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photography

print making

metal working

drawing

painting

jewelry making

ceramics

calligraphy

wood working

printing

Environmental Health & Safety in the Arts: A Guide for K-12 Schools, Colleges and Artisans

Proper Management of Waste and Residuals from Art Studios and Shop Practices

ENSR | AECOM

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This compliance assistance project was undertaken in connection with a settlement of an enforcement action taken by EPA against Pratt Institute for alleged violations of the regulations governing wastes.

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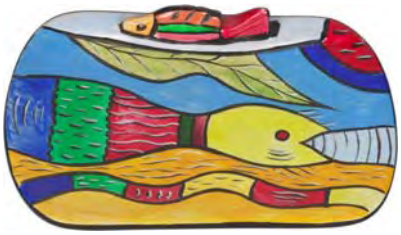
FOREWORD AND ACKNOWLEDGEMENTS



FOREWORD

Dear Educator for the Visual Arts,

This publication has been prepared as a supplemental environmental project in conformance with a compliance agreement with the United States Environmental Protection Agency (U.S. EPA). It has been prepared to assist you in complying with the Federal Hazardous Waste Management Regulations.

Note: This document focuses on the federal hazardous waste management requirements. State and local government entities may have requirements that are different/more stringent than the Federal requirements; it is important to become familiar with, and comply with, the state and local requirements as well as those of the federal government.

The intent also is to expand the focus of educational standards for the Arts to include basic environmental, health and safety training information on the hazardous materials, hazardous substances and hazardous waste found in various art mediums and processes.

Knowing and Using Arts Materials and Resources

"Students will be knowledgeable about and make use of the materials and resources available for participation in the arts in various roles."

While every attempt has been made to present complete and accurate information on applicable regulations, please be aware that any inadvertent misrepresentations or omissions do not relieve any person from any regulatory compliance requirements of state, local or federal law. The complete regulations may be accessed online from U.S. EPA or NYSDEC (websites are listed in the appendices), and may also be obtained in hard copy from many public libraries.

"Safety isn't just one more thing. It's Everything!

General Motors motto

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SECTION 1.0
INTRODUCTION

Numerous health hazards and environmental risks are associated with the creation of art. Art instructors are in a unique position to not only prevent pollution by the careful selection, use and management of art materials, but also to pass on their knowledge to their students.

This document is intended to provide a basic understanding of the potential hazards present in various art materials and processes. Many art materials contain regulated hazardous substances which, by law, must be disposed of properly. As the teacher or supervisor in charge of the area, it is your responsibility to provide a safe "workplace" for all your students and to ensure that all hazardous waste is managed properly.

1.1 Proper Waste Management and Disposal

Proper waste management and disposal is important for everyone. It is also required by law. The Environmental Protection Agency (EPA) was empowered by Congress to enact rulemaking that would protect the public from improper waste disposal. The Resource Conservation and Recovery Act (RCRA) requires that a generator of hazardous waste manages it "from cradle to grave".

In order to ensure a safe future, personal commitment to regulatory compliance is important.

1.2 Art Instructors' Obligations

In general, the obligation of art instructors is to ensure a safe environment for everyone – themselves, their students, other faculty members and visitors to the classroom or studio. This requires creating an environment that encourages minimal use and exposure to hazardous materials by, for example, disposing of existing hazardous materials and using more environmentally-friendly materials, and educating students in the proper handling techniques and maintenance of the area in a way that benefits everyone.

Legal obligations are discussed in further detail later in this document. Basically, they include:

- Creating and maintaining a safe environment;
- Keeping an inventory of potentially hazardous art materials;
- Informing others of the potential risks by:
  - providing Safety Data Sheets (SDSs) for review by anyone who will be using the product;

- alerting school officials and other emergency responders to assist them in emergency response planning;
- Submitting annual reports to government agencies as required; and
- Ensuring proper disposal of hazardous wastes.

1.3 Document Organization

The remainder of this document is organized as follows:

- Section 2.0 Hazardous Waste Management Basics
- Section 3.0 Hazardous Waste Generator Requirements/ Ensuring Technical Compliance
- Section 4.0 Expanding the Health & Safety Program
- Section 5.0 Sources of Potentially Hazardous Waste in Art Studios
- Section 6.0 Pollution Prevention And Waste Minimization

Appendices contain additional information that includes lists of regulated chemicals and hazardous wastes; codes; definitions of environmental acronyms and terms; record keeping checklists; where to obtain additional information (including useful websites); and preferred, environmentally-friendly vendors.

SECTION 2.0
HAZARDOUS WASTE MANAGEMENT BASICS

2.1 The Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) was enacted in 1976 to deal with the large quantities of municipal and industrial solid waste, as well as hazardous waste that is generated throughout the United States. Under RCRA, the EPA developed regulations to attain the goals listed below, in large part by setting requirements at all levels of waste management by commercial, industrial and governmental facilities, to ensure that such wastes would be properly managed. These regulations are contained in Title 40 of the *Code of Federal Regulations (CFR), [Parts 240-282]*.

RCRA has four goals:

1. To protect human health and the environment from the hazards posed by waste disposal;
2. To conserve energy and natural resources through waste recycling and recovery;
3. To reduce or eliminate the amount of waste generated, including hazardous waste; and
4. To ensure that wastes are managed properly to protect human health and the environment.

RCRA contains three separate, yet related programs: hazardous waste; solid waste; and, underground storage tanks. However, for the purposes of this document, only Subtitle C – Hazardous Waste Program is discussed.

2.2 RCRA's Hazardous Waste Program

The Hazardous Waste Program under RCRA provides a system to manage hazardous wastes "from cradle to grave" (i.e., from initial generation to ultimate disposal). The primary objective of this program is to ensure that hazardous wastes are handled in a manner that protects human health and the environment. Consequently, the program deals with hazardous waste generation and transportation, as well as treatment, storage, and disposal.

2.3 Material Knowledge/Safety Data Sheets

All art materials used or stored in the art studio or classroom and shop areas should have an accompanying Safety Data Sheet (SDS). An SDS provides detailed information about the product, including physical data (such as boiling point, melting point, and flash point), toxicity, health risks, reactivity, necessary personal protective equipment, spill cleanup, disposal and recommendations for storage and handling. It is important to be familiar with the information contained in the SDS for each chemical that you use. The SDS should be readily available for review by anyone having a need to know about process raw materials.

2.4 Hazardous Waste Identification/How to Determine What Constitutes Hazardous Waste

Proper hazardous waste identification is critical. Review the following three questions to determine if the material is potentially hazardous waste. (See Section 5.0. for a list of potentially hazardous wastes that are commonly found in art studios and shops.)

1. Is the material a solid waste?

For a material to be considered a hazardous waste, it must first be considered a solid waste. Hazardous wastes are a subset of solid wastes. As strange as it may sound, a solid waste does not have to be a solid. According to RCRA, a solid waste is defined as any material that is discarded by being either abandoned, inherently waste-like, or recycled. As such, a "solid waste" can be a solid, liquid or compressed gas.

2. Is the waste excluded?

There are several exclusions under RCRA that apply to specific waste streams. These exclusions would not normally apply to an art studio or workshop, with the exception of hazardous waste samples. Specifically, samples of hazardous wastes can be sent to a laboratory to aid in determining whether the waste is a hazardous waste. These samples are typically taken and transported solely for the purpose of waste characterization and are regulated differently than other hazardous waste.

3. Is the waste a listed or characteristic hazardous waste?

Once it has been determined that the waste is a solid waste and not excluded, the next step is to figure out whether it is actually hazardous. There are two ways by which a waste can be considered hazardous:

1) It can be listed as a hazardous waste; and/or
2) It can exhibit certain characteristics particular to a hazardous waste.

Listed Hazardous Wastes

There are four lists of hazardous wastes - F, K, P, and U. Of these, F-wastes are generated from generic processes, K-wastes are from specific industrial sectors, and P- and U-wastes are unused pure chemical products and formulations. Of these, U, P and several K wastes may apply to art wastes. Such wastes are deemed dangerous based on their origin, and, consequently, are considered listed hazardous wastes. The lists are summarized below (see Appendix A for entire lists).

- F List – This list includes hazardous wastes from common industrial and manufacturing processes. The processes that generate such wastes can take place in various sectors, and, consequently, F-listed wastes are known as wastes from non-specific sources. There are seven groups of wastes contained in the F list, which are as follows:
  - Spent solvent wastes (waste codes F001 through F005);
  - Electroplating and other metal finishing wastes (F006 through F012, and F019);
  - Dioxin-bearing wastes (F020 through F023, and F026 through F028);
  - Chlorinated aliphatic hydrocarbons production wastes (F024 and F025);
  - Wood preserving wastes (F032, F-34, and F035);
  - Petroleum refinery wastewater treatment sludges (F037 and F038); and
  - Multisource leachate (F039).

Of the above groupings, the two most likely to be found in an art studio or shop are spent solvent wastes (waste codes F001 through F005), and electroplating and other metal finishing wastes (F006 through F012, and F019).

- K List – This list contains wastes from very specific industrial and manufacturing sectors. Consequently, K listed wastes are known as wastes from specific sources. There are 13 categories of industries that are covered in the K list, none which would apply to standard art related classrooms studios/shops. Consequently, this list is not discussed further in this document.
- P and U Lists – These two lists cover pure and commercial grade formulations of certain unused chemicals that are being disposed. Unused chemicals can become wastes for various reasons, such as being spilled, exceeding the expiration date, change in activities that eliminate the need for the material making them obsolete, or because they no longer meet the specifications necessary for their intended use. In order for a chemical waste to fall under the P or U lists, the waste must meet the following criteria:
  - The listed chemical in the waste must be unused and the listed chemical in the waste must be in the form of a commercial chemical product and the sole active ingredient in the chemical formulation; or,
  - A residue or contaminated media that contains one of the chemicals listed on the P or U lists.

  P wastes are considered acutely hazardous wastes. As such, generating or storing a relatively small amount (1 kg, or 2.2 lbs) can make you subject to certain large quantity generator management and disposal requirements (see Section 3.0).

  Note that a container that previously held a P waste is also considered a hazardous waste, unless it is triple-rinsed (with the rinsate managed as a P waste). However, it is recommended that such a container be managed and disposed of as a P waste, rather than rinsing out the P waste contents, as this is generally safer and more cost-effective.

  Some examples of P and U wastes that may be found in art studios, classrooms and school buildings include, but are not limited to, the following:

  - P wastes - cyanide salts used in photography; certain pesticides used in buildings and grounds; some chemical inventory found in chemistry classrooms and physics labs; and, epinephrine and nitroglycerin in the nurses' station.
  - U wastes – acetone; 2-butanone; ethyl acetate; ethyl ether; dichloromethane; methyl ethyl ketone; certain solvents; acrylamide; hydrofluoric acid; and, thiourea in jewelry making and photography.

Characteristic Hazardous Wastes

A characteristic hazardous waste is one that exhibits certain properties that indicate that it poses enough of a threat to be considered hazardous. A characteristic waste may or may not also be a listed hazardous waste (as defined above). If a waste is listed as a hazardous waste *and* exhibits the characteristics discussed below, it may be subject to more extensive requirements. However, it is possible for a waste to not be a listed waste (i.e., F, K, P, or U), but still exhibit one or more hazardous characteristics. In order to determine whether the solid waste exhibits one or more of the following characteristics, a sample may need to be sent to an authorized laboratory for testing. Alternatively, a chemical's SDS often includes relevant information, such as the flash point or constituent concentrations, that may allow you to make the determination without testing. It is recommended that, in either case, you document the method used to make the waste determination and keep the documentation; this information will be useful in discussions with

your waste hauler, during inspections by regulators and for use by other staff members who may work with you or succeed you in management of particular waste streams.

There are four hazardous waste characteristics established by EPA: Ignitability, Corrosivity, Reactivity and Toxicity. If your waste meets any one of these, it is considered a hazardous waste:

- Ignitability – This characteristic applies to wastes that **can readily catch fire and sustain combustion**. Paints and cleaners often fall under this category. An ignitable waste can be either a liquid or a non-liquid, though most tend to be in the liquid form. A laboratory will typically perform a flash point test to determine the lowest temperature at which fumes from the waste will ignite when exposed to a flame. If the flash point is below 140 °F, the waste is considered to be hazardous.

  Ignitable wastes have the waste code D001, and are some of the most common types of wastes generated.

- Corrosivity – This characteristic applies to wastes that are highly acidic or alkaline (basic). These wastes are typically liquids, and **can easily corrode/dissolve flesh, metal, or other materials**. Spent sulfuric acid is a common example of a corrosive waste. There are two criteria that are used to determine whether a waste falls under this category:
  - pH test: if the waste has a pH less than or equal to 2, or greater than or equal to 12.5, it is considered corrosive; and
  - Steel test: if the waste can corrode steel under specific conditions, it is considered corrosive.

  Corrosive wastes have the waste code D002, and are commonly generated by art programs.

- Reactivity – This characteristic applies to wastes that are unstable and easily explode or undergo violent reactions, or react to or release toxic gases, fumes or vapors when mixed with water or under other conditions such as heat or pressure. While such wastes are not as common in art as other types of waste, it is still possible to find facilities that have these chemicals and do not know they are reactive. If you do not identify these reactive chemicals, you risk inadvertently storing them near, or allowing mixing with, incompatible chemicals. Accordingly, it is important to check SDSs or other sources of technical information to determine if the materials stored or used in the art department are, or could become, reactive with age, inappropriate storage, or mixture with other chemicals.

  Materials that may be reactive include acetyl chloride, chromic acid, cyanides, hypochlorites, organic peroxides, perchlorates, permanganates, and sulfides. Several common processes involving reactive chemicals are described below, though this is not an exhaustive list of art processes that may use such chemicals:
  - Cyanides – Cyanide compounds can be found in art departments with jewelry programs, as well as occasionally in metal sculpture departments, that have small cyanide plating baths. Users are often aware that the chemical can be dangerous, but don't often know that hydrochloric acid (and other acids) should not be stored on the shelf above the bath, as a strong reaction can occur if these are mixed. In addition, the hexacyanoferrates used in cyanotype, blue print, and in Prussian blue pigment should be considered true cyanides in determining chemical compatibility.
  - Organic Peroxides – Organic peroxides are common curing agents for polyester resins used in sculpture and several other types of two-component resin systems.
  - Perchlorates - Potassium perchlorate is used in printmaking departments for an etching process called Dutch Mordant. Perchlorate should not be contaminated with organic substances or acids. Additionally, in schools, it should be stored away from areas with general student access, as it can be used for making pyrotechnics.
  - Sulfides - Sulfides are used in certain photographic toners and pigments (e.g., cadmium sulfide, mercuric sulfide.)

  Reactive wastes have the waste code D003.

- Toxicity – EPA developed a toxicity characteristic to identify wastes that are likely to leach dangerous concentrations of toxic chemicals into underground water when disposed of in landfills. It is based on a laboratory procedure known as the Toxicity Characteristic Leaching Procedure (TCLP). It recreates the leaching process and conditions to determine how a waste will act in a typical landfill. During this process, a liquid "leachate"

is created from the waste (if it is a solid) in the laboratory. If the waste is a liquid, then the waste itself is considered to be the extract or leachate. If the leachate contains one or more certain hazardous chemicals in concentrations that exceed corresponding regulatory limits, the original waste is deemed to exhibit the toxicity characteristic.

Toxicity characteristic wastes have the codes D004 through D043. Among the wastes regulated under the toxicity characteristic are several solvents and a number of metals commonly used in the visual arts programs.

See Appendix A for a list of the hazardous wastes and the corresponding codes. Keep in mind that the list is not exhaustive and some "unlisted" or non–regulated wastes may still be toxic and/or pose other risks of harm if improperly handled, such as glycol ethers, epoxies, plasticizers, lube and hydraulic oils, metal shavings/borings, silicas, turpentine and PCBs, to mention a few. The saying goes "even if it's not listed, if it will melt metal or plastic, it's probably not too good for you!"

2.5 Universal Waste

In order to promote the collection and recycling of certain **widely generated hazardous wastes**, known as universal wastes, EPA developed the Universal Waste Program. Through this streamlined subset of the hazardous waste regulations, EPA has eased the regulatory burden on facilities that generate these particular ubiquitous wastes. Wastes covered under the universal waste program include:

- Hazardous waste batteries (e.g., rechargeable nickel-cadmium, lithium);
- Lead containing devices (e.g., cathode ray tubes, lead acid batteries, printed circuit boards and electronics);
- Waste mercury-containing devices (e.g., thermometers, thermostats, barometers, manometers, temperature and pressure gauges); and
- Hazardous waste bulbs (e.g., fluorescent lights, high intensity discharge, neon, mercury vapor, high pressure sodium, and metal halide lamps - these usually contain mercury).

Note that hazardous waste pesticides that are recalled or collected in a pesticide collection program are also considered universal wastes, but are not typically used in art studios/shops. However, pesticides from a school's facility maintenance shop or agriculture program may fall under this program.

See Section 3.0 for a discussion of obligations relative to ensuring compliance with applicable Hazardous Waste Management regulations.

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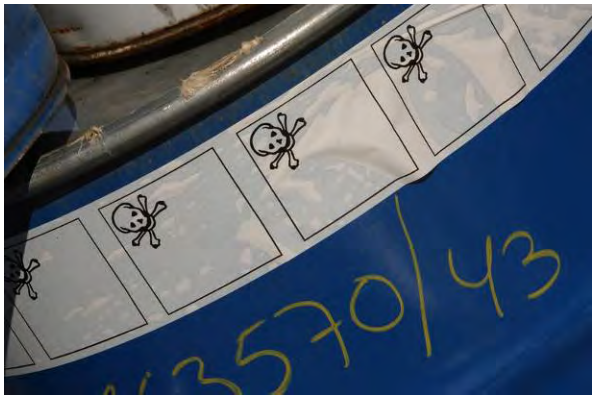
SECTION 3.0
HAZARDOUS WASTE GENERATOR REQUIREMENTS/ ENSURING TECHNICAL COMPLIANCE



3.1 Hazardous Waste Generators

Hazardous waste generators are broadly defined as any person, by site, who creates or produces or brings a hazardous waste into the United States. Such generators and sites in the art field could include individual artists or craftspeople working in their studios or shops, art teachers or technicians in public or private schools at the high school or college level, artists' cooperatives in which many artists work together, or businesses whose products are artistic works.

