sodium bicarbonate base) To be used on Class B and C fires.

Cartridge Operated--puncture carbon dioxide cartridge located on the side. Squeeze handle, use with a side to side motion directing at the base of the fire.

Stored Pressure--Chemical discharges from nozzle due to stored (air) pressure. Use with side to side motion.

CO2 Horn: To be used on Class B and C. fires. Is filled with liquid carbon dioxide which produces "snow" and gas as it discharges from the horn. Point at the base of the fire.

Dry Chemical: (metal, special chemical bases) To be used on Class D fires.
Cartridge Operated--puncture carbon dioxide cartridge located on the side. Squeeze handle, use with a side to side motion directing at the base of the fire.

## Personal Safety

The issue of personal safety pertains to hazards in the laboratory and to the possibility of theft, vandalism, and assault by strangers with access to the buildings. Section 4 on ***Laboratory Safety*** discusses the danger of working alone with regard to laboratory hazards.

*Safety Guidelines:*

1. Note the presence of strangers in the building. If appropriate, ask their business, escort them to an exit, or call the police.

2. Do not prop open locked doors.

3. If you come into the building during off hours, let someone know where you are and how long you expect to be there. Keep the doors to the outside locked as well as the doors to your work area, if appropriate.

4. If you feel yourself to be in danger, call the Murrysville Police.

# 4. Laboratory Safety

### General Safety Procedures

Laboratory work must be performed in ways that will reduce the probability and severity of an accident or toxic exposure to a negligible level. Minimizing risks depends on employing safe laboratory practices, proper engineering controls, proper selection and use of personal protective equipment, using the smallest quantity of material needed for experiments, and whenever possible, chemical substitution.

### Minimize Exposure

Laboratory safety requires the full cooperation from everyone in the lab. The ultimate responsibility for one’s safety rests with the individual. This can be achieved by following these basic guidelines:

Follow all safety instructions carefully. Do not deviate from these instructions without discussing the issue with management.

Know the location and proper use of safety equipment (fire extinguishers, eyewash, fume hoods, spill kits) and emergency exits.

Before performing any laboratory work, laboratory personnel must:

a. Be familiar with the hazards of the chemicals being used.
b. Review safety precautions and emergency procedures.
c. Become familiar with the apparatus being used and the process involved.
d. Know what to do to protect themselves and others from such hazards.
e. Wear appropriate eye protection, gloves and clothing that protect from splashes and spills.
f. Be aware of the dangers of ingesting chemicals.
g. Do not store, prepare, or consume food and beverages in any laboratory.
h. Do not apply cosmetics in a laboratory setting.
i. Wash hands before leaving the laboratory, even if gloves were worn.
j. Do not wear lab coats into areas where food is consumed.
k. Never pipette by mouth. Use aspirator bulbs or automatic pipetting devices.
l. Do not attempt to identify chemicals by smell or taste.
m. Chemical use shall be restricted to only laboratory areas. Use of chemicals in a non-laboratory area such as an office or meeting area is not permitted.

**Chemical Substitution**

One of the most effective ways to reduce risk is to eliminate it. This can be accomplished by replacing hazardous materials with safer, less toxic ones.

Some examples include:

1. Use temperature/pressure-sensing devices that operate without mercury.
2. Use enzymatic detergents instead of chromic/sulfuric acid mixture for ultra clean glassware.

**Engineering Controls**

Engineering control are those devices that automatically isolate or limit exposure to a hazard, thereby reducing the risk to personnel. Those that are more “automatic” are preferred to those that are less so. For this reason, engineering controls are considered as the “first line of defense” for reducing exposure, as opposed to personal protective equipment and work practices which are subject to human error. Engineering controls must not be modified unless appropriate testing clearly indicates that protection of personnel will be equal or greater than the original protection afforded by the control device.

### *Chemical Fume Hood*

Engineering controls such as the laboratory fume hood are primary means of controlling or minimizing hazardous chemical exposures. These controls must be properly maintained to ensure the highest level of protection. Any fume hood that is not functioning properly or is inoperable must be reported immediately to management.

Work with a 12-inch sash opening. This is the height at which proper airflow velocity is established and that will protect the upper body from splashes.

