**Corrosive Chemicals Guidance**

The following information is intended to provide general guidance on how to safely work with a specific class of chemical or hazard. This information is generic in nature. It addresses the use and handling of substances by hazard class only.

Corrosive chemicals are substances that cause visible destruction or permanent changes in human skin tissue at the site of contact or are highly corrosive to steel. Corrosive chemicals can be liquids, solids, or gases and can affect the eyes, skin, and respiratory tract.  The major classes of corrosives include strong acids, bases, and dehydrating agents.  Liquid **corrosive** chemicals are those with a pH of 4.0 or lower or a pH of 9 or higher. Solid chemicals are considered corrosive when in solution; they fall in the above pH range. A **highly corrosive** chemical has a pH of 2 or lower or a pH of 12.5 or higher. **Injurious**chemicals cause tissue destruction at the site of contact.

Some examples of corrosive materials:

Strong Acids:  hydrochloric, sulfuric, phosphoric

Strong Bases:  hydroxides of sodium, potassium, ammonia

Strong Dehydrating Corrosives:  sulfuric, phosphorus pentoxide, calcium oxide

Strong Oxidizing Corrosives:  concentrated hydrogen peroxide, sodium hypochlorite

Corrosive Gases:  chlorine, ammonia

Corrosive Solids:  phosphorus, phenol

**Storage:  Corrosive Chemical Storage Cabinets**

* Chemicals should be segregated according to the Chemical Storage and Transportation section of the Chemical Hygiene Plan
* Cabinets:  Specially designed corrosion resistant cabinets should be used for the storage of large quantities of corrosive materials.
* If no corrosion-resistant cabinet is available, store corrosives on plastic trays.
* Do not store corrosive liquids above eye level.

**Engineering Controls (ventilation, shielding, vacuum protection)**

* Safety Shielding:  Shielding is required any time there is a risk of explosion, splash hazard or a highly exothermic reaction.  All manipulations of corrosives which pose this risk should occur in a fume hood with the sash in the lowest feasible position.  Portable shields, which provide protection to all laboratory occupants, are also acceptable.

The Principal Investigator/Course Director is responsible to the select the appropriate shielding.

The Office of Environmental Health and Safety is available to provide guidance.

* Special Ventilation:Corrosive materials must be handled in a chemical fume hood if production of corrosive vapor is anticipated.  Manipulation of corrosives outside of a fume hood may require special ventilation controls in order to minimize exposure to the material. Fume hoods provide the best protection against exposure to corrosives in the laboratory and are the preferred ventilation control device. Always attempt to handle quantities of corrosives greater than 500 mL in a fume hood. If your research does not permit the handing of large quantities of corrosives in your fume hood, contact the EHS to review the adequacy of all special ventilation.
* Vacuum Protection:  Evacuated glassware can implode and eject flying glass, and chemicals. Vacuum work involving corrosives must be conducted in a fume hood, glove box or isolated in an acceptable manner.  Mechanical vacuum pumps must be protected using cold traps and, where appropriate, filtered to prevent particulate release. The exhaust for the pumps must be vented into an exhaust hood. Vacuum pumps should be rated for use with corrosives.

**Personal Protective Equipment**

* Splash proof goggles in addition to standard laboratory personal protective equipment (PPE) consisting of a 100% cotton lab coat, closed toe shoes and nitrile gloves must be worn when there is a significant risk of splash.  Pouring very large volumes or handling particularly corrosive materials may require additional PPE consisting of thicker gloves and an apron.

The Principal Investigator/course director is responsible to the select the appropriate chemical resistant glove when direct or prolonged contact with hazardous chemicals is anticipated.

The Office of Environmental Health and Safety is available to provide guidance.

* Eye protection in the form of safety glasses must be worn at all times when handling corrosives. Ordinary (street) prescription glasses do not provide adequate protection. (Contrary to popular opinion these glasses cannot pass the rigorous test for industrial safety glasses.) Adequate safety glasses must meet the requirements of the Practice for Occupational and Educational Eye and Face Protection (ANSI/ISEA Z87.1-2010) and must be equipped with side shields. Safety glasses with side shields do not provide adequate protection from splashes; therefore, when the potential for a splash hazard exists other eye protection and/or face protection must be worn.  In addition to safety glasses, a face shield should be worn when splash or spray is foreseeable.

The Principal Investigator/course director is responsible to the select the appropriate eyewear.

The Office of Environmental Health and Safety is available to provide guidance.

* Gloves must be worn when handling corrosives.  Disposable nitrile gloves (4 mil minimum thickness) provide adequate protection against accidental hand contact with small quantities of most laboratory chemicals.  Lab workers should contact EHRS for advice on chemical resistant glove selection when direct or prolonged contact with hazardous chemicals is anticipated.

The Principal Investigator/course director is responsible to the select the appropriate chemical resistant glove when direct or prolonged contact with hazardous chemicals is anticipated.

The Office of Environmental Health and Safety is available to provide guidance.

* Some examples of when specialty gloves may be necessary are:  Handling of hydrofluoric acid, when immersion in corrosive liquids is anticipated, when large volumes of corrosive liquids are being transferred or dispensed.
* At a minimum, 100% cotton lab coats, closed toed shoes and long-sleeved clothing must be worn when handling corrosives.  Additional protective clothing, such as a chemical-resistant apron, should be worn if the possibility of skin contact is likely.
* Protect all skin surfaces from contact with corrosive or irritating gases and vapors.

**Eyewash**

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

**Safety shower**

A safety or drench shower should be available in a nearby location where the oxidizing chemicals are used.