3.1.1 Generator Categories

Such entities are classified according to quantity of hazardous waste generated, as follows:

- Large Quantity Generators (LQGs): LQGs produce more than 1,000 kg (2,200 lbs) in a calendar month, or more than 1 kg (2.2 lbs) of acutely hazardous waste in a calendar month;
- Small Quantity Generators (SQGs): SQGs produce less than 1,000 kg (2,200 lbs) but more than 100 kg (220 lbs) of hazardous waste per month, and accumulate less than 6,000 kg (13,200 lbs) of hazardous waste at any time; and
- Conditionally Exempt Small Quantity Generators (CESQGs): CESQGs are those that generate less than 100 kg (220 lbs) of hazardous waste in a calendar month and less than 1 kg (2.2 lbs) of acutely hazardous waste in a calendar month. Additionally, CESQGs must limit accumulation to less than 1,000 kg (2,200 lbs) of hazardous waste, or 100 kg (220 lbs) of any residue from the cleanup of a spill of acute hazardous waste at any time.

3.1.2 Definition of a site (facility)

Determining which category you fall into must be done on a facility-wide basis. In a school, for example, it is not just the quantity of hazardous waste generated in your art department that matters, but the total quantity of hazardous waste generated by the entire school or facility that determines the category. Included in the total will be waste from building maintenance and cleaning, science classes, and all other departments. In fact, for purposes of hazardous waste management, the definition of a facility is based on the property boundaries, rather than buildings. For example, a high school, middle school and district administrative office on a single parcel of land would generally constitute a single "site" or "facility" for purposes of hazardous waste regulations. Alternatively, if a school district has a maintenance facility or administration building on a parcel of land that is not contiguous with the land containing the school, the former would constitute a separate facility and would determine its waste generation rate and corresponding level of requirements based solely on wastes generated on that property; similarly, the high school would not count

wastes from the remote site in its generation rate.

3.1.3 Counting Monthly Waste Generation

Even if you only generate a small amount of hazardous waste in your department, you are subject to the requirements of the category into which your whole facility falls.

While art cooperatives and art business owners must calculate their monthly quantities and determine their categories, it is not possible for a single art teacher in a school to calculate the total waste accumulation for the entire facility. Instead, the school's environmental personnel, or the school or district staff designated to manage your waste, must provide you with the category into which your facility falls.

It is possible for a facility to be in any of the three categories. Remember that, since these categories are based on monthly generation quantities, it is possible to be in one category during a certain month and in another category during a different month. In general, the more hazardous waste a facility generates, the more strict the applicable regulations. Consequently, it is important to be constantly mindful of the quantities of hazardous wastes generated in your area, to manage your materials properly to keep hazardous waste generation to a minimum and to confer with your environmental/waste management staff on a regular basis. If you are in a situation where the category changes from time to time, for example between a CESQG and a SQG, it might be simpler, safer, and provide less opportunities for errors if you picked the SQG category and maintained compliance with its requirements permanently.

3.1.4 Haz. Waste Identification Number

The site (facility) definition is also used in obtaining a unique hazardous waste generator identification number from the U.S. EPA or a delegated state if the facility is a SQG or LQG at any time. This number, often referred to colloquially as a "RCRA ID", is used on manifests for shipment of all hazardous wastes.

3.1.5 Meeting the requirements

Once you know the category into which your facility falls, this booklet will provide the requirements for proper handling and disposal of your hazardous waste.

This section of the manual focuses on the requirements for SQGs, though certain portions (as specified) also apply to CESQGs. Additional requirements for LQGs are also noted where applicable.

3.2 Basic Requirements for CESQGs

If you are a CESQG, there are three primary requirements with which you must comply:

- Account for all the hazardous waste you generate, and stay below the monthly, facility-wide thresholds of 100 kg of hazardous waste and 1 kg of acute hazardous waste;
- Do not store more than 1,000 kg of hazardous waste at any one time; and
- Ensure that your hazardous waste is sent to one of the following types of facilities:
    - a permitted hazardous waste treatment, storage, or disposal facility;
    - a facility that reuses, recycles or reclaims the hazardous waste; or,
    - A permitted industrial or municipal landfill.

Note that some states may have additional requirements for CESQGs. Hence, it is important to check with your state to find out if you should be doing something more to stay in compliance.

3.3 Hazardous Waste Storage and Labeling

Regardless of what hazardous waste generator category you are in, good container management helps protect health and the environment by preventing spills or releases. While required for SQGs and/or LQGs, the

following are also recommended practices for CESQGs:

- Labeling containers such that the contents (including anything that might be hazardous) are clear to those handling the materials;
- Storage of incompatible compounds or wastes in separate containers;
- Secondary containment for waste containers; and,
- Keeping containers that hold hazardous waste closed, except when adding or removing waste.

3.3.1 Storage Areas and Accumulation Areas

Satellite Accumulation Area

The hazardous waste regulations are written using a "cradle-to-grave" approach to waste management, ensuring that hazardous waste is properly identified and safely managed from the time and place at which it becomes a waste until it is properly treated or disposed of at a permitted facility. The first step is identification of the hazardous waste by the generator (e.g., artist, teacher) and collecting the waste in an appropriate container within a satellite accumulation area, an area at or near the point of generation where a SQG or LQG can store limited quantities of hazardous waste. As such, managing a satellite accumulation area is the task most commonly applicable to art teachers, art students with studios or separate work areas, or artists working in a commercial environment (i.e., not alone in a personal studio.)

Typically, facility maintenance, operations or custodial staff will be responsible for moving full containers to the hazardous waste storage area and overseeing offsite shipment. However, it is important to understand the process, and know who within your organization is responsible for each aspect of waste management, so you can determine (in consultation with the waste management personnel) the best way to store, package, label and otherwise safely store your waste, respond to a spill or unintended release, and make arrangements for waste removal.

You are allowed to accumulate a total of up to 55 gallons of hazardous waste per waste stream or one quart of acutely hazardous waste (see P List in Appendix A) in an area that is:

- At or near the point of waste generation;
- Under the supervision of the person/operator overseeing the process that generated the waste;
- The waste must be moved to the facility's main centralized hazardous waste storage area within three calendar days after the accumulation of 55 gallons of hazardous waste or 1 kg of acute hazardous waste is exceeded (but it is recommended that smaller containers be moved to the storage area when they become full.)

Furthermore, for hazardous waste containers in the satellite storage area, you must:

- Label each container with the words "Hazardous Waste" and with other words that identify the contents;
- Use containers that are made of materials compatible with the waste to be stored;
- Keep containers that hold hazardous waste closed, except when adding or removing waste; and,
- Maintain the containers in good condition.

In addition to the accumulation requirements above, it is recommended that you do not open, handle or stack containers such that they may rupture, leak or fall and that you do not mix wastes that are incompatible.

Even though you are allowed to store up to 55 gallons in a satellite accumulation area, as previously noted, it is a good and safer practice to use smaller containers (e.g., 500 ml, 5 gallon.) and move each to the main central storage area when it is full.

Centralized Container Storage Area

There are generally two categories of centralized hazardous waste storage areas: less than 90 days storage for LQGs and less than 180 days storage for SQGs (or 270 days if the SQG must ship the waste 200 miles or more). Note that these time limits are based on

calendar days and not business days. In addition, the accumulation start date begins when the waste container is placed in storage (either directly or when moved from a satellite storage area).

A centralized hazardous waste storage area is similar to a waste warehouse. It is the main storage facility for the hazardous waste generator and, as such, it is in this location that the waste removed from studio and lab satellite accumulation areas are placed pending off-site disposal.

For hazardous waste containers placed in the centralized hazardous waste storage area, you must:

- Mark the container with the date on which it is placed in storage;
- Label the container with the words "Hazardous Waste" and with any other words that will specifically identify the contents of the container. For example, use "Acetone and Toluene" rather than "Organic Solvents," which is not specific enough ;
- Ensure that the maximum storage time allowed is not exceeded;
- Provide enough aisle space between containers, or rows of containers, to allow inspection of the label and container condition, as well as enough space to allow access to the area to investigate or respond to a release or other emergency; and,
- Inspect the storage area at least weekly to ensure that container leaks and deterioration are prevented.

In addition, it is recommended that the facility:

- Note the address, as well as the specific location, where the waste was generated (for example, Art Studio, Room 222).
- Permanently mark any container of 110 gallons or less to be used for transportation of hazardous waste with the standard red and white, or red and yellow, hazardous waste label (shown at the end of this section.)

SQG and LQG facilities that store hazardous waste must have the following equipment (unless none of the hazards posed by the waste handled at the facility could require a particular kind of equipment specified below):

- An internal communications or alarm system capable of providing immediate emergency instruction (voice or signal) to facility personnel;
- A device, such as a telephone (immediately available at the scene of operations) or a hand-held two-way radio, capable of summoning emergency assistance from local police departments, fire departments, or State or local emergency response teams;
- Portable fire extinguisher, fire control equipment (including special extinguishing equipment, such as that using foam, inert gas, or dry chemicals), spill control equipment, and decontamination equipment; and
- Water at adequate volume and pressure to supply water hose streams, or foam producing equipment, or automatic sprinklers, or water spray systems.

  The above equipment, where required, must be tested and maintained as necessary to ensure proper working order in the event of an emergency.

In addition, all personnel in the process of handling hazardous waste must have immediate access to an internal alarm or emergency communication device. These facilities (SQGs and LQGs) are also required to maintain aisle space in the centralized hazardous waste storage area to ensure the unobstructed movement of personnel and emergency equipment.

3.4 Emergency Preparedness and Prevention

Emergency preparedness and prevention means having procedures in place to prevent, prepare for, and respond to spills and releases that could occur in the classroom, lab, shop or studio. Everyone who uses the facility needs to know what they should do, how to do it, and who to call. LQGs are responsible for complying with "preparedness and prevention" requirements in the event of emergencies, including preparing a written contingency plan and training employees in hazardous waste management and emergency

response.; while this would generally be handled by, or in conjunction with, a facility manager, it is useful to understand the purpose and scope of such planning. It may also be useful for your facility, even if not an LQG, to perform this task.

This section outlines the components of an emergency response system that needs to be in place in the event of a spill or release.

3.4.1 Contingency Plan – Spills, Releases

Spill Response Plan

If one does not already exist, a spill response plan needs to be developed for the materials you use in the classroom, studio or shop. When preparing a spill response plan, consider the following:

- Type and quantity of materials handled;
- Toxicity of and dangers associated with the materials;
- Ease of release into the environment; and,
- Each responsible individual's role (see Section 2.4.2, below)

The SDS for a substance is a good place to begin gathering information needed for spill response; it contains recommendations for cleanup procedures and personal protective equipment (e.g., gloves, respirators, protective clothing). Consult the manufacturer, waste disposal broker, and/or other chemical engineering sources for recommended cleanup materials and methods.

Spill Kit

A Spill Kit is a collection of spill control materials used to contain spills anticipated in the spill control plan. It generally includes absorbents and other spill control methods, for example: Vermiculite®, spill pillows, personal protective equipment, neutralizing materials, and cleanup tools. Create cleanup kits for the major substances used in the studio or shop and label them clearly. Indicate what PPE should be used under what conditions.

Spill cleanup materials also need to be disposed properly. If anything is contaminated with hazardous waste, it needs to be disposed using hazardous waste procedures.

3.4.2 Emergency Response – Incident Command

The emergency response system for your classroom, shop, studio or lab should conform to the one for your entire facility. Familiarize yourself with your facility's emergency action plan, including the evacuation plan and who to contact in an emergency. All LQGs and SQGs are required to have, and CESQGs should have, the following information posted next to each telephone closest to where hazardous waste is generated (i.e., satellite accumulation areas) or stored:

- The name and telephone number of the emergency coordinator/contact;
- Locations of fire extinguishers, spill control kits, and the fire alarm pull stations; and
- The telephone number of the local fire department.

In the event of an emergency, alert everyone in the area of the spill or release and evacuate the area if necessary. In the event of a fire or medical emergency, call 911. Follow the spill response plan. By having the right equipment ready and accessible, knowing what chemicals are used at a location and their associated

risks, having procedures in place to respond and knowing each person's role in the event of a spill or other accident, the potential for such an event to cause harm can be greatly reduced.

3.4.3 Transport and Disposal

If any spill materials need to be transported and disposed, keep records of the date, transporter, and quantity. Complete a manifest for regulated hazardous waste shipments and employ only licensed hazardous waste transporters and TSD facilities (facilities that treat, store or dispose of hazardous wastes).

3.4.4 Inspection and Record Keeping

It is very important to keep records of the materials you have in storage. Keep track of the chemicals you have, how old they are, and where they are located.

Conduct regular inspections of storage areas and, though not required, maintain records of those inspections. Included in Appendix E are examples of weekly inspection checklists for "Satellite Accumulation Areas" and "90-Day/180-Day Storage Areas." While the former is not required to be inspected, it is a good idea to do so weekly to ensure that wastes are labeled, containers are closed and other requirements and safe practices are being followed, and that any previously noted concerns have been promptly corrected.

3.4.5 Training

Train those who are in the area regularly (staff and students), as well as anyone who is responsible for identifying or managing hazardous waste, on the handling of any hazardous materials or hazardous wastes. Make sure they know which materials are used in the studio or lab, as well as the appropriate methods to handle spills and releases.

Training should occur at least at the beginning of each school year and whenever new types of potentially hazardous materials are added to your inventory. Staff and students should also be trained in the use of personal protective equipment during handling of hazardous materials or wastes. For activities that produce excessive dust, vapor or fumes, staff and students must be trained in the fitting of and use of face masks or other respiratory protective equipment.

Keep training records that indicate who was trained, the content of the training, and the date of the training. Because such training is specifically required for LQGs, documentation of the training of each employee, along with a description of their job duties (including any duties that involve waste determination and/or hazardous waste management) must be kept on site for at least three years. While not required for SQGs and CESQGs, similar procedures should be used in case the facility becomes an LQG, if only for a short period, in the future.

3.5 Off-Site Shipping Requirements

EPA has adopted the Department of Transportation's (DOT's) packaging, labeling, marking and placarding regulations to ensure the safe transportation of hazardous waste from its point of generation to its final disposal site.

Proper packaging is essential to prevent leakage of hazard waste during transport or in the event of even a minor accident, such as a container falling over.

Labeling, marking and placarding of the waste containers must correctly identify the hazardous characteristics of the waste and any risks in storing and transporting the waste.

If you are a CESQG, you are not required to use a manifest when shipping hazardous waste

off site, but careful identification and tracking of the waste is strongly recommended. Since LQGs and SQGs are required to ensure that hazardous waste is transported to a permitted hazardous waste treatment or disposal facility, or to a facility that reuses, recycles or reclaims the hazardous waste *[40 CFR 261.5(g)(3)],* the manifest provides tracking documentation to prove that you have managed your waste "from cradle to grave."

If you, as a CESQG, decide on a bill of lading as shipping documentation, obtain and keep receipts and records from any hazardous waste contractors that list the EPA or state identification numbers of the transporter and the facility to which the waste is taken.

SQG and LQG facilities are required to consign hazardous waste solely to transporters and hazardous waste management facilities that have EPA identification numbers *[40 CFR 262.12(c)],* and must use the uniform waste manifest.

SQGs may be excused from the manifest requirement in the following circumstances: *[40 CFR 262.20(e)]*

- If the waste is reclaimed under a contractual agreement pursuant to which:
    1. The type of waste and frequency of shipments are specified in the agreement;
    2. The vehicle used to transport the waste to the recycling facility and to deliver regenerated material back to the generator is owned and operated by the waste reclaimer; and
- The waste generator maintains a copy of the reclamation agreement in his files for a period of at least three years after termination or expiration of the agreement.

Included as Appendix G is a table summarizing regulatory differences and select basic requirements for New York and New Jersey.

Sources:

Environmental Virtual Campus

Art Safety Training Guide, Princeton University, http://web.princeton.edu/sites/ehs/artsafety/index.htm

Container Management/Transport, Campus Consortium for Environmental Excellence, http://www.c2e2.org/evc/LabConm.html

Darkrooms, Campus Consortium for Environmental Excellence, http://www.c2e2.org/evc/ArtDark.html

Hazardous Waste Requirements for Large Quantity Generators, EPA530-F-96-032, June 1996

Health & Safety in the Arts, City of Tuscon, http://www.ci.tucson.az.us/arthazards/home.html

Managing You Hazardous Waste: A Guide for Small Businesses, EPA530-K-01-005, December 2001

New York State Department of Environmental Conservation, http://www.dec.state.ny.us/website/dshm/hzwstman/hzwst.htm

New Jersey Department of Environmental Protection, http://www.nj.gov/dep/enforcement/shwr.html

RCRA Orientation Manual, U.S. EPA530-R-02-016, January 2003.

SECTION 4.0
EXPANDING THE HEALTH AND SAFETY PROGRAM

A leading environmental organization once suggested that our planet could use CPR: "Conservation, Preservation and Restoration". Everyone can help!

If your art classroom program "produces" something, in other words a piece of artwork such as a painting, sculpture, jewelry etc. you Should understand that clean up materials, paints/solvents , metal shavings or process rinse waters may fall into the hazardous waste management category. Painting, ceramics, photography, jewelry, printing and printmaking, metalworking, welding, and woodworking, as well as the associated buildings, studios and storage space, are some activities that commonly use materials that are hazardous and may therefore become regulated waste. For home/personal use (unless you're a professional artist who qualifies as a small business), the recreational art materials and residuals that you dispose in the trash are exempt from hazardous waste regulations. But teaching good habits early on in an art students career is something an educator should strive for. Students should be made aware that although they may be technically exempted from regulation they should attempt to use some or all of the Best Management Practices that you will find presented here. Why?

It has been conservatively estimated that approximately 1% of trash collected is potentially hazardous waste. This is a significant threat to the environment. If your community or county has a Household Hazardous Waste Collection Day, this a great opportunity if you qualify as a CESQG or generator of HHW (Household Hazardous Waste) to dispose of any unwanted or obsolete hazardous art materials. The Collection Center may also accept such wastes from schools or commercial studios if they are CESQG with prior approval. Alternately, if the materials are still good and could be reused by another artist, craftsperson or school, find an organization that can use these materials.

Hazardous wastes need to be properly managed in order to ensure that they will not pollute the land, air, or water. Through your efforts and your students' efforts to reduce toxic materials usage and minimize hazardous waste generation in your art classroom programs, you will be making a significant contribution to providing for a cleaner, safer and healthier planet and further ensure that you will have a safe studio and classroom to work in.

4.1 Know the Materials You Use and Store

Read the label. Read the directions prior to use. These are important concepts to stress with your students. Many people, young and old, do not read the directions until whatever it is that they are using does not seem to be doing what they thought it should do. In order to manage your art materials, it is important to understand their chemical and physical properties, and potential health and environmental hazards.