Use a fume hood, glove box, or other specially ventilated or enclosed space, for work in which airborne, toxic, flammable and malodorous substances may be released either from the material in use or as products of a reaction.

Devices that may discharge hazardous gases, vapors, or fine dusts, e.g., vacuum pumps, distillation columns should be used in a fume hood or ducted so that the exhaust is discharging into a fume hood, rather than allowing it to discharge directly into the laboratory.

If a hood is not equipped with an airflow monitor, tape a Kim-Wipe to the bottom of the sash to verify the direction of flow and qualitative force of the airflow.

### *Ductless Chemical Fume Hood*

These are stand-alone devices that discharge air back into the room, relying on filters to remove airborne contaminants. Typically, they operate at face velocities lower than those in chemical fume hoods and filtration is not as reliable as exhaust (as in a standard fume hood) for removing hazardous gases and vapors. For these reasons the purchase and use of ductless fume hoods are prohibited unless preceded by approval from management. A description of the procedures to be conducted, material to be used, and the schedule for filter checks and change out must be provided. If given, approval will be limited to the use of the device with small quantities of relatively low hazard materials. They must never be used in rooms from which air is re-circulated.

### *Safety Shields*

Appropriate safety shields should be used whenever splashes or exothermic reactions are possible or evacuated glassware is present. Pull-down fume hood sashes are also effective for this purpose. Tip-resistant bench-top safety shields stop splashed substances as well as flying glass shards and other debris produced by an uncontrolled reaction or by an implosion resulting from a defect in the glass in an evacuated system.

### *Centrifuge Safety Devices*

Always secure the rotor’s top to reduce contamination of the chamber if a tube breaks. Use safety cups (gasketted, screw-capped containers) when centrifuging tubes containing hazardous chemicals or infectious materials.

### *Traps*

Some vacuum set-ups include traps that use either extremely low temperatures or chemical media (e.g., charcoal, limestone) to capture organic or acid vapors. Ensure that these systems are assembled properly, connections are tight, and that residues are properly disposed. Sewer drain

traps, especially cup sink drains, must be kept filled with water (can also add some mineral oil) to prevent noxious fumes from entering the laboratory from the sewer drain.

## 5. Work Practices

### *Purchasing Chemicals*

Purchase chemicals in the smallest quantity sufficient for your work.

### *General Housekeeping*

Disorderly laboratories contribute to accidents and can hinder emergency response activities.

The following rules must be adhered to:

Do not block exits, aisles and doorways; they must be kept free of obstructions.

Never obstruct access to emergency equipment i.e. fire extinguishers, eyewashes & safety showers.

Work with flammable substances only after removing sources of ignition (i.e. flames, hot surfaces, sparks or electrical switches and motors) near enough to cause a fire or explosion.

Store incompatible substances apart from one another.

Do not store chemical containers, especially glass bottles, on the floor. They should be stored in a cabinet or on shelves. If it is absolutely necessary to place a bottle of chemical on the floor, put the container in a plastic tray and store away from high traffic areas.

Keep only the minimum amount of chemicals, do not store chemicals in excess of limits.

Flammable liquids requiring refrigeration must be kept only in explosion-proof refrigerators.

Securely clamp or wire all flexible tubing in place on fittings. This prevents leakage of water, coolant fluids, etc., caused when the tubing slips loose from the fittings. Spills of this kind can lead to serious flooding with consequent extensive property damage as well as overheating of equipment.

Handle and store laboratory glassware with care to avoid damage. Glassware, especially when used in vacuum systems should be carefully inspected before each use. Never use glassware that is nicked or cracked. Discard it immediately in a container for broken glassware.

Secure compressed gas cylinders either by chaining to a secure support or by securing to a lab bench with a clamp. Systems containing or generating poisonous, flammable, explosive, or malodorous gases should always be used in fume hoods. Joints and other connections should be periodically checked for leaks.

All electrical outlets must have a grounding connection requiring a three-pronged plug.

Electrical wires that are frayed or worn shall not be used. Electrical wires must not be stretched across the floor where personnel and visitors could trip over them. Electrical outlets must have a cover plate.

Ground-fault interrupters should protect electrical outlets, especially those located near sinks and

faucets.

