SOP 1. Standard Operating Procedure for Flammable Liquids

I. General Statement of Coverage

Flammable liquids are chemicals that have a flash point below 100°F (38.7° C) and a vapor pressure that does not exceed 25 psig at 100°F (more than 25 psig is considered a compressed gas). Combustible liquids have a flash point above 100°F.

II. Hazard Assessment

A Job Hazard Assessment should be performed for work involving flammable liquids and should address the issues of proper use and handling, fire safety, toxicity, storage, disposal, spill response, and required PPE. See Section 21 and Form 4 of Section 25 of the Chemical Hygiene Plan.

III. Resources

A. Available Training
   - Chemistry 685
   - EHS/Chemistry Lab Safety Course

B. Text and Literature References
   - Department of Chemistry Safety Handbook

C. CHP Appendix III (Section 23.3) Chemical Information Tables
   - Table 2. Ohio Fire Code
   - Table 3. Solvent Flammability Properties
   - Table 8. Peroxide Forming Chemicals

IV. Chemical Storage

A. Special Storage

1. The storage of flammable and combustible liquids in a laboratory, shop or building area must be kept to the minimum needed for research and/or operations. Not more than 10 gallons of flammable liquids can be stored outside of an approved storage cabinet. Flammable-liquids storage cabinets are not designed for the storage of acids, bases, or compressed gases. Approved storage cabinets are NOT required to be vented. Ventilation is recommended for the storage of large quantities of Class 1A flammable liquids (such as Diethyl Ether or Pentane) or malodorous compounds such as mercaptans.
2. Some flammable liquids, such as low molecular weight ethers and vinyl compounds, THF, and Dioxane, slowly form peroxides upon exposure to air and sunlight. This may necessitate periodic testing for peroxides. Refer to the Department Safety Handbook under "Chemical Storage" for details.
3. Store flammable materials away from oxidizers and other incompatible materials.

B. Gas Cylinders

Gas cylinders must be secured while in use or in storage (empty or full). They should be stored with the valve cap secured. Refer to SOP #6-Compressed Gases.

V. Personal Protective and Emergency Equipment

A. Eye and Face Protection

Refer to the Eye Protection Policy, Appendix IIB (Section 23.2). At a minimum, safety glasses with permanently attached top and side shields must be worn in the laboratory. These glasses, however, do NOT protect against splash hazards. When performing a hazardous activity, a face shield must be worn in addition to the safety glasses OR switch to chemical splash goggles (with shielded ventilation ports). Face shields are available from the Safety Office (free of charge).

B. **Gloves**

Appropriate gloves should be worn when handling flammable liquids. The selection of glove materials should be made from Appendix II, Part A (Section 23.2). If this chart is insufficient, please see the Safety Coordinator/CHO.

C. **Protective Clothing**

Lab coats, closed toed shoes and long sleeved clothing should be worn when handling flammable liquids. Additional protective clothing, such as aprons or full-length arm protection, should be worn if the possibility of skin contact is likely.

D. **Hearing Protection**

The use of hearing protection requires monitoring and training. See the Safety Coordinator/CHO for details.

E. **Respirators**

The use of respirators requires medical certification, fit testing, and training. See the Safety Coordinator/CHO for details.

F. **Eye Wash**

Where the eyes or body of any person may be exposed to flammable liquids suitable facilities for quick drenching or flushing of the eyes and body shall be provided within, or near, the work area for immediate emergency use. Bottle type eyewash stations are not acceptable.

G. **Safety Showers**

A safety shower should be available and functioning as specified by ANSI Z358.1.

H. **Fire Extinguishers**

All laboratories must contain at least one Carbon Dioxide (Type B-C) or Dry Chemical (Type A-B-C) fire extinguisher. Additional fire extinguishers are located near exits and/or stairwells in each building. Special Class D fire extinguishers (for certain metal fires) are available from the Safety Office.

VI. **Controls**

A. **Designated Areas**

Some flammable liquids such as Benzene, Methyl Mercaptan, and Carbon Disulfide, require Designated Areas. See Section 18 of this document.

B. **Chemical Fume Hoods**

When possible, experiments involving greater than 500 ml of flammable liquids should be carried out in a fume hood.

C. **Glove Boxes**

Refer to SOP 14 on the use of Dry Boxes.