Creating a Comprehensive Chemical and Hazardous Materials Inventory

Anyone who has ever moved recognizes how easy it is to accumulate "stuff". Just look around your art classroom(s). There are probably a lot of items that can or *should* be disposed of. Make an inventory list of all the art materials you have, and determine whether the material is still usable; check the quality and expiration dates.

If you have very old paints and pigments, you may have what the EPA considers "abandoned" or "orphaned" hazardous waste materials. ANY containers that are unlabelled or unmarked, or are in any way unidentifiable, need to be dealt with – do not keep them around! You should arrange for their proper disposal or, if you are exempt from hazardous waste management requirements as a generator of Household Hazardous Waste (and in some cases CESQG), bring them to the next Household Hazardous Waste Collection Day in your region or community, if they will accept such wastes. Determining if a material is hazardous takes a scientific approach. Do not *sniff* anything to determine what it is! It is unscientific and potentially dangerous. Some dyes and catalysts used in fabrics, and plasticizers may contain reactive or explosive organic peroxides; don't try to unscrew the tops of bottles that have crystals around the edges - the friction alone can cause them to explode. Always start with the safety data information provided by the manufacturer or contact the supplier to get the correct information on the product. If these aren't available (i.e., labels are missing or illegible) you may have to have a sample analyzed to get the information you need.

Use your final materials inventory list to determine which materials to dispose, and which materials to replace with safer versions (see Appendix D for a list of some environmentally friendly products and vendors). The information you collect regarding hazardous materials will need to be shared with your coworkers, students and local officials (see below).

4.2 The Community's Right to Know and the Workers' Right to Know

Everyone has the Right to Know (RTK) under federal Occupational Safety and Health Act (OSHA) regulations, all there is to know about the risks and hazards of the materials and processes they will be expected to use. In addition, each community has the Right to Know under federal Environmental Protection Agency (EPA) regulations. These regulations have numerous implications.

4.2.1 Your Community's Right to Know and Emergency Planning

EPA regulations require that emergency response information is available for emergency response personnel. Generally, the regulations apply to any facility that has an inventory of hazardous materials in excess of certain quantities, some of which can be very small for extremely hazardous substances (see Section 5.0). If you store certain items in these quantities, a list of the hazardous substances will need to be completed and a Tier II report filed that will include information on the quantities kept at the facility, such as where they are located and if they are flammable, toxic, reactive, etc. This report will be submitted annually (due March 1) and must be accompanied by a Safety Data Sheet (SDS) for each item listed in the report. The report is distributed to your local emergency planning commission (LEPC), your local Fire Department, and the State Emergency Response Commission (SERC). The Fire Department also commonly has specific requirements on the storage and use of flammable and combustible liquids, compressed gas and hazardous

materials. Depending on the type and quantity of materials stored you may need to register the activity and obtain a Certificate of Fitness for the process or materials used. In any emergency situation at your facility, they will have basic safety information on how to best plan their response action to protect the surrounding community and themselves. *(Note: For those in the New York City area, this regulation may be particularly applicable for your art curriculums. The NYCDEP has established lower threshold quantities for certain chemicals and chemical categories used or stored in the city; the reporting and distribution are similar to federal requirements.)*

If your art materials are hazardous (and especially if you are not sure whether they are hazardous), bring your inventory list to the attention of the school administration, chemistry department, and/or the local fire department to help you determine what you have and what your legal obligations are in respect to ensuring the safety of the environment and the students, your coworkers and yourself. Check out the web resources and links provided in the appendices and look for compliance assistance information and contacts from the NYCDEP, NYSDEC and EPA Region II. There is a lot of good and useful information to be found.

4.2.2 The Workers' Right to Know

OSHA ensures that all employers provide their employees with a safe workplace. One of the key provisions for worker safety is that Employees have a "Right to Know" all there is to know about the risks and hazards of the materials and processes that they will be expected to use. Employers comply with this *Hazard Communication Standard [29 CFR-1910.1200]* by formally identifying all of the potential health risks to workers from materials and processes that they would be expected to use. After this job hazard analysis the employer needs to develop a written hazard communication program and provide training for its employees. A critical element of the program is to make Safety Data Sheets (SDSs) available to their workers.

As the teacher, you become the technical person and supervisor in charge of your art classroom and facility area. Furthermore, as part of the management structure, it is now your responsibility to fulfill the duty of your employer in providing a safe "workplace" for all your students. You should train students to recognize materials that can cause fire, adverse chemical reactions, health risks and environmental threats. They must be prepared to act accordingly in the event of an emergency such as fire or spill.

In order to help you in communicating the hazards identified, you should contact the manufacturer or supplier and request a copy of the SDS for each product used or stored in the classroom or studio space you manage. Keep in mind that this will only be basic training. There is an important point to make here in how you present the information provided. How you present this safety information is critical; make sure it is displayed neatly and in an appropriate place. An artist's material may contain a hazardous chemical and that artist should use and store it according to the manufacturer's recommendation. We can not stress the importance of clearly and simply communicating risk to your staff and students. Some people are afraid of being exposed to materials that have <u>any</u> amount of hazardous ingredients. You need to consider both the perception of risk and actual risk and potential consequences for each material before using it in the classroom. Use the SDS as a start, which should contain a variety of information about the product, including the following: information about the hazardous ingredients; their concentrations or percent composition for mixtures; physical and chemical information; its state (solid, liquid or gas); how it enters the body (i.e., routes of exposure, inhalation, eye contact,

skin absorption, and ingestion); suggestions for keeping within permissible exposure limits; and, first aid measures if adverse health effects occur from excessive or accidental exposures. The manufacturer can also provide basic information for safe transportation and disposal as well as ecological information and recommendations for safe handling, use and storage.

After ensuring that you have an SDS for every hazardous material on your list, it is your obligation to post the information where it is readily available to anyone who wishes to view it. (See Appendix E for a listing of resources where you can obtain copies of SDS's.)

It is important that you know the chemical composition of each item to determine if any of the scrap or waste is, by definition, RCRA hazardous waste.

4.3 Minimizing Exposure

There are three major categories of hazard control measures that you can use to minimize exposure:

1. Engineering controls, which may include process modification or substitution of a less hazardous material or process;
2. Isolation of the hazard by enclosing it or using exhaust and local ventilation systems to remove the hazard at the source; and
3. Administrative controls, which include:
    - reducing the amount of time the person spends with hazardous materials or in a hazardous area;
    - using safe, standard operating procedures;
    - training; and
    - using personal protective equipment. This includes eye protection, hand protection, and clothing (e.g., aprons, lab coats, safety shoes, goggles).

Careful review of the manufacturers' recommendations will help you determine which control methods to use.

In general, good personal hygienic and safe work practices will help you to avoid or reduce most exposures to toxic art materials.

NEVER:

- have food or drinks (including coffee) in an area where hazardous materials are being used;
- store food in a refrigerator used for chemical storage;
- hold a paint brush or other tool in your mouth; and
- NEVER USE SOLVENTS TO CLEAN YOUR SKIN. Avoid all skin contact with these materials. They not only can defat the skin but can have chronic health effects on the central nervous system and target organs such as the heart and liver. Pregnant women should minimize all exposure to the extent possible to prevent injury to an unborn fetus.

ALWAYS:

- wash hands frequently when working with any chemicals (especially prior to eating, drinking or smoking or using the bathroom);
- use soap and water with scrubby mitts or a loofah to clean hands and splatters;
- wear protective gloves when using solvents to clean surfaces, then follow with a decontamination wash with hot soapy water and rinse off thoroughly with clean water;
- know what to do in an emergency; and
- Be a good role model. Your students look to you for guidance, if you are careless, they will be careless, too.

There are a number of general precautions and some useful advice that should be followed when using any hazardous material. First, know as much as you can about the materials you have chosen to create your masterpiece. Then,

ask yourself some basic questions, starting with what happens when I take the lid off the jar? And what should I do if I spill some on me?

Routes of Exposure and Personal Protective Equipment are two primary considerations in reducing the risk of using or handling hazardous materials.

There are potentially many ways a toxic substance can enter the body; these pathways are called Routes of Exposure and are further described as:

- Inhalation
- Skin Contact
- Eye Contact
- Ingestion

And then you have to also consider both physical and ergonomic hazards of the process or techniques used to create "the product" (e.g., lifting, bending, twisting, repetitive motion, sharp edges, tools.)

Inhalation Risks

Regardless of the type of art work you do, the materials and processes can generate air emissions.

Uncontrolled emissions from woodworking, welding and ceramics studios become readily visible and obvious in very short order. Aside from the visible particulate emissions (i.e., dust, mists and smoke fumes) you have to be aware of the non-obvious hazards, such as heavy metal oxides.

If you are a painter, printer or photoprocessor the emissions are not always visible but generally more likely to be detected by smell. These air contaminants can cause adverse health effects at concentrations well below established odor thresholds.

There are basically two ways to defend yourself against overexposure. One is to provide for adequate exhaust ventilation and the second is to mechanically filter out the contaminant using a personal protective device.

If you have obtained the manufacturer's material safety information, one of the sections will recommend providing adequate ventilation, which translates into making sure you have sufficient air change in the room you're working in by opening windows, installing fans or using HVAC make-up air systems. In some cases, manufacturers recommend providing local exhaust, which translates into providing a means to capture the contaminants at the point of generation so that they do not saturate a room.

Air emissions can be a mixture of many different chemical constituents, some hazardous and some labeled as a nuisance.

OSHA has established permissible exposure limits for a long list of chemicals and intermediaries, as well as nuisance particulates. ACGIH and NIOSH are also good sources of information on acceptable or recommended exposure levels, which can be found at their websites:

http://www.acgih.org/

http://www.cdc.gov/niosh/

Process contaminant categories can be established following the waste listing codes.

- D codes are the characteristic wastes and exhibit a hazard based on the nature of the material or a specific chemical compound.
- F codes that may apply to artwork are for the solvent type of waste processes.
- P & U codes are for acutely hazardous waste and commercial chemical products, respectively, so if you're starting with a process material that is on either of the lists, you know that it exhibits one of the characteristics or contains a toxic chemical.

In printmaking, for example, you might use volatile haze removers or press wash solutions that can release flammable and toxic vapors into the air. In surface finishing using aerosol spray paints you could release a lot of listed volatile toxic organics. These solvent-based emissions are health risks due to overexposure and can lead to blindness, or brain or central nervous system damage. They can also damage the heart, liver and kidneys. Photoprocessing and acid etch solutions are, or can be, both toxic and corrosive. Breathing in mists can cause severe respiratory discomfort and long term damage.

Certain pigments present in powders used in printmaking, ceramics and sculpture can contain chromate constituents that cause nasal ulceration and are known, or suspected as, carcinogens.

For the toxic substances that may be present, always provide a means to minimize the potential for exposure using engineering controls such as local exhaust. Examples include welding fume extractors, spray paint booths, acid bath fume hoods and laboratory chemical fume hoods.

For flammables and combustibles, always ensure adequate dilution ventilation in the room by using fans or make-up air systems to prevent the build up of contaminants to unsafe levels in air in order to minimize the potential for fire and explosions.

Particulate emissions, such as dust from printmaking, ceramics and sculpture, may contain silica powders, lead chromate pigments or carbon black, all of which can cause adverse health effects. Even plain woodworking dust generated by cutting or sanding operations can be harmful and explosive if allowed to build up.

Skin Contact

The skin can act as a sponge and readily absorbs toxics present in solvents that can cause serious damage to target organs. It also is easily irritated and burned by aggressive chemical compounds.

Wearing a lab or shop coat or apron to prevent exposure is strongly recommended for two reasons. First, it helps to prevent you from immediately getting overexposed. Second, it prevents your clothing from becoming contaminated, in which case you might have inadvertently taken contaminants home on clothing, potentially exposing your family or pets. This would be of particular importance if using materials having any concentration of lead. When using or handling chemicals, always wear appropriate approved chemically resistant gloves to minimize the risk of injury. Recommended gloves for a particular task can be determined from manufacturer information, industry trade groups, or other reference sources. OSHA's Office of Training and Education cites the following common types of gloves and their rated use.

- *Norfoil* laminate resists permeation and breakthrough by an array of toxic/hazardous chemicals.
- Butyl provides the highest permeation resistance to gas or water vapors; frequently used for ketones (M.E.K., Acetone) and esters (Amyl Acetate, Ethyl Acetate).
- Viton is highly resistant to permeation by chlorinated and aromatic solvents.
- Nitrile provides protection against a wide variety of solvents, harsh chemicals, fats and petroleum products and also provides excellent resistance to cuts, snags, punctures and abrasions.
- Kevlar protects against cuts, slashes, and abrasion.
- Stainless steel mesh protects against cuts and lacerations.

Often overlooked is foot protection. Never wear open-toed shoes or sandals when using or working around hazardous materials. Chemicals used in photoprocessing, acid etching, jewelry acid pickle solutions and building maintenance masonry cleaners, for example, are all corrosive and can severely damage intact skin. If you have an accident, flush the skin surface with copious amounts of water and seek medical attention. Some acid exposures, such as Nitric and Hydrofluoric acids, do not always provide immediate warning of overexposure until hours after use. Hydrofluoric is particularly dangerous in that, while you might think it was flushed from the skin's surface, it absorbs through the skin only to attack the calcium in bone.

Dry powders can also release chemicals, such as chromates in lamp black pigments in inks used in printmaking. UV lights used in certain developing processes can also damage the skin.

Eye contact

There are no second chances when we're talking about eye injury. If you're using any equipment or material that has a potential to fragment – sending out sparks, chips or other debris –

always wear approved safety eyewear with side shields.

When working with or around hazardous fine powders or corrosive liquids, wear safety goggles and face shields for full eye protection. Remember to thoroughly wash your hands before touching the eyes. If the area or activity you are doing causes you to perspire, wipe your face frequently using a clean towel to prevent absorption through the eyes.

Rules of the road –DON'T TAKE CHANCES!

- Wear suitable eye protection. Eye and face PPE purchased after July 5, 1994 must comply with ANSI Z87.1-1989, *American National Standard Practice for Occupational and Educational Eye and Face Protection,* and must be distinctly marked to facilitate identification of the manufacturer.
- Know the location of emergency eye wash stations and safety showers.
- Flush the eyes with copious (lots and lots) amounts of water.
- Report the accident and seek proper medical attention.

Ingestion

Toxic and hazardous substances can be ingested primarily due to poor housekeeping and inadequate personal hygiene. If you are using such materials or are in an area where they are routinely used, never eat, drink or smoke in the area, and never do so elsewhere without first washing your hands. Proper decontamination of work tables, floors and the surrounding area after you have completed your work is essential. You can not always see or smell process residuals and the next person that comes along – or even you – could inadvertently come into contact with them and put a piece of gum in your mouth or have lunch shortly after without realizing what you may be exposing yourself to. This reminds us to repeat two key points:

- *Wash your hands frequently.*
- *Wear approved PPE.*

Physical / Ergonomic Hazards

Certain types of equipment and materials storage and handling activity can result in having to lift heavy or bulky items. Always ask for help. Organize work stations to minimize pinch points or risks of being exposed to chips, sparks, open flames, welding arcs, fumes or mists. Avoiding repetitive motions over a prolonged period of time and providing proper seating with support for the lower lumbar region are recommended. Keep the work area clean and free from any accumulation of oils and debris to minimize the potential for slips, trips and falls. If you are doing elevated work, such as with sculpture projects, use a proper ladder or work platform. Follow electrical safety rules, use properly grounded equipment and receptacles and minimize the use of extension cords. If the equipment or tools create noise, wear hearing protection devices such as ear plugs, canal caps or muffs.

- OSHA 1910.132(d) requires that if all feasible engineering and work practice controls are in place, but employees are still exposed to potential hazards, PPE must be provided.
- See Checklist B in OSHA Publication 3151, *Assessing the Need for PPE, A Guide for Small Business Employers*, to assess the need for PPE.
- See also General Industry (29 CFR 1910)
- 1910 Subpart I, Personal protective equipment
- 1910.134, Respiratory protection

Please note that a covered facility must have a written Respiratory Protection Program that includes as a minimum the following requirements:

- Appendix A, Fit testing procedures (Mandatory)
- Appendix B-1, User seal check procedures (Mandatory)
- Appendix B-2, Respiratory cleaning procedures (Mandatory)
- Appendix C, OSHA respirator medical evaluation questionnaire (Mandatory)
- Appendix D, Information for employees using respirators when not required under standard (Mandatory)

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SECTION 5.0
SOURCES OF POTENTIALLY HAZARDOUS WASTE IN ART STUDIOS

This section lists some of the more common artwork methods and materials, and the primary and less obvious risks associated with each, in addition to suggestions for safe usage and disposal.

5.1 Painting and Solvents Use

5.1.1 Major Dangers

Inhalation of dusts, sprays and solvent vapors: Powdered pigments (dust), spray mist, and vapors are easily inhaled, often without being noticed. Just opening a container of solvent and breathing in can cause damage. The strength of the smell is *not* a reliable indicator of potential danger. **Always** ensure that you have adequate ventilation in the class area and studios. Use personal protective equipment (PPE) and clothing. Follow the recommendations suggested in the manufacturer's Safety Data Sheets (SDS's) and product safety literature, and follow the safety guidelines in your school department or studio guidance policy.

Accidental ingestion of paints, pigments, and solvents: No one would take a spoon full of paint or solvent intentionally; however, it is relatively easy to accidentally swallow small amounts of hazardous materials simply by eating, drinking, or smoking in your studio. Skin will also absorb chemicals; as such, precautions should be taken to minimize contact, especially with the eyes, nose and mouth.

Do not allow eating, drinking or smoking in your studio. Each of these activities can not only a provide a pathway for exposure, if the food, drinks or cigarettes, respectively, were exposed to paint, pigments, solvents or residue of these materials, but can provide a more direct pathway for chemicals to reach the digestive tract or respiratory system (and thereby to the bloodstream) than passive exposure.

5.1.2 Less Obvious Dangers

Skin contact with paints and solvents: Skin absorbs chemicals *quickly* – minimize or avoid contact.

Oil and solvent based paints, cleaners and thinners: Many oils and solvents can be readily absorbed into the body by inhalation.

Water-Based paints: They may seem harmless but they may still contain toxic metal pigments such as cadmium, chromium, lead as well as toxic organics such as formaldehyde, isocyanates and glycol ether solvents.

Low-odor solvents: Odorless is not synonymous with safe. If it can melt plastic, assume it is hazardous.

