

C N C
Si Pi S
**The Pratt Institute
Guide to the Safe
Use of Art Materials**
Ge As S

Revision 3

Sn Sp T
Pratt

**PRIMARY EMERGENCY
ACTION COORDINATOR –**

*Fire, Explosion, Severe Weather,
Natural Disaster, Civil Disobedience,
Acts of Terror*

Mr. Edmund F. Rutkowski Pratt
Institute – Crisis Communications –
(718) 636-3542

RESPONSE ORGANIZATIONS:

National Response Center
800-424-8802

NY State DEC
(Statewide 24 hours) 1-800-457-7362

NYC DEP HELP 718-337-4357

Police, 88th Precinct
(24 hours) 718-636-6511

NYC Fire Department 57th Battallion –
Brooklyn 718-965-8357

Pratt Campus Security Ext. 3541

Pratt Medical Clinic – Nurse Station
Ext. 4542

Emergency Medical Services 911

Brooklyn Hospital – DeKalb Avenue
718-250-8000

Long Island College Hospital –
Atlantic Ave. 718-780-1000

Poison Control 800-343-2722

National Weather Service 716-328-7633

U.S. Environmental Protection Agency,
Region II – NY 212-637-4145

**EMERGENCY RESPONSE,
SPILL CLEAN-UP VENDOR:**

Major chemical spill or release event

Miller Environmental Group
287 Maspeth Avenue
Brooklyn, NY 11205
(631) 369-4900

**ENVIRONMENTAL
COORDINATOR:
(AND ALTERNATES)**

*Chemical Reaction – Oil & Hazardous
Materials, Hazardous Substances, Waste
and emissions spill or release events.*

Facility Contacts

PRIMARY – Kevin A. Tassey
Director of Environmental Health
(718) 399-4250

SECONDARY – Conrad Milster
Off Shift (After 4 pm & Weekends)
(718) 636-3579

DESIGNATED ALTERNATES

Jeffry Bernardo (718) 399-4250
Security Control Booth Ext. 3540



**The Pratt Institute
Guide to the Safe
Use of Art Materials**

Pratt

“Art is dangerous. It is one of the attractions, when it ceases to be dangerous you don’t want it.”

–Anthony Burgess

Using Art Materials Safely

WHAT IS THIS BOOKLET FOR?

Much of what we do in art and design brings us into contact with toxic materials and processes. Don't be alarmed - be aware. This booklet provides basic information on the primary hazards associated with different artistic mediums. In conformance with current health and safety standards (OSHA 29 CFR 1910.1200) the Pratt Institute is providing you with this "Right To Know" information about the risks that may be involved while using or otherwise handling certain art supplies and materials. This booklet will serve as written Hazard Communication for available and generally known environmental, safety and health risk information about art supplies and studio practices that you may have occasion to use or be exposed to. This information is not meant to discourage you from practicing your art! Instead, it is meant to make you a wiser and healthier art practitioner---All that you have to do is 1: read the information, 2: be aware of what you're dealing with before you start using it or start working in an area where a hazardous material is being used or stored, and 3: use the safety suggestions provided, as well as any other manufacturer's or chemical supplier material safety data information available to help you prevent any potential for toxic exposure and resulting adverse health effects. You must be made to understand the consequences of improper handling, use, storage and disposal practices and also be able to recognize situations or conditions that may have the potential for immediate or long term adverse health effects.

LONG-TERM (CHRONIC) VERSUS SHORT-TERM (ACUTE) EXPOSURE

Definition: "Health hazard" means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed individuals. The term "health hazard" includes chemicals which are carcinogens,

toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes.

While even brief exposure to some hazardous materials may cause harm, long-term exposure is of major concern and presents a high degree of risk to your long term good health. As you move on to your career in art or design, you will be using the materials and processes particular to your field each and every day, thus it's extremely important to develop safe habits from the beginning to avoid potential health problems now and in the future. If at any time you feel you are having any kind of reaction to materials make sure to talk to your professor or technician to ensure that you are operating in a safe work environment. Remember!!! They are there to help you and guide you. If you have a question or concern ask it or voice it ASAP!! Some things just should not be left to chance!

MOST HAZARDS CAN BE REDUCED WITH THESE SIMPLE STEPS:

- 1.** Ensure good ventilation - Follow the recommendations suggested in the manufacturer's material safety data sheet or product safety literature. When engineering controls (exhaust hoods, spray booths etc.) are not available in the space you are working in, use approved respiratory protection devices (dust masks, half mask cartridge respirators etc.). If you are not sure about the potential exposure levels of the hazardous substance that you'll be using, consult with your professor and technician to make sure you understand the safe and proper use and handling for any material - **BEFORE YOU START YOUR PROJECT!!!**
- 2.** Use PPE [Personal protective clothing and equipment] - Follow the recommendations suggested in the manufacturer's material safety data sheet or product safety literature and guidelines for your shop or studio's policy.
- 3.** Never eat, drink, or smoke in the studio or shop or wherever there is a potential for chemical exposure.
- 4.** Thoroughly wash your hands and exposed skin with soap and water after using any hazardous material or substance. Good hygiene after hazardous materials and chemical handling is a must.
- 5.** Be aware of the activities of the people working around you. If you feel that there is any health risk in the area that you're sharing, discuss the issue with the professor and technician.
- 6.** In all cases follow the directions of your professor and technician. They are there to train and assist you to ensure that you have a safe workplace.

MATERIAL SAFETY DATA SHEETS (MSDS)

This section requires chemical manufacturers or importers to assess the hazards of chemicals which they produce or import, and all employers to provide information to their employees about the hazardous chemicals to which they are exposed, by means of a hazard communication program, labels and other forms of warning, material safety data sheets, and information and training.

Material Safety Data Sheets must be available on all OSHA regulated materials used at Pratt. Ask your technician for the location of MSDS for materials supplied by the Institute and used or stored in the area. If you have any questions or concerns about a particular material you bought, the Hazard Communication Standard says, "You have a Right To Know." Contact the product's manufacturer OR art supplier for the required MATERIAL HEALTH and SAFETY DATA information.

The Institute's master file for all hazardous materials used or stored on campus is maintained in the Provost office. If you need information on a particular product or chemical substance please submit a written request to the Provost office and they will perform a file search or literature search and get back to you in a timely manner. We have also included a list of Web Resources in the Glossary Section at the end of the booklet, that provides helpful information on MSDS and HEALTH and SAFETY DATA.

EMERGENCY MEDICAL PROCEDURES

If you have injured yourself in any way, immediately alert your studio professor or technician for help. If you feel you may be having adverse health effects or show symptoms of chemical exposure, seek medical attention from the Pratt medical center.

It would be good work practice if you know you are going to be working, in the studio or shop alone, to let someone know beforehand so that you can set up a time to have them check on you. If that's not possible, alert a studio or department technician or otherwise contact Pratt security (ex. 3540.) to let them know your exact location and work schedule and how you can be contacted.

This booklet focuses on hazards associated with toxic materials. Remember that there are other kinds of hazards associated with art and design processes that may not be addressed specifically in this text. Be sure to avail yourself of any opportunity on the safe and proper use of tools and equipment you may have and need to use. Be Smart! And be safe!

But clay looks so harmless.

Ceramics

MAJOR DANGERS

Free silica Free silica poses the biggest threat to artists using this medium because of its large presence in clay. Repeated inhalation of free silica dust over an extended period of time can lead to silicosis, a form of emphysema that causes shortness of breath, an increased susceptibility to infections, and lung scarring.

Inhalation of dusts and glazes Everything in ceramics involves some form of powder and water. These are mixed to make clay or glazes, and then when they dry, dust results. Often the dusts involved are very fine and once in the air aren't always visible, which makes it much easier to inhale them accidentally. As well as silica, other hazardous particulates such as kaolin are present. Low fire and slip casting clays also contain talcs, which may be contaminated with asbestos. Asbestos can cause lung cancer and lung scarring. Always wear a mask when doing anything that puts powder or dust into the air, work wet whenever possible, and never sweep in the shop as it will stir up the dust—wet mop or sponge surfaces.

LESS OBVIOUS DANGERS

Toxic metals in clays and glazes Glazes are metals in suspension. Avoid inhaling or ingesting glazes. Many glazes; Iron, cobalt, manganese, copper; most used in ceramics shops, are cumulative in their toxicity and have long term, damaging health effects. Damage to liver, kidney and brain function are most common. Use PPE

[Personal protective clothing and equipment] - Follow the recommendations suggested in the manufacturer's material safety data sheet or product safety literature and guidelines for your shop or studio's policy.

