



Printmaking Safety Manual

Poison Control: 1-800-222-1222

HACC Security/Emergency number: 780-2568

HACC Department of Environmental Health and Safety 221.1300

x:1567

If the emergency is life threatening call 911, or ask a professor or secretary to call.

Chemicals enter the body through the skin, inhalation and ingestion. Smoking increases the hazards of respiratory reactions.

Art materials may be:

Toxic, cause physical injury via breathing (inhalation), eating (ingestion), or by skin contact & absorption

Caustic, may burn you on contact

Irritant, cause skin, eye, mucous membrane inflammation or pain

Flammable, can ignite or be set on fire

Explosive, may explode when exposed to heat, pressure or shock

GENERAL PRECAUTIONS:

Do not eat or drink close to work area (to prevent accidental ingestion).

Familiarize yourself with substances that are hazardous.

Clean hands thoroughly after working using baby oil, soap and water, or a non-toxic hand cleaner such as GoJo.

Keep work area clean and organized.

Ask your doctor if you are taking medication or are pregnant about what precautions you should be taking.

Identify location of fire extinguishers, first aid box and eye wash stations (ask your professor if need be).

Notify your professor about any health condition or medication that may affect you in the classroom.

Intaglio, Relief Printing and Silkscreen are taught at HACC

Material Safety Data Sheets (MSDS), which give chemical properties and hazards, are available at <https://myhacc.hacc.edu/cp/home/displaylogin> or contact the Department of Environmental Health and Safety at 221.1300 x:1567.

Additional information can be found in *Artists Beware*, a copy of this book is in the studio.

Most information contained in this booklet will be helpful at HACC. Some chemicals and processes not used at HACC may be mentioned to strengthen your awareness of possible hazards in the art studio.

Quick Overview of Hazards

Solvents - mineral spirits

Pigments - Cadmium, cobalt, lead, manganese, and others

Photo Emulsions - Ammonium dichromate

MATERIALS

Acids

Different acids may be used to etch different metal plates. Nitric acid is used to etch zinc plates and is commonly used at HACC.

Refer to *Artist Beware* for information on other acids used in the etching process.

PRECAUTIONS

Store concentrated nitric acid and potassium chloride separately from other chemicals.

Whenever possible use diluted acid.

Acid etching should be done with local exhaust ventilation.

An important safety rule when diluting concentrated acids is to add the acid to the water, never the reverse.

Wear appropriate gloves, goggles and protective apron or lab coat when handling acids.

If acid is spilled on your skin, wash with lots of water. In case of eye contact, rinse the eyes with water for at least 15-20 minutes and seek medical attention.

Cover acid baths when not in use.

HAZARDS

Nitric acid etching releases the respiratory irritant nitrogen dioxide which has poor odor warning properties. During the etching process, flammable hydrogen gas is also produced.

Concentrated nitric acid is a strong oxidizing agent and can react with many other chemicals, especially solvents or other organic compounds, to cause a fire.

Concentrated acids are corrosive to the skin, eyes, respiratory system and gastrointestinal system.

Dilute acids can cause skin irritation on repeated or prolonged contact. Concentrated nitric acid is a strong oxidizing agent and can react explosively with other concentrated acids, solvents, etc.

Nitric acid gives off various nitrogen oxide gases, including nitrogen dioxide which is a strong lung irritant and can cause emphysema.

Chromic, phenol and hydrofluoric acids are highly toxic.

Inks

Intaglio and relief inks consist of pigments suspended in either linseed oil or water as a vehicle. There can be additional modifiers, such as binders or preservatives, which may be hazardous.

PRECAUTIONS

Know what materials are used. Obtain the material safety data sheets (MSDS) on all products used.

Use the least toxic inks possible.

Do not use an open flame to heat linseed oil, varnishes or burnt plate oil. Take normal fire prevention measures (e.g. no smoking or open flames in work area).

Place oil-soaked rags in self-closing disposal cans.

HAZARDS

Oil-based inks contain treated linseed oils. While linseed oil is not considered a hazard by skin contact or inhalation, ingestion of large amounts of some treated linseed oils might be hazardous due to presence of small amounts of toxic heavy metals. Oil vehicles are flammable when heated, and rags soaked in these may ignite by spontaneous combustion.

Modifiers: benzene used with magnesium carbonate as a tack reducer is moderately toxic and flammable. Vaseline, cup grease and Crisco are not significantly hazardous.