5.1.3 Safety Suggestions

- Pigments, paints, mediums, solvents and varnishes all may contain toxic chemicals; some even contain lead and arsenic, as well as other toxic "heavy" metals. The solvents in varnishes and thinners are particularly dangerous because of their volatility - they transition from a liquid state to a vapor state and can quickly permeate throughout a room, creating unsafe and unhealthy concentrations. Keep containers tightly closed except when adding or removing material and waste. Seemingly harmless supplies such 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.
- Consider using the new water washable oil paints that do not require the use of any solvents. Other solvent-free paints include acrylics, gouache and watercolors.
- Buy paints that list the pigments and avoid those containing cadmium, chromium, lead, barium, mercury (e.g., cadmium mercuric sulfate, mercuric sulfate), selenium (e.g., cadmium seleno-sulfide), and arsenic; waste paints containing these metals and wastes containing these paints may be toxic characteristic hazardous waste. Also consider avoiding paints containing antimony, cobalt, manganese and nickel. Similarly avoid paints and gessos containing lead-pigments, such as flake white. Pregnant women in particular should not use any lead pigments or products.
- Water-based products are not necessarily the safest; they may contain toxic metals. Pay close attention to the labels. Other metals that may be present in some paints may be regulated in waste water and storm drain releases, including copper, zinc, cobalt, nickel manganese, and others. Local regulations should be checked to compare contents of your paints with what is allowed down sinks and floor drains.
- Try to replace turpentine and other aggressive solvents with solvents that are less toxic, volatile, and flammable. This will require learning about air quality limits, evaporation rates, and flash points (See Glossary.) These concepts should be included in classroom health and safety training. Some products on the market are significantly less toxic, volatile and flammable than turpentine, such as some of the better "turpenoids" or turpentine substitutes. All the solvents can be damaging to the developing fetus.
- Ensure proper ventilation. Classrooms and studios should have a rapid exchange of air if solvents are used. Spray products require local exhaust, such as spray booths. High solvent painting techniques, such as solvent washes, should also be done in local exhaust.
- Use pump spray bottles rather than spray paints. The result will be less paint use due to better transfer efficiency and loss due to overspray. If you do use spray painting techniques upgrade your spray guns to high volume low pressure HVLP styles. This will also help you to minimize paint waste as overspray.
- Avoid spray-paints that contain known carcinogens.
- While not common in painting, benzene and carbon tetrachloride are banned in consumer products by the U.S. Consumer Product Safety Commission. Accordingly, it is worth noting that, while they can be ordered by chemistry departments, art departments should never buy solvents that include benzene or carbon tetrachloride.
- Wear protective clothing and cover your hands and face, particularly when spraying or using solvents.
- Do not eat, drink or smoke in your classroom work spaces or personal studio.
- Do not leave open containers of solvents or varnish - they will evaporate quickly and create unsafe and unhealthy working conditions. Before you put the covers on clean the edges so that you get a good seal and close the lid tightly. Remember that if the container is a waste material you could be in violation of the hazardous waste regulations for illegal treatment and disposal of hazardous waste if the material is not properly contained.
- Baby oil or vegetable oil can be used for cleaning brushes and knives that are coated with oil based paint formulations

  Clean-up and disposable rags may also be used to wash off pallets and wipe brushes clean. If they contain concentrated levels of pigments containing metals defined as regulated hazardous waste, the rags are also regulated hazardous waste. They need to be collected,

segregated, placed in the area designated for the hazardous waste container, and picked up in a timely manner. Other materials with paints or pigments on them should also be placed in a designated hazardous waste container, rather than be thrown in the regular trash.

In addition, if linseed oil, citrus oil/d-limone, tung oil, or any other setting oil is present on the rags, a safety container must be used because these rags can spontaneously combust if left exposed to the air.

5.1.4 Disposal

Typical EPA Regulated hazardous wastes from painting classes and studio work include paint pigments and colorants that may contain toxic heavy metals (e.g., cadmium, chromium, lead, barium, selenium, mercury.) Paint thinners and reducers and cleaners may contain toxic and/or flammable organic solvents containing toluene, xylene and acetone, and many others not specified. You **must** know the materials you are working with to ensure proper disposal either from product knowledge or analytical testing.

5.2 Ceramics

5.2.1 Major Dangers

Inhalation of dusts and glazes: 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 can lead to silicosis, or a form of lung fibrosis that causes shortness of breath, an increased susceptibility to infections, and lung scarring.

Everything in ceramics involves some form of powder and water. These are mixed to make clay or glazes - when they dry out, dust results. Often the dusts involved are very fine and once in the air they are not always visible, which makes it much easier to inhale them accidentally. As well as silica, other hazardous particulates such as kaolin clays may be present. Low-fire and slip-casting clays also contain talcs, which may be contaminated with trace amounts of asbestos. Asbestos can cause lung cancer and lung scarring.

Always wear appropriate respiratory protection when doing anything that puts powder or dust into the air and try to work with wetted materials whenever possible, and never sweep in the shop as it will just stir up the dust, wet mop or sponge off surfaces. For a thorough cleaning of dusty areas use a vacuum cleaner equipped with high efficiency particulate filtration apparatus.

5.2.2 Less Obvious Dangers

Clays: Clays usually do not contain either regulated or unregulated toxic metals. Often they can be released to floor drains or put out with ordinary trash. The exception is when clays are specially colored (e.g., black clays colored with manganese compounds, green clays colored with chromium compounds)

The dust from all clays, however, is hazardous to inhale because clays contain minerals such as silica, talc and kaolin. To avoid inhaling the dust, it is safest to buy clays premixed and clean up potteries by wet mopping and/or using a HEPA vacuum.

Glazes: Glazes, whether sold premixed or mixed from raw ingredients by the potter, may contain almost any known metal.

You need to consult the SDSs and other specific information from the manufacturer to find out exactly which ones are present. For example, if barium, cadmium, chromium, lead, selenium or silver are present, wastes containing these glazes may be RCRA-regulated and these waste glazes must be disposed of as hazardous waste. Spills and debris containing these glazes, whether from floors or work surfaces, must also

be collected and disposed of as hazardous waste.

While SDS can be valuable sources of information, they are only required to include chemical components that "have been determined to be health hazards, and which comprise 1% or greater of the composition, except…chemicals identified as carcinogens." Because some of these metals may be present at less than 1%, but still above the TCLP limit, the fact that a metal (or other chemical) is not listed on the SDS does not ensure that it is not present at levels that might fail a TCLP test. Manufacturers should be able to identify which glazes would be hazardous waste if disposed of. However, because glazes containing these metals are commonly found to be hazardous, it may be simpler and less expensive to treat these wastes as hazardous than to perform a TCLP test.

Glazes containing these metals are commonly used in ceramics studios and classrooms as follows:

- Arsenic - a contaminant of a number of colorant oxides such as copper, cobalt, and cadmium oxides, carbonates, and sulfates.
- Barium - a major flux for medium and high fire glazes. This means it will be found in much greater amounts than if it were a colorant. It is not uncommon for glaze formulas to contain 25% or more barium.
- Cadmium - a common colorant in low fire commercial glazes in the yellow to red spectrum.
- Chromium - used in many forms and compounds as a green colorant. It can be a chromate, oxide, carbonate, etc.
- Lead - Many formulators of their own glazes use lead frits and nearly every glaze company that sells low fire premixed glazes has at least some lead formulations in their catalogs. These are still frequently found in ceramic studios and school ceramic programs. Teachers, students and artists often cannot use lead if they fire at high temperatures, at which lead will burn off. However, if there are electric kilns on the premises, these kilns are often used for low fire work involving lead. You can always tell if lead is present if you see certain bright reds and oranges in exhibited work, as it is often difficult to get distinctly bright reds without lead fluxes in the glaze, in combination with cadmium and selenium colorants. China painters and slipware casters/decorators still commonly use all-lead glazes.
- Mercury - not common except in specialty work involving certain old lustre glazes. The mercury from these old glazes, which were based on mercury amalgams of real silver and gold, would fire off in the kiln, leaving the metal lustre on the glaze surface. Old stocks of these still exist.
- Selenium - The "new" reds, yellows and oranges touted by many glaze manufacturers rely on selenium compounds, often used by potters who want to avoid cadmium reds and yellows.
- Silver - used in luster glazes for decorating glazed ware by re-firing at a lower temperature or for lustre effects in a fast firing method called "raku." A majority of ceramic programs in schools and universities fire some raku and, if they do, are likely to have silver lustre glazes or silver compounds, such as silver nitrate, hidden away to get these effects.

Glazes also may contain many metals that are not regulated under RCRA, but which are toxic under certain conditions including cobalt, copper, zinc, manganese, antimony, nickel, lithium, boron, and bismuth. Some of these metals may be regulated by local waste water and storm drain regulations and should not be put down sink or floor drains. Check with local authorities.

Glaze Chemicals: Potters who mix glazes from raw ingredients are likely to be using some regulated chemicals. Glaze chemicals that are, or that contain, regulated metals must also be subject to a hazardous waste determination –

and may be hazardous waste – when they are discarded.

In addition to the RCRA toxicity characteristic metals listed above, a common colorant, vanadium pentoxide, used as a yellow high fire colorant, is regulated as a hazardous waste when disposed of. Excess or off-spec vanadium pentoxide (CAS No. 1314-62-1) is regulated under RCRA as an "acute hazardous waste" and, as such, it must be manifested using the waste code P120 and it may raise the facilities hazardous waste generator category (see explanation in Section 3.) Vanadium pentoxide is often sold to potters in a paper sack with the name of the chemical hand-written with a marker on the sack.

Use of Glazes: Glazes should be applied in ways that do not create air-borne particles such as by spraying or by dusting on dry glaze powders. Such methods should only be done in local exhaust such as a spray booth. Spray booth filters and scrapings must be treated as regulated hazardous waste if they contain the regulated metals. State or local air quality permits may be required for the spray booth, so check with state and local officials.

Floors and surfaces contaminated with spills, small splashes or dust from glazes should be cleaned with methods that capture the glaze waste. If regulated metals are present, this material should be disposed of as hazardous waste.

If liquid glazes are used or stored or large containers (e.g., buckets containing several gallons or more) containment trays are needed under the containers to capture potential spills or leaks. Containers of liquid glaze should not be present in areas in which there are floor drains into which a spill could seep.

Firing: Potentially toxic fumes and gases may be emitted during the firing process in ceramics. Exposure to carbon monoxide and carbon dioxide causes headaches, dizziness and can deplete oxygen levels to unsafe levels. Sulfur dioxide and formaldehyde fumes are only two examples of hazardous air contaminants resulting as byproducts of combustion processes. They are toxic and carcinogenic - avoid any exposure in any amount. Always ensure the exhaust system is on and operating properly during ceramic firing operations. State or local air quality permits may be required for the kilns, so check with state and local officials.

Do not look directly into the kiln when in operation. This can cause cataracts or other damage to your eyes due to infrared radiation. Wear protective goggles if you have to work with the kiln and must visually inspect the combustion chamber.

5.2.3 Safety Suggestions

Usage

- Do not use glazes containing lead or cadmium. There are substitutes for these very toxic materials. Pregnant women and nursing mothers should never use lead in any form and should consider avoiding exposure to any of the toxicity characteristic metals.
- Buy premixed clays rather than mixing from dry powder unless you have a local ventilation system for the glaze mixing area. In a related matter, ensure that the work area has proper ventilation for kilns, glaze spraying and processes in which clay or glaze dusts are raised, such as mixing glazes from powdered chemicals.
- If you make items for use with food, consult a laboratory about regular testing for leaching of toxic metals from your glazed ware.
- Dust masks or respirators can be worn to reduce exposure to dusts and sprays if you, your school or employer comply with the OSHA respiratory protection rules.
- Work with clays and glazes when they are wet to reduce exposure to dust.
- Never sweep floors. Use a HEPA vacuum or wet mop and sponge surfaces. If regulated metals are present in floor and surface debris, the mop water and/or the HEPA filter must be disposed of as regulated hazardous waste.
- Wash hands and skin thoroughly after working with clay or glazes. Keep soiled shoes and smocks in the studio rather than wearing them home.

- Wear eyewear rated for infrared radiation protection whenever it is necessary to look into glowing hot kilns.
- There are many other safety and health precautions. For more complete lists, see other safety books in the resource list.

5.2.4 Disposal

Recycle glazes by collecting spills and debris from spray booth walls and filters. Mix this waste with water and test fire. Often these are acceptable glazes or can be adjusted with colorants to make good glazes. If they are unattractive, use the waste glazes for unseen surfaces such as the insides of hollow pieces not intended for food use.

Clay is not normally a regulated hazardous waste. However, it can be dangerous to recycle clay if you use a mechanical clay mixer or pug mill and adjust the texture with the addition of dry clay. One safer way to recycle clay is to make a slurry by adding water to chunks of dry waste clay and drying the slurry out on plaster bats.

Typical EPA- and state-regulated hazardous wastes from a ceramic classroom would be premixed commercial glazes and raw glaze chemicals. Some potters also use certain lustre glazes or paints, which contain flammable and toxic solvents that dry to look like glazes.

5.3 Jewelry Making and Small Metals

5.3.1 Major Dangers

Soldering: Silver soldering is a common practice in jewelry making, but even the lowest melding 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 heart beat. 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 primary ingredient, sodium bisulfate, can even lead to corroded teeth. In addition to pickles, alcohol and acetone solutions are sometimes used for cleaning and finishing. For all hazardous materials involved, personal protective equipment and appropriate clothing should be used. Follow the recommendations suggested in the manufacturer's safety data sheet or product safety literature, and ensure classroom safety guidelines exist and are adhered to.

Enamels: These are powders of colored glass-like materials that fuse with heat onto metals. Some enamels are lead-bearing, but there are now lead-free enamels commonly available. Enamels cannot be made completely safe because some of the colorants are hazardous. For example, opaque yellows usually are cadmium pigments. Opaque white pigments usually are arsenic compounds. And so on.

Silica: Sources of inhalable silica include polishing compounds (e.g., tripoli), dust from investment molds, and dust from grinding and polishing of many types of gem stones.

Wax: Certain types of hot and burning wax release formaldehyde, acrolein and other toxic fumes. If this is the case in your studio or classroom, provide ventilation for burn out kilns and other hot wax processes.

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,* a condition with severe flu-like symptoms. The fever usually appears a few hours after exposure and lasts roughly thirty-six hours; however, it can lead to chronic impairment..

Lead fumes are very dangerous; these fumes can be released when certain types of bronze are melted. Always be alert for lead exposure when using bronze.

Always provide adequate local exhaust and ventilation in the jewelry workspace, wear protective clothing when melting metals and use an approved respirator.

Lead: Lead is extremely dangerous, even in its solid form. Protective clothing; and gloves should be worn, as organic lead compounds can be absorbed into skin. 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.

Inhaling particulates while grinding or polishing: Wear a mask to avoid breathing in toxic particulates released during these processes.

5.3.2 Safety Suggestions

Usage

- Ensure proper ventilation.
- Dust masks or respirators can be worn if you, your school or employer comply with the OSHA respiratory protection rules.
- Wear eye protection rated for impact when grinding or chipping materials. Wear eyewear rated for chemical splash when working with liquids.
- Pregnant women should work neither with solders, metals or enamels that contain lead, cadmium, or antimony, nor with solvent-containing products.
- Avoid lead-containing metals, solders, and enamels.
- Avoid resins and adhesives that release formaldehyde
- Avoid cyanide plating systems for surface treatments.
- Use patinas and other surface treatments safely (see the foundry section)

5.3.3 Disposal

One common EPA regulated waste stream from jewelry making is pickle solutions. These are acidic and corrosive. If the solution has been used for regulated metals such as those containing silver, lead, chromium, or cadmium, and if these metals are in the solution at levels above characteristic waste levels, then the pickle waste will require off-site disposal as hazardous waste. If, instead, the solution has only been used of other metals such as copper or zinc, and if the levels of metals in solution will not exceed the local water treatment plant's discharge limits, the solution can be neutralized and put down the sink. Neutralization can be done by adding baking soda until the solution reaches a pH of 7, then mixing with water in the ratio of 1 part neutralized solution to 5 parts water.

Typical EPA regulated hazardous waste from jewelry making classes and studio work may include toxic heavy metals such as cadmium, chromium, lead, barium, and silver, as well as hazardous organic solvents, such as acetone, flammable liquids, corrosive cleaning solutions, etc. If you are unsure about the constituents contained in the waste resulting from your project work, ask to have samples analyzed so that you can properly identify any hazardous waste and ensure that it is handled and disposed of in a proper manner.

5.3.4 Recommended Alternative Materials

- Provide ventilation for soldering, grinding, polishing, pickling and other processes that produce air contaminants.
- Olivine sand or synthetic amorphous silica can be used to replace the very toxic crystalline silica (e.g., cristobalite) in lost wax casting investment molding compounds.
- Borax and chloride fluxes may be toxic, and can cause throat and nose irritation, but can be used to replace the even more toxic fluoride fluxes.
- Use detergent solutions for cleaning metals instead of solvent-based or acid solutions
- Use lead- and cadmium-free enamels, solders and metal alloys.

5.4 Photography

5.4.1 Major Dangers

Inhalation of Chemical Vapors: Be aware that many of the individual chemical substances which are be present in photo processing solutions either have their own particular odors or react in the photodeveloping process to release odorous chemicals. These odors can provide a warning that they are in the air. But people's ability to detect odors varies, so odors alone are never a good indicator of hazardous conditions.

Other indicators that hazardous substances become airborne in the process can be seen in the rusting and etching of metals in the room. In fact, some of these chemicals are strong enough to etch and ruin the glass on enlargers. Imagine what these chemicals could do to lungs and tissues.

Ventilation is necessary in all types of photography work, as well as a keen awareness of what is happening while you are mixing and using the chemicals. Always use personal protective equipment and wear appropriate clothing. Follow the recommendations suggested in the manufacturer's safety data sheet or product safety literature and follow the safety guidelines in your class or school safety guidance policy.

If breathing ever becomes difficult leave the darkroom and get fresh air immediately.

Skin Contact with Chemicals: Many photo developing chemicals and liquids are corrosive and/or sensitizing to the skin, or will cause irritation; some have the potential to be absorbed through your skin. Wear impervious chemically resistant gloves at all times, use tongs to move prints in and between baths, and avoid wiping your face or eyes while in the darkroom. Wash hands and skin thoroughly after any contact with chemicals.

5.4.2 Less Obvious Dangers

Metals: The only clinical condition that is known in humans to be associated with long-term exposure to silver is argyria, a medically benign but permanent bluish-gray discoloration of the skin, typically resulting from ingestion of pharmacologic preparations contained silver. However, repeated dermal contact with silver may, in some cases, lead to contact dermatitis and a generalized allergic reaction to silver. Additionally, exposure of open cuts to silver, such as silver nitrate used in some of the historic processes, can result in a non-harmful black color remaining in the scar. Accordingly, putting your unprotected hands in fixing baths or any chemical solution should be avoided, and hands and other potentially exposed skin should be washed thoroughly after working in the darkroom or upon contact with any chemical preparation.