Misuse of Glazes Shop-made glazes are safe for most uses, but commercial glazes are often more specialized. Check the packaging for instructions about recommended uses, and make sure to have them approved by your technician.

Firing Toxic fumes and gasses may be emitted during the firing process in ceramics. Exposure to carbon monoxide and carbon dioxide causes headaches, dizziness and depletes oxygen concentrations in air to unsafe levels. Sulfur dioxide and formaldehyde fumes are only a couple of examples of hazardous air contaminants resulting as by-products of combustion processes. They are toxic and carcinogenic. Avoid any exposure in any amount. Make sure the exhaust system is on and operating properly during ceramic firing operations.

You should also be aware that looking directly into the kiln when in operation can cause cataracts or other damage to your eyes due to the infrared radiation involved. Wear protective goggles if you have to work with the kiln and must visually inspect the combustion chamber.

SAFE SUGGESTIONS

Usage

- » Ensure proper ventilation.
- » Use a mask.
- » Be aware of what is going on around you. Is someone else putting dust into the air?
- » Avoid creating dust when possible. Work wet whenever you can.
- » If you must do a large sanding job, use the spray booth.
- » Never sweep! Wet-mop or sponge surfaces after using clay to remove dust.
- » Wash hands and skin well after working in the shop.
- » Wear protective eyewear when working with the kiln.
- » Have a technician approve any glazes you bring into the shop before using or firing - As a pollution prevention and toxics use reduction measure, always consider using less or non-toxic material substitutes – (Better for you & the Environment!)

Disposal

- » Clay is infinitely recyclable. Put unwanted clay in the designated wet or dry clay bins.
- » Follow your technician's instructions on disposal of powders and glazes.
- » EPA Regulated hazardous waste; toxic heavy metals such as cadmium, chromium, lead, barium, silver, toxic organic solvents, flammable liquids, corrosives etc. The Institute requires that all regulated waste or hazardous process residuals must be properly segregated and placed in the designated container provided for waste in your area. If you are unsure about the waste resulting from your project work ask your technician to ensure proper disposal.
- » Blue/green barrel: recyclables that haven't been in contact with hazardous materials
- » Grey barrel: regular trash

Design and Architecture

MAJOR DANGERS

Inhalation of fumes and vapors while modeling and drawing

Markers, glues, spray paints and adhesives all have the potential to produce hazardous fumes and vapors. As modeling and drawing require close-up work, you are even more likely to be at risk for exceeding permissible exposure levels. Good ventilation while using all of these products is imperative. These vapors can cause nerve damage and respiratory irritation. When your work requires prolonged periods of using volatile organics like those contained in paints and solvents, the surface coating or solvent cleaning should be performed in a spray booth having adequate exhaust.

Inhalation of resins, silica, and molding materials

Occasionally molds contain formaldehyde resins, which are strong lung irritants. Formaldehyde exposure can lead to asthma and, possibly, cancer. During the casting process, these resins may thermally decompose to allow the release of toxic formaldehyde, phenolic, and ammonia fumes, all of which are potentially harmful. Casting plasters also contain silica, which can lead to silicosis. Always provide for adequate ventilation and wear an approved dust mask or organic respirator while using any of these products.

Skin contact with glues, sprays, and fillers

It's especially easy while doing modeling work to end up with glue or filler all over your hands. Because of the close-up nature of the work, you should be extremely cautious with the use and handling of these materials. Wear the appropriate levels of protective clothing. Wear impervious nitrile or other approved chemical resistant gloves when using solvent based materials, and wash your hands often.

For details about metalworking processes see the Metalworking and Foundry Section.

For details about woodworking processes see the Woodworking Section.

LESS OBVIOUS DANGERS

Modeling materials

Wood - MDF, plywood, and other laminated/compressed wood products contain formaldehyde which can bring on asthma and can lead to cancer.

Foam - toxic gasses are released when cutting foam with hot wire - ventilate well!

Rubber cement - commonly used for modeling and thinning, contains n-hexane. Hexane may cause chronic systemic and nerve damage if exposure occurs over long periods. Rubber cement that contains heptane rather than hexane is much safer, but it, too, like most solvent-based materials, can cause respiratory irritation.

Ink Markers

Working with several Ink markers at once can result in high levels of exposure to solvent vapors. They can be irritating to the eyes and respiratory tract, can cause dizziness, headaches and nausea. Alcohol-based markers are much safer than ones containing xylene or toluene, and water based markers are even safer and not an air contaminant or hazardous air pollutant.

Pastels

Pastel dust can deposit toxic pigments in the throat and lungs. Wear a respirator. *See information on pigments in the Painting section.*

BANNED MATERIALS

- » Turpentine and turpentine based products
- » Pressure treated wood
- » The School of Architecture discourages the use of oil-based resins or spray paints. Otherwise, they are only allowed in approved spray painting areas.

SAFE SUGGESTIONS

Usage

- » Ensure proper ventilation and wear protective clothing.
- » Wear a mask when spraying or working close-up.
- » Use rubber, vinyl, or latex gloves with solvent based stains/products.
- » Use water or alcohol-based markers.
- » Use non-aerosol paints and adhesive.
- » Use soap and water, not solvents to wash hands.

Disposal

- » Don't wash anything down sinks.
- » EPA Regulated hazardous waste; toxic heavy metals such as cadmium, chromium, lead, barium, silver, toxic organic solvents, flammable liquids, corrosives etc. The Institute requires that all regulated waste or hazardous process residuals must be properly segregated and placed in the designated container provided for waste in your area. If you are unsure about the waste resulting from your project work ask your technician to ensure proper disposal.

- » Blue/green barrel: recyclables that haven't been in contact with hazardous materials
- » Grey barrel: regular trash

RECOMMENDED ALTERNATIVES

- » Borden's Rubber Cement contains heptane instead of hexane.
- » Durham Rock Putty is a safe adhesive for wood modeling.
- » Elmer's Products puts out a variety of extra strength glues for modeling.
- » Use water-based paints for coloring models.
- » Dri Mark Products Permanent Markers are a safer alternative.

It looks pretty, but...

Jewelry Making and Small Metals

MAJOR DANGERS

Soldering Silver soldering is a common practice in jewelry making, but even the lowest melting silver contains at least 30% cadmium. Cadmium fumes can cause chemical pneumonia from a single exposure. Some silvers also contain antimony, which is highly toxic by inhalation and can cause vomiting and irregular heartbeats. Chronic exposure to antimony fumes can lead to birth defects. Fluoride fluxes are also commonly used and are strong respiratory irritants; borax fluxes are much safer. Soldering is also dangerous due to metal melting hazards (see below).

Contact with cleaning agents The pickles used to clean metals in jewelry making are corrosive to the skin as well as being eye and respiratory tract irritants. Inhaling the fumes of the main ingredient of Rio Pickle, sodium bisulfate, can even lead to corroded teeth! As well as pickles, alcohol and acetone solutions are sometimes used. Whatever chemical substance or hazardous material involved, Use PPE [Personal protective clothing and equipment] - Follow the recommendations suggested in the manufacturer's material safety data sheet or product safety literature and follow the safety guidelines in your shop or studio's guidance policy.

Inhalation and skin contact with fumes during melting and casting When metals are melted, many release toxic fumes. Inhaling these fumes can lead to metal fume fever, an affliction with severe flu-like symptoms. The fever usually appears a few hours after exposure and lasts roughly thirty-six hours; worse still, it can leave permanent damage. An especially dangerous fume is

lead, which occurs when bronze is melted. ALWAYS ventilate the workshop and wear protective clothing when melting metals and consider using proper respiratory protection.

Lead

What isn't dangerous about lead? You may encounter it as a molding material in jewelry making - make sure you wear protective clothing and gloves; lead goes right in through your skin. Even in its cold form, it is extremely dangerous - clean up carefully after use. Pregnant women have been advised to avoid all situations that may result in exposure or contact with lead based materials.

Junk metals

A dangerous practice in metalworking is the use of junk metals. Junk metals are extremely hazardous because they are often coated with lead, mercury or cadmium, all of which are highly toxic. The only way you can use junk metals at Pratt is if you gain advance permission from your teacher. It is better, however, to avoid using junk metal – there's no completely safe way to work with it.