***Transport of Chemicals***

Secondary containers must be used whenever chemicals are transported. Secondary container are made of rubber, metal, or plastic, with carrying handles and are large enough to hold the contents of the chemical container should it break. Secondary containers are available commercially through laboratory equipment suppliers.

Do not carry jugs and bottles by the caps or by the molded glass ring.

Use both hands when moving chemicals in the laboratory, one under the vessel and the other around the neck of the bottle.

## 6. Safety Equipment

Proper maintenance of safety equipment is vital to the health and welfare of all laboratory personnel. The following items, common to almost all laboratories, must be properly maintained and regularly inspected to prevent or respond to laboratory accidents or emergencies. These devices must be accessible at all times.

***Eyewash Units***

Laboratories should be equipped with a plumbed-eyewash.

Laboratory personnel are responsible for weekly inspection, which entails flushing the unit for at least three minutes and reporting any problems to management. Eyewash stickers are posted at each eyewash.

***Fire Extinguishers***

Fire extinguishers must be inspected monthly and tested annually. If an extinguisher has been used to extinguish a fire or accidentally discharged, this must be reported immediately to management.

***Telephone system***: Emergency numbers are posted near laboratory telephones.

***Spill Control Kits***. Available from laboratory supply companies. Neutralizers and absorbents are available for specific classes of chemicals. Most laboratories will need specific neutralizers/absorbents for acids, bases, and organic solvents. Spill control kits for mercury are also available.

## 7. Personal Protective Equipment (PPE)

***Eye Protection***

Safety glasses with solid side shields and a brow bar (to minimize the open space between the top of the frame and the forehead) are the **basic** forms of eye protection and must be used whenever handling hazardous chemicals or in the vicinity of someone else doing so.

Safety goggles, which provide a tighter fit than glasses, must be used whenever activities entail a

moderate splash risk or when handling corrosive (strong acids or bases), and highly irritating or toxic chemicals.

Face shields are necessary for high risk activities such as pouring large amounts of corrosive liquids, washing glassware with acid*, handling glassware at non-ambient pressure, and using highly reactive chemicals. If the potential exists for splashed material to drip from the top of the head toward the eyes, goggles are also required.

Personnel who wear glasses have several options for eye protection. They may wear their regular glasses beneath a face shield.

Contact lenses are prohibited when chemical vapors are present or when a greater than negligible risk of a splash to the eyes exists. However, contact lenses may only be worn in conjunction with tight-fitting goggles for the lowest risk activities.

***Uniforms/Lab Coats/Aprons***

Uniforms, lab coats, and/or aprons must be worn whenever working with chemicals or materials.

They must be changed immediately if they become contaminated. Keep clothing buttoned to prevent their getting caught in equipment.

Liquid resistant (vinyl, rubber, depending on particular compound in use) aprons supplement lab coats for activities with an elevated splash potential. Uniforms/Lab coats/Aprons may not be taken home for cleaning.

***Gloves***

Protection is largely a factor of the ability of the glove material to resist permeation by the materials used; **there is no glove material that will protect against all chemicals.** Glove selection guides are available from manufacturers and are included in lab supply catalogues.

Latex gloves are resistant to aqueous materials but provide little protection against non-polar solvents and corrosives. Their principle application is for protection against blood and body fluids. However, nitrile gloves should be used to avoid the risk of latex sensitization. If latex gloves are chosen, use only powder-free gloves that the manufacturer documents as being low in soluble proteins (to reduce the risk of sensitization).

Always wash hands thoroughly before and after glove use.

Never reuse disposable gloves.

Change gloves as soon as possible if they become torn or damaged in any way.

Remove gloves as soon as work with hazardous materials is completed; this will prevent contamination of notebooks, work surfaces, telephones, etc.

Remove gloves when leaving the laboratory.

Wash reusable gloves (the heavier, ‘utility’ type) after use and inspect carefully for cracking and other signs of degradation.

### *Other Clothing Considerations*

Shorts and sandals should not be worn in the laboratory. While long pants and closed shoes are by no means considered “protective equipment”, the small additional element of protection they provide may make the difference between a serious injury and simply a ruined piece of clothing.

Avoid loose, dangling jewelry that may get caught in equipment or dip into chemicals; the same considerations apply to unrestrained long hair. A change of clothes should be kept at work in the event that an accident requires clothing removal.