5.4.3 Developing Process Awareness

Mixing photochemicals: This is the first step in the developing process. Always purchase photochemicals in liquid form rather than as powdered chemicals to avoid exposure to highly concentrated chemical dusts. Although the liquid photochemical concentrates are safer, they still should be handled and diluted with water carefully to avoid skin and eye contact. Eyewear rated for protection from chemical splash should always be worn when working with photo chemicals and eye wash stations should be installed in every darkroom.

The liquid concentrate for one of the baths (the stop bath) requires special warnings. Some photographers make these solutions by diluting concentrated "glacial" acetic acid which is

99.8% pure. Glacial acetic acid is flammable, must be stored alone because it is reactive with both other acids and solvents, and can cause instant burns to the skin and eyes. When diluting this, or any acid, add the acid to the water -- never the other way around.

Storing & using photochemicals: Store the chemicals in clearly labeled and sealed bottles. Place large containers, dispensers and cubitainers in containment trays to control spills. Non-flammable chemical sorbants should be in all storage areas and darkrooms for emergencies to absorb spills quickly. All photo darkroom emergency response procedures for chemical spills or accidents should be posted and rehearsed. This is especially important because emergency response may be complicated by low lighting or by restricted access to darkrooms through light-tight doors or baffles.

Chemical dispensers of regulated chemicals should not be placed above sinks where an open spigot or spill will direct the chemical straight into the drain. One good solution to this problem is to place dispensers with pump systems in them in containment trays on the floor under the sink. Then the chemicals can be pumped up into developing trays in the sink and siphoned back down again without risking large spills to the drain.

Black & white processing. There are three basic chemical baths used in sequence in photoprocessing: Developing solutions to bring up the image, stop baths to keep the print from over developing, and fixers to wash the dissolved silver out of the film. All these solutions are toxic and/or sensitizing in their own ways and skin and eye contact should be avoided.

The solutions usually have sulfite compounds in them, as preservatives, which release sulfur dioxide gas to the air. This gas is a common trigger for allergies including asthma and is also irritating to the respiratory system and eyes. The air in the darkroom will contain some acetic acid vapors from the stop bath and small amounts of other chemicals from the process.

Silver. The major regulated waste in darkroom chemicals is the spent fixer which contains dissolved silver. Sometimes there also is silver at levels of concern in the stop bath and any additional wash water rinses as well.

One way to manage silver-containing waste is to collect it all in containers and have it taken off site by either toxic waste disposal companies or by other photo companies that will reclaim the silver and sell it.

Another way to handle this waste is to contract with companies that provide silver reclaiming machines which will filter the silver from the solutions. Once silver wastewater has been run through one of these units, it can be put down the drain. Periodically, the company services the machine, removes the collected silver, and provides a fresh filtering cartridge.

Some areas of the country, including New York City, have specific requirements for wastewater containing silver. In NYC, for example, a facility that releases silver to the drain would need to develop and write a Best Management Practices Plan, conduct periodic testing of the effluent (discharged wastewater) and record the quantities of spent solutions generated.

The method you choose will depend on the quantity of chemicals used, frequency of use, local sewer requirements, staffing resources, space limitations, and other factors. Keep in mind that for a small photo department, it is often more economical to simply collect the solutions and have them recycled by a commercial vendor, rather than buy or lease silver recovery units.

Color processing: Most color developing is now done in color processing machines so exposure to the solutions only occurs when they are mixed, put into and taken out of the processor. Many of the hazards are the same as black and white chemicals with the addition of some unusual and esoteric chemicals about which little is known.

Toning: This is a process by which silver is removed from the print and replaced with another metal or substance of a different color. Some of the metals used to replace silver

include selenium, copper, platinum, palladium, uranium, and iron. Sulfide toning replaces silver with brown-colored silver sulfide. Some of the common emissions from these processes are sulfur dioxide and hydrogen sulfide. However, there are many toning processes and the ones you use must be assessed for their hazards and the types of waste they generate.

Historic processes: There are far too many historic processes to cover all the regulated chemicals that could be involved. Artisans doing historic processes must carefully assess the chemicals they use for hazards both to themselves and to the environment.

For example, some of the processes employ hydrochloric acid, which is a strong corrosive. Other processes use potassium and ammonium dichromates, and other chromium compounds, which are regulated as hazardous wastes if they are spent, obsolete or disposed of. Potassium ferricyanide and the other ferri- and ferrocyanides are particularly hazardous because, when heated or allowed to mix with acidic solutions, they release hydrogen cyanide gas which is deadly by inhalation. They also are known to release cyanide under both alkaline and acid soil conditions in the environment.

UV Light Sources: UV light looks wonderful, but it is intense radiation; exposure to it can cause burns, cataracts, and blindness. Do not look directly at the light source, and keep skin exposure to a minimum.

5.4.4 Safety Suggestions

- Provide appropriate ventilation for each process. Usually general or dilution ventilation is adequate for black and white processing. Mixing of chemicals, toning, and some historic processes will need local ventilation such as a sink with a built-in exhaust slot opening at the splash board. Color processors can now be purchased with a local exhaust opening and duct build in. If the facility conducts an OSHA respiratory protection program, users may also choose to wear respiratory protection with a cartridge that filters organic vapors,.
- Purchase black and white and color processing chemicals premixed in liquid form rather than dry powders.
- Purchase acetic acid for stop baths in a diluted form (e.g., 50%) rather than as glacial acetic acid.
- Evaluate the formulas of all toners and historic chemicals to determine if they are potentially toxic to you or regulated in toxic waste or waste waters.
- Use gloves, tongs or photoprocessing machines rather than putting your hands in contact with the chemicals.
- Always wear eyewear rated for chemical splash when using photochemicals.
- Follow all general hygiene procedures, such as washing hand thoroughly after any exposure, not eating in the darkroom and cleaning up spills promptly.
- Set up emergency procedures to deal with potential spills, accidents or illnesses. Post information in readily visible locations (such as in the darkroom and just outside the entrance to the darkroom) and rehearse procedures.
- Pregnant women should not work with any material that contains lead or solvents in particular. Many of the complex photochemicals have never been evaluated for the effects on the fetus and caution should be used.

5.4.5 Disposal

Certain photo processing wastes -- from black and white, color and toning – are hazardous waste because they contain significant levels of RCRA toxic metals (e.g., silver, selenium, cadmium, chromium, lead, barium) or because they release sulfides or cyanides. The most common is waste silver solution, which is often generated in concentrations above 5 mg/L, thereby being a regulated hazardous waste requiring proper treatment or disposal.

Check to see if solutions containing metals other than the RCRA metals are restricted by local waste water and storm discharge regulations; as mentioned previously in regard to silver, if pretreatment or recovery of the metals is needed to keep them from being discharged to sewers, it is often more economical for small programs to simply collect the wastes for recycling or disposal through a commercial vendor, rather than using onsite recovery equipment.

Corrosive liquids (pH <2 or >12.5) are also hazardous waste and need proper treatment and/or disposal.

Any unused film, aerosol spray cans such as for surface mount adhesives, and any toners and developers that are obsolete should be sent off site for proper treatment and disposal.

5.5 Printing and Printmaking

5.5.1 Major Dangers

Inhalation: Vapors and gases from evaporating solvents and acids, spray mists from power washing of screens and aerosol products, and dusts from powdered materials such as talc (French chalk) abound in printmaking. It is necessary to evaluate procedures which produce toxic airborne contaminants and determine the proper type of ventilation needed to reduce or eliminate these exposures. The ventilation systems can range from dilution room ventilation to local exhaust systems such as chemistry fume hoods for acid etching baths and flexible duct systems for cleaning presses with solvents.

Be aware that some of the solvents used in printmaking have very low odor warning levels or may even smell good (e.g., lithotine.) Such solvents may cause damage before you are aware that you have been overexposed. Headaches and lightheadedness are acute symptoms of solvent over exposure which may also be silently causing chronic damage to the nervous system, liver and kidneys. Acids can cause respiratory irritation which varies with exposure from a little sore throat to chemical pneumonia.

Skin contact: Some substances used in printmaking are associated with skin cancer, such as chromate pigments, carbon black and lamp black pigments in inks and Tusche (crayons), and UV light used for exposing photo etching plates.

In addition, many substances absorb through the skin, such as certain solvents, including hexane, toluene, and the glycol ethers in some water-based printmaking inks. Lead pigments and lead metal may also be absorbed though skin. The lead pigments include chrome yellow and chrome green (both lead chromates), milori green, and molybdate orange. Lead metal and the compounds formed on the surface of lead as it oxidizes (turns dark) also absorb through the skin. Setting lead type is one way this exposure can occur.

Eye contact: There are a number of solvents and acids used in etching and lithography that can cause serious eye damage. Eyewear rated for protection against chemical splash should be worn when working with acids and eye wash stations should be located in the areas where acids are used and stored. If acids (or bases) are used, an emergency shower should also be installed and may be required by OSHA or a state counterpart.

Lead exposure: Printmaking is likely to expose artisans to lead, which is a possible carcinogen and causes both acute and subtle chronic damage, such as loss of mental acuity, neurological damage, and kidney and liver damage. Printmakers using lead also may be putting their children at risk from the lead contamination they inadvertently bring home on clothing, shoes, skin and hair. Pregnant women, in particular, should never be exposed to any amount of lead that can be avoided, however small.

Printmaking techniques: All of these techniques can be made safer with proper ventilation, wearing gloves, and thorough washing of hands and exposed skin after processes. However, each process may also have specific concerns

based on the materials used. There are too many techniques to cover them all, but some of the major ones are discussed below.

Intaglio: Traditional etching employs nitric acid, hydrochloric acid, and Dutch Mordant (hydrochloric acid plus potassium perchlorate.) These are highly hazardous etches, which many schools and printmakers have replaced with the much safer ferric chloride solutions. Some printmakers add citric acid to the ferric chloride which makes the solution almost as acidic as hydrochloric acid. It is better to use ferric chloride alone even though it takes longer to etch.

The resists or "grounds" often contain toxic solvents; accordingly, ventilation may be needed when using them. Powdered rosin, which is a strong respiratory sensitizer associated with asthma, is used in the aquatint process. When the rosin dust is concentrated in the air in the aquatint box, it is also explosive. Sources of flame, electricity, and. static electrical discharges should be kept away from the rosin box.

Lithography: All of the same acids used in intaglio, plus phosphoric acid, are commonly used in lithography. Although the acids are usually used in very small (eye dropper) amounts, eye protection and gloves are still needed.

Litho presses usually need a local exhaust system because acids and solvents often are used to modify the surface of the litho stone while it is on the press.

Silkscreen: Solvent-based silk screen is not often done today. Instead, safer water-based silk screen materials can be used. However, they will also contain pigments, some of which may contain toxic and regulated metals. The resists to make the stencils are usually solvent-bearing. Diazo photo emulsions are usually safer.

Cleaning, screens with power spraying will result in a water mist containing the potentially toxic inks getting airborne. Either ventilation should be provided for this process or inexpensive screens can be used and discarded to save time and the cost of ventilation. Alternatively, if your facility has a respiratory protection program in place, mist-filtering respirators can be used during screen cleaning.

Photoetching: It is important to obtain the SDSs on the solvents used in this process, since some will be very toxic glycol ethers.

Typesetting: Setting old fashioned lead type for letter press work can expose you to lead by skin absorption. The lead type also "sheds" small particles of lead oxides which end up on surfaces throughout the pressroom. This contamination can be transferred to the skin, to the mouth by hand-to-mouth contact, and taken home on shoes and clothing.

The inks also may contain lead and other toxic pigments. Ventilation should be used for the presses if solvents are used to clean the press and the type.

5.5.2 Safety Suggestions

- Ensure proper ventilation, even if you don't smell anything or if you like the smell. Remember that pleasant odors are not necessarily from safe sources.
- Wear protective clothing, including gloves, when using oil-based products.
- Try to substitute safer pigments for all the lead pigments. Typesetting with lead type can be replaced with digital methods.
- If lead is used, get regular blood lead tests for yourself and any young children at home. Pregnant women should never use lead or solvent products.
- Since pigments and solvents must sometimes be used, select the safest ones.
- Use the safer etches such as ferric chloride.
- Use water-based silk screen and monoprint inks when possible.
- Do not use spray products unless there is a proper spray booth available. Many spray products can be replaced (e.g., adhesive contact paper or double sided tapes can replace spray adhesives.)
- Assess each printmaking process, press cleaning, etching and other activity in terms of the airborne contaminants created and provide the proper ventilation for that process.
- If you use acids or solvents, provide eye protection rated for chemical splash protection.

If the amounts of acid present are in pint quantities or more, provide emergency (deluge) showers. Make sure that you, and all students and/or artists working in the space, know the location of emergency eyewash stations and emergency showers and are familiar with their operation.

- Locate aquatint boxes containing powdered rosin away from all sources of potential ignition and provide ventilation for the escaping rosin dust when the door is opened. If a spray booth is available, aerosol spray aquatinting can be done which is safer.
- If lithography is done, wear steel-toed shoes.
- Follow all sensible hygiene rules such as not bringing food or drink into the studio, washing hands before leaving, cleaning up properly, etc.
- Clean-up and disposable rags may also be used to wash off plates. If they contain concentrated levels of chemical residues that can be defined as regulated hazardous waste, the rags may be regulated hazardous waste and, as such, must be collected, segregated, placed in an appropriate container in the satellite accumulation area and picked up in a timely manner.
- If linseed oil, citrus oil, tung oil, or any other setting oil is also present on the rags, the container must be air tight because these rags can spontaneously combust if left exposed to the air.
- If you are uncertain as to whether waste is hazardous, it may be advisable to manage all materials with inks or chemical residue on them as hazardous waste, rather than throwing them into the regular trash. Unless you generate large volumes, it may be cheaper and simpler to manage all of these wastes as hazardous rather than conduct TCLP tests on all of the material.

5.5.3 Disposal

Typical EPA regulated hazardous waste from printing and printmaking classes and studios include the following:

- Inks, dyes and pigments containing toxic metals, such as cadmium, chromium, lead, barium and silver;
- Haze and emulsion removers and printing plate cleaners containing toxic and/or flammable organic solvents, such as acetone, xylene and toluene;
- Spent corrosive acid solutions used in etching; and,
- Obsolete inks, etching grounds and cleaning materials.
- Lead metal from old type can be sold to recyclers rather than disposed of as toxic waste.

5.5.4 Recommended Alternatives

- Water-based inks and monoprint paints.
- Zinc plates, whose dissolved metals are less toxic in the environment than copper.

5.6 Metalworking and Foundry

5.6.1 Major Dangers

Inhalation of metal fumes: When metals are heated to a liquid state, many release potentially toxic fumes (tiny metal oxide particles.) Processes during which metals are melted include welding, cutting and casting. Metal fumes inhaled during such activities can cause "metal fume fever", a temporary condition that appears a few hours after exposure as severe flu-like symptoms and a dry, hoarse throat. It generally lasts from 24 to 48 hours, with all symptoms generally clearing within four days. The fever usually appears a few hours after exposure and all symptoms . However, severe cases can leave permanent damage.

An especially toxic metal fume is from lead such as when casting lead objects or casting bronze alloys that contain lead.

Welding: The fumes created during welding and brazing are released from the ingredients present in the metal being welded or cut, in the

welding rods or wire feed stock, or in the brazing rods. Check the SDS for each of these items to determine which metals will release fumes. Common toxic metals found in welding fume include manganese, nickel, chromium, zinc, copper, and vanadium. Decorative brazing may also employ silver, antimony, and other metals.

Welding also produces gases such as nitrogen oxides and ozone which are damaging to the respiratory system.

The best protection from welding fumes is local ventilation to remove the plume of fumes and gases to the outside. Alternatively, air-purifying respirators can be used. If respirators are used, a proper OSHA respiratory protection program should be provided and cartridges should be selected for your type of respirator in consultation with an industrial hygienist or someone familiar with the available cartridges, based on the specific task to be performed.

In addition to fumes and gases, welding also produces ultraviolet radiation (UV) which can cause painful temporary burns to the eyes called "welding flash" and which may lead to permanent eye damage. Protection is provided by welding eyewear or shields which must be matched to the specific type of welding being done.

Foundry work: Avoid inhalation of metal fumes created during melting and pouring of metals and inhalation of toxic emissions from heating and burning of wax. Ventilation should be provided for the crucible, the pouring area, wax pots, and burnout kilns. Respirator filters can protect workers from metal fumes as part of a proper OSHA respiratory protection program.

Forming and breaking of molds should be done with ventilation or respiratory protection to protect workers from silica dusts which can cause permanent lung damage (silicosis.) Most investment molds, often called "plaster" molds, actually contain mostly silica (usually in the cristobalite form.) Silica in this form can cause silicosis a progressive and often deadly lung disease. Foundry sand molds can be used which release silica when they are broken off cast objects. The resin adhesive in sand molds also may release formaldehyde, ammonia, and/or phenolic compounds depending on its composition. Less toxic ceramic shell casting mold methods which can be used, but they also employ sand.

It is possible to use more expensive olivine or amorphous silica sands for some of these mold processes. These minerals are not associated with silicosis.

Heat: Pouring hot metal involves obvious dangers of burns. Special protective clothing, gloves and shoes, as well as face shields, should be worn for this process.

Other People: Always be aware of the processes going on around you, and use or wear protective equipment when you feel you are being exposed to fumes, particulates or other hazards.

5.6.2 Less Obvious Dangers

Junk Metals: A dangerous practice often overlooked in metalworking is the use of junk or found metals. There are no SDSs or ingredient information available for such metals and it is impossible to tell if junk metals contain toxic components, such as nickel, chromium, cobalt, lead and more. For example, a metal that appears to be ordinary mild steel can be cadmium-coated, while some non-ferrous metals can contain extremely toxic beryllium; the cadmium-coated metals and beryllium alloys are too toxic to use in ordinary art studios.

Avoid using junk metals; the only safe way to work with them is to have perfect local ventilation systems installed which completely prevents exposure to airborne fumes and dusts.
Patinas: Patinas contain chemicals which darken, age, or change the color of metal. One of the most common patinas which darken metals is potassium sulfide. It releases toxic hydrogen sulfide gas, in the process. Most patinas are sulfides, chlorides, bromides, or fluorides of a wide variety of metals such as selenium, antimony, copper, or tellurium. Most also release toxic gases when they are used. Some are applied cold while others are applied to heated metals. The hot process patinas usually release the largest amounts of toxic

substances, but ventilation should be provided for both types of patinas. Wear an appropriate respirator, gloves and protective clothing when doing any patina work.

