



1. Purpose

This Standard Operating Procedure (SOP) establishes procedures for the safe handling, transportation, and storage of Ethyl Ether, which is also known as Diethyl Ether, and Ether (CAS# 60-29-7).

2. Scope

This SOP addresses only the use of Ethyl Ether and its solutions in the laboratory. It applies to all Kennesaw State University (KSU) employees, students, and contractors. It assumes that all of the KSU minimum safety requirements, as detailed in the KSU Chemical Hygiene and Safety Plan (EOSMS-201) have been implemented.

3. Personnel Qualifications and Responsibilities

- All faculty, staff, and students engaged in the use or handling of Ethyl Ether, or working within a laboratory using Ethyl Ether, are responsible for understanding all hazards associated with its use, using appropriate personal protective equipment (PPE), and following all handling and storage requirements for diethyl ether.
- The Principal Investigator (PI)/Laboratory Supervisor/ Laboratory Coordinator/ Manager is responsible for ensuring that his/her staff have been trained in the use, storage, access control, and handling of Ethyl Ether, and all associated emergency procedures. Records of this training must be retained by the department, and a copy must be forwarded to the Environmental Health and Safety Department (EHS).
- Ethyl Ether use is restricted to the specific employees or students who have had prior training in proper use, handling and storage, and emergency procedures.

4. EHS Responsibilities

- Provide guidance in assessing hazards, establishing engineering and administrative controls, good work practices, and selection of personal protective equipment (PPE).
- Perform and document exposure monitoring to determine employee exposures to hazardous materials and to evaluate the adequacy of controls.

5. Health and Safety Hazards of Ethyl Ether

- Ethyl Ether ($C_4H_{10}O$) is a colorless liquid with a pungent, "sweetish" odor. Ether is highly volatile and extremely flammable (both its liquid and vapor).
- It is commonly used as a solvent in laboratories (e.g., organic chemistry labs).
- Ethyl Ether has a Permissible Exposure Limit (PEL) which cannot be exceeded. No employee shall be exposed to more than 400 parts per million (ppm) of Ethyl Ether as an 8-hour time weighted average

(TWA). There is also a short term exposure limit (STEL) of 500 ppm, meaning that no employee shall be exposed to more than 500 ppm in any 15 minute sampling period.

- Ethyl Ether can cause irritation of the eyes, and dryness of skin through repeated exposures.
- Since this is a highly volatile chemical, inhalation exposure is a major concern. Exposure at high concentrations can cause sedation, unconsciousness, and respiratory paralysis. Chronic exposure can cause loss of appetite, exhaustion, drowsiness, dizziness, and other central nervous system effects (National Research Council, 2014).
- Ethyl Ether, when exposed to air and light over time, can form explosive peroxides which can detonate when subjected to shock or friction.

6. Requirement for Working with Ethyl Ether

Ethyl Ether is considered a Particularly Hazardous Substance (PHS) due to its flammability, volatility, and its potential to form explosive peroxides over time. For more information, consult the Safety Data Sheet (SDS) as well as other sources of information such as the [National Academic Press' Safety Summary on Diethyl Ether](#).

6.1. Hazard and Risk Assessments

- The Principal Investigator (PI)/Laboratory Supervisor/ Laboratory Coordinator/ Manager must be aware of and approve the work performed under their jurisdiction, and shall ensure that an appropriate hazard assessment for the use of Ethyl Ether has been conducted. EHS may be consulted to provide assistance in performing hazard assessments.
- Each new operation using Ethyl Ether must be evaluated individually; assessment of the level of risk depends on how the substance will be used.
- The assessment should ensure appropriate protective measures have been put into place and that the proper level of work authorization has been obtained, before commencing the operation.

6.2. Hazard Prevention and Control

The hazards of Ethyl Ether can be mitigated by a variety of means including chemical substitution, engineering controls, administrative controls, personal protective equipment, and work practices. General control measures are discussed in this section. Principal Investigator (PI)/Laboratory Supervisor/ Laboratory Coordinator/ Manager must develop control measures specific to the particular operation after conducting the appropriate hazards assessment and develop a separate Standard Operating Procedure (SOP) specific to the operation/project.

6.2.1. Chemical substitution

- Before Ethyl Ether is selected for use in a particular operation/process, a safer alternative chemical should be determined that can be used in lieu of Ethyl Ether.

6.2.2. Engineering Controls:

- Because of its high volatility and the possibility of aerosol formation, Ethyl Ether (and Ethyl Ether solutions) must be handled in a chemical fume hood with negative pressure ductwork.

- Ensure the fume hood has been inspected by a qualified vendor in the last 12 months and must function within the acceptable flow rate range. Work should be performed with the sash lowered as much as possible.

6.2.3. Personal Protective Equipment (PPE):

- Gloves, lab coat, and splash goggles must be worn when working with Ethyl Ether. Wearing nitrile gloves will provide adequate protection for use of this chemical.
- Change gloves regularly (at least every two hours), or when they obtain a breach. Wash your hands when changing.
- If splashes may occur, wear a face shield with splash goggles. Safety glasses do not provide adequate protection from splashes.