## 8. Chemicals

### Chemical Labeling Requirements

Any container holding a chemical substance should be labeled with the substance’s proper chemical name. Shortcuts, ring structures, abbreviations may not be used. If the hazardous properties of the chemical are known, they must be included on the label.

In most cases, manufacturer’s chemical labels will indicate whether or not the chemical is hazardous. Look for key words such as flammable, toxic, corrosive, reactive, oxidizer, and carcinogen. A Material Safety Data Sheet (MSDS) also provides hazard information.

### Chemical Storage

Use sturdy cabinets and shelving for storage. Chemicals should not be stored on floors.

Store chemicals away from direct sunlight, heat, or ignition sources.

Avoid storing chemicals on top of cabinets.

Avoid storing chemicals on bench tops or in chemical fume hoods, except during use.

Chemicals must be segregated into compatible groups or hazard classes. These include:

flammables, reactives (including water reactives, pyrophoric, and flammable solids), oxidizers and organic peroxides, toxics, and corrosives (acids and alkalis).

Provide a definite storage place for each hazard class of chemical.

Separate dry chemicals away from wet chemicals.

Segregate acids and alkalis.

Segregate organic and inorganic acids.

Segregate inorganic acids from flammables.

Do not store flammables (flashpoint less than 100°F) in an ordinary household refrigerator.

Keep reactives and oxidizers away from incompatible chemicals (acids, alkalis, flammables).

Store the most hazardous chemicals in the least trafficked area.

**Disposal of Intact or Broken Laboratory Glass**

All laboratory glassware must be discarded such that it cannot injure anyone who handles it. This includes not only laboratory workers but all employees. Place laboratory glassware, intact as well as broken, (except for clean chemical source containers) into a specially marked rigid container designed for this purpose. A properly labeled thick-walled, rigid cardboard container may be substituted. The container must be able to withstand penetration by any broken glass it contains, and must be lined with a leak-resistant liner (e.g. a polyethylene or polypropylene bag). Seal the container and clearly mark it 'BROKEN GLASS' to describe its contents. Containers can be obtained from most laboratory equipment supply houses.

## 9. Chemical Spill Response

Laboratory personnel must know what to do in an emergency involving a chemical release. They must know how to report the incident and clean up the spill, if possible. Personnel conducting experiments must keep their co-workers informed of their activities so that they can respond to an emergency. They should be aware of their level of expertise, and ability to respond to a chemical accident. It is advisable not to take action outside your expertise but rely on other trained emergency responders. Inappropriate actions by personnel can delay appropriate response activities and worsen the situation. Proper emergency response depends upon knowledge of the chemicals present in the lab.

Chemical spills must be cleaned up promptly, efficiently and properly. The immediate clean up of a spill limits exposure to toxic materials, prevents possible slips and falls, as well as fire and explosions. It must be noted that the volume spilled is not as important as the toxicity of the chemical.

Report all chemical spills to management.

**Type of Spill Neutralizing Agent/ Clean up supplies**

Acid Sodium bicarbonate

Bases Citric Acid

Organic Solvents Absorbent pads, charcoal if available

Metals e.g., sodium Sand, Class D fire extinguishers

* See Mercury spills

Spills are classified as manageable or unmanageable. Manageable spills are spills that do not spread rapidly, do not seriously endanger people or the environment, and can be managed safely by lab personnel familiar with the hazardous properties of the chemical without the assistance of management. All other spills are considered unmanageable.

**Manageable Chemical Spills**

Alert people in the immediate area. Avoid breathing vapors and quickly determine what chemical and the quantity of material have been spilled.

Consult the Material Safety Data Sheet (MSDS) for hazardous properties, incompatibilities, and wear appropriate PPE (personal protective equipment such as safety glasses, gloves, long sleeve lab coat).

If the spill involves a flammable liquid, (acetone, methanol, diethyl ether, etc.) turn off all ignition and heat sources.

If the spill involves finely divided solids such nitrates, permanganates, perchlorates, they must not come in contact with combustible materials (wood, paper, or reducing agents).

Use a scoop, or dustpan and hand broom and collect finely divided solids in a plastic bag. Use an appropriate solvent to clean up residues.

Fires should be extinguished using the portable fire extinguisher. If clothing is on fire, follow Stop, Drop & Roll, wrap with a fire blanket to smother the flame, or douse the person with water.