D. **Safety Shielding**

Safety shielding is required any time there is a risk of explosion, splash hazard or a highly exothermic or unstable reaction. All manipulations of flammable liquids which pose this risk should occur in a fume hood with the sash in the lowest feasible position.

E. **Special Ventilation**

Fume hoods provide the best protection against exposure to flammable liquids in the laboratory and are the preferred ventilation control device. Always attempt to handle large quantities of flammable liquids in a fume hood. If your research does not permit the handling of large quantities of flammable liquids in your fume hood, contact the Chemical Hygiene Officer or the Division of Environmental Health and Safety to review the adequacy of all special ventilation.

F. **Vacuum Protection**

1. Evacuated glassware can implode and eject flying glass, and splattered chemicals. Vacuum work involving flammable liquids must be conducted in a fume hood, glove box or isolated in an acceptable manner.
2. Mechanical vacuum pumps and the "House Vacuum System" must be protected using cold traps and, where appropriate, filtered to prevent particulate release. See the article in the Department Safety Handbook under "Compressed Gases." The exhaust for the pumps must be vented into an exhaust hood. Vacuum pumps should be rated for use with flammable liquids.

G. **Signs and Labels**

1. Doorways: All OSHA Select Carcinogens, Reproductive Toxins, Highly Toxic materials, and NFPA Level 4 Flammable Liquids (Section 23.3, Tables 10-15) must be indicated on the acrylic door sign.
2. Containers: All flammable liquids must be clearly labeled with the correct chemical name.

H. **Utilities**

In Evans and Celeste Labs, utility shut-off valves are located in pipe chases just outside of the laboratories. In Newman/Wolfrom, the valves are located above the ceiling in the hallways. Look for the ceiling tiles with the green dots.

I. **Fire Protection**

Older buildings, such as Evans and Johnston Labs, do not have sprinkler suppression systems. This could be a consideration for storing or using large quantities of flammable liquids.

VII. Specific Procedures

Refer to the MSDS or other sources of information to become familiar with the properties of the particular substances including: chemical and physical properties, health hazard information, symptoms of over-exposure, etc.

When transferring large quantities of flammable liquids, use bonding and grounding techniques in order to minimize the chance for a static spark. Refer to the Department Safety Handbook under "Flammable Liquids" for details.

VIII. Emergency Procedures

A. **Notification**

Refer to the "Emergency Response" section of the Department Safety Handbook for generic emergency response procedures. Specific emergency procedures should be developed for each group or laboratory. The procedures should address as a minimum the following:

1. Who to contact: (University police at 292-2121 or 292-2525, and Division of Environmental Health and Safety at 292-1284 during normal working hours, and the Principal Investigator of the laboratory including evening phone number).
2. The method used to alert personnel in nearby areas of potential hazards.
3. Special spill control materials required by the type of flammable liquids handled in the laboratory.

B. **Spill Response**

1. Anticipate spills by having the appropriate clean up equipment on hand. The appropriate clean up supplies can be determined by consulting the material safety data sheet and other sources. This should occur prior to the use of any flammable liquids. Spill supplies, located in each laboratory, for flammable liquids are designed to control the liquid portion of the spill and minimize the production of

flammable vapors. Never use paper towels on large spills of flammable liquids. Each spill kit comes with a sheet of instructions and information. This sheet is also available on the web page. Maintaining the spill kit is the responsibility of the Laboratory Supervisor. For spills that are too large or if you are unsure of the specific hazards, call the Safety Coordinator/CHO or 911 for assistance. Once cleaned up, refer to the "Waste Disposal" section of the Department Safety Handbook.

2. In the event of a spill all personnel in the area should be alerted. If safe to do so, turn off all sources of ignition.
3. Remain on the scene, but at a safe distance, to receive and direct safety personnel when they arrive.

IX. **Decontamination and Waste Disposal**

A. **Decontamination Procedures**

1. Personnel: Wash hands and arms with soap and water immediately following any skin contact with flammable liquids.
2. Area:
3. Equipment:

B. **Waste Disposal**

Most flammable liquids must be disposed of as hazardous wastes. Questions regarding waste disposal should be directed to the Chemical Hygiene Officer, Hazardous Waste Specialist, or the Division of Environmental Health and Safety. Refer to the "Waste Disposal" section of the Department Safety Handbook

X. Approvals

Some flammable materials require special handling or prior approvals. See Sections 18 and 20 of the CHP.

XI. SOP Prepared by _____ Date _____

Reviewed by _____ Date _____