LESS OBVIOUS DANGERS

Patinas, plating, and enamel work

Cyanide plating solutions should always be avoided. Historically, copper enamels were lead-based, but non-lead based enamels are now available. However, most enamels still contain nickel, manganese, chromium and cobalt, all of which are toxic. Always ventilate your workshop and wear protective clothing when working with agents and solutions.

Inhalation of resins, silica, and molding materials

Techniques used for molding metal usually employ sand, which contains some silica. Occasionally molds contain formaldehyde resins, which are strong lung irritants. Formaldehyde resins can lead to asthma and possibly cancer. During the casting process, these resins cause toxic formaldehyde, phenolic vapors and ammonia vapors, all of which are very harmful. Lost-wax casting uses a wax pattern that is covered with plaster and a cristobalite mix. That mix is a highly toxic form of silica, which can lead to silicosis. A much safer alternative is using 30-mesh sand, but this may not be feasible for certain types of work. Always wear a mask while using any of these products.

**Inhaling
particulates
while grinding
or polishing**

Wear a mask to avoid breathing in toxic particulates released during these processes.

SAFE SUGGESTIONS

Usage

- » Ensure proper ventilation.
- » Use a dust mask or respirator and goggles.
- » Wear protective clothing.
- » Pregnant students should never handle lead, or silver alloys containing antimony.
- » Avoid resins with formaldehyde.
- » Avoid using junk metals and lead based products.
- » Avoid cyanide plating solutions for jewelry making.
- » Clean and neutralize with baking soda.

Disposal

- » Rio pickle must first be neutralized with baking soda, then mixed with water in the ratio of 1 part neutralized acid to 5 parts water.
- » EPA Regulated hazardous waste; toxic heavy metals such as cadmium, chromium, lead, barium, silver, toxic organic solvents, flammable liquids,

corrosives etc. The Institute requires that all regulated waste or hazardous process residuals must be properly segregated and placed in the designated container provided for waste in your area. If you are unsure about the waste resulting from your project work ask your technician to ensure proper disposal.

- » Blue/green barrel: recyclables that haven't been in contact with hazardous materials
- » Grey barrel: regular trash

**RECOMMENDED
ALTERNATIVE MATERIALS**

- » Use 30-mesh sand for lost wax casting.
- » Borax fluxes, while not toxicant-free, are much safer than fluoride and antimony fluxes.
- » Use sparax solutions for cleaning metals instead of sulfuric acid solutions.
- » Use non-lead based enamels.

*Shop savvy is paramount in the metalshop.
Be aware of what's going on around you.*

Metalworking and Foundry

MAJOR DANGERS

Inhalation and skin contact with fumes during welding, melting and casting

When metals are heated to their liquid state or melted, many release potentially toxic fumes. Welding, cutting, and grinding, as well as casting processes may create this potential. Inhaling these “metal” fumes can lead to metal fume fever, an affliction with severe flu-like symptoms. The fever usually appears a few hours after exposure and lasts roughly thirty-six hours; worse still, it can leave permanent damage. An especially dangerous fume is lead, which occurs when bronze is melted. Use PPE [Personal protective clothing and equipment] - Follow the recommendations suggested in the manufacturer’s material safety data sheet or product safety literature and follow the safety guidelines in your shop or studio’s guidance policy.

Welding

Welding emits ultraviolet (UV) light as well as causing hazardous fumes. Anyone in an active welding zone should wear helmets, goggles, or cutting glasses with welding shades. If appropriate eye protection isn’t worn properly, a painful burn of the cornea called welding flash can occur. Welding flash can heal in time, but watching a welding arc for long periods of time can cause serious and permanent injury to the eyes. To protect the body from UV radiation, welders should wear protective clothing that keeps their skin covered. Gasses such as carbon monoxide, nitrogen oxide and ozone can result from welding operations. Metal fumes that can result from welding include zinc, cadmium, chromi-

um, copper, lead, manganese and vanadium. If ventilation is inadequate, welders will need respiratory protection equipment. The importance of using a respirator appropriate to the type of welding being done cannot be overemphasized. Don't take chances; consult a technician.

Foundry processes **Inhalation of toxins while working with wax** - ensure proper ventilation while melting and working with wax. The heating and burning of the wax releases toxic vapors that are respiratory irritants; wear a mask or respirator and protective clothing.

Inhalation and contact with plaster - after making the piece out of wax, an investment mold is made out of high refractory plaster. Plaster contains silica, which can lead to silicosis. Wear a mask at all times.

Other people Just because you might not be engaging in a hazardous process doesn't mean the person behind you isn't. Always be aware of the processes going on around you -use and wear protective equipment when fumes or particulates are generated.

LESS OBVIOUS DANGERS

Patina work To put on a patina, the bronze must be heated to allow the chemicals to fuse. The fumes released by the bronze, as well as the contact toxicity of the ferric nitrate, cupric nitrate (liver of sulfate) and other chemicals used in patinas make it a hazardous process. Wear a mask or use a respirator, wear gloves and protective clothing when doing any patina work.

Airborne particulates from grinding and sanding Grinding and sanding release tiny particles into the air that are quickly inhaled and also settle on the skin. The processes can also heat the metals involved and cause fumes. Always wear a respirator and wear protective clothing including goggles – it's easy for particulates to enter through your eyes.

BANNED MATERIALS IN THE METALSHOP

- » Galvanized steel
- » Lead and lead based products

SAFE SUGGESTIONS

Usage

- » Ensure proper ventilation.
- » Always be aware of the other people working in the shop.
- » Wear a respirator or mask when appropriate.
- » Wear eye goggles.
- » Wash hands and skin well with soap and water.

Disposal

- » Follow the metal shop technician's directions.
- » EPA Regulated hazardous waste; toxic heavy metals such as cadmium, chromium, lead, barium, silver, toxic organic solvents, flammable liquids, corrosives etc. The Institute requires that all regulated waste or hazardous process residuals must be properly segregated and placed in the designated container provided for waste in your area. If you are unsure about the waste resulting from your project work ask your technician to ensure proper disposal.
- » Blue/green barrel: recyclables that haven't been in contact with hazardous materials
- » Grey barrel: regular trash

Painting wouldn't be painting without paint, solvents, and varnish but...

Painting

MAJOR DANGERS

Inhalation of pigments, sprays, and fumes Powdered pigments, spray mist, and vapors are easily inhaled, often without notice. Even taking the lid off a pot of varnish and breathing in can cause damage. Do not rely on the strength of the smell to tell you if there is a potential danger. ALWAYS ventilate your studio. Spray painting may only be performed in an approved spraybooth and is not allowed in studios. Use PPE [Personal protective clothing and equipment] - Follow the recommendations suggested in the manufacturer's material safety data sheet or product safety literature and follow the safety guidelines in your shop or studio's guidance policy.

Accidental ingestion of paints, pigments, and solvents No one means to eat these things, but it easy to accidentally swallow small amounts simply by eating, drinking, or smoking in your studio, or by getting stuff on your hands then brushing your lips with it. Don't forget that your skin will absorb chemicals, too. —Not to mention that we already said not to eat, drink, or smoke when using chemicals —Pay attention!

LESS OBVIOUS DANGERS

Skin contact with paints and solvents SKIN ABSORBS CHEMICALS QUICKLY - Be careful using products and use protective clothing!

Water based paints They may seem harmless, but they still contain pigments, and even formaldehyde.

Odorless solvents Just because you can't smell the fumes, doesn't mean the stuff is safe!

WHAT WILL HAPPEN?

Pigments, paints, mediums, solvents, and varnishes all may contain toxic chemicals, some even contain lead and arsenic, as well as other toxic heavy metals. Varnishes and solvents are particularly dangerous because of their volatility. They evaporate and quickly permeate throughout a room, creating unsafe and unhealthy concentrations in air. Even something as harmless looking as water-based paint can contain trace amounts of formaldehyde, isocyanates and ammonia. Nearly all can cause dizziness, blurred vision, nerve damage, eventual kidney and liver damage, or, in extreme cases, chronic poisoning and death if used in a careless manner.

BANNED MATERIALS:

No turpentine or turpentine based products - use odorless mineral spirits instead.