Attend to persons contaminated by chemicals and removing contaminated clothing, and when feasible, flush the affected body area with water.

Confine spill to small area. Absorb and neutralize spill with appropriate material and create a dam around the perimeter. Use appropriate spill kit or sodium bicarbonate for acids; citric acids for caustics; and vermiculite, dry sand, or diatomaceous earth for other chemicals.

Clean spill area with soap and water. Notify the management. If they are unavailable, notify other members of the workforce.

Management must also be notified of any release of toxic materials in the laboratory even if it is deemed manageable. Telephone numbers to call in emergencies are posted near the telephones.

**Unmanageable Chemical Spills**

Do not attempt to clean up unmanageable spills.

If spill involves a flammable liquid, turn off ignition and heat sources if you can do this safely.

Hold your breath and leave the spill area immediately.

Alert people in the immediate area and post warning signs to inform others of hazard.

Evacuate personnel and close doors leading to affected area. Keep personnel away from affected area until management can evaluate the situation.

Determine what chemical and the quantity of material that have been spilled and consult MSDS for hazardous properties, incompatibilities.

Attend to any persons contaminated by chemicals by removing contaminated clothing, and when feasible, flush the affected body area with water. Affected employees should report to the Emergency Room.

After hour spills should be immediately reported to management. Be prepared to give the chemical name, volume spilled, location and any other pertinent information. Have a person knowledgeable of the incident available to provide information to emergency personnel.

**Mercury**

Mercury is used in measurement and control systems such as thermometers.

Equipment containing mercury or use small quantities of mercury in their laboratories. While small spills in well-ventilated areas do not pose a serious health hazards, they should be promptly cleaned up. Major spills, however, must be reported to management, who will contact trained professionals to handle and clean up such mercury spills.

**Mercury Spills**

The first response to a spill involving elemental mercury is to isolate the area. Clean up procedures should begin promptly.

In the case of a small spill (broken thermometer):

Contain the mercury with an absorbent sponge or powder from your mercury spill kit*.

Do not use sulfur to clean up mercury spills.

Package the spill waste or breakage in a plastic/glass container or sealable plastic bag.

Complete and affix a Hazardous Waste label to the container.

Store the container or bag in a chemical fume hood.

* Labs that use mercury must have mercury spill kit. These can include mercury absorbent sponges and powders, vapor absorbent powders, small pumps and shovels, and bags or jars to contain any spills.

These kits can be ordered from most laboratory safety supply catalog:

Fisher Scientific: 1-800-766-7000 or online at www.fisherscientific.com

In case of a large mercury spill (larger than a broken thermometer)

Confine (isolate) the area of the spill and do not allow access to the area.

Contact management immediately.

**After Hours Chemical Spills.**

If an unmanageable spill occurs after normal business hours (after 3:00 p.m.), leave the area at once. Close all doors leading to the laboratory or spill area after all affected employees exit the room. Post warning signs on the door advising of the impending danger. Do not attempt to clean up spill alone.

Immediately inform management of:

Your Name

Location of the incident

Nature of the incident (name and quantity of chemical spilled, color, odor if any)

Number, if any, of injured employees.

**Accident Reporting**

All incidents must be reported to management. A short summary of the incident should be give to determine the root cause of the accident (or near miss) and in determining the appropriate measures to prevent reoccurrence. The summary must include the date and time of incident, location, identification of any injured personnel, a brief narrative of the incident, and any corrective actions taken.

## 10. Personal Contamination Response Guidelines

Spills of hazardous chemicals that involve personal contamination increase the possibility of the exposure, especially if the chemical may be absorbed through the skin. The following procedures are recommended in the event of a personal chemical contamination.

1. **Chemical spill on the body**

Do not attempt to wipe or brush hazardous chemicals from clothes, shoes and jewelry.

Authority supplied uniforms offer protection against personal contamination and must be worn when working.

Flush exposed area with water from the faucet or deluge hose for at least 10 minutes.

Remove contaminated clothing at once. Try to prevent contamination of the eyes by

cutting away pullover garments instead of pulling them over the head.

If there are no visible burns, wash with warm water and soap. Remove any jewelry to ensure proper removal of residual material. Ensure areas between fingers are flushed properly.