Other surface treatments: Plating surfaces with cyanide solutions should always be avoided (see the jewelry section) . Enamels can be applied to metal surfaces with heat. Metal priming paints also can be used, but this type of paint is exempt from consumer paint lead laws and may contain lead. Those containing lead should be avoided.

Metal dusts: Grinding, abrading, wirebrushing, and polishing produce small particles of metal into the air that can be inhaled and settle on the skin. Some grinding processes also heat the metal enough to generate a small amount of metal fume (see above)

Grind wheels, abrasive blasting, grit, and polishes (e.g., rouge and tripoli) may contain silica and/or other mineral abrasives' that are released during use and can be inhaled. Grindwheels and grits can be made of safer abrasives such as carborundum or aluminum oxide. Grits made of glass beads are also less toxic.

5.6.3 Safety Suggestions

- Get SDSs on all stock metals, welding and brazing rods; and wire. Almost all metals contain some toxic ingredients. Even mild steel will contain manganese. Avoid coated metals such as galvanized (zinc coated) or metals coated with cadmium, or other toxic metals.
- Get SDSs on the ingots for all foundry metals. Avoid any bronze or other casting metal containing lead, cadmium, beryllium, nickel, antimony, or other very toxic metals.
- Replace crystalline silica in mold and casting materials when possible with amorphous silica, olivine or other minerals not associated with silicosis.
- Provide ventilation appropriate for each type of welding or foundry work and for surface treatment application such as patinas and for the making and breaking of molds and investments.
- Use respiratory protection if needed with a proper OSHA program. Be aware that there are no approved respirator cartridges for some substances created in foundry and welding work, such as ozone, nitrogen oxides, hydrogen sulfide, wax emissions (e.g., acrolein), etc.
- Wear protective eyewear and clothing. Provide eye protection for welding appropriate for each types of welding to protect from UV radiation. Proper clothing, shoes, gloves and face protection for welding and foundry should be worn.
- Follow all sensible hygiene rules such as not bringing food or drink into the welding areas or foundry, washing hands before leaving, cleaning up properly, etc.
- Always be aware of other activity in the shop.

5.6.4 Disposal

Typical EPA regulated hazardous waste from welding and foundry classes or shops include:

- Grinding waste;
- Welding and brazing rods;
- Oils and lubricants containing metals;
- Used abrasive blasting grit;
- Toxic and flammable organic solvents found in surface coatings and degreasers;
- Aerosol paint and marking cans; and,
- Spent corrosive liquid solutions used in etching and patinas

SDSs on all metals products should be checked for the presence of RCRA metals, including barium, cadmium, chromium, lead, mercury, selenium, or silver. If these are in the alloys used, they will also be in the waste.

5.7 Design and Architecture; and Model Making

5.7.1 Major Dangers

Inhalation of dusts, fumes and mists when fabricating models, architectural plan drawing using solvent based inks and markers, adhesive bonding, and surface finishing. Markers, glues, spray paints and adhesives all have the potential to produce hazardous 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 these types of products is imperative, especially when your work requires prolonged periods of exposure. The fumes from the chemicals involved, particularly volatile organics such as those present in paints and solvents, can cause nerve damage and respiratory irritation.

Any sprayed-on surface coating should be performed in a spray booth with an adequate exhaust system. Solvent cleaning should be performed with a system equipped with local mechanical exhaust. If these are not available follow the manufacturer's recommended guidelines for safe use and handling to minimize exposure to yourself and others.

Inhalation of resins, silica, and cast molding materials: Some 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. Unlike the investment casting plasters used in foundries, the plaster used for making models and for cold casting of sculpture pieces usually does not contain significant amounts of silica. However, if it does contain silica, see Sections 4.2 and 4.6 for information on minimizing silica exposure and corresponding health concerns. Always provide for adequate ventilation and wear respiratory protection if warranted by the material being used.

Skin contact with glues, sprays, and fillers: While modeling, avoid contact with glue or filler. Because of the close-up nature of the work, extreme care needs to be taken in the use and handling of these materials. Wear the appropriate, protective clothing, wear impervious nitrile or other approved chemical-resistant gloves when using solvent-based materials, and wash your hands frequently and thoroughly.

5.7.2 Less Obvious Dangers

Modeling materials:

- Wood – MDF (glue), plywood, and other laminated/compressed wood products contain formaldehyde and other wood additives that can bring on asthma and can lead to cancer. See Section 4.10.1 for more information on working with wood and wood additives.
- Foam - toxic gases due to thermal decomposition are released when cutting foam with hot wire; provide adequate local exhaust.
- 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, which is significantly less neurotoxic than hexane, is much safer. However, as with most solvent based materials, it can cause respiratory irritation. Both are flammable

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, and can cause dizziness, headaches and nausea. Alcohol-based markers are much safer than ones containing xylene or toluene; water-based markers are even safer and not an air contaminant or hazardous air pollutant.

5.7.3 Safety Suggestions

- Eliminate the use of turpentine and turpentine-based products.
- Avoid pressure treated wood.
- Avoid the use of oil-based resins or spray paints.
- Ensure proper ventilation and wear protective clothing.
- Wear an NIOSH approved and appropriate respiratory protection mask when spraying or working close-up.

- Use rubber, nitrile or vinyl gloves with solvent based stains and other products.
- Use water or alcohol-based markers rather than those containing toxic and flammable solvents.
- Use non-aerosol spray paints and adhesive.
- Use soap and water (not solvents) to wash hands.

5.7.4 Disposal

Don't wash anything down sinks. Typical EPA regulated hazardous wastes include: inks; paints containing toxic heavy metals, such as cadmium, chromium, lead, barium and silver; cleaning solvents; spent ink markers; aerosol. spray paints; and, glues/adhesives containing toxic and or flammable organic solvents.

5.7.5 Recommended Alternatives

- Choose Rubber Cement that contains heptane instead of hexane.
- Rock Putty is a safe adhesive for wood modeling.
- Wood glue and white craft adhesive product are available with a variety of extra strength glues suitable for modeling.
- Use water-based paints for coloring models.
- Choose Permanent Markers that do not contain toxic and flammable organics.. They are available and are a safer alternative.

5.8 Drawing Materials and Pastels

Drawing materials include pencils, conte crayons, charcoal sticks, oil and dry pastels, and more. When these materials are intended for archival art work, they can contain the same toxic pigments that are in artists' paints. Of particular concern in this area is that drawing materials produce dust when used, especially the soft pastels, which produce significant amounts of dust containing exceedingly small particles of pigments and carriers. This dust can be inhaled and will settle all over surfaces, clothing, shoes and hair.

5.8.1 Safety Suggestions

- Use pencils, conte crayons, chalk and charcoal, whose particles are larger and easier to control with good clean up and ventilation.
- Use oil/wax pastels, rather than dry pastels, which eliminates the dust hazard and only requires good hygiene to be used safely.
- If soft, dry pastels are used, follow several simple procedures:
  - work in a studio separate from your home;
  - wear a respirator or provide special ventilation;
  - leave work clothing and shoes in the studio;
  - clean with a HEPA vacuum;
  - avoid pastels colored with highly toxic pigments, such as those containing cadmium, chromium or cobalt; and,
  - spray fixative in a spray booth or according to the manufacturer's recommendations for use and handling. Also be advised that spent aerosol cans may be regulated waste material.

5.9 Sculpture

5.9.1 Major Dangers

Inhalation: Dusts and free silica: *Always* be mindful of the dust created when sculpting; wear eye protection and appropriate respiratory protection, if warranted by the material. If respiratory protection is needed, filters appropriate to the material should be used, users should be fit-tested to ensure that the equipment is properly sized and shaped, and users should be trained in use of and care of the equipment.

- 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 lung fibrosis 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. Keep in mind that oil is a source of water pollution and is regulated in waste water discharges so it has to be used carefully in the mixing process so it doesn't go down the drain. It can also create slip and fall hazards in the class area if it is spilled or there's poor housekeeping in the storage and handling areas. Requirements for storing flammable and combustible liquids apply here as well. (See Ceramics section 4.2 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 section 4.10 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 also 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 gases from decomposition (e.g., monomers, plasticizers) of the chemical components. Overheating of wax can be a common occurrence in wax sculpture, but heating it to a point where it becomes flammable incurs the risk of emitting vapors that are respiratory irritants. Also, 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. Be wary of using solvents near plastics as they will often melt upon contact and release vapors. Always ventilate well when working with wax and plastic processes, and wear a respirator when appropriate.
- Foam: *Never* heat, burn, or expose foam (polystyrene, Styrofoam® etc.) to solvents. It can decompose the foam and release toxic fumes.
- Laminating and casting with resins: Resins are highly dangerous. Resins emit toxic fumes and are hazardous when they contact 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 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. Some catalysts used may contain methyl ethyl ketone peroxide. Because it can become shock sensitive with age, it should be logged in and out, and evaluated for age and condition when it is used. This is highly flammable and reactive, and a potentially explosive organic peroxide as well.

5.9.2 Less Obvious Dangers

Plaster: Plaster looks harmless, but in addition to the 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, which is 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. When working close-up while gluing, be even more aware of exposure levels; avoid all skin contact, wear protective clothing and ventilate the area. Solvents, which are used to remove wax, usually contain a variety of toxic chemicals. (See the Painting Section for details on solvents.)

5.9.3 Safety Suggestions

Usage

- Ensure proper ventilation.
- Use dust masks, respirators and eye protection, and wear protective clothing.
- Use spray booth for all spray operations. If booths are not available, follow the manufacturer's use and handling recommendations to minimize exposure to yourself and others.
- Clean dusty areas with a HEPA vacuum rather than sweeping, which makes dust airborne.
- Select stone that contains the least amount of free silica.

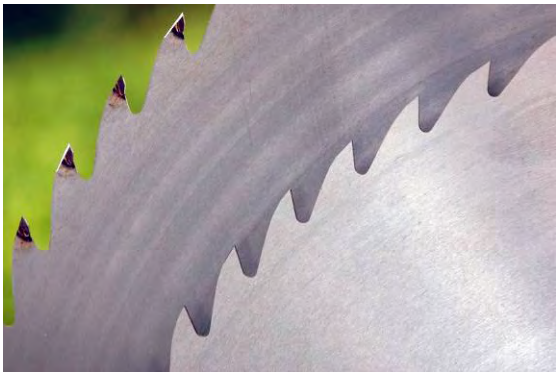
- Be aware of what others are doing and protect yourself from their activities.
- Never use chlorinated waxes.
- Use a kneaded eraser to remove wax instead of toxic solvents.
- Work with commercially available or "finished" plastic whenever possible. "Producing" plastic involves the use of many toxic chemicals.
- Thoroughly wash skin that has been exposed to dust, with soap and water.

5.9.4 Disposal

Typical EPA regulated hazardous wastes from sculpture class and studios include: paints and coatings containing toxic heavy metals, such as cadmium, chromium, lead, powders containing barium, and silver; aerosol paints and adhesives; paint booth filter media; toxic and/or flammable organic solvents used in paint related cleaning and thinning processes; rags or wipes; and, corrosive cleaning and degreasing solutions.

5.9.5 Recommended Alternatives

- Non Toxic carving wax.
- Non Silica Art Plaster.
- Balsa wood foam product rather than Styrofoam
- Select Aqua-based resins and adhesives



5.10 Woodworking

Every year, 7 in every 10,000 wood workers contract nasal cancer. Always ensure that proper respiratory protection is used.

5.10.1 Major Dangers

Chronic inhalation of sawdust is the biggest chronic 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 that may make people more reactive to allergens present in other woods. Research the particular species you plan to work with; use the less toxic varieties whenever possible. Wear protective clothing, eye protection, and a mask when doing anything that will create sawdust.

Inhalation, ingestion, and skin contact with wood glues: Many glues potentially contain toxic substances and must be used carefully. Plywood glues, for example, 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 not only highly flammable, but also toxic through inhalation, causing nerve damage. Adhesives may contain harmful levels of toxic organic solvents. Epoxy glues are moderately toxic by inhalation, and through eye and skin 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 eye and skin contact. Water-based glues are slightly toxic through skin contact and inhalation. Try to use less toxic glues, always ventilate well, and thoroughly wash hands after use.

TIP** If you receive a stack of "fresh" material remove the plastic sheathing or shrink wrap and store the material in a well ventilated area for a few days to allow the bonding materials used in the manufacturing process to dissipate which

will help to minimize exposures during the cutting and sanding procedures.

Paint strippers and finishes: These materials can be extremely hazardous to your health (methylene chloride, and corrosives). Paint strippers manufactured using toxic or flammable solvents should be permitted for use *only* if the proper engineering controls are available *and* enforced to ensure safe working conditions.

There are many formulations available now that are less toxic or nontoxic. If you have a project that requires the use of a paint stripper, also consider the type of paint being removed (for example, it could contain lead), and how that needs to be managed. Shellac used for finishing wood usually contains ethyl alcohol and methyl alcohol, which are flammable and toxic. They evaporate quickly - only use in a well ventilated area and keep containers tightly closed.

Other people: Be aware of what others are doing; 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.

5.10.2 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 extremely hazardous to people and the environment. However, they can still be found in some older woods. For example, until recently arsenic was present in all pressure-treated lumber. Most ply products still contain formaldehyde, which can cause asthma and cancer. Wash your hands thoroughly after using either wood and consider using gloves in handling the wood. If your project involves outside work using wood treated with creosotes or asphalt compounds, like railroad ties, keep in mind that these compounds also have the potential to release toxic organics during cutting or handling. None of these materials treated with preservatives should ever be used in a fireplace or wood stove, or used as feedstock with a wood burning kit or laser cutter.

Foam: Toxic gases are released when cutting foam with hot wire; ventilate properly. Never expose foam to solvents. Thermal or chemical decomposition can allow the release of carcinogens and hazardous air pollutants such as styrene, acrylonitrile, butadiene and formaldehyde.

5.10.3 Safety Suggestions

Usage

- Ensure proper ventilation; have air blowing from behind NOT towards you.
- Wear an approved and properly maintained mask or respirator.
- Wear protective clothing.
- Use appropriate, disposable latex or vinyl gloves when using finishing products.
- Avoid working with woods that are preserved with toxic chemicals.
- When buying wood, particularly old wood, find out about it and protect yourself accordingly. The wood may have been in contact with contaminants; find out what it was used for and where it was stored previously.
- Avoid glues that contain formaldehyde
- When using paints, coatings, adhesives or solvents containing volatile compounds that will evaporate readily, always open the lids only while actively removing material and then replace the lids carefully to ensure a tight, fitting seal when you are finished.
- Properly store all paints, finishes, solvents, etc. in accurately labeled, sealed containers
- Don't eat, drink or have open food containers in the shop.
- Wash hands thoroughly with soap and water after handling wood and glues.

5.10.4 Disposal

Typical EPA Regulated hazardous waste from woodworking shop class and studio; paints, coatings, toxic heavy metals such as cadmium, chromium, lead, barium, silver, paints, spray paint booth filter media, brushes, rags, wipes used in staining or shellac using finishes containing toxic and or flammable organic

solvents, aerosol paint and adhesive cans, solvent cleaners and thinners, machine lubricants, corrosive cleaners and degreasers.

5.10.5 Recommended Alternatives

- "White glue" and putty product is available that is a safe wood glue and filler alternative
- Rock Putty can be used as a filler and bonding material
- Use water-based glues whenever possible but be mindful that they may be hazardous and handle carefully.
- Use water-based finishes; they may take a few minutes longer to dry but it is well worth the wait.

5.11 Audio/Video and Computer Labs

All electronic and mechanical devices require a certain amount of routine maintenance. For example, you may discover that lab technicians in audio/video and computer class areas routinely solder connections on printed circuit boards, use aerosol spray cans of solvent cleaners, and touch up paint scratches on enclosures. Additionally, equipment upgrades also make some equipment obsolete and this obsolete equipment can contain materials that are hazardous, requiring proper treatment and/or disposal. EPA estimates that 57 million computers and televisions are sold just in the U.S. each year. When you realize that CRTs or TV screens can contain as much as 8 pounds of lead, the scope of the problem becomes readily apparent.

These materials are potentially regulated as hazardous or universal waste and should not be disposed of as normal trash. There are a lot of asset recovery programs available to you from computer manufacturers and also recycling companies that deconstruct electronic equipment for beneficial reuse.

Among the potentially RCRA-regulated materials contained in waste consumer electronics, personal computers (PCs), laptops, hand held devices and monitors, the primary concerns involve toxic heavy metals. Specifically, if any of these types of electronic devices become obsolete or inoperable they need to be disposed. For example, power supplies in electronic equipment may use batteries that contain nickel, cadmium, lead, mercury and lithium; printed circuit boards in hard drives may have lead solder joints; and even the PC monitor "CRT" cathode ray tube (like TV screens) contains lead shielding in the glass.

The big picture goal is not to let them get into the local landfills where the toxic heavy metals could leach into the water table and contaminate groundwater supplies. The predominant contaminants of concern can include the following: lead shielding, mercury switches and relays; cadmium-plated components and solders; nickel-cadmium batteries; or lithium batteries in two way radios or cameras; lead-acid battery packs in emergency lighting; or silver oxide or mercury oxide button power cells. They're everywhere! And if you were to decide to simply treat old computers, TVs, VCRs, stereos, fax machines, copiers, or even cell phones as regular trash you could be putting yourself and your school in violation of waste management laws. Most states have household hazardous waste collection days where you can properly dispose of these items. What happens to them is that they are mined for metals, glass and plastic. The units are demanufactured and the metals are reclaimed for reuse. There are actually companies that upgrade and refurbish PC equipment and make them available to low income or underprivileged children, a much better alternative to throwing them out.

Non-hazardous equipment or components may also have recyclable salvage value as scrap metal for the aluminum frames, copper wire, etc.

Fortunately, there are a number of asset recovery programs available, from computer manufacturers to computer collection/reuse programs, as well as recycling companies that deconstruct electronic equipment for beneficial reuse. The rules regarding resale or reuse of electronic equipment are fairly simple. Electronic products, including monitors and PCs, that are either donated or resold for continued use are not considered to be waste. Similarly, non-working electronic equipment

that is serviced by a repair shop and then returned to the user, or serviced for reuse by another person or organization, is also not considered to be a waste. However, all other nonworking electronic products and components that are not intended for repair or reuse must be managed as waste, with a proper hazardous waste determination conducted to determine if they or their components are regulated materials. Several states have additional rules regarding some of these items, such as New Jersey and six other states allowing electronics to be managed as universal waste, and several states have adopted increasingly stringent rules regarding electronics waste disposal and even non-hazardous waste batteries. There is currently a movement in the U.S that will require electronics manufacturers to take back equipment at the end of its useful life cycle. This is already happening in some European Union countries.

