

Standard Operating Procedure

Flammable and Combustible Liquids

Section 1 – Lab-Specific Information

Department:	College of Engineering – Discovery Learning Labs
Date SOP was written:	10/29/2018
Date SOP was approved by PI/lab supervisor:	Click here to enter a date.
Principal Investigator:	Thomas Silman
Internal Lab Safety Coordinator/Lab Manager:	Thomas Silman
Lab Phone:	414-288-4602
Office Phone:	414-288-5423
Emergency Contact:	Thomas Silman 414-350-5432
Location(s) covered by this SOP:	<i>Engineering Hall – Discovery Learning Labs Complex</i>

Section 2 – Type of SOP:

Process Hazardous Chemical Hazardous Class

Section 3 – Physical / Chemical Properties and Uses

Physical / Chemical Properties:

CAS#: N/A

GHS Classification: Flammable or Combustible Liquid (depending on the type of flammable liquid, other hazards such as toxicity often apply as well)

Molecular Formula: N/A

Form (physical state): Liquid

Color: N/A

Boiling Point: N/A

Flash Point: N/A

Lower Explosive Limit: N/A

Upper Explosive Limit: N/A

Relative Vapor Density: N/A

Uses:

Many laboratory applications require the use of flammable and/or combustible liquids. Uses include applications such as cleaning, preparing solutions, organic synthesis, spectrometry techniques, and many more. Examples of commonly used flammable and combustible liquids in the laboratory include: Acetone, Hexane, Tetrahydrofuran, Diethyl ether, and Kerosene. The safe use of flammable and combustible liquids is fundamental to any laboratory management system.

Important Definitions:

- **Flammable Liquid:** Liquids having a flash point below 38°C (100°F).
- **Combustible Liquid:** Liquids having a flash point at or above 38°C (100°F) and no greater than 93°C (200°F).
- **Flash Point:** The minimum temperature at which vapors are formed on the surface of a substance in sufficient quantity to ignite when exposed to an ignition source.
- **Fire Point:** The minimum temperature at which self-sustained combustion of a substance will occur upon or after exposure to an ignition source.
- **Boiling Point:** The temperature at which the vapor pressure of a liquid equals the atmospheric pressure and the liquid changes into a vapor.
- **Auto Ignition Temperature:** The minimum temperature at which self-sustained combustion will occur in the absence of an ignition source.
- **Lower Explosive Limit (LEL):** The lowest concentration (percentage) of a gas or a vapor in air capable of producing a flash of fire in presence of an ignition source (arc, flame, heat).
- **Upper Explosive Limit (UEL):** Highest concentration (percentage) of a gas or a vapor in air capable of producing a flash of fire in presence of an ignition source (arc, flame, heat).

Section 4 – Potential Hazards

Flammable or combustible liquid. Keep away from heat/sparks/open flames/hot surfaces. Flammable and combustible liquids often have other hazards associated with them such as toxicity and the ability to form explosive organic peroxides. Make sure that all of the potential hazards are understood before handling any chemical.



Section 5 – Personal Protective Equipment (PPE)

Respirator Protection:

If flammable and/or combustible liquids are being used outside of a chemical fume hood, respiratory protection may be required. If this activity is absolutely necessary, contact EH&S so a respiratory protection analysis can be performed. Respirators should be used under any of the following circumstances:

- As a last line of defense (i.e., after engineering and administrative controls have been exhausted).
- When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
- Regulations require the use of a respirator.
- An employer requires the use of a respirator.
- There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL)
- As PPE in the event of a chemical spill clean-up process
- Lab personnel intending to use/wear a respirator mask must be trained and fit-tested. This is a regulatory requirement. Contact EH&S 8-8411 regarding respirator clearance.

Hand Protection:

Gloves must be worn. Use proper glove removal technique to avoid any skin contact. Nitrile gloves are recommended for low volume applications. Wearing two pairs of nitrile gloves is recommended. If handling a high volume (> 4 liters) of flammable or combustible liquid, then disposable gloves are likely not suitable; a more heavy duty glove such as a butyl rubber is required. Check the resources below for the most suitable glove.

NOTE: Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with the specific flammable or combustible liquids being used.

Refer to glove selection chart from the links below:

http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf

OR

<http://www.showabestglove.com/site/default.aspx>

OR

<http://www.mapaglove.com/>

Eye Protection:

ANSI approved properly fitting safety glasses or chemical splash goggles are required. A face shield may also be appropriate depending on the specific application.

Skin and Body Protection:

Laboratory coats must be worn and be appropriately sized for the individual and buttoned to their full length (flame resistant lab coats must be worn when handling volumes greater than 1 liter). Laboratory coat sleeves must be of sufficient length to prevent skin exposure while wearing gloves. Personnel must also wear full length pants, or equivalent, and close-toed shoes. Full length pants and close-toed shoes must be worn at all times by all individuals that are occupying the laboratory area. The area of skin between the shoe and ankle must not be exposed.

Hygiene Measures:

Wash thoroughly and immediately after handling. Remove any contaminated clothing and wash before reuse.

Section 6 – Engineering Controls

Use of flammable and combustible liquids should be conducted in a properly functioning chemical fume hood whenever possible. The chemical fume hood must be approved and certified by EH&S and have a face velocity between 85 – 125 feet per minute.

