1.0 PURPOSE
The purpose of this standard is to provide guidelines for the safe handling of flammable materials. Consult the MSDS for specific information about a particular flammable material.

2.0 DEFINITIONS
Flammable means a chemical that falls into one of the following categories:
1. **Aerosol, flammable** means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;
2. **Gas, flammable** means:
   a. A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less; or
   b. A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12 percent by volume, regardless of the lower limit.
3. **Liquid, flammable** means any liquid having a flashpoint below 100 deg F (37.8 deg. C), except any mixture having components with flashpoints of 100 deg. C) or higher, the total of which make up 99 percent or more of the total volume of the mixture.
4. **Solid, flammable** means a solid, other than a blasting agent or explosive as defined in § 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

3.0 POTENTIAL HAZARDS
Vapors evolving from flammable liquids are the most common fire hazard in a laboratory. In sufficient concentration in air, these vapors can enflame rapidly to produce an explosion if concentrations in air fall between the upper and lower explosion limits.
4.0 EXPOSURE HAZARDS

4.1 Contact/Absorption
Solvents in contact with skin may cause defatting and drying of the skin. Absorption may lead to edema, blurred vision, liver damage, and kidney failure.

4.2 Inhalation
Inhalation of vapors may cause bronchial irritation, dizziness, central nervous system depression, nausea, headache or coma. Prolonged exposure to high solvent vapor concentration may result in liver or kidney damage.

4.3 Ingestion
Ingestion may cause abdominal pain, nausea, central nervous system depression, convulsions or vomiting.

5.0 PERSONAL PROTECTIVE EQUIPMENT
Use chemical splash goggles for eye protection in combination with a full-length face shield for operations that present splash hazards. Thick butyl rubber, neoprene, nitrile, or polyethylene gloves may be appropriate. Check glove manufacturer for recommendations on a suitable glove for the specific chemical.

Wear a lab coat (100% cotton) and closed-toe shoes (non-fabric) with non-slip soles.

If a respirator is needed, then user must follow guidelines of the Respiratory Protection Program.

6.0 ENGINEERING AND VENTILATION CONTROLS
All procedures involving flammable materials/solvents must be conducted in a chemical fume hood to protect against hazardous exposure (and the accumulation of flammable vapors).

7.0 SPECIAL HANDLING PROCEDURES
1. CONDUCT PROCEDURES IN A FUME HOOD.
2. Minimize the quantity of flammable substances stored in the work area.
3. Handle flammable substances only in areas free of ignition sources. Ignition sources include open flames, electrical equipment, static electricity, and hot surfaces. Check the work area for flames or ignition sources before using a flammable substance.
4. Keep containers of flammable substances tightly closed when not in use.
5. Assure proper bonding and grounding when transferring or dispensing flammable liquid from a large container, or when pouring from one metal container to another.

8.0 LABELING REQUIREMENTS
Label flammable storage cabinets with the wording: FLAMMABLE – KEEP FIRE AWAY.
Label containers for Class I liquids: DANGER - FLAMMABLE! KEEP AWAY FROM HEAT AND OPEN FLAME.
Label containers for Class II or III liquids: CAUTION - COMBUSTIBLE!

9.0 STORAGE REQUIREMENTS
1. Store flammables/combustibles in an approved storage cabinet or in safety cans.
2. If flammable/combustible must be refrigerated, store in an explosion-proof refrigerator.
3. A maximum of ten (10) gallons of flammable solvents may be stored outside of approved flammable storage cabinet.

10.0 FIRST AID
Consult MSDS of specific chemical for first aid treatment.

10.0.1 Eye/Skin Contact
1. Immediately go to the emergency shower/eye wash facility and remove all contaminated clothing.
2. Flush affected body area with water for at least 15 minutes.
3. Do not use neutralizing chemicals, creams, abrasives, or lotions.
4. If the eyes have been contaminated, forcibly hold them open and flush for least 15 minutes.
5. Resume flushing area with water if pain continues.

10.0.2 Inhalation
1. Move exposed person to fresh air if safe to do so.
2. If victim is breathing, loosen victim's clothing and maintain the airway.
   a. Lay victim flat on their back.
   b. Place one hand under the neck and lift.
   c. With the heel of other hand on victim's forehead, rotate or tilt the head backward into maximum extension.
   d. If additional airway opening is required, it can be achieved by thrusting the lower jaw into a jutting-out position.
3. If the victim is not breathing, contact DPS, and perform CPR (if certified) until medical assistance arrives. Be careful to avoid exposure to chemical poisoning via mouth-to-mouth resuscitation. If available, use a mouth-to-mask resuscitator.

10.0.3 Ingestion
1. Contact DPS and request medical assistance.
2. If possible, determine what material was ingested by victim.
3. If victim begins to vomit, turn head or entire body to one side to avoid choking.
4. Do not induce the victim to vomit or drink any beverage unless instructed to by qualified medical personnel.
5. If victim stops breathing, see Inhalation, step 3.

