


Standard Operating Procedure (SOP)		
Working with Corrosives		
<i>Approved by:</i> David A. Brown, Director, EH&S 	<i>Effective Date:</i>	April 24, 2007
	<i>Revised Date:</i>	
	<i>Section:</i>	CHEM

#### PURPOSE

Presents guidelines for the handling and storage of corrosive materials used at WFUHS.

#### SCOPE

The requirements of this document apply to all faculty, staff, students, volunteers and outside contractors working under the auspices of WFUHS.

#### GENERAL

##### Common Corrosives

The following tables list common types of acids and alkalis used at WFUHS.

#### TYPES OF ACIDS

Hydrobromous Acid	Nitrous Acid
Hydrochlorous Acid	Phosphoric Acid
Hydrochloric Acid	Phosphorous Acid
Hydrofluoric Acid	Propionic Acid
Hydroiodic Acid	Sulfuric Acid
Muriatic Acid	Sulfurous Acid

#### TYPES OF STRONG OXIDIZING ACIDS

Chromic Acid	Nitric Acid
Hydrobromic Acid	Perchloric Acid
Iodic Acid	

#### TYPES OF ORGANIC ACIDS

Acetic acid	Phenol
Benzoic acid	Sulfamic Acid
Chloroacetic Acid	Sulfanilic Acid

#### TYPES OF BASES

Ammonium Hydroxide	Bicarbonates, Salts of; potassium bicarbonate, sodium bicarbonate, etc.
Carbonates, Salts of calcium carbonate, sodium carbonate, etc.	Calcium hydroxide
Potassium Hydroxide	

## HAZARDS ASSOCIATED WITH CORROSIVES

- General hazards include:
  - **Skin contact:** Most concentrated acids and bases are corrosive and must immediately be flushed with water. Eyes are especially susceptible to liquids, vapors, dusts, or mists and must be immediately flushed with water if exposure occurs.
  - **Inhalation:** Vapors, mists, and dusts act on the body in two ways: *irritation of the air passages* of the nose, throat, and lungs and *absorption of the substance from the lungs into the blood stream*. The seriousness of injury will depend on the concentration in air and on the duration of exposure.
  - **Ingestion:** Ingestion causes severe burns of the mucous membranes of the mouth, throat, esophagus, and stomach.
- Most acids are liquids, and most bases are solids. Acids, especially when in concentrated form, are most likely to cause immediate pain when they come in contact with the body. Contact with strong bases, on the other hand, usually goes unnoticed since immediate pain does not occur. This allows the base time to react with the body part and a serious injury may result.
- Solid bases, when dissolved in water, can cause serious damage to eyes and skin by their corrosive action. Fine dust from almost any solid base can cause severe damage to the eyes, upper respiratory tract, and lungs. Fine dust can also cause skin irritation, particularly to persons who have become wet or perspire freely.
- All of these materials are corrosive and will destroy body tissue. The seriousness of the injury depends on such factors as the type and concentration of the chemical, the body parts contacted, and the speed used in applying emergency measures.

## PERSONAL PROTECTIVE EQUIPMENT

The following personal protective equipment is required when using **acids**:

- Safety glasses with side shields
- Face shield
- Rubber apron
- Long-sleeved shirt
- Long pants

The following personal protective equipment is required when using **alkalis**:

- Safety glasses with side shields
- Face shield
- Rubber apron
- Long-sleeved shirt
- Long pants

## GENERAL STORAGE REQUIREMENTS

The corrosive properties of these materials and their ability to produce fires or explosions by combination with combustible materials make the following considerations mandatory in the selection of a storage site:

- A relatively cool, dry environment free from extremes of temperature--humidity should be maintained.
- Acids and bases should be stored in a manner that separates them from other materials and from each other. Each acid or base should be stored in a manner consistent with its properties.
- When stored, small containers (approximately 1 gallon or less) should be placed on material that is acid-resistant; this facilitates flushing and other cleanup procedures in the event of leaks or spills.

- Carboys (approximately 5 gallons) should be stored in the same manner as small containers preferably covered, not stacked on one another, and on acid-resistant material.
- All drums (approximately 55 gallons) should be stored on individual racks or securely blocked on skids with the closure (plug) facing upward to prevent leakage. Drums containing acids in liquid form should be vented when received (and at least weekly thereafter) to relieve accumulated internal pressure.