Further information on electronics recycling can be found at EPA's eCycling web page at:

http://www.epa.gov/epaoswer/hazwaste/recycle/ecycling/index.htm

To determine if your state allows waste electronics to be managed as universal waste, see EPA's state-by-state Universal Waste summary at:

http://www.epa.gov/epaoswer/hazwaste/id/lunivwast/statespf.htm

SECTION 6.0
POLLUTION PREVENTION AND WASTE MINIMIZATION

Pollution prevention and waste minimization is good for you and good for the environment.

6.1 Less is More

Use of less toxic alternatives and smaller amounts of hazardous materials decreases your exposure to potentially harmful chemicals in the studio or shop. Additionally, it helps protect the environment from the disposal of hazardous wastes. Waste minimization also decreases our reliance on landfills and other disposal methods. Reducing the use of toxic or hazardous art supplies can help save you money.

Both pollution prevention and waste minimization can reduce costs and improve the working conditions. That can be important around budget time as well as to your long term health. The EPA's Pollution Prevention website will show you real case histories that have saved a lot of companies money. Pollution prevention and waste minimization reduce the risk to workers, the liability for an environmental cleanup, fines and penalties, health care costs, workers compensation costs, and safety costs to install and maintain engineering controls to ensure a safe work place.

There are a number of ways to prevent pollution and minimize waste in your studio or shop. This section provides guidelines and best management practices, including:

- standardizing regular studio or shop activities;
- understanding the hazards and obtaining only what you need; and
- appropriately segregating and handling waste.

6.2 Organic and Inorganic Wastes

Proper disposal of hazardous wastes is required by law. Many chemicals used in your studio or shop should not be put into the sewer system and or thrown away in the trash for numerous reasons.

Organics: These include solvents and oils. They can contaminate groundwater supplies such that they will be unfit for drinking for decades or even centuries. Organic solvents are one of the most commonly used chemicals in the workplace. NIOSH estimates that, in the United States, three million women and six million men are occupationally exposed to solvents that may be present in inks, cleaning products, degreasers, paints and paint thinners, enamels and lacquers, adhesives, resins, and marking fluids. If your art work requires the use of adhesives, paints, resins, plastics, and dyeing and printing materials, look for suitable non toxic water based substitutes, they are out there. Understand fully that overexposure may cause adverse health effects such as contact dermatitis, respiratory irritation, pulmonary edema and kidney failure. Chlorinated solvents, such as

trichloroethylene and perchloroethylene were once very popular as degreasing and cleaning fluids and widely used in manufacturing and in dry cleaning. This category of solvent was found to cause many forms of cancers. They have largely been replaced with non chlorinated or water based systems. Pregnant women are even more at risk if overexposed. Studies have found a higher probability for major birth defects.

Inorganics (metals): Some are persistent, bioaccumulative and toxic or neurotoxic if ingested. Lead and mercury are two examples. Other RCRA characteristic metals are listed for the same reasons. The entire food chain can be affected: contaminated soil can contaminate plants that are then eaten by animals that humans eat.

The inorganics present physical and chemical risks to human health. Some oxidizing substances can react with organic waste and spontaneously combust.

6.3 Standard Operating Procedures (SOPs)

The best way to manage hazardous waste is to eliminate it or minimize at the source. First, purchase only the supplies you will need. When ordering supplies for your classroom shop or studio, determine how much you need for the number of students using the supplies before purchasing them. Also consider just demonstrating techniques that use hazardous materials rather than have 30 students experiment with hazardous materials and generate 30 more times the waste. Use Standard Operating Procedures (SOPs) for each product and ensure that each student knows the quantity to use and how to safely handle the materials. For example, it is important to have an SOP for brush cleaning that specifies size of containers and amount of solvent to be used based on brush size, and that further specifies how the spent solvent will either be reused or disposed.

Art materials can contain very toxic substances. For example, art materials are exempt from consumer paint lead laws. Lead, cadmium, chromium, and many other toxic metal compounds and pigments are commonly found in paints, ceramic glazes, and other art materials.

In 1988, a special labeling law for art materials was passed. The law, which is enforced by the U.S. Consumer Product Safety Commission, requires that a certified toxicologist evaluate the formula of each product to determine what warnings, if any, need to be on their labels. Guidance for the toxicologist is found in a chronic toxicity labeling standard of the American Society of Testing and Materials called ASTM D-4236.

Always look for the statement "Conforms to ASTM D-4235." It is illegal to sell any art material in the United States that does not reference this standard. The presence of the statement does not mean the material is inherently safe; rather, it means that, in the opinion of a toxicologist, any warnings on the label are sufficient for safe use.

One of the serious deficiencies of this law is that substances requiring labeling must be *known* to cause chronic effects, such as cancer, birth defects or other long term harm. However, many art material ingredients, especially the organic pigments, have never been tested for chronic hazards. Some of these pigments are members of classes of chemicals that are suspected of causing cancer or other long term harm, yet products containing these untested chemicals can be labeled "nontoxic."

Use all art materials with common sense precautions, even ones that are labeled in conformance with ASTM D 4236. Such items will contain information from a certified toxicologist on any known health hazards for that material. Read and follow the recommended procedures for the hazards identified for all of the materials used.

If it presents a risk to your health, it may be a hazardous waste. Prior to disposing of any potentially

hazardous items or items containing a RCRA-regulated hazardous constituent – using SDS information, toxicologist warnings and any other available technical product information -- be sure to conduct a proper hazardous waste determination and manage the waste accordingly. Relying on product safety information alone will not be adequate. OSHA only requires that an SDS list hazardous ingredients only if they are present in quantities at or above 1% and a lesser value of 0.1% if the material is a listed carcinogen! So, for example, if the artist color product label you buy does not list cadmium because it is only present at let's say 0.50% and after you used it a couple of times decided it wasn't quite what you were looking for and you just let it sit around for awhile and it "globbed up" and was therefore no longer suited for the purpose intended. You have ended up with a potentially hazardous waste requiring proper waste management and disposal. Why?? Because the characteristic waste limit for land disposal of cadmium is established at 1.0 ppm or mg/L. which amounts to a concentration % by weight of 0.000100% - several orders of magnitude less than what is in the colorant.

We have included a listing of Art Suppliers in Appendix D. The list is not exhaustive nor does it suggest that if a company is not listed that they provide a less preferable product. Some companies not listed may have simply chosen not to label products non –toxic for a variety of reasons even though, technically, they could. Read product labels carefully and try to choose the ones that are best for you and the environment whenever possible.

6.4 Good Housekeeping

Be aware exactly where the material will be used. Keep the following in mind:

- If the shop or studio has floor drains, cap them off. (Once a spill is in the drain, you can't do much about it except to report it and pay for an expensive cleanup.)
- Avoid using water to clean floors contaminated with paints, oils or solvents.
- Do not store chemicals or oils outside.
- Have spill absorbents immediately available for accidental spills during material transfers, including shipping and receiving activities.

6.5 Waste Segregation

Keeping wastes in separate containers based on their individual hazards reduces costs and increases safety.

- If regular trash is mixed with hazardous waste, the *whole* mixture becomes hazardous waste.
- Follow the same compatibility rules used for storing new chemicals. It can be dangerous to mix chemicals: toxic vapors may form and fires or explosions can result
- Segregate wastes according to the categories defined by federal regulations.
- Ensure that you have separate, *labeled* containers for each type of waste.
- Remember that swabs, rags, or other saturated materials may be considered hazardous waste that, by law, cannot be disposed of as regular trash.
- Containerize to prevent solvent evaporation - evaporation of regulated volatiles is illegal. Do not leave funnels in the tops of materials such as acetone; this constitutes illegal disposal.
- Waste containers should have tight fitting tops and only be opened when adding or removing waste.

To ensure compliance, your facility can be inspected by the EPA. A violation will result in a "notice of noncompliance" and can incur fines of up to $32,500 per day.

For everyone's safety, and to ensure that the material is properly managed, waste containers must be labeled as Hazardous Waste with specific information on the description of its contents **as soon** as the material is put into the container.

6.6 Waste Minimization Program

Having a waste minimization program will reduce both the volumes and toxicity of generated waste streams.

Less waste and toxics means reduced costs, risks and liability, and a healthier environment.

- Recycle to reduce hazardous waste.
- Do a pollution control check routinely.
- Maintain segregation of wastes.

- Enlist top management support if you feel your concerns are not being taken seriously.
- Encourage others to help.

6.7 Waste Management Hierarchy

EPA hierarchy of waste disposal preferences:

1. Reducing
2. Reusing
3. Reclaiming
4. Recycling
5. Landfill disposal or treatment

These priorities reduce dependency on landfilling. It is usually environmentally beneficial to follow the above hierarchy and to avoid the need for treatment or disposal of hazardous waste; however, the regulations are very detailed and extensive on requirements for proper management when recycling, reclaiming and even reusing a hazardous waste. Accordingly, it is important that a generator confirm the regulatory acceptability of on-site recycling and reclamation before beginning an on-site program.

6.7.1 Reusing

Many art materials that are seemingly waste can sometimes be reused in the studio or used by another person or group. For example, mineral spirits used for cleaning oil paint brushes can be allowed to settle, then either decanted or strained through cheesecloth to remove the solids, with the filtered solvent being reused. This type of recycling is often very cost effective. There are also commercially available cleaning units that have a built in pump and filter system that will extend the useful life of the cleaning solvents used. Note that sludge removed from the cheesecloth, filter, bottom of the container or from a solvent recovery system might be hazardous waste; a waste determination would have to be made prior to removal of the sludge from the equipment for disposal.

6.7.2 Recycling

One person's trash may be another person's treasure.

Waste materials generated during a project should not be automatically thrown out. Evaluate for possible reuse or recycling, including outside your classroom, studio or shop. For example, leftover art materials can be donated to an art center, children's museum or another school. In New York City, the "Materials for the Arts" organization (http://www.mfta.org/home.php) takes excess arts materials for distribution to other programs that need similar material.

Many other organizations welcome such donations. However, several factors must first be considered:

- Before you offer it, determine that it can be safely and beneficially reused.
- Do not donate hazardous materials to elementary schools, or other organizations for use by young children.
- Highly toxic materials, like lead glazes, should never be recycled.
- Hazardous waste may never be donated to another individual or organization to avoid regulatory requirements; it may only be sent for disposal or recycling at an approved facility, unless it can be used as a substitute for new product without further processing (e.g., through a waste exchange.)

6.7.3 Reclaiming

There are licensed companies who reclaim hazardous wastes. For example, some companies pick up, launder and return solvent or oil-soaked rags from large printing facilities for reuse. They use the reclaimed solvents as fuel in their boilers to produce steam and hot water in their commercial laundries.

There are also designated materials recycling companies that take solvents, fluorescent lamps, computer equipment and metals, as well as a variety of waste exchanges. They may have an interest in your waste as a raw material for their processes.

Look online for more information and to locate recycling companies. You can contact your state environmental agency (e.g., New York State Department of Conservation, New Jersey

Department of Environmental Protection) for more detailed information on recycling. Many states can provide a listing of recycling companies serving the region. The EPA's website is another source for pollution prevention and waste recycling information (see Appendix E)

6.7.4 Landfill Disposal

If you generate hazardous waste from your classroom, studio or shop that cannot be reused or recycled, it must be handled by a licensed hazardous waste disposal company or picked up by a licensed hazardous waste transporter.

The licensed disposal company will know the land disposal restrictions, and how and where to dispose of the waste based on the information you provide to them by completing a generator waste material profile sheet for the waste stream to be disposed. They will also be familiar with record keeping, labeling, transportation, packaging and other requirements for the waste and can help you make the best decision regarding disposal.

Your contracted waste company or transporter will give you information about the types of containers they require and how to label the containers.

- You may reuse glass bottles containing the waste from the same chemicals that were purchased in them. Keep the original labels intact and add a hazardous waste label describing the waste added.
- Before using a container for a different substance, be certain that the new material will not be incompatible with any remaining residues of the original material and re-label the container to reflect its new contents. If using the container to store hazardous waste, remember to label the containers clearly as hazardous waste and with a specific description of the waste material.
- Glass or plastic containers are usually preferred for corrosive materials, as metal containers may corrode. However, you must first conform that the container is compatible with the material. Hydrofluoric acid, for example, will eat through glass and must, therefore, be stored in plastic containers.
- Ensure that the waste will not react harmfully with the container or be placed in packaging where two or more different materials could react together, creating a hazardous condition. In addition, the US Department of Transportation (DOT) has specific packaging requirements for hazardous materials and hazardous waste based on the material's hazard classification. Refer to the Shipping Tables found at 49 CFR 172.101

Land Disposal Restrictions

The Land Disposal Restrictions (LDR) program imposes hazardous waste treatment requirements that make the waste safe for land disposal. The LDR program was created by Congress in 1984 to minimize potential environmental threats resulting from land disposal of hazardous wastes. Since then, the LDR program has developed mandatory treatment standards that must be met before hazardous waste is placed in a landfill.

To be subject to the land disposal restrictions, a waste must first be a RCRA hazardous waste (i.e., unless a waste meets the definition of a solid and hazardous waste, its disposal will not be subject to the LDR program.) If your hazardous wastes are subject to LDR requirements, either the waste transporter or the treatment or disposal facility will typically provide you with information on the treatment standard and a form that specifies the corresponding treatment or disposal method to be used.

6.7.5 Generator Responsibility and Liability

While reliable hazardous waste transporters and hazardous waste treatment, storage and disposal facilities help to simplify many aspects of waste management, responsibility for proper management of the waste remains primarily with the generator. Accordingly, it is important to adhere to the federal and state regulatory requirements, conduct due diligence on all companies with whom you contract for hazardous waste services and educate yourself as much as possible on the requirements for waste

generated from your studio or classroom. If this responsibility is assigned to a teacher, facility operations staff member, district manager, custodian or other staff member, rather than to you, be sure to provide them with complete, detailed information on all of the potentially hazardous wastes that you generate and familiarize them with your operations.

It is important to remember that if hazardous waste from your facility is misidentified or otherwise mismanaged, your facility will typically bear the liability for enforcement and potential penalties, regardless of whether your staff or a waste hauler's staff made the waste determination.

If you have questions, you can call your state environmental agency, a U.S. EPA regional hazardous waste office or your professional society or organization for assistance; alternatively, you can often find useful information on these organizations' respective websites. (See Appendix E for links to useful organizations and websites.)

A well managed hazardous waste program contributes to a safer working environment and reduces the both the risk of spills and the likelihood of hazardous waste being mismanaged, thereby protecting human health and the environment, while reducing your organization's potential liability.

6.8 Toxics Use Reduction

The amount of hazardous waste from your classroom, shop or studio can be minimized by using less toxic substitutes, for example:

- substituting water-based silkscreen printing inks for solvent-based inks;
- using cadmium-free paint; and
- using lead-free glazes instead of leaded glazes for ceramics, which results in less lead entering the environment from kiln exhaust and from throwing away the waste material.

To minimize the use of toxics, first understand the hazards present in the materials you use. Then, research and experiment with similar but less toxic materials.

See Appendix D for a list of alternative products suppliers and vendors.

6.9 Planning Ahead

To reduce waste, you will need to do a materials accounting of what you generate. Evaluate each waste-generating activity and consider how the waste management hierarchy – reduce, reuse, recycle – may apply and whether your purchasing and materials management are optimal for your organization. While this may require some exploration of alternatives recommended by professional societies, consultants, regulators or similar organizations who have had some success in this area, you will also likely discover a few easy steps that will produce less waste and be cost effective. For example, centralizing purchasing to ensure that you don't overbuy chemicals or purchase redundant materials can reduce both the upfront purchasing costs and waste management expenses. The following are just a few other common examples of product substitutions and process changes that may prove useful.

Use:

- nontoxic and biodegradable cleaners and degreasers,
- cadmium free fluxes,
- lead free solders,
- adhesives and sealants without volatile organic chemicals (VOC's),
- solvent distillation units,
- printmaking screen washout equipment,
- nontoxic pigments, and
- water-based nontoxic paints.

Use the web for research on products that are promoted as environmentally-friendly (see Appendix D for some suggested web sites to explore).

The table in Appendix F presents examples of possible Waste Treatment and Disposal Technologies and some basic precautions, comments, and suggestions.

APPENDIX A

CHARACTERISTIC WASTES: D AND LISTED HAZARDOUS WASTES: F, P, AND U

RCRA LISTS OF HAZARDOUS WASTES "D" CODES

TOXICITY CHARACTERISTIC CONSTITUENTS AND REGULATORY LEVELS (TCLP)

EPA Waste No.	Constituent	CAS Number	Regulatory Level (mg/L)
D001	Ignitability	na	Flash Pt. ≤ 140 F
D002	Corrosivity	na	Ph ≤2.0 or ≥12.5
D003	Reactivity	na	Any material that will react under normal conditions to cause an explosion or fire or release a toxic gas.
D004	Arsenic	7440-38-2	5.0
D005	Barium	7440-39-3	100.0
D006	Cadmium	7440-43-9	1.0
D007	Chromium	7440-47-3	5.0
D008	Lead	7439-92-1	5.0
D009	Mercury	7439-97-6	0.2
D010	Selenium	7782-49-2	1.0
D011	Silver	7440-22-4	5.0
D012	Endrin	72-20-8	0.02
D013	Lindane	58-89-9	0.4
D014	Methoxychlor	72-43-5	10.0
D015	Toxaphene	8000-35-2	0.5
D016	2,4-D	94-75-7	10.0
D017	2,4,5-TP (Silvex)	93-72-1	1.0
D018	Benzene	71-43-2	0.5
D019	Carbon Tetrachloride	56-23-5	0.5
D020	Chlordane	57-74-9	.03
D021	Chlorobenzene	108-90-7	100.0

EPA Waste No.	Constituent	CAS Number	Regulatory Level (mg/L)
D022	Chloroform	67-66-3	6.0
D023	o-Cresol	95-48-7	200.0
D024	m-Cresol	108-39-4	200.0
D025	p-Cresol	106-44-5	200.0
D026	Cresol	1319-77-3	200.0
D027	1,4-Dichlorobenzene	106-46-7	7.5
D028	1,2-Dichloroethane	107-06-2	0.5
D029	1,1-Dichloroethylene	75-35-4	0.7
D030	2,4-Dinitrotoluene	121-14-2	0.13
D031	Heptachlor (and its hydroxide)	76-44-8	0.008
D032	Hexachlorobenzene	118-74-1	0.13
D033	Hexachloro-1,3-butadiene	87-68-3	0.5
D034	Hexachloroethane	67-72-1	3.0
D035	Methyl ethyl ketone	78-93-3	200.0
D036	Nitrobenzene	98-95-3	2.0
D037	Pentachlorophenol	87-86-5	100.0
D038	Pyridine	100-86-1	5.0
D039	Tetrachloroethylene	127-18-4	0.7
D040	Trichloroethylene	79-01-6	0.5
D041	2,4,5-Trichlorophenol	95-95-4	400.0
D042	2,4,6-Trichlorophenol	88-06-2	2.0
D043	Vinyl chloride	75-01-4	0.2

40 C.F.R. § 261.31

CODE OF FEDERAL REGULATIONS

TITLE 40--PROTECTION OF ENVIRONMENT

CHAPTER I--ENVIRONMENTAL PROTECTION AGENCY

SUBCHAPTER I--SOLID WASTES

PART 261--IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

SUBPART D--LISTS OF HAZARDOUS WASTES

Current through August 17, 2004; 69 FR 51014

§ 261.31 Hazardous wastes from non-specific sources.