Section 7 – First Aid Procedures

If inhaled:

Move into the fresh air immediately. Consult a physician. If not breathing give artificial respiration and seek immediate medical attention.

In case of skin contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash any contaminated clothing before reuse. Thoroughly clean shoes before reuse. Consult a physician.

In case of eye contact:

Check for and remove any contact lenses. Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Seek immediate medical attention.

If swallowed:

Do NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person. Seek immediate medical attention.

Section 8 – Special Handling and Storage Requirements

- A designated storage area must be established for flammable and combustible liquids such as a flammable storage cabinet (as shown to the right).
- No more than 37 liters (10 gallons) of flammable liquid is permitted to be stored outside of a flammable storage cabinet/area.
- Do not over purchase; only purchase what can be safely stored in the laboratory.
- Avoid contact with skin, eyes, and inhalation.
- Keep away from sources of ignition.
- Keep containers tightly closed. Store in a cool, dry, and well-ventilated area away from incompatible substances such as oxidizers. More handling details are described below in Section 13.
- Follow laboratory supervisor’s instructions for PPE, which may differ depending on the type and/or quantity of flammable/combustible liquid being used.
- Use in the smallest practical quantities for the experiment being performed.
- Work must be conducted in a chemical fume hood if air concentrations above 10% of the LEL could be created, if the chemical is irritating to the eyes or respiratory system, and/or is toxic by inhalation.
- Containers should remain closed when not in use. This is key to preventing accumulation of flammable vapor concentrations and/or accidental ignition.
- Containers should be labeled appropriately. Label should indicate the name of the chemical(s) in the container. Avoid using chemical abbreviations (acceptable if a legend is present in the lab) and formulae.
- Containers should be in good condition and compatible with the material; store in safety cans (spring closing lid, as illustrated to the right) if possible.
- When not in use, store in flammable storage cabinets if possible.
- Avoid using ignition sources (flame burners or any open flame source, hot plates, electrical equipment with frayed or cracked wiring, etc.) and/or creating static electricity in areas where flammable/combustible chemicals are being used.
- Ground and bond containers when transferring more than 4 liters of flammable/combustible liquids.
- Transport all flammable/combustible liquids in secondary containment, such as polyethylene or other non-reactive acid/solvent bottle carrier.
- Flammable/combustible liquids must be segregated from incompatible materials such as oxidizers (e.g., Hydrogen peroxide, Nitric acid). Incompatibilities will be noted in Section 10 of the SDS, “Stability and Reactivity”.
- If flammable liquids will be stored in refrigerators or freezers, these will be specially modified or purpose-made “flammable-safe” refrigerators and freezers which have no internal sources of ignition posed by an internal light or thermostat circuit.

Section 9 – Spill and Accident Procedures

Chemical Spill Dial 8-1911

Immediately evacuate area and ensure others are aware of the spill. If there is an imminent threat of a fire, pull the nearest fire alarm station to evacuate the building and **dial 8-1911**. If the spill is minor and does not pose a threat to personnel, contact EH&S at 8-8411 during normal business hours (7:30 AM – 4:30 PM) for spill cleanup assistance (dial 8-1911 if spill occurs after hours and assistance is needed).

Chemical Spill on Body or Clothes:

Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention; **dial 8-1911**.

Chemical Splash into Eyes:

Immediately rinse eyes and inner surface of eyelid with water from the emergency eyewash station for 15 minutes by forcibly holding the eye open. Seek medical attention; **dial 8-1911**.

Section 10 – Medical Emergency

Life Threatening Emergency, After Hours, Weekends And Holidays:

Dial 8-1911

Non-Life Threatening Emergency:

Immediately report injury to supervisor and complete the First Report of Injury.

http://www.marquette.edu/riskunit/riskmanagement/documents/Employee_First_Report_of_Incident.pdf

Section 11 – Waste Disposal Procedures

Label Waste:

Make sure the waste container(s) is properly labeled; label should indicate all of the contents of the container. EH&S provides hazardous waste labels free of charge, contact dennis.daye@marquette.edu to obtain labels.

Store Waste:

Store hazardous waste in closed containers, and in a designated area (flammable cabinet is recommended).

Dispose of Waste:

Complete a Chemical Waste Pickup Request Form to arrange for disposal by EH&S. Contact dennis.daye@marquette.edu or visit the EH&S webpage for questions.

http://www.marquette.edu/riskunit/environmental/documents/waste_disposal_form.pdf

Section 12 – Safety Data Sheet (SDS)

A current copy of the SDS for the specific flammable/combustible liquids being used must be made available to all personnel working in the laboratory at all times. To obtain a copy of the SDS, refer to Marquette's MSDS library http://www.marquette.edu/riskunit/environmental/documents/msds_library.pdf or contact the chemical manufacturer. Many manufacturers' SDSs can be found online on websites such as Sigma-Aldrich (<http://www.sigmaaldrich.com/united-states.html>) or Siri MSDS Index (<http://hazard.com/msds/>).

Section 13 – Protocol/Procedure (Additional lab protocol may be added here)

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NOTE: Any deviation from this SOP requires approval from PI.

Section 14 – Documentation of Training (signature of all users is required)

- Prior to conducting any work with flammable/combustible liquids, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
- The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and a copy of the SDS provided by the manufacturer.
- The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last one year.

I have read and understand the content of this SOP:

Name	Signature	Date
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