**Safety Data Sheet**

Consult the Safety Data Sheet (SDS) for any new corrosive chemicals you introduce to your lab.  Fully assess the potential hazards and consider what safety equipment will be needed before you begin your work.

**Signs and labels**

* **Doorways:** The room sign must contain a Designated Area Within identifier where carcinogens, reproductive hazards, and/or acutely toxic chemicals are stored or used.
* **Containers:** All acutely toxic chemicals must be clearly labeled with the correct chemical name and CAS #. Handwritten labels are acceptable; chemical formulas and structural formulas are not acceptable. Chemical containers must be dated upon receipt as well as when opened.

**Handling**

Handling process for liquids should be designed to minimize the potential for splash, splatter, or other likely scenarios for accidental contact.

Do not pour water into acid.  Slowly add acid to water with stirring and cooling if heat generation can be anticipated.

Reactions involving acids and bases are often very exothermic

* Use only heat resistant labware
* Allow for extra volume in your mixing or reaction vessel to account for expansion and/or foaming
* It may be necessary to pre-cool solutions and cool while mixing or reacting
* Corrosive Gases
  + Corrosive compressed gases can burn and destroy body tissue (especially the eyes or respiratory contact) on contact.  The magnitude of the effect is related to the solubility of the material in the body fluids.  Highly soluble gases such as ammonia or hydrogen chloride can cause severe nose and throat irritation, while substances of lower solubility such as nitrogen dioxide, phosgene, or sulfur dioxide can penetrate deep into the lungs.  Corrosive gases also can corrode metals.  Warming properties such as odor or eye, nose or respiratory tract irritation may be inadequate with some substances.  Do not rely upon these symptoms as warning of overexposure.
  + All procedures detailed in the Standard Operating Procedures for Compressed Gases should be followed for work with corrosive gases.
  + Perform manipulations of materials that pose an inhalation hazard in a chemical fume hood to control exposure.
  + To prevent environmental pollution and damage to equipment it may be necessary to trap and or scrub exhaust from processes which utilize corrosive gases even when working in the fume hood.
  + When corrosive gases are to be discharged into a liquid, a trap, check valve, or vacuum break device must be employed to prevent dangerous reverse flow.
  + Regulators and valves must be closed when the cylinder is not in use and flushed with dry air or nitrogen after use.
* Labeling
  + All corrosives must be clearly labeled with the correct chemical name.  Handwritten labels are acceptable; chemical formulas and structural formulas are not acceptable.
  + The label on any containers of corrosives should say “Flammable” and include any other hazard information, such as “Flammable” or “Toxic”, as applicable.
* Heating/Open flame
  + Do not store corrosives in chemical fume hoods or allow containers of corrosives in proximity to heating mantles, hot plates, or torches.
* Transferring/Dispensing
  + Weighing, transferring, and dispensing of corrosive solids must be performed carefully to avoid aspiration and ingestion of airborne powders and solids.
  + The materials of construction for lab apparatus and vessels that will come in contact with corrosive chemicals must be evaluated for compatibility with the chemical in use.
  + Transport corrosives in secondary containment, preferably a polyethylene or other non-reactive bottle carrier and/or a sturdy cart designed for chemical transport.
  + When combining acid and water, always add ACID to WATER

**Emergency procedure**

Emergency procedures which address response actions to fires, explosions, spills, injury to staff, should be developed by each laboratory. The procedures should address as a minimum the following:

* **Who to contact:** (Public Safety, Principal investigator/course director of the laboratory including evening phone number and Office of Environmental Health and Safety)
* The location of all safety equipment (showers, eye wash, fire extinguishers, etc.)
* The method used to alert personnel in nearby areas of potential hazards
* Special first aid treatment required by the type of acutely toxic material(s) handled in the laboratory

**Emergency Procedures – Spill Clean Up**

* Spill Clean Up
  + Anticipate spills by having the appropriate clean up equipment on hand. The appropriate clean up supplies can be determined by consulting the Safety Data Sheet. This should occur prior to the use of any corrosives.
  + Corrosive spill controls neutralize the hazardous nature of the spilled material. Acids and bases require different types of spill control materials.
* Specific acid and base neutralizing spill kits are available from one of Rowan University’s preferred vendor’s.
  + Sodium carbonate (soda ash) can also be used to neutralize spills of acidic liquids prior to clean-up.
  + In the event of a spill all personnel in the area should be alerted. Turn off all sources of ignition.
  + Waste disposal
* Corrosives are hazardous wastes.  All waste generated during a spill cleanup should be disposed of through the University’s hazardous waste vendor.

**Emergency Procedures – Decontamination**

* Decontamination
  + **Personnel:** Immediately flush contaminated area with copious amounts of water after contact with corrosive materials. Remove any jewelry to facilitate removal of chemicals. If a delayed response is noted report immediately for medical attention. Be prepared to detail what chemicals were involved. If there is any doubt about the severity of the injury, seek immediate medical attention.
  + **Area:** Decontamination procedures vary depending on the material being handled.

Contact University’s Emergency Response number 856-256-4911 in the event of a large spill. Remain on the scene, but at a safe distance, to receive and direct safety personnel when they arrive.

**Fire**

* RESCUE anyone in the same room as you if they need assistance.
* Pull the fire alarm to ALERT everyone of the emergency
* CONFINE the emergency by closing doors behind you.
* EVACUATE the building by using the stairs. Never use the elevators.
* Make yourself available to give emergency responders information as needed