(a) The following solid wastes are listed hazardous wastes from non-specific sources unless they are excluded under §§ 260.20 and 260.22 and listed in Appendix IX.

Industry and EPA hazardous waste No.	**Hazardous waste**	**Hazard Code**
Generic		
F001	The following spent halogenated solvent used in degreasing: Tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride, and chlorinated fluorocarbons; all spent solvent mixtures/blends used in degreasing containing, before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(T)
F002	The following spent halogenated solvents: Tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro- 1,2,2-trifluoroethane, ortho-dichlorobenzene, trichlorofluoromethane, and 1,1,2-trichloroethane; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents or those listed in F001, F004, or F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(T)

Industry and EPA hazardous waste No.	Hazardous waste	Hazard Code
F003	The following spent non-halogenated solvents: Xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol; all spent solvent mixtures/blends containing, before use, only the above spent non-halogenated solvents; and all spent solvent mixtures/blends containing, before use, one or more of the above non-halogenated solvents, and, a total of ten percent or more (by volume) of one or more of those solvents listed in F001, F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(I) [Fna]
F005	The following spent non-halogenated solvents: Toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, and 2-nitropropane; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, or F004; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(I, T)

FNa (I,T) should be used to specify mixtures containing ignitable and toxic constituents.

40 C.F.R. § 261.33

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Current through August 17, 2004; 69 FR 51014

§ 261.33 Discarded commercial chemical products, off-specification species, containers, and spill residues thereof.

The following materials or items are hazardous wastes if and when they are discarded or intended to be discarded as described in § 261.2(a)(2)(i), when they are mixed with waste oil or used oil or other material and applied to the land for dust suppression or road treatment, when they are otherwise applied to the land in lieu of their original intended use or when they are contained in products that are applied to the land in lieu of their original intended use, or when, in lieu of their original intended use, they are produced for use as (or as a component of) a fuel, distributed for use as a fuel, or burned as a fuel.

(a) Any commercial chemical product, or manufacturing chemical intermediate having the generic name listed in paragraphs (e) or (f) of this section.

(b) Any off-specification commercial chemical product or manufacturing chemical intermediate which, if it met specifications, would have the generic name listed in paragraphs (e) or (f) of this section.

(c) Any residue remaining in a container or in an inner liner removed from a container that has held any commercial chemical product or manufacturing chemical intermediate having the generic name listed in paragraphs (e) or (f) of this section, unless the container is empty as defined in § 261.7(b) of this chapter.

[Comment: Unless the residue is being beneficially used or reused, or legitimately recycled or reclaimed; or being accumulated, stored, transported or treated prior to such use, re-use, recycling or reclamation, EPA considers the residue to be intended for discard, and thus, a hazardous waste. An example of a legitimate re-use of the residue would be where the residue remains in the container and the container is used to hold the same commercial chemical product or manufacturing chemical intermediate it previously held. An example of the discard of the residue would be where the drum is sent to a drum reconditioner who reconditions the drum but discards the residue.]

(d) Any residue or contaminated soil, water or other debris resulting from the cleanup of a spill into or on any land or water of any commercial chemical product or manufacturing chemical intermediate having the generic name listed in paragraph (e) or (f) of this section, or any residue or contaminated soil, water or other debris resulting from the cleanup of a spill, into or on any land or water, or any off-specification chemical product and manufacturing chemical intermediate which, if it met specifications, would have the generic name listed in paragraph (e) or (f) of this section.

[Comment: The phrase "commercial chemical product or manufacturing chemical intermediate having the generic name listed in ..." refers to a chemical substance which is manufactured or formulated for commercial or manufacturing use which consists of the commercially pure grade of the chemical, any technical grades of the chemical that are produced or marketed, and all formulations in which the chemical is the sole active ingredient. It does not refer to a material, such as a manufacturing process waste, that contains any of the substances listed in paragraphs (e) or (f). Where a manufacturing process waste is deemed to be a hazardous waste because it contains a substance listed in paragraphs (e) or (f), such waste will be listed in either §§ 261.31 or 261.32 or will be identified as a hazardous waste by the characteristics set forth in Subpart C of this part.]

(e) The commercial chemical products, manufacturing chemical intermediates or off-specification commercial chemical products or manufacturing chemical intermediates referred to in paragraphs (a) through (d) of this section, are identified as acute hazardous wastes (H) and are subject to be the small quantity exclusion defined in § 261.5(e).

[Comment: For the convenience of the regulated community the primary hazardous properties of these materials have been indicated by the letters T (Toxicity), and R (Reactivity). Absence of a letter indicates that the compound only is listed for acute toxicity.]

f) The commercial chemical products, manufacturing chemical intermediates, or off-specification commercial chemical products referred to in paragraphs (a) through (d) of this section, are identified as toxic wastes (T), unless otherwise designated and are subject to the small quantity generator exclusion defined in § 261.5 (a) and (g).

These wastes and their corresponding EPA Hazardous Waste Numbers are:

Common name	CAS Name	Cas No.	HW Code
A2213	Ethanimidothioic acid, 2-(dimethylamino)-N-hydroxy-2-oxo-, methyl ester	30558–43–1	U394
Acetonitrile	Same	75–05–8	U003
Acetophenone	Ethanone, 1-phenyl-	98–86–2	U004
2-Acetylaminefluarone	Acetamide, N-9H-fluoren-2-yl-	53–96–3	U005
Acetyl chloride	Same	75–36–5	U006
1-Acetyl-2-thiourea	Acetamide, N-(aminothioxomethyl)-	591–08–2	P002
Acrolein	2-Propenal	107–02–8	P003
Acrylamide	2-Propenamide	79–06–1	U007
Acrylonitrile	2-Propenenitrile	107–13–1	U009
Aldicarb	Propanal, 2-methyl-2-(methylthio)-, O-[(methylamino)carbonyl]oxime	116–06–3	P070
Aldicarb sulfone	Propanal, 2-methyl-2- (methylsulfonyl) -, O-[(methylamino) carbonyl] oxime	1646–88–4	P203

Common name	CAS Name	Cas No.	HW Code
Aldrin	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-10-hexachloro-1,4,4a,5,8,8a-hexahydro-(1alpha,4alpha,4abeta,5alpha,8alpha,8abeta)-	309–00–2	P004
Allyl alcohol	2-Propen-1-ol	107–18–6	P005
Aluminum phosphide	Same	20859–73–8	P006
5-(Aminomethyl)-3-isoxazolol	3(2H)-Isoxazolone, 5-(aminomethyl)-	2763–96–4	P007
4-Aminopyridine	4-Pyridinamine	504–24–5	P008
Amitrole	1H-1,2,4-Triazol-3-amine	61–82–5	U011
Ammonium vanadate	Vanadic acid, ammonium salt	7803–55–6	P119
Aniline	Benzenamine	62–53–3	U012
Arsenic acid	Arsenic acid H3 AsO4	7778–39–4	P010
Arsenic pentoxide	Arsenic oxide As2 O5	1303–28–2	P011
Arsenic trioxide	Arsenic oxide As2 O3	1327–53–3	P012
Auramine	Benzenamine, 4,4'-carbonimidoylbis[N,N-di-methyl	492–80–8	U014
Azaserine	L-Serine, diazoacetate (ester)	115–02–6	U015
Barban	Carbamic acid, (3-chlorophenyl) -, 4-chloro- 2-butynyl ester	101–27–9	U280
Barium cyanide	Same	542–62–1	P013
Bendiocarb	1,3-Benzodioxol-4-ol, 2,2-dimethyl-, methyl carbamate	22781–23–3	U278
Bendiocarb phenol	1,3-Benzodioxol-4-ol, 2,2-dimethyl-,	22961–82–6	U364
Benomyl	Carbamic acid, [1- [(butylamino) carbonyl]-1H-benzimidazol-2-yl] -, methyl ester	17804–35–2	U271
Benz[c]acridine	Same	225–51–4	U016
Benz[a]anthracene	Same	56–55–3	U018
Benzal chloride	Benzene, (dichloromethyl)-	98–87–3	U017
Benzene	Same	71–43–2	U019
Benzidine	[1,1'-Biphenyl]-4,4 1-diamine	92–87–5	U021
Benzo[a]pyrene	Same	50–32–8	U022

Common name	CAS Name	Cas No.	HW Code
p-Benzoquinone	2,5-Cyclohexadiene-1,4-dione	106–51–4	U197
Benzotrichloride	Benzene, (trichloromethyl)-	98–07–7	U023
Benzyl chloride	Benzene, (chloromethyl)-	100–44–7	P028
Beryllium powder	Same	7440–41–7	P015
Bromoacetone	2-Propanone, 1-bromo-	598–31–2	P017
Bromoform	Methane, tribromo-	75–25–2	U225
4-Bromophenyl phenyl ether	Benzene, 1-bromo-4-phenoxy-	101–55–3	U030
Brucine	Strychnidin-10-one, 2,3-dimethoxy-	357–57–3	P018
Cacodylic acid	Arsinic acid, dimethyl-	75–60–5	U136
Calcium chromate	Chromic acid H2 CrO4, calcium salt	13765–19–0	U032
Calcium cyanide	Calcium cyanide Ca(CN)2	592–01–8	P021
Carbaryl	1-Naphthalenol, methylcarbamate	63–25–2	U279
Carbendazim	Carbamic acid, 1H-benzimidazol-2-yl, methyl ester	10605–21–7	U372
Carbofuran	7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-, methylcarbamate	1563–66–2	P127
Carbofuran phenol	7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-	1563–38–8	U367
Carbon disulfide	Same	75–15–0	P022
Carbon oxyfluoride	Carbonic difluoride	353–50–4	U033
Carbon tetrachloride	Methane, tetrachloro-	56–23–5	U211
Carbosulfan	Carbamic acid, [(dibutylamino) thio] methyl-, 2,3-dihydro-2,2-dimethyl-7-benzofuranyl ester	55285–14–8	P189
Chloral	Acetaldehyde, trichloro-	75–87–6	U034
Chlorambucil	Benzenebutanoic acid, 4-[bis(2-chloroethyl)amino]-	305–03–3	U035
Chlordane	4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-	57–74–9	U036
Chlordane (alpha and gamma isomers)	----------		U036
Chlornaphazin	Naphthalenamine, N,N'-bis(2-chloroethyl)-	494–03–1	U026
Chloroacetaldehyde	Acetaldehyde, chloro-	107–20–0	P023

Common name	CAS Name	Cas No.	HW Code
p-Chloroaniline	Benzenamine, 4-chloro-	106–47–8	P024
Chlorobenzene	Benzene, chloro-	108–90–7	U037
Chlorobenzilate	Benzeneacetic acid, 4-chloro-alpha-(4-chlorophenyl)-alpha-hydroxy-, ethyl ester	510–15–6	U038
p-Chloro-m-cresol	Phenol, 4-chloro-3-methyl-	59–50–7	U039
2-Chloroethyl vinyl ether	Ethene, (2-chloroethoxy)-	110–75–8	U042
Chloroform	Methane, trichloro-	67–66–3	U044
Chloromethyl methyl ether	Methane, chloromethoxy-	107–30–2	U046
beta-Chloronaphthalene	Naphthalene, 2-chloro-	91–58–7	U047
o-Chlorophenol	Phenol, 2-chloro-	95–57–8	U048
1-(o-Chlorophenyl)thiourea	Thiourea, (2-chlorophenyl)-	5344–82–1	P026
3-Chloropropionitrile	Propanenitrile, 3-chloro-	542–76–7	P027
Chrysene	Same	218–01–9	U050
Copper cyanide	Copper cyanide CuCN	544–92–3	P029
Creosote	Same		U051
Cresol (Cresylic acid)	Phenol, methyl-	1319–77–3	U052
Crotonaldehyde	2-Butenal	4170–30–3	U053
m-Cumenyl methylcarbamate	Phenol, 3-(methylethyl)-, methyl carbamate	64–00–6	P202
Cyanides (soluble salts and complexes) NOS*	----------		P030
Cyanogen	Ethanedinitrile	460–19–5	P031
Cyanogen bromide	Cyanogen bromide (CN)Br	506–68–3	U246
Cyanogen chloride	Cyanogen chloride (CN)Cl	506–77–4	P033
2-Cyclohexyl-4,6-dinitrophenol	Phenol, 2-cyclohexyl-4,6-dinitro-	131–89–5	P034
Cyclophosphamide	2H-1,3,2-Oxazaphosphorin-2-amine, N,N-bis(2-chloroethyl)tetrahydro-, 2-oxide	50–18–0	U058
2,4-D	Acetic acid, (2,4-dichlorophenoxy)-	94–75–7	U240
2,4-D, salts, esters	----------		U240

Common name	CAS Name	Cas No.	HW Code
Daunomycin	5,12-Naphthacenedione, 8-acetyl-10-[(3-amino-2,3,6-trideoxy-alpha-L-lyxo-hexopyranosyl)oxy]-7,8,9,10-tetrahydro- 6,8,11-trihydroxy-1-methoxy-, (8S-cis)-	20830–81–3	U059
DDD	Benzene, 1,1'-(2,2-dichloroethylidene)bis[4-chloro-	72–54–8	U060
DDT	Benzene, 1,1'-(2,2,2-trichloroethylidene)bis[4-chloro-	50–29–3	U061
Diallate	Carbamothioic acid, bis(1-methylethyl)-, S-(2,3-dichloro-2-propenyl) ester	2303–16–4	U062
Dibenz[a,h]anthracene	Same	53–70–3	U063
Dibenzo[a,i]pyrene	Benzo[rst]pentaphene	189–55–9	U064
1,2-Dibromo-3-chloropropane	Propane, 1,2-dibromo-3-chloro-	96–12–8	U066
Dibutyl phthalate	1,2-Benzenedicarboxylic acid, dibutyl ester	84–74–2	U069
o-Dichlorobenzene	Benzene, 1,2-dichloro-	95–50–1	U070
m-Dichlorobenzene	Benzene, 1,3-dichloro-	541–73–1	U071
p-Dichlorobenzene	Benzene, 1,4-dichloro-	106–46–7	U072
3,3'-Dichlorobenzidine	[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dichloro-	91–94–1	U073
1,4-Dichloro-2-butene	2-Butene, 1,4-dichloro-	764–41–0	U074
Dichlorodifluoromethane	Methane, dichlorodifluoro-	75–71–8	U075
1,1-Dichloroethylene	Ethene, 1,1-dichloro-	75–35–4	U078
1,2-Dichloroethylene	Ethene, 1,2-dichlrol-, (E)-	156–60–5	U079
Dichloroethyl ether	Ethane, 1,1'oxybis[2-chloro-	111–44–4	U025
Dichloroisopropyl ether	Propane, 2,2'-oxybis[2-chloro-	108–60–1	U027
Dichloromethoxy ethane	Ethane, 1,1'-[methylenebis(oxy)]bis[2-chloro-	111–91–1	U024
Dichloromethyl ether	Methane, oxybis[chloro-	542-88-1	P016
2,4-Dichlorophenol	Phenol, 2,4-dichloro-	120–83–2	U081
2,6-Dichlorophenol	Phenol, 2,6-dichloro-	87–65–0	U082
Dichlorophenylarsine	Arsonous dichloride, phenyl-	696–28–6	P036
1,3-Dichloropropene	1-Propene, 1,3-dichloro-	542–75–6	U084

Common name	CAS Name	Cas No.	HW Code
Dieldrin	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-,(1aalpha,2beta,2aalpha,3beta,6beta,6aalpha,7beta,7aalpha)-	60–57–1	P037
1,2:3,4-Diepoxybutane	2,2'-Bioxirane	1464–53–5	U085
Diethylarsine	Arsine, diethyl-	692–42–2	P038
Diethylene glycol, dicarbamate	Ethanol, 2,2'-oxybis-, dicarbamate	5952–26–1	U395
1,4-Diethyleneoxide	1,4-Dioxane	123–91–1	U108
Diethylhexyl phthalate	1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester	117–81–7	U028
N,N'-Diethylhydrazine	Hydrazine, 1,2-diethyl-	1615–80–1	U086
O,O-Diethyl S-methyl dithiophosphate	Phosphorodithioic acid, O,O-diethyl S-methyl ester	3288–58–2	U087
Diethyl-p-nitrophenyl phosphate	Phosphoric acid, diethyl 4-nitrophenyl ester	311–45–5	P041
Diethyl phthalate	1,2-Benzenedicarboxylic acid, diethyl ester	84–66–2	U088
O,O-Diethyl O-pyrazinyl phosphoro-thioate	Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester	297–97–2	P040
Diethylstilbesterol	Phenol, 4,4'-(1,2-diethyl-1,2-ethenediyl)bis-,(E)-	56–53–1	U089
Dihydrosafrole	1,3-Benzodioxole, 5-propyl-	94–58–6	U090
Diisopropylfluorophosphate (DFP)	Phosphorofluoridic acid, bis(1-methylethyl) ester	55–91–4	P043
Dimethoate	Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl] ester	60–51–5	P044
3,3'-Dimethoxybenzidine	[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethoxy-	119–90–4	U091
p-Dimethylaminoazobenzene	Benzenamine, N,N-dimethyl-4-(phenylazo)-	60–11–7	U093
7,12-Dimethylbenz[a]anthracene	Benz[a]anthracene, 7,12-dimethyl-	57–97–6	U094
3,3'-Dimethylbenzidine	[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethyl-	119–93–7	U095
Dimethylcarbamoyl chloride	Carbamic chloride, dimethyl-	79–44–7	U097
1,1-Dimethylhydrazine	Hydrazine, 1,1-dimethyl-	57–14–7	U098
1,2-Dimethylhydrazine	Hydrazine, 1,2-dimethyl-	540–73–8	U099

Common name	CAS Name	Cas No.	HW Code
alpha,alpha-Dimethylphenethylamine	Benzeneethanamine, alpha