10.0.4 Injection
Contact DPS and request medical assistance.

11.0 SPILL AND ACCIDENT PROCEDURES
For all spill emergencies contact the Department of Public Safety (DPS).

In the event of a large chemical spill, follow these guidelines:
1. Notify everyone in the immediate area and the supervisor.
2. Evacuate personnel from the spill area.
3. Deny entry.
4. Alert other building occupants. NOTE: Evacuation of the building and its occupants may be necessary depending on the volume of chemical/biological material spilled and its relative hazard.
5. Notify DPS from a safe location and provide the following information:
   a. Your name, telephone number, and location;
   b. Type of incident, location, and time of occurrence;
   c. Name and quantity of material involved, to the extent known;
   d. If victims are involved, relay the victim(s)' name(s) and extent of injuries, if any;
   e. If exposed to a hazardous spill, see 7.9.2 Chemical Exposure

11.1 Chemical Spill Clean-Up
Chemical spill clean-up must not be attempted if the employee does not have the proper training and experience, the necessary spill kit supplies, and personal protective equipment. Contact DPS for large chemical spill clean-up.

11.1.1 Corrosive Liquids
1. Neutralize the spill. Apply neutralizer from a spill clean-up kit to the perimeter of the spill. If a spill clean-up kit is not available, sodium bicarbonate can be used on acid spills and 2% hydrochloric acid or citric acid powder can be used to neutralize caustic spills.
2. Mix thoroughly until fizzing and evolution of gas ceases. NOTE: It may be necessary to add water to the mixture to complete the reaction. Neutralizer has a tendency to absorb acid before fully neutralizing it.
3. Check mixture with pH strips or pH paper. Ensure that the final pH is between 6 and 10.
4. Once the chemical is completely neutralized, cover with an absorbent material (e.g. paper towels, pads, etc.)
5. Collect the absorbent and place it in a Ziploc bag.
6. Label the bag, place it in the fume hood and call EH&S immediately.

11.1.2 Other Hazardous Liquids
1. Prevent the spill from spreading by depositing absorbent material such as Super Fine, sand, or vermiculite (paper towels do not control the vapor release as well as sand) at its outer edges.
2. Cover the entire spill with the absorbent by working from the edge toward the center in a circular motion.
3. Mix the absorbent until it has absorbed all of the flammable liquid.
4. Collect the absorbent and place it in a Ziploc bag.
5. Label the bag, place it in the fume hood, and call EH&S immediately.

11.1.3 Solids
1. Solid material of low toxicity may be swept onto a dust pan and deposited into a Ziploc bag. Any powder clinging to the dust pan may be wiped with a lab tissue and the tissue disposed of in the Ziploc bag. Ensure that fine powder or dust from the spilled material does not become airborne.
2. Label the bag, place it in the fume hood and call EH&S immediately.
3. If the spilled material is highly toxic, contact EH&S or Laboratory Safety.

12.0 WASTE DISPOSAL
Chemical waste is segregated into the following groups:
- Flammable/combustible solvents e.g. acetone, xylene, methanol;
- Halogenated solvents e.g. chloroform, methylene chloride;
- Nitrogenous hydrocarbon e.g. trimethylamine, diisopropylamine;
- Sulfurous hydrocarbon e.g. dimethylsulfoxide, dimethylsulfate;
STANDARD OPERATING PROCEDURE: Flammables

USC Environmental Health and Safety
(213) 740-6448 UPC
(323) 442-2200 HSC

- Corrosives. A separate stream must be started for each of the following:
  o Mineral acids e.g. hydrochloric acid, sulfuric acid
  o Organic acids e.g. trichloroacetic acid, formic acid
  o Bases e.g. calcium oxide, sodium hydroxide
- Aqueous solutions e.g. metal salts, ethidium bromide; and
- Oils e.g. vacuum pump oil, motor oil.

1. Collect the chemical waste in appropriate containers described in the table below. Do not commingle or mix dissimilar waste streams.

<table>
<thead>
<tr>
<th>Waste type</th>
<th>Waste container</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammable liquids</td>
<td>glass bottles, steel cans, safety cans, high density plastic containers</td>
</tr>
<tr>
<td>Concentrated acids &amp; bases</td>
<td>2.5 liter “acid” bottle. Note: one gallon glass bottles are unacceptable for acids and bases; the high specific gravity of the substance and the thinness of one gallon glass containers increases the likelihood of container breakage.</td>
</tr>
<tr>
<td>Trace contaminated solid waste</td>
<td>contaminated paper, gloves, etc. should be double-bagged using polyethylene bags</td>
</tr>
<tr>
<td>Aqueous solutions</td>
<td>glass bottles, plastic bottles, plastic cans</td>
</tr>
<tr>
<td>Broken mercury thermometers</td>
<td>broken thermometers without free-flowing mercury may be packaged in the same manner as trace contaminated solid waste. Broken thermometers with mercury should be contained in a glass or plastic bottle with a tight cap</td>
</tr>
</tbody>
</table>

2. Containers must be sealed airtight with a screw-on lid. Rubber stoppers, corks, and parafilm are not allowed. They must also be in sound condition, leak-proof, and appropriate for the waste type.
3. Do not fill liquid containers to more than 80% capacity. This is to prevent spillage on top of the container.
4. Solid chemical waste can be collected in plastic bags, fiber boxes or plastic containers.

13.0 PROGRAM APPROVAL AND REVIEW

Date prepared: 03/24/2004  By: Alfred M. Bouziane

Date revised: 09/23/2009  By: Alfred M. Bouziane