Stiffeners: Magnesium carbonate is not significantly toxic.

Pigments

Pigments are the colorants used in intaglio, and relief printing inks. There are two types of pigments: inorganic pigments, and synthetic organic pigments.

PRECAUTIONS

Obtain MSDS at <https://myhacc.hacc.edu/cp/home/displaylogin> on all pigments. This is especially important because the name that appears on the label of the color may or may not truly represent the pigments present.

Use the safest pigments possible. Avoid lead pigments.

Avoid mixing dry pigments whenever possible. If dry pigments are mixed, work in a spray booth or wear a NIOSH approved dust respirator.

No eating or drinking in the work area.

HAZARDS

Pigment poisoning can occur if pigments are inhaled or ingested. For normal printing with prepared inks, the main hazard is accidental ingestion of pigments due to eating, drinking or smoking while working, or inadvertent hand to mouth contact.

The classic example of a toxic inorganic pigment in printmaking is lead chromate (chrome yellow).

Lead pigments can cause anemia, gastrointestinal problems, peripheral nerve damage (and brain damage in children), kidney damage and reproductive system damage. Other inorganic pigments may be hazardous also, including pigments based on cobalt, cadmium, and manganese.

Some of the inorganic pigments, in particular cadmium pigments, chrome yellow and zinc yellow (zinc chromate) may cause lung cancer if inhaled. In addition, lamp black and carbon black may contain impurities that can cause skin cancer.

Chromate pigments (chrome yellow and zinc yellow) may cause skin ulceration and allergic skin reactions.

The long-term hazards of the modern synthetic organic pigments have not been well studied.

Solvents

In general, organic solvents are one of the most underrated hazards in art materials. Organic solvents are used in printmaking to dissolve and mix with oils, resins, varnishes, and inks; and to clean plates, rollers, tools, and even hands.

PRECAUTIONS

Obtain the MSDS at <https://myhacc.hacc.edu/cp/home/displaylogin> on all solvent products used.

Use the least toxic solvent possible. For example, replace the more toxic methyl alcohol with denatured alcohol or isopropyl alcohol.

Use adequate ventilation.

Keep minimum amounts of solvents on hand and purchase in smallest practical container size. Large amounts of solvents or solvent-containing materials should be stored in a flammable storage cabinet.

Never store solvents or solvent-containing materials in food or drink containers. Always label containers.

Do not allow smoking, open flames or other sources of ignition near solvents.

Have a class B fire extinguisher in the area.

Wear nitrile gloves when handling solvents to avoid skin contact. In particular do not use solvents to clean ink off hands. Baby or vegetable oil is a good substitute.

HAZARDS

Repeated or prolonged skin contact with solvents can cause defatting of the skin and resultant dermatitis. Many solvents can also be harmful through skin absorption.

Inhalation of solvent vapors is the major way in which solvents are harmful. High concentrations of most solvents can cause dizziness, nausea, fatigue, loss of coordination, or coma. This can also increase the chances for mistakes and accidents.

Many solvents are toxic if ingested. Swallowing an ounce of turpentine can be fatal.

Most solvents, except chlorinated hydrocarbons, are either flammable or combustible.

PROCESSES

Intaglio

Intaglio is a printmaking process in which ink is pressed into depressed areas of the plate and then transferred to paper. These depressed areas can be produced by a variety of techniques, including acid etching, drypoint, engraving and mezzotint.

ETCHING

HACC uses nitric acid, other acids are hydrochloric acid, and phosphoric acid, and less commonly carbolic acid (phenol), chromic acid, hydrofluoric and sulfuric acids. Etching involves use of dilute acid to etch the zinc or copper metal plate. Unetched parts the plate are protected with resists such as stopout varnishes containing ethyl alcohol, grounds containing asphaltum or gilsonite and mineral spirits, rubber cement, and rosin or spray paints for aquatinting. Soft grounds may contain more toxic solvents.

PRECAUTIONS

Obtain the MSDS <https://myhacc.hacc.edu/cp/home/displaylogin> for all materials used, whenever possible use diluted acid.

Use Dutch mordant with extreme caution. A safer substitute for etching copper plates is ferric chloride (iron perchloride). This forms acidic solutions so should be handled accordingly, but does not have the dangers of handling concentrated acids. Ferric chloride solution might cause minor skin irritation from prolonged contact.