Make sure chemical and contaminated water has not accumulated in shoes.

Obtain Material Safety Data Sheet (MSDS).

Obtain medical attention as necessary.

Report the incident to your supervisor

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2. **Chemical splash in the eye**

Immediately flush the eyes with water for at least 10 minutes. (Eyewash stations are prominently marked and plumbed devices are mounted on at least one sink in each laboratory. (Laboratory personnel should be familiar with their location).

Hold the eyelids away from the eyeball. Move the eye up and down and sideways to wash the

thoroughly behind the eyelids. Obtain copy of the MSDS.

Seek medical attention promptly.

3. **Accidental inhalation of hazardous chemicals**

Immediately notify management.

Try to determine the material inhaled and obtain a copy of the MSDS.

If the employee is conscious and there is no threat to health, move the employee to fresh air.

If an employee is found unconscious in an area of the laboratory where chemical vapors are likely to be trapped, do not enter the space. Immediately call 911 for assistance.

Monitor the employee from a safe distance.

Seek medical attention as soon as possible.

4. **Accidental ingestion of hazardous chemicals**

Take the employee to the Emergency Room.

Do not give the employee water, milk or any other liquid.

Try to identify the chemical in question and obtain a copy of the MSDS.

Pay special attention to the Health Hazard section to find out about the symptoms of exposure.

**5. Minor Cuts and Puncture Wounds**

Wash injured area with soap and water for several minutes.

Report injury to supervisor.

Seek medical attention as necessary.

**6. Work-related Illness, Injury and Incident Reporting**

Employees suffering from a work-related illness or injury must report this to their supervisor, and seek medical attention.

## 11. Fire Safety and Emergency Response to Fires and Explosions

Research laboratories differ from other work environments in that they usually contain a variety of fire hazards. In addition to the 'ordinary' (Class A) fires, those fueled by wood, paper and textiles; hazards include the presence of flammable and volatile solvents such as petroleum distillates which are not miscible with water; reactive metals such as sodium and potassium;

flammable metal powders such as magnesium, titanium, and zirconium; metal hydrides such as lithium hydride, lithium aluminum hydride and sodium borohydride; as well as many kinds of

electrical equipment.

Complications arise when fighting these fires because each type of fire must be fought with the extinguishing agent and procedure appropriate for it; the use of the wrong technique or extinguisher can be catastrophic. FTMSA has simplified fire-fighting in the laboratories by recommending laboratories be equipped with multi-purpose (ABC) dry chemical fire extinguishers, which can be used on all types of fires with the exception of reactive flammable metals (which must use extinguishers suitable for the particular metal).

Fire extinguishers are inspected monthly and tested annually by an outside vendor. If a fire extinguisher in any laboratory, chemical storeroom, or nearby location requires inspection or recharging, notify management. A monthly inspection of the fire extinguisher pressure gage by laboratory personnel is strongly recommended as a further safeguard to ensure the extinguisher is properly charged.

Before attempting to extinguish, the fire must first be judged as being controllable by laboratory personnel. This depends on the judgment of the person making the decision and the factors involved: the size, intensity of the fire, the nature of the burning material, proximity of other flammable or explosive materials, availability of escape routes, availability of proper fire-fighting equipment, and the safety of personnel in the area.

1. **Classification of Fires**

Should the nature and size of the fire make it controllable, use the appropriate available extinguisher and proceed with the methods described under “controllable fires”.

Should the fire be judged “uncontrollable”, follow the evacuation and notification procedures.

**CLASS A.** (Wood, paper, textiles, rubber, coal). The ABC extinguisher can extinguish this type of fire.

**CLASS B.** (Flammable or combustible liquids, greases, petroleum products, solvents)

Carbon dioxide or dry chemical ABC extinguishers should be used. Carbon dioxide extinguishers do not leave any residue, whereas dry chemical devices do. Pressurized water units should not be used since the immiscibility of solvents and water may result in spreading of the fire.

**CLASS C.** (Live electrical equipment involved in a fire). If possible, turn off the electrical power to the devices, and then use either the dry chemical extinguisher or a carbon dioxide or halon extinguisher, if available.