SAFE SUGGESTIONS:

At the store

- » Buy paints that list the pigments contained - be doubly careful when you know there are ultra-toxic pigments involved.
- » Avoid flake white - it usually contains lead.
- » Don't make the mistake of thinking anything water based is automatically safe.
- » Replace turpentine with the less toxic and less flammable turpenoid or odorless mineral spirits. Gamblin GAMSOL is a 100% pure odorless mineral spirit. Eco-House makes citrus thinners and solvents, but remember they are still flammable.
- » Never buy solvents that include benzene, carbon tetrachloride, toluene, or xylene. Use the solvent petroleum naphtha provided at the cleaning stations.

In the studio

- » Ensure proper ventilation.
Never spray or use solvents.
- » Wear protective clothing - cover your hands and face in particular if you are spraying or using solvents.
- » Do not eat or drink in your studio.
- » Do not leave open containers of solvents or varnish - they will evaporate quickly and create unsafe and unhealthy working conditions.

Clean up

- » Use the brush cleaning stations in the studios.
- » NEVER USE SOLVENTS TO CLEAN YOUR SKIN! Avoid all skin contact.
- » Use soap and water and scrubby mitts or a loofah to clean hands and splatters.
- » Baby or vegetable oil is also good for cleaning.
- » When using solvents to clean surfaces, wear protective gloves.

Disposal

- » DON'T PUT ANYTHING DOWN SINKS EVER!
 - » EPA Regulated hazardous waste; toxic heavy metals such as cadmium, chromium, lead, barium, silver in paints or pigments, toxic organic solvents, flammable liquids, corrosives etc. The Institute requires that all regulated waste or hazardous process residuals must be properly segregated and placed in the designated container provided for waste in your area. If you are unsure about the waste resulting from your project work ask your technician to ensure proper disposal.
 - » Blue/green barrel: recyclables that haven't been in contact with hazardous materials
 - » Grey barrel: regular trash
-

Taking photos is the safest part of photography; at every step of the developing process, toxic and, or, corrosive chemicals may be involved.

Photography

MAJOR DANGERS

Inhalation of chemical vapors

You should be keenly aware that individual chemical substances have their own particular odors and rates of evaporation. You need to know that the combinations of chemicals necessary for different parts of the photo developing process often produce fumes resulting from chemical reaction. These fumes are strong enough to etch and ruin the glass on the enlargers - imagine what they could do to your lungs and tissues! Ventilation is necessary, as well as awareness of what is happening while you are mixing and using the chemicals. Use PPE [Personal protective clothing and equipment] - Follow the recommendations suggested in the manufacturer's material safety data sheet or product safety literature and follow the safety guidelines in your shop or studio's guidance policy. If breathing ever becomes uncomfortable, leave the darkroom and get fresh air at once, then report the incident to a technician.

Skin Contact with chemicals

Many photo developing chemicals and liquids are corrosive to the skin, or will cause irritation, not to mention their potential to be absorbed through your skin. Wear impervious chemically resistant gloves at all times, and avoid wiping your face or eyes while in the darkroom. Wash hands and skin thoroughly after any contact with chemicals or vapors.

LESS OBVIOUS DANGERS

Metals ONCE YOU GET SILVER OR OTHER METALS IN YOUR SYSTEM, THEY NEVER LEAVE. Putting your hands in fixing baths, may result in long term health effects. Wash hands and skin carefully after working in the darkroom.

Color developing Color developing is more toxic than black and white. Limit potential exposures – don't spend time in the room with the color processor in operation.

UV Light Sources UV light looks wonderful, but it is intense ionizing radiation - exposure to it can cause burns, cataracts, and blindness. Don't ever look directly at the light source, and keep skin exposure to a minimum.

DEVELOPING PROCESS AWARENESS

Mixing photo chemicals This is the first step in the developing process. Students at Pratt deal with stock solutions of concentrated photo chemicals. These are then diluted with water. Avoid all skin contact with concentrated chemistry and make sure to store all chemicals in clearly labeled, carefully sealed bottles. Remember that spilling a bottle is creating a chemical spill. All spills must be taken care of immediately. First, wash the area with plenty of water, let a technician know, and leave the darkroom area if fumes create a problem.

Developers Developers are a combination of a number of toxic chemicals. The most common developers used are Dektol and D76. They contain chemicals that can cause eye injury, skin irritations, and allergic reactions that may result in upper respiratory distress, and all of them are hazardous if ingested. It very important not to eat, drink, or smoke in the darkroom. Go to the eyewash station if you get splashed.

Stop baths Stop baths are weak solutions of acetic acid, which can cause dermatitis and ulcers. It is highly toxic by inhalation, ingestion and skin contact. Potassium chrome alum is also present and is highly toxic by skin contact and inhalation - it is corrosive to bronchial tissue and membranes. If your nose is burning, you need to dilute the solution more and go and get fresh air! Always wear gloves or use tongs.

Fixing baths

Always add acid to water (not the other way around) to avoid generating gasses, aggressive chemical reactions or splash. Fixer solution takes the silver residue out of the prints and film, thus fixing baths contain silver, a regulated toxic heavy metal - avoid all contact. Silver is also an EPA regulated hazardous waste and must be disposed of properly. Spent fixers must be treated in the silver recovery cartridges located in the lab areas. The silver will be reclaimed and beneficially reused, plus you will have prevented a source for water pollution. The main component in fixers is sodium thiosulfate, which is toxic by ingestion. Sodium thiosulfate decomposes in the bath over time to allow for the release of sulfur dioxide, which is highly toxic by inhalation. Hydrogen Sulfide can be formed as well. Boric acid is also used and is moderately toxic by ingestion and inhalation. Always wear gloves or use tongs when working with these solutions.

Non-silver processes

Any student taking a non-silver class will come into contact with a variety of new chemicals with their own particular hazards. Hydrochloric acid is a skin corrosive when in highly concentrated form. Potassium and ammonium dichromates used are known carcinogens. Chromium is also regulated as a hazardous waste and must be properly disposed of. Ammonia is highly toxic by inhalation and sodium sulfite with ingestion. Potassium ferricyanide is not toxic by itself but if heated or mixed with acids will release hydrogen cyanide, which is extremely poisonous. If you are making photo developing formulations that use any chemicals, you must at a minimum wear chemically resistant gloves, an approved acid inorganic fume or mist cartridge respirator, and an apron. Avoid anything (such as eating) that may lead to accidental ingestion. When using the UV lightsource, never look at it directly as it may cause permanent eye damage.

Toners

Toners are particularly toxic. Selenium is a skin and eye irritant that can also cause kidney damage. Sulfide toners are dangerous because of the risk of emitting highly toxic dihydrogen sulfide gas. Always use tongs or wear gloves and watch out for fumes.

SAFE SUGGESTIONS:

In the darkroom

- » Always ask your technician if you have any questions, have concerns about materials you are using, or are feeling unwell.
- » Pregnant students/ women planning to become pregnant should completely avoid photographic chemicals.
- » Ventilation is paramount.
- » Get fresh air regularly - get out of the darkroom at least every two hours.
- » Always use impervious chemically resistant gloves at all times or tongs (never use your hands!).
- » Wash hands and exposed skin regularly with soap and water as splashes and accidental contact do occur regularly.
- » Wear gloves, especially with non-silver processes. Wash them carefully.
- » Do not breathe directly over chemicals while they are being mixed or used.
- » Use a respirator for non-silver processes and if you are sensitive to other photo processes.
- » Do not eat or drink in the darkroom - you will ingest chemicals even if you don't taste them.
- » Be prepared for chemical reactions - know what you're mixing!
- » Wash towels often (remember when you're wiping your hands that the chemicals build up).

- » Always shower carefully after long hours in the darkroom (fumes and splashes will stick to, then be absorbed by your skin).
- » FOLLOW TECHNICIAN'S INSTRUCTIONS CAREFULLY

Disposal

- » Follow technicians' instructions on disposal procedures.
- » Be sure to read all signs posted.
- » Do not automatically throw stuff in the trash - when in doubt about where to dispose of something, bring it to the tech room.
- » EPA Regulated hazardous waste; toxic heavy metals such as cadmium, chromium, lead, barium, silver, toxic organic solvents, flammable liquids, corrosives etc. The Institute requires that all regulated waste or hazardous process residuals must be properly segregated and placed in the designated container provided for waste in your area. If you are unsure about the waste resulting from your project work ask your technician to ensure proper disposal.
- » Blue/green barrel: recyclables that haven't been in contact with hazardous materials
- » Grey barrel: regular trash
- » Purple barrel: hazardous or obsolete photo materials

MSDS

Material Safety Data Sheets are available if you have questions about the chemical content of the materials you will be using.