Application of grounds or stopouts should be done with local exhaust ventilation, (e.g. slot or enclosed hood).

Acid etching should be done with local exhaust ventilation.

Rosin (or asphaltum) boxes should be explosion-proof. Use sparkproof metal cranks, explosion-proof motors, or compressed air. Don't use hair dryers to stir up rosin dust.

Store concentrated nitric and chromic acids away from organic materials. Concentrated nitric acid should always be stored separately even from other acids.

An important safety rule when diluting concentrated acids is to add the acid to the water, never the reverse.

Wear appropriate gloves, goggles and protective apron or lab coat when handling acids. If acid is spilled on your skin, wash with lots of water. In case of eye contact, rinse the eyes with water for at least 15-20 minutes and seek medical attention.

HAZARDS

See Solvents section for the hazards of solvents. 1,1,1- trichloroethane found in some soft grounds is moderately toxic by inhalation under normal conditions but may cause fatalities at very high concentrations.

See Acids section for the hazards of acids. In particular nitric acid etching releases the respiratory irritant nitrogen dioxide which has poor odor warning properties. During the etching process, flammable hydrogen gas is also produced.

Concentrated nitric acid is a strong oxidizing agent and can react with many other chemicals, especially solvents or other organic compounds, to cause a fire.

Mixing hydrochloric acid with potassium chlorate to make Dutch mordant produces highly toxic chlorine gas. Potassium chlorate is a key ingredient in many pyrotechnics, and is a potent oxidizing agent. It can react explosively with organic compounds, sulfur compounds, sulfuric acid or even dirt or clothing. On heating it can violently decompose to oxygen and potassium chloride. Storage and use are very dangerous and require special precautions especially when mixing.

Rosin dust (and asphaltum dust which is also sometimes used) is combustible. Sparks or static electricity have caused explosions in enclosed rosin and aquatint boxes. Rosin dust may also cause asthma and dermatitis in some individuals.

Inhalation of solvents and pigments can result from use of aerosol spray paints.

Concentrated acids are corrosive to the skin, eyes, respiratory system and gastrointestinal system.

Dilute acids can cause skin irritation on repeated or prolonged contact. Concentrated nitric acid is a strong oxidizing agent and can react explosively with other concentrated acids, solvents, etc.

Nitric acid gives off various nitrogen oxide gases, including nitrogen dioxide which is a strong lung irritant and can cause emphysema.

OTHER TECHNIQUES

Drypoint, mezzotint and engraving use sharp tools to incise lines in metal plates.

PRECAUTIONS

Keep tools sharp, store them safely and always cut away from yourself. In advance, locate the nearest first-aid box.

When possible, clamp down plates to avoid slippage.

Minimize the chance of carpal tunnel syndrome by choosing tools with wide handles, avoiding tight grips and including hand flexing exercises during regular rest periods. Set work table height so wrist flexing motions are minimal.

HAZARDS

See Solvent section for the hazards of solvents. Plate cleaning is more hazardous than cleaning inking slabs or press beds because larger amounts of solvents are used.

Lithotine, turpentine, or oil-soaked rags can be a spontaneous combustion hazard if improperly stored.

One major hazard associated with these types of processes involves accidents with sharp tools. Long-term use of these tools can cause carpal tunnel syndrome, which can cause numbness and pain in the first three fingers. Severe cases can be incapacitating.

Relief Printing

Relief printing techniques include woodcuts, linoleum cuts and acrylic plates for plaster relief. These techniques involve the cutting away of plate areas that are not to be printed. Relief inks can be oil-based or water-based.

PRECAUTIONS

Obtain the MSDS at <https://myhacc.hacc.edu/cp/home/displaylogin> for all materials used.

See Acids and Solvents sections for precautions with acids and solvents.

Use water-based inks when possible to avoid solvents.

Wear appropriate gloves, goggles and protective apron when handling caustic soda. If the chemical is spilled on your skin, wash with lots of water. In case of eye contact, rinse the eyes with water for at least 15-20 minutes and contact a physician.

Always cut in a direction away from you, with your free hand on the side or behind the hand with the tool.

Carpal tunnel syndrome can be minimized or avoided by using tools with wide handles, avoiding tight grips and including rest periods with hand flexing exercises. Linoleum cutting is softer to work, and thus can reduce musculoskeletal injury.