**CLASS D.** (Sodium, potassium, magnesium, titanium, zirconium and other metals)

If sodium, potassium, magnesium, or any of the flammable metal powders are to be used in a laboratory, call MVFD for guidance on the appropriate dry powder-extinguishing agent. A specific "Class D" **(**dry powder) extinguishing agent such as graphite, limestone, sand or sodium carbonate must be made available for fire emergency before work is started.

DO NOT USE pressurized water, carbon dioxide, dry chemical or halon (Freon) extinguishers on metal fires. The use of these extinguishers may introduce substances that are very reactive with the burning metal that may either make the fire grow or trigger an explosion.

2. **RACE and PASS**

**R** - RESCUE anyone in immediate danger

**A** - Activate the ALARM

**C** - CONTAIN the fire (close the door)

**E** - EXTINGUISH small controllable fires

**P** - PULL the pin

**A** - Aim the nozzle at the base of the fire

**S** - SQUEEZE the levers together

**S** – SWEEP from side to side

3. **Fire-fighting Procedures for Controllable Fires**

Clothing fires must be extinguished immediately in order to minimize skin burns.

For all fires, the fire alarm must be transmitted to ensure (Murrysville Fire Department) response.

The decision of whether to fight the fire or wait for fire-fighting help must be made according to the type and size of the fire, its location and the circumstances of the fire. A small fire in a container may be easily snuffed out by the placement of a nonflammable cover across the container opening. A small fire in an area free of other fuels can be extinguished with appropriate available extinguishers. When extinguishing a burning solid, direct the extinguisher discharge at the base of the flame; in the case of burning liquids, direct it at the leading edge. Larger or rapidly growing fires are best left to the Fire Department.

After evacuating, immediately notify the Murrysville Fire Department.

4. **Evacuation Procedures for Uncontrollable Fires**

Leave the area of danger. Transmit fire alarm. DO NOT stay to fight a large fire. On your way out, if it can be done safely, turn off equipment and move any explosive or flammable materials away from possible contact with hot surfaces or other sources of ignition. Using the laboratory circuit breaker is often the quickest and most effective way to turn off all the laboratory's electrical equipment simultaneously. Your safe exit, however, must be given the highest priority.

Leave by means of one of the predetermined evacuation routes for your laboratory area.

If considerations of safety make it necessary to leave the building, evacuate promptly.

If a person's clothing is on fire, they must not be allowed to run, as this will fan the flames and cause a more serious burn. Either wrap him/her in a fire blanket, coat, or whatever is available to smother the flames or put the person under a shower. Roll the person on the floor if necessary. After calling the emergency numbers, place clean, wet, ice-packed cloths on small burned areas, wrap the person warmly to avoid shock, and secure medical assistance.

5. **If an Explosion causes a Fire**, immediately:

Alert and evacuate all personnel in the immediate area.

Close all doors leading to the affected area and secure area until personnel arrive to evaluate the situation. Do not attempt to re-enter the space.

Be prepared to give the chemical name, location (building and room), and any other pertinent information.

Attend to any persons contaminated by chemicals by removing contaminated clothing, and when feasible, flush the affected body area with water.

Have a person knowledgeable of the incident and laboratory available to provide information to emergency personnel.

# Remember STOP, DROP & ROLL

## 12. Record Keeping

***Personal Exposure Monitoring***

Management shall also keep any results of routine and special personal and/or area monitoring, evaluations of worker exposures to chemicals as a result of accidents, spills, fires, explosions, etc.

***Chemical Inventories***

A list of chemicals present in the laboratory must be prepared, updated, and maintained in the laboratory. The list should include, for each container, the chemical name(s) of its contents, the CAS (Chemical Abstracts Service) Number, quantity, and container type. The inventory must be made available, at any time, to lab personnel and workplace visitors.

***Container Labeling***

All containers in laboratories are required to be properly labeled with a chemical name and CAS number on the label for purposes of identification of the chemical.

Any accumulated chemical waste must be properly labeled with the words “Hazardous Waste,” the proper chemical name(s) of the substance(s), and the quantity in the container.

***Material Safety Data Sheets***

The FTMSA laboratory shall maintain and update MSDS for each chemical present in the laboratory. MSDSs must be made available to any worker or workplace visitor within 1 week of a written request. MSDSs are available through the manufacturer.