Over one hundred toxic and noxious substances are commonly used in traditional printmaking media.

Printmaking

MAJOR DANGERS

Inhalation of fumes and dusts

Make sure your workshop is well ventilated before beginning any processes. Some fumes are nearly odorless, so the damage can be done before you're aware you have been exposed. Exposure, however, will lead to dizziness and headaches, and long term exposure can lead to blood, liver, kidney, and nervous system damage. In the short term, fumes and dusts are lung irritants and can bring on asthma.

Skin contact

The crayons, acids, emulsions and pigments used in printmaking can lead to skin cancer, as well as causing other damage through absorption. Direct emulsions also involve ammonium dichromate and chlorine bleaches during removal procedures. Both of these chemicals are skin, eye and respiratory tract irritants. Wear protective clothing, use gloves, and wash your hands with soap and water after using any media. Lead pigments, which are highly toxic, are more common in printmaking than in most other mediums. These include chrome yellow, chrome green, milori green and molybdate orange. Lead is quickly absorbed into the body and direct contact with it should be completely avoided.

PRINTMAKING TECHNIQUES

All of these techniques can be made safer with proper ventilation, gloves, and thorough washing of hands and exposed skin after processes.

Intaglio

The biggest health hazard in intaglio is acid etches, especially nitric acid etching of zinc, which produces the highly toxic nitrogen dioxide gas. In addition, etching grounds contain naphtha and methylbenzene, which can cause convulsions and lung damage.

Lithography

Lithographic crayons may contain carbon and lamp black, both of which are suspected of contributing to causing skin cancer. Whenever possible, use commercially prepared etches to avoid handling concentrated acids necessary in preparing your own. Resin dust, also common in lithographic processes, can bring about asthma. Talcs containing asbestos should always be avoided.

Silkscreen

While solvents pose the greatest health hazard in silk screening, lacquer stencils are also hazardous. Diazo photoemulsions are a much safer alternative.

Photo etching

These involve a number of highly toxic solvents such as ethylene glycol and monomethylene glycol, ether acetate, which can lead to blood, liver, and nervous system damage through inhalation and skin contact.

SAFE SUGGESTIONS

At the store

- » Always buy the least toxic pigments available.
- » Use adhesive based contact paper.
- » Use water based silk screen inks.
- » Use biodegradable developers.

In the printshop

- » Pregnant women should avoid printmaking classes because of the chemicals involved in the processes.

- » Ensure proper ventilation – even if you don't smell anything.
- » Pleasant smells are not necessarily always a good thing - Be sure to provide for adequate ventilation even if you like the smell!!!
- » Wear protective clothing.
- » Wear gloves when using oil-based products.
- » Do not wear contact lenses in the shop.
- » When using the resin box, wear a mask and eye protection.

- » Make sure you know where the emergency eyewash station is in the shop.
- » Do not take food or drinks into the shop (to avoid accidental ingestion).
- » Wash hands and exposed skin often with soap and water - do not let chemicals dry on your skin.

Clean-up and disposal

- » DO NOT PUT ANYTHING DOWN SINKS OR DRAINS.
- » All plates and tools must be washed in the specialized recycling machines - see your technician.
- » Rags may also be used to wash off plates, but if they contain concentrated levels of chemical residues that can be defined as regulated hazardous waste they need to be collected and segregated and then placed in the area designated hazardous waste container to ensure proper disposal.
- » Don't throw anything with inks or chemicals on it or in it into the regular trash - put it in the designated hazardous waste container.

- » EPA Regulated hazardous waste; toxic heavy metals such as cadmium, chromium, lead, barium, silver, toxic organic solvents, flammable liquids, corrosives etc. The Institute requires that all regulated waste or hazardous process residuals must be properly segregated and placed in the designated container provided for waste in your area. If you are unsure about the waste resulting from your project work ask your technician to ensure proper disposal.
- » Blue/green barrel: recyclables that haven't been in contact with hazardous materials
- » Grey barrel: regular trash

RECOMMENDED ALTERNATIVES

- » Use water-based inks - AquaGraphic and the Green Drop Ink Company put out a wide variety.
- » Use ecologically safe zinc plates - available from Revere Metals.
- » Use condensed milk on copper or zinc plates.
- » Use Speedball Art Products Co.'s Diazo Photo Emulsion.

For more information on safe printmaking, go to Keith Howard's Non-Toxic Printmaking Page at www.mtsu.edu/~art/printmaking/non_toxic.html

Sculptors have a world of materials to work with, hence more to watch out for.

Sculpture

MAJOR DANGERS

Dusts and free silica

ALWAYS be mindful of the dust created when sculpting - wear a mask and eye protection!

Plaster dust, also known as calcium sulfate, is an eye and respiratory tract irritant.

Clay dust contains free silica. Inhalation of free silica leads to silicosis, a form of emphysema that causes shortness of breath, an increased susceptibility to infections and lung scarring. The chance of inhaling the dust is greater when mixing dry powders rather than wet clay. Oil based clays are significantly less hazardous for this reason. See the Ceramics Section for more detailed information.

Sawdust from wood is the biggest single hazard when working with wood. It can cause cancer and chronic respiratory diseases. See Woodworking for more detailed information.

Stone dust can also contain free silica that can lead to silicosis. There are many stones that contain large amounts of free silica such as: quartz, granite, sandstone, brownstone, slate, jasper, opal, amethyst, onyx and soapstone. Soapstone, serpentine and greenstone also contain asbestos, which is very harmful if inhaled.

Heating and melting of waxes and sheet plastics

ALWAYS avoid overheating and burning of waxes and plastics as it can result in the release of toxic gasses from chemicals trapped inside. Overheating of wax is a common occurrence in wax sculpture, but heating it to a point when it becomes flammable runs the risk of emitting vapors that are respiratory irritants. Chlorinated waxes are extremely dangerous, as the toxic components can lead to skin disease, liver damage and possible reproductive damage as well. For this reason, they should never be used. Also be wary of using solvents around plastics - they will often melt upon contact and release vapors. Always ventilate well when using wax and plastic processes, and wear a respirator when appropriate.

Foam

Never heat, burn, or expose foam (polystyrene, styrofoam etc.) to solvents.

Laminating and casting with resins

Resins and catalysts are highly dangerous and reactive. Their safe and proper use is taught in the plastics technique class. Resins emit toxic fumes and are hazardous when in contact with skin. Methyl methacrylate is a common material used for casting and laminating. It is a skin irritant and its vapors can cause nausea, headaches and lowering of blood pressure. Additives used in the laminating process usually contain fiberglass, which is very irritating to the skin and can cause fine cuts, aiding in further exposure to other chemicals. Glass fibers can also become airborne and cause respiratory complications. Always use an approved respirator, and wear eye protection and impervious gloves when using resins and glass cloth.

LESS OBVIOUS DANGERS

Plaster

Plaster looks harmless, but as well as the nuisance dust hazard, there may be potassium sulfate, potassium aluminate and borax present, which are all slightly toxic by ingestion. It also contains calcium oxide, or burnt lime, that is reported to be moderately corrosive by skin contact and highly toxic by inhalation or ingestion.

Glues, cements and solvents

Glues and cements used to bond plastics usually contain toxic chemicals as well. Because you will be working close-up while gluing, be aware of the permissible exposure levels for the concentrations of toxic organics that these glues and adhesives may contain - avoid all skin contact. Solvents (which are used to remove wax) usually contain a variety of toxic chemicals. See the Painting Section for details on solvents.

BANNED MATERIALS

- » Turpentine and turpentine based products
- » Pressure treated lumber

SAFE SUGGESTIONS

Usage

- » Ensure proper ventilation.
- » Use dust masks, respirators and eye protection when appropriate.
- » Wear protective clothing.
- » Use spray booth for all spraying.
- » Watch out for dusty areas and don't put dust into the air - work wet when possible.
- » Work with stones that contain the least amount of free silica.
- » Be aware of the students around you - will their processes affect you?
- » Never use chlorinated waxes.
- » Use a kneading eraser to remove wax instead of toxic solvents.
- » Work with commercially available or "finished" plastic whenever possible, since producing plastic involves the use of many toxic chemicals.
- » Wash hands with soap and water, and wash skin that has been exposed to dust.