These measures do not in any way eliminate the necessity for good housekeeping and for continual inspection of containers.

## USE AND STORAGE OF ACIDS

### Storage

- Store large bottles of acids on low shelves or in acid storage cabinets.
- Segregate oxidizing acids from organic acids, and flammable and combustible liquids.
- Segregate acids from bases and active metals such as sodium, potassium, magnesium, etc.
- Use bottle carriers for transporting acid bottles.
- Have spill-neutralizing agent available in case of acid spills.

### Handling

- Pouring acids into small containers by hand, except by use of cradle, is prohibited.
- The safest type of cradle should hold the acid container securely and should return to its upright position by gravity with the provision for locking when not in use. A slow steady motion should operate the cradle.
- When pipettes are used to remove small quantities of acids from carboys, drawing of the acid into the pipette shall be by suction bottle and never by mouth.
- When mixing acids and water, always add acid to water. **NEVER add water to acid!**
- Plastic carriers shall be used to move acids from one location to another.

### Use

- The Occupational Hygiene Officer should be consulted concerning the need for local exhaust ventilation, appropriate work practices and personal protective equipment.
- All areas where acids are used shall have local exhaust ventilation.
- When the contents of nitric acid or sulfuric acid containers are accidentally spilled, there is a possibility of serious injury to employees from breathing the acid vapors. The following precautions shall be observed:
  - Send employees out of the area immediately if there is any possibility of them breathing the acid vapors.
  - Call the Medical Center Emergency team (6-9111) and WFUHS Environmental Health & Safety (6-9375).
  - Send any employee who has inhaled acid vapors to the Employee Health immediately and notify the Medical Department that the employees have been exposed to nitric acid vapors.
  - WFUHS Environmental Health & Safety will determine when the area is safe for resuming work.
- [Standard Operating Procedures for Common Inorganic and Organic Acids](#) are provided in the Chemical Safety Section of EH&S website.

## **USE AND STORAGE OF ALKALIS**

### **Storage**

- Segregate bases from acids.
- Store solutions of inorganic hydroxides in polyethylene containers.
- Have Spill-X-C available for spills of caustic solutions.

### **Handling**

- Liquid alkali solutions should be moved from one place to another in a bottle carrier to prevent breakage in the event the container is dropped during transit or use.

### **Use**

- All areas where alkalis are used should have local exhaust ventilation. The Occupational Hygiene Officer should be consulted concerning the need for local exhaust ventilation, appropriate work practices, and personal protective equipment.
- [Standard Operating Procedures for Common Inorganic Bases](#) are provided in the Chemical Safety Section of the WFUHS EH&S Website.

## **FIRST AID**

- Acids and alkalis are caustic materials that can cause serious burns to the eyes and skin. In addition, many give off vapors that can cause serious damage to the mucous membranes. They are classified as primary irritants and cause damage by direct action on body tissues.
- It is essential to prevent skin and eye contact, but shall it occur, it is necessary to immediately flush the affected area with large amounts of clean water for at least fifteen minutes to prevent injury. The sooner the area is flushed the better the chance of preventing damage. After the area is flushed, medical attention is required.

### **Eye**

- Immediately flush the eye with clean tap water (flush the eye before other parts of the body) and dial the Medical Center emergency number 716-9111. Report the incident--an emergency team will be dispatched.
- Spread the eyelids with fingers, and allow water to flood the eye. Roll the eye about so that the water may contact all surfaces. Use nothing but clean water, and use plenty of it.
- Continue washing the eye with clean tap water until medical aid can be obtained.

### **Skin Exposure**

- Flush the exposed area thoroughly with plenty of clean water; remove contaminated clothing, and then gently flush the area again with water.
- Report to the Employee Health for treatment as soon as possible.

### **Swallowing**

- Follow all instructions on the container label.
- Dial the Medical Center Emergency number (716-9111) and report the incident--an emergency team will be dispatched. Save the container for medical personnel.

## **FIRE OR EXPLOSIONS**

Concentrated aqueous solutions of inorganic acids are not in themselves flammable. Combustion can occur when an acid is mixed with other chemicals or with combustible materials. Acids also react with many metals, resulting in the liberation of hydrogen, a highly flammable gas. Some acids are strong oxidizing agents and can react destructively and violently when in contact with other materials. For this reason, it is essential to ***read warning labels*** indicating physical hazards.