HAZARDS

Some woods used for woodcuts can cause skin irritation and/or allergies. This is particularly true of tropical hardwoods.

Accidents involving sharp tools can result in cuts.

Wood carving and cutting tools can cause carpal tunnel syndrome. This was discussed earlier in the section that included drypoint and mezzotint.

Caustic soda (sodium hydroxide) is sometimes used for etching linoleum. It can cause skin burns and severe eye damage if splashed in the eyes.

Eating, drinking or smoking while printing can result in accidental ingestion of pigments and solvents.

Hazardous solvents are used in stopouts and resists in linoleum etching, and for cleaning up after printing with oil-based inks. See Solvents section for more information on the hazards of solvents.

Collagraphs

Collagraphs are prints produced by using a collage of different materials glued onto a rigid support. A wide variety of materials and adhesives are used in making collagraphs.

PRECAUTIONS

Know the hazards of materials used. Obtain the MSDS at

<https://myhacc.hacc.edu/cp/home/displaylogin> .

Use the least toxic materials available. In particular use water-based glues and mediums (e.g. acrylic medium) whenever possible. Some rubber cements are made with the solvent heptane, which is less toxic than n-hexane, primarily because peripheral neuropathy is not associated with its use.

Wear gloves when using epoxy glues.

Wear a NIOSH-approved toxic dust respirator when sanding collagraph plates.

HAZARDS

Rubber cement, a common adhesive used with collagraphs, is extremely flammable and most rubber cements and their thinners contain the solvent n-hexane which can cause damage to the peripheral nervous system (hands, arms, legs, feet) from chronic inhalation.

Epoxy glues can cause skin and eye irritation and allergies.

Spraying fixatives on the back of collagraph plates to seal them can involve risk of inhalation of the solvent-containing spray mist.

Sanding collagraph plates which have been treated with acrylic modeling compounds or similar materials can involve inhalation of irritating dusts.

Monoprints

Monoprints involve standard intaglio, lithographic and other printmaking techniques, but only one print is made. Monoprints have the same hazards involved in plate preparation and printing as the parent techniques.

Photo Processes

Photo-printmaking involves exposing a light-sensitive emulsion or film to ultraviolet light through a transparent support containing an opaque image to transfer the image to a plate. The transparency through which the photo-emulsions are developed can include drawings on a transparent support such as Mylar or acetate, or photographic images processed on graphic arts film to yield a positive image.

Photo-etching is usually done using Image On Film. It is developed with soda ash and water, which is relatively non-toxic. Exposure of the plate is done with ultraviolet sources, specifically a mercury lamp. Other processes, not used at HACC, may be more toxic.

PRECAUTIONS

Pregnant or nursing women, children, and men trying to conceive should not work with these materials.

Use photofloods or other light sources instead of carbon arcs.

Use presensitized plates if possible.

Use photoresist solutions with local exhaust ventilation, or wear an organic vapor respirator. Wear butyl rubber gloves when handling KPR solutions.

Some lights used in photo processes may be hazardous. HACC uses only quartz mercury lights, common sense should be used in protecting the eyes.

HAZARDS

In particular, methyl and ethyl ether acetates of ethylene glycol are highly toxic by skin absorption and inhalation and can cause anemia, kidney damage, testicular atrophy and sterility in men, and miscarriages and birth defects in pregnant women.

Xylene is moderately toxic by skin absorption, and highly toxic by inhalation and ingestion. It is a strong narcotic.

Screen Printing

Most screen printing at HACC is done with water based inks. Screen filler is used. Ulano TZ is used for the photo emulsion. It is a diazo based film, only instructors mix it up, once it is mixed it is less hazardous.

Other Resources

The Artist's Complete Health and Safety Guide, Monona Rossol, Allworth Press, NY (available in the studio and the McCormick Library)

Artist Beware, Michael McCann, The Lyons Press, NY (Available in the studio and the McCormick Library)

Health Hazards Manual for Artists, Michael McCann, The Lyons Press, NY
(available in McCormick Library) and online at
http://www.uic.edu/sph/glakes/harts/HARTS_library/index.htm

Making Art Safely, Merle Sanforfer, Deborah Curtiss and Jack Snyder, Van Nostrand Reinhold, NY
(available in McCormick Library)

New Jersey Department of Health website provides organized lists on hazardous substances, similar to MSDS, possibly easier to understand - <http://nj.gov/health/eoh/rtkweb/index.shtml>