Disposal

- » EPA Regulated hazardous waste; toxic heavy metals such as cadmium, chromium, lead, barium, silver, paints, paint filter media, toxic organic solvents, flammable liquids, corrosives etc. The Institute requires that all regulated waste or hazardous process residuals must be properly segregated and placed in the designated container provided for waste in your area. If you are unsure about the waste resulting from your project work ask your technician to ensure proper disposal.
- » Blue/green barrel: recyclables that haven't been in contact with hazardous materials
- » Grey barrel: regular trash

RECOMMENDED ALTERNATIVES

- » American Art Clay Co.'s AMACO carving wax
- » Activa Products Art Plaster
- » Jiffy Foam, Inc. Balsa-Foam
- » Aqua-based resins

Every year, 7 in every 10,000 woodworkers contract nasal cancer—protect yourself by wearing proper respiratory protection!

Woodworking

MAJOR DANGERS

Sawdust

Chronic inhalation of sawdust is the biggest hazard involved in woodworking. It causes cancer and chronic respiratory diseases. 7 in 10,000 woodworkers annually contract adenocarcinoma, a particular type of nasal cancer. All sawdust can cause respiratory damage. Symptoms include nosebleeds, shortness of breath, sweating, fever and chills, and heart disturbance. Many wood species contain natural toxins, while others are not toxic by themselves but are "sensitizers" and may make you more susceptible to reactions to allergens present in other woods. Ask your technician about the particular species you are working with, and pay attention to any situation you suspect of causing adverse health effects or allergic reactions. Wear protective clothing, eye protection, and a mask when doing anything that will create sawdust.

Inhalation, ingestion, and skin contact with wood glues

All glues potentially contain toxic substances and must be used carefully.

Plywood glues, like most glues, often contain formaldehyde resins which are highly toxic by inhalation, eye contact and ingestion. Skin contact should be avoided as formaldehyde is a known carcinogen.

Dry casein glues are highly toxic by inhalation and ingestion as they contain sodium fluoride and alkalis.

Contact adhesives contain hexane, which is highly toxic through chronic inhalation. It has been known to cause serious nerve damage. Adhesives may also contain harmful levels of flammable and toxic solvents.

Epoxy glues are moderately toxic by inhalation and also through skin and eye contact. They include amine hardeners, Bisphenol A type resins and trace levels of epichlorohydrin, which cause skin allergies, asthma and respiratory problems.

Cyanoacrylate glues are moderately toxic through skin and eye contact.

Water-based glues are slightly toxic through skin contact and inhalation. Always try to substitute less toxic glues, ventilate well, and remember to wash hands after use.

Paintstrippers and finishes

Paintstrippers manufactured using toxic or flammable solvents are only permitted for use in extreme situations. Unless the proper engineering controls are available to ensure safe working conditions these materials are not approved for use. There are many formulations available that are less or non-toxic alternatives. If you have a project that requires the use of a paint stripper see the shop technician for guidance.

Shellac used for painting woods, usually contains ethyl alcohol and methyl alcohol, which are slightly toxic and moderately toxic respectively. Remember that they evaporate quickly, so only use in a well-ventilated area. For additional hazards involved with painting or surface coating applications, please see the Painting section.

Other people

Just because you might not be engaging in a hazardous process, doesn't mean the person behind you isn't. Always be aware of what's going on around you, and use and wear protective equipment when sawdust or vapors are being created. Be considerate of the health and safety of people around you Communicate any known chemical or physical hazards that your project has the potential to create!

LESS OBVIOUS DANGERS

Wood preservatives and plywood

Toxic preservatives also cause harm to woodworkers. In particular pentachlorophenol, creosote and arsenic compounds have all been banned in the U.S. because they are so hazardous. However, they can still be found in some older woods. Arsenic is present in all pressure treated wood, hence it has been banned on campus. Plywood and most ply products contain formaldehyde, which can bring on asthma and lead to cancer. Wash your hands well after using it.

Foam

Toxic gasses are released when cutting foam with hot wire - ventilate well! Also, never expose foam to solvents. Thermal or chemical decomposition may allow for the release of carcinogens and hazardous air pollutants such as styrene, acetylonitrile, butadiene and formaldehyde.

BANNED MATERIALS IN THE WOODSHOP

- » Pressure treated wood (arsenic is the main preservative)
- » Turpentine and turpentine based solvents
- » Some woodshops on campus have banned all oil-based products.

SAFE SUGGESTIONS

Usage

- » Ensure proper ventilation - have air blowing from behind NOT towards you.
- » Wear a properly maintained 2-strip mask or respirator. Make sure not to leave it lying around the shop in between uses.
- » Wear protective clothing.
- » Use disposable latex or vinyl gloves when using finishing products.
- » Avoid working with woods that are preserved with toxic chemicals - consult your technician.
- » When buying wood, particularly old wood, find out about it and protect yourself accordingly. Remember that the wood could have been in contact with toxic contaminants (find out what it was used for and where it was stored previously).
- » Avoid glues that contain formaldehyde.
- » Properly store all paints, finishes, solvents, etc., in carefully labeled, sealed containers.
- » Don't eat, drink or have open containers in the shop.

- » Wash hands thoroughly with soap and water after handling woods and glues, etc.

Disposal

- » EPA Regulated hazardous waste; toxic heavy metals such as cadmium, chromium, lead, barium, silver, paints, paint filter media, toxic organic solvents, flammable liquids, corrosives etc. The Institute requires that all regulated waste or hazardous process residuals must be properly segregated and placed in the designated container provided for waste in your area. If you are unsure about the waste resulting from your project work ask your technician to ensure proper disposal.
- » Blue/green barrel: recyclables that haven't been in contact with hazardous materials
- » Grey barrel: regular trash
- » If you're not sure where a particular product or material should go - ask your technician.

RECOMMENDED ALTERNATIVES

- » Use Delta Technical Coatings Woodwiz.
- » Use Elmer's Products puts out a variety of safe wood glues and fillers.
- » Use Durham Rock Putty.
- » Use water-based glues whenever possible, but remember to still be careful with them.
- » Use water-based finishes.

Glossary

1,1,1 Trichloroethane 1, 2

1,1,1 Trichloroethane is a chlorinated solvent that is non-flammable in liquid form but can explode when ignited in vapor form. It is a skin and mucous membrane irritant and can depress the central nervous system and respiratory track. Inhaling vapors can cause dizziness, suffocation and skin and eye burns. It is also an ozone depleting substance and is banned for use.

Acetic Acid 1

Also known as glacial acetic acid.

A colorless liquid or solid with a pungent, vinegar-like odor that is manufactured from petroleum for industrial use. Acetic acid can depress the central nervous system and cause irritation to the eyes, dermatitis and skin ulcers.

- 1** EPA Regulated Hazardous Waste
- 2** EPA known carcinogen
- 3** Persistent Bio-Accumulator Toxins (PBTs)
PBTs are a class of toxins that accumulate in fat tissue. Therefore, even low-exposure to PBT are hazardous as the health effects develop and increase over time.

Acetone 1

Most commonly found in nail polish remover, it is also used as a solvent. Acetone is a clear liquid with a sweet, pungent odor. Chronic low exposures usually don't pose a high risk, but in high concentrations it can cause eye and mucous membrane irritation, headaches and dizziness. Ingestion brings about diabetes-like symptoms. Some people are allergic to acetone by skin contact and usually develop dermatitis.
LD50, oral, rat, 10.7 ml/kg.

Alcohol (ethyl alcohol, ethanol) 1

LD50, young rats, 10.6 g/kg;
Old rats, 20.6 g/kg. Human toxicity; nausea, vomiting, stupor, coma, death.

Aluminum

The most abundant metal in the Earth's crust, aluminum does not dissolve readily in neutral water. Exposure to aluminum dust can lead to lung disease. Through ingestion, it can cause kidney damage. Although not yet proven, it is widely believed that aluminum is a factor in the development of Alzheimer's disease.

Ammonia 1

Ammonia is a colorless gas, less dense than air, with a strong odor. At high concentrations, it can be explosive in the air. It is a skin, eye and respiratory tract irritant. Ingestion can cause corrosive effects to the mouth, throat and stomach. Inhaling concentrated ammonia fumes may be toxic and lead to asphyxiation. Direct eye contact with concentrated ammonia gas or liquid will cause immediate serious irreversible damage.