6.2.4. Work Practice Controls

- Use a less dangerous product than Ethyl Ether if possible or purchase in dilute solutions.
- When possible, purchase ether with peroxide forming inhibitors.
- Prior to working with ethyl ether, always perform a visual inspection before opening the bottle. Fresh diethyl ether should be clear and colorless. Cloudiness, yellowing, or the presence of a viscous oily layer suggests degradation and potential peroxide formation. Do not attempt to open a visibly dented, rusty, bulging, or otherwise compromised container of ether. If you observe a compromised container of ethyl ether, contact EHS immediately.
- Periodically test ether containers for peroxides with peroxide test strips.
- It is recommended that containers of ether not be kept longer than one year or past the expiration date listed by the manufacturer on the bottle. Ensure that containers are dated upon receipt and at the time they are opened. If tested, note the date it was tested.
- Keep away from ignition sources such as open flames, hot surfaces, steam baths, heat guns, and sparking devices.
- Ensure proper grounding and avoid creating static electricity. Ensure to ground metal containers when transferring flammable liquids.
- Keep all containers of Ethyl Ether closed as much as possible. This is a highly volatile chemical, and open containers will result in inadvertent release of flammable vapors.
- Since this chemical is highly flammable, be aware of the location of the nearest fire extinguisher.
- Once work is complete, wipe down the work area with a soap and water solution.
- Always transfer the chemical from one container to another inside of the fume hood.
- When transferring the chemical from one container to another, only pour the amount that is needed.
- Do not wear contact lenses when working with ethyl ether.

6.2.5. Handling and Storage

- Ethyl Ether is incompatible with strong oxidizers, strong acids, and halogens. To avoid violent reactions store it away from these chemicals.
- Ensure that containers are stored in an appropriate flammable cabinet.
- Ensure that ethyl ether containers are stored away from light.

- To prevent exposure and unauthorized use of this chemical, it must be stored in a location with appropriate access control sufficient to ensure that only individuals trained and authorized to use it have access.
- Containers, including aliquots of the material, must be returned back to the access controlled location whenever they are no longer in active use.
- Laboratories with ethyl ether in their inventory should implement a system to carefully track ethyl ether usage and continuously monitor the inventory to ensure that all access and usage is only by authorized users for authorized purposes.

6.3. Emergency Procedures

- In the event of an emergency involving Ethyl Ether, contact the KSU Police Department by dialing extension 6666 or (470)-578-6666.
- Be prepared to communicate what the emergency is, how many people are involved and what is the extent of their injuries or illnesses. Remove exposed personnel to fresh air. Evacuate adjoining spaces as necessary. Notify the lab manager, lab coordinator, and/or the PI of the lab.

Emergency Contact

ex. 6666

6.3.1. Accidental Exposure to Ethyl Ether

- If Ethyl Ether vapor has been inhaled, move the victim to fresh air immediately.
- If ether has been spilled on the skin or clothing, wash the affected area with large amounts of soap and water, using a safety shower or eyewash, as appropriate, for a minimum of 15 minutes. During washing, remove contaminated clothing and footwear. Remove goggles last. Those assisting the victim should wear appropriate PPE including protective gloves. A disposable laboratory coat, scrubs, or jumpsuit should be available for the exposed individual to wear after using a safety shower.
- If exposure to the eyes has occurred, immediately flush affected eye(s) for at least 15 minutes without stopping. Hold upper and lower eyelids open and away from the eyes during irrigation. Do not allow victim to rub eyes or keep eyes closed. Remove contact lenses if possible (Note: contact lenses should not be worn when working with this material). If necessary, continue flushing with personal eyewash or apply ice water compresses during transport to a medical facility or eye specialist. **Seek medical attention immediately.**
- If Ethyl Ether is ingested, do not induce vomiting, but flush mouth immediately. Never give anything by mouth to an unconscious person. **Seek medical attention immediately.**
- Ethyl Ether exposure requires immediate first aid and medical treatment. Prompt first aid is essential, even if the victim does not exhibit any signs or symptoms or feel any pain. After seeking medical attention, contact EHS department to report the accident or incident.

6.3.2. Spill Clean-up

- Spill clean-up must be performed by properly trained individuals. Do not attempt to clean up a spill of pure Ethyl Ether or a solution of greater than 5% unless you have been trained.

- Wipe up solutions with chemical absorbent pads. Once the spill has been completely absorbed, wipe the area down at least twice using a soap and water solution.
- Waste generated from a spill must be handled as hazardous waste.

6.4. Waste Management

- Ethyl Ether is considered hazardous waste. If it is disposed of as a pure chemical, it carries a waste code of U117. As a spent solvent, it carries a waste code of F003. As a small quantity generator, KSU is allowed to generate up to 1000 kg of this type of waste per month. Any amount over that will change the generator status to a large quantity generator with all the regulations thereof.

6.5. Training Requirements

- All faculty/staff/students who work with Ethyl Ether are required to complete the OwlTrain online training course “Laboratory Safety” and the course “Globally Harmonized System of Classification and Labeling of Chemicals (GHS)”.
- They are also required to read and fully comply with this SOP for Ethyl Ether. Use EOSMS-Form 0001 Training Attendance Sign-in Form or the form in Appendix A below to record training for this SOP.

Appendix A: SOP Review Record Form

To be completed by the employee/student

Ethyl Ether is considered a Particularly Hazardous Substance (PHS) due to its flammability, volatility, and potential to form explosive peroxides. To manage risks associated with use of Ethyl Ether and to ensure the safety of KSU employees and students, the University has established a Standard Operating Procedure (SOP) for the safe handling of Ethyl Ether.

The procedure requires that all faculty/staff/students who work with Ethyl Ether complete the appropriate safety training and read and comply with the SOP for Ethyl Ether. This form, therefore, should be completed and signed by each KSU employee or student who works, or plans to work with Ethyl Ether, as documentation that he/she has read and understood the requirements of the SOP.

Name		<input type="checkbox"/> Faculty <input type="checkbox"/> Staff <input type="checkbox"/> Student	
Job Title		Department	
Supervisor's Name			
<i>By signing this form I certify that I have read, understood and will comply with the requirements of this SOP for safe handling of Ethyl Ether.</i>			
Signature		Date	
<i>Note:</i>			