Antimony and Compounds 3

Antimony is a silvery-white metallic element that is often alloyed with other metals. It is a highly acute toxic that causes skin rashes, eye conjunctivitis and gastrointestinal damage if ingested. Chronic exposure to antimony will result in respiratory and cardiovascular damage, such as shortness of breath and increased blood pressure.

Arsenic and Compounds 1,2

Arsenic is a metallic-like substance that is processed to a white powder. Its toxicity depends on its form, with inorganic arsenic being more toxic than organic arsenic. Arsenic and selenium are antagonistic toxins; exposure to one reduces the adverse effects of the other. The most dangerous effects are lung cancer from inhalation and skin cancer from ingestion. Poisoning can result from chronic, low-level exposures. Acute arsenic poisoning causes severe stomach damage and death.

Asbestos 2

NY State regulated waste/ EPA Toxic Substances Control Act/ Clean Air Act

NESHAPS- National Emission Standards for Hazardous Air Pollutants. Asbestos is a broad term applied to a group of naturally occurring fibrous compounds. The fibers are small, odorless and can be suspended in the air to travel long distances. The main route of exposure is inhalation and can cause lung and bowel cancer as well as non-cancerous lung diseases.

Barium Compounds 1

Barium is a silvery-white, shiny metal that burns in the air and acts violently with water. Due to its high reactivity it is always found as a compound. If barium is absorbed it can cause strong and prolonged muscle contractions, including the digestive tract and the heart. Barium chloride is the most toxic of the barium compounds. However, in order for ingestion of barium carbonate to be life threatening, 15 grams would have to be ingested.

Benzene 1, 2

Also known as naphtha. Benzene is a clear, highly volatile, colorless liquid that is widely distributed in air and water. Dangerous chemical reactions result when it is mixed with oxidizing agents such as chlorine, liquid oxygen and sodium peroxide. Exposure can lead to respiratory tract irritation, dermatitis and eye irritation. If benzene is aspirated into the lungs it can cause the lungs to hemorrhage. Acute exposure through ingestion or inhalation depresses the nervous system and can cause death. EPA classifies benzene as a known human carcinogen. *LD50, oral, rat, 3.8ml/kg.*

Boric Acid

Crystalline solid, LD50, oral, rat 5.14g/kg
Human Toxicity – Acute LD 5-20g in adults chronic – dry skin, eruptions, gastric disturbances.

Cadmium and Compounds 1

Cadmium is a soft, silvery metal that maintains its luster when exposed to the environment. At high concentrations, inhaled cadmium is associated with lung cancer. Chronic exposure to low levels can lead to severe lung, heart, kidney and liver disease as well as skeletal weakening. Ingestion of food heavily contaminated with cadmium compounds causes vomiting, diarrhea and occasionally shock.

Carbon Black

Carbon black is a powder that is nearly pure carbon, most often used in newspaper ink. There are no health hazards involved with inhaling or ingesting small amounts of carbon black. However, simultaneous exposure to aromatic hydrocarbons can lead to health problems. Studies have shown it causes cancer in rats.

Carbon Tetrachloride 1

Carbon tetrachloride is a clear, colorless liquid with a sweet smell. It was removed from the consumer market once infor-

mation about its toxicity was known. However, it is still present in industry. Adverse effects are seen through inhalation, ingestion or skin contact with the liver, kidneys and lungs most affected by overexposure. Inhalation of high doses can be fatal. Liquid carbon tetrachloride splashed in the eye causes painful but minimal damage. EPA considers carbon tetrachloride a probable human carcinogen. Although not yet proven, it is widely believed that pregnant women exposed to carbon tetrachloride vapors may risk damage to the fetus.

LC50, mice, 9528 ppm.

Chlorine 1

Chlorine is greenish-yellow gas with a pungent smell. It is very reactive, combining with most elements to form compounds. In high concentrations, chlorine is a strong irritant to mucous membranes in the eyes, nose, throat and lungs. It can cause coughing, headaches, dizziness. Severe exposure can be fatal by causing the airways to close.

Chloroform 1, 3

Chloroform is a liquid solvent that smells and tastes sweet. It is not volatile and evaporates quickly. At very high doses, chloroform is a narcotic. Chronic exposure to high but not life threatening levels can lead to fatigue, blurred vision, and liver and kidney damage. EPA considers chloroform a probable human carcinogen.

LD50, oral, rat, 2.18 ml/kg; 0.9 ml/kg

- 1** EPA Regulated Hazardous Waste
- 2** EPA known carcinogen
- 3** Persistent Bio-Accumulator Toxins (PBTs)
PBTs are a class of toxins that accumulate in fat tissue. Therefore, even low-exposure to PBT are hazardous as the health effects develop and increase over time.

Chromium 1, 3

Chromium is a naturally occurring element in the soil and volcanic dust. Exposure occurs from inhalation and ingestion. In small amounts, chromium is believed to be essential for a proper diet. However, there are various types of chromium compounds and some are known carcinogens.

Cobalt

Cobalt is a shiny, gray metal that occurs in nature. Everyone is exposed to cobalt at low levels in the air, water and food. It is healthy in these small amounts but high level exposure can cause asthma, pneumonia and vomiting. Cobalt has been shown to cause cancer in animals. Toxicity problems can be due to Cobalts.

Creosote 1

Creosote is a flammable, heavy, liquid with a sharp smell. Direct skin contact and exposure to vapors can cause burning, itching, discoloration and ulcers. Acute exposure can cause headaches, vomiting, respiratory difficulties and even death. EPA considers creosote a probable human carcinogen.

Hydrogen Cyanide 1

Cyanide is often found as a compound and in vapor form, especially with hydrogen. It is toxic by inhalation and ingestion. Acute high-level exposure causes depression of the central nervous, respiratory and cardiovascular systems. Brief low-level exposure will cause changes in breath and convulsions. People who are

chronically exposed to cyanide can suffer deafness, vision loss and muscle damage.

Ethylene Glycol- NY State Regulated

Also known as ethylene alcohol

Ethylene glycol is a clear, colorless, liquid with a sweet taste. At room temperature, ethylene glycol is not a serious health threat but when heated produces harmful vapors. It causes no significant skin irritation but is extremely dangerous when swallowed. If the exposure is large enough through inhalation or ingestion, convulsions and coma will occur.

Formaldehyde 1

Formaldehyde is a colorless gas that has a pungent odor. It is a strong eye and respiratory tract irritant. Acute exposure to formaldehyde vapors can cause abdominal pain, depression of the nervous system, convulsions and coma. The EPA considers formaldehyde a probable human carcinogen. Formaldehyde solution (formalin).

Hydrofluoric Acid 1

Fluorine is a highly reactive, yellowish green gas. Hydrofluoric acid causes severe burns on contact, and will penetrate the skin to attack underlying bone calcium, respiratory damage if inhaled and eye irritation.

Hydroquinone

Hydroquinone is a white, crystalline phenol. Ingestion can lead to ringing in the ears, nausea, dizziness, difficulty breathing and other ailments. A large

dose is lethal. Repeated skin contact with hydroquinone causes dermatitis. Chronic exposure can lead to discoloration of the eyelids and iris. It has been found to cause bladder cancer in animals. *LD50, oral, rat, 320mg/kg.*

Lead 1, 3

Lead is a soft, grayish metal that is transported mainly through the atmosphere. Lead affects the nervous system, kidneys, reproductive system, production of blood cells. Blood and the nervous system are the most often affected from exposure. Children and pregnant women are at greatest risk for lead poisoning.

Lithium 1

Lithium is a soft, silvery-white metal that turns yellow when exposed to the air or moisture. It is flammable and can cause violent combustion. Lithium is toxic by inhalation and ingestion causing damage to the respiratory and gastrointestinal tracts. It is also corrosive to the eyes and skin.

Manganese

Manganese is an odorless, silvery, hard metal that when in dust or powder form is highly flammable. It is commonly found as a compound. Manganese causes irritation to the

eyes, nose, throat and respiratory tract if inhaled for a short time. Chronic exposure can cause damage to the central nervous system with symptoms similar to Parkinson's disease.

Mercury 1, 3

Mercury is a heavy, silvery-white metal. It is the only metal that is in liquid form at room temperature. Inhaled mercury vapor causes damage to the nervous system, memory loss and emotional instability. Liquid mercury also affects the nervous system, especially in developing fetuses.

Methanol 1

Methanol is a colorless liquid that explodes when exposed to an open flame. It is toxic by inhalation and skin absorption, causing headaches, sleep disorders and optic nerve damage. If ingested, methanol can cause damage to the central nervous system.

Methylene Chloride 1

Methylene chloride is a colorless, volatile liquid that decomposes into carbon monoxide in the body. Once inhaled, it is readily absorbed inside the lungs where it is distributed throughout the body and crosses the blood-brain barrier. Absorption through ingestion and skin contact is much slower but can cause skin burns. Acute exposure can cause fatigue, nausea, and liver and nervous system damage. The EPA classifies methylene chloride as a probable human carcinogen. *LD50 oral, rat, 1.6ml/Kg*

1 EPA Regulated Hazardous Waste
2 EPA known carcinogen
3 Persistent Bio-Accumulator Toxins (PBTs)
 PBTs are a class of toxins that accumulate in fat tissue. Therefore, even low-exposure to PBT are hazardous as the health effects develop and increase over time.

Methyl methacrylate

Ethylene Glycol Monomethyl Ether Acetate. Human toxicity may cause anemia, macrocytosis, CNS symptoms.

Mica

Mica is an odorless, often transparent solid. There are no health hazards associated with short-term exposure. However, chronic exposure can cause lung irritation and scarring.

n-hexane 1

n-hexane is a flammable, colorless liquid with a mild gasoline-like odor. Inhalation of n-hexane can cause mild central nervous system damage and skin and mucous membrane irritation. Chronic exposure can lead to muscle weakness, blurred vision and headaches. *LC, mice, air ~ 40,000 ppm.*
LD50, oral, rat, 49.0 ml/kg.

Nickel

Nickel is a hard, silvery metal. Some people are allergic to nickel and symptoms will occur through skin contact. Inhalation of nickel can also be harmful.

Nitric Acid 1

Nitric acid is corrosive and poisonous. In vapor form it is a strong irritant to the mucous membranes of the eyes and the respiratory tract. It is also a skin irritant causing burns. It may be fatal if inhaled, swallowed or even absorbed through the skin.

Pentachlorophenol 1, 3

Pentachlorophenol is a colorless crystal that is extremely toxic by ingestion, causing circulatory and heart failure leading

to death. Chronic exposure leads to damage of the respiratory tract, liver, blood, kidneys, eyes, nose and skin. EPA considers pentachlorophenol as a probable human carcinogen.

LD50, oral, m, t rate, 0.146, 0.175 g/kg.

Phenol

Phenol is a toxic chemical by all routes of exposure including dermal exposure. It is highly corrosive to the skin and a strong irritant to the eyes, nose, throat and tissue. *LD50, oral, rat, 0.530 g/kg.*

Selenium 1, 3

Selenium is a metalloid that is required in small amounts for human health, but in large quantities can be toxic. Selenium has anticancer properties and can also reduce the toxicity of cadmium and mercury. Although acute poisoning of selenium is rare, after a few hours it can cause nausea, vomiting and diarrhea.

Silica (Silicon Dioxide)

Silicon dioxide is one of the most common materials found in the earth's crust. It counts for roughly sixty percent of the elements in clay. Through inhalation, it causes silicosis, a chronic, disabling disease of the lungs. It can also cause lung cancer.

Styrene 1

Styrene is a colorless, oily liquid with a sweet odor. It is readily absorbed through all routes of exposure and tends to store in fatty tissues. Acute exposure causes eye and mucous membrane irritation, dizziness, and even death due to

respiratory system paralysis. EPA classifies styrene as a Class C carcinogen which means that the evidence is limited but suspicion remains.

LD50, 0.660 g/kg dp, 0.090 g/kg mouse

Sulfuric Acid 1

Sulfuric acid is an oily liquid that irritates and burns the skin. Upon contact with the eyes it can cause blindness. Inhaling sulfuric acid will irritate the lungs and if the exposure is especially high, cause liquid to build up in the lungs. Chronic exposure can lead to bronchitis, emphysema and erosion of the teeth.

Toluene 1

Toluene is flammable and may cause irritation of the skin, respiratory tract and eyes. It is also slightly toxic by ingestion. Narcotic in high concentrations.

LD50, oral, 7.53 g/kg, rat.

Trichlorethylene 1

Trichlorethylene is a colorless, volatile, nonflammable liquid with a sweet odor. It is easily absorbed when inhaled and once it is in the bloodstream it is distributed throughout the body, concentrating in fat tissue, kidneys, lungs and brain. It is a narcotic at high doses and produces headaches, dizziness and fatigue after inhalation. At extremely high concentrations, it can cause

death. It is easily transferable to the fetus. EPA classifies trichlorethylene as a probable human carcinogen.

LD50, oral, rat, 4.92 ml/kg.

LC, rat, 8,000 ppm.

Turpentine

Turpentine is a colorless liquid with a strong odor. On contact it irritates the eyes. If turpentine is inhaled, coughing and wheezing will result. Chronic exposure to turpentine causes skin allergies, lung irritation, kidney damage, gastrointestinal irritation, delirium and coma.

Xylene 1

Xylene is a flammable solvent. If inhaled it may cause headaches and nose and throat irritation. It is toxic by ingestion and can cause central nervous system depression. Contact can cause skin and eye irritation.

LC50, rat, 6700 ppm/4hr.

Zinc and Compounds 3

Zinc is a soft, bluish-white metal that combines with other metals to form alloys. Although it is required for human health at certain levels, over consumption may impair heart function. When heated, zinc oxide fumes are created that if inhaled can lead to metal fume fever.

1 EPA Regulated Hazardous Waste
2 EPA known carcinogen
3 Persistent Bio-Accumulator Toxins (PBTs)
 PBTs are a class of toxins that accumulate in fat tissue. Therefore, even low-exposure to PBT are hazardous as the health effects develop and increase over time.

There's always more to learn...

Internet Resources

MSDS's on the Internet	Cornell Center for Materials Research Computing Facility. Material Safety Data Sheet Information and Web Links. <i>http://www.msc.cornell.edu/helpful_data/msds.html</i>
MSDS Online	Access material safety data sheets. Free searches for products, manufacturers, and specific chemicals. <i>http://www.msdsonline.com/</i>
MSDS–Search 2000	Find Material Safety Data Sheets with Information that covers hazardous ingredients, health effects, fire data and first aid procedures. <i>http://www.msdssearch.com/</i>
Material Safety Data Sheets	Learn what a typical data sheet has to teach about a substance and link to a variety of material safety sheet resources. <i>http://www.che.ilstu.edu/ChemSafety/msds.htm</i>
Vermont SIRI MSDS Collection	Create or locate material safety data sheets, hunting by names and manufacturer or with the search engine. Get other safety–related links. <i>http://hazard.com/msds</i>
NWFSC MSDS Search	Northwest Fisheries Science Center listings and search engine. <i>http://research.nwfsc.noaa.gov/msds.html</i>
HazCom Standards	For further information about 29 CFR 1910.1200 HazCom Standards, please log on to: <i>http://www.osha-slc.gov/OshStd_data/1910_1200.html</i>

EPA	Environmental Protection Agency. Government agency furnishes extensive resources in environment-related information, including news, legislation, test methods, and data. <i>http://www.epa.gov/</i>
OSHA	Occupational Safety and Health Administration site. Includes news, statistics, publications, regulations, standards, and reference/resources. <i>http://www.osha.gov/</i>
NIOSH	National Institute for Occupational Safety and Health. Includes NIOSH services, publications, research, news, job vacancies, and directory. <i>http://www.cdc.gov/niosh/homepage.html</i>
ANSI	American National Standards Institute. Official US standards body offers news and other information from the Information Infrastructure Standards Panel. <i>http://www.ansi.org/</i>

Credits:

The introduction and discipline specific information in this booklet were written by Lol Fow, Director of Writing Across the Curriculum at Pratt Institute. The text is based on research and text by Jenifer Roth, a recent graduate from Pratt's Center for Planning and the Environment, which she undertook with the support of the Campus Environmental Concerns Committee (C.E.C.C.) Jenifer Roth's research was made possible by the generous support of the National Wildlife Federation and INFORM, Inc. Subsequent research and information was collected by Lol Fow with the help of Pratt Institute's technical staff; special thanks to Jenny Lee. The glossary and link information were written by Jenifer Roth.

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IN CASE OF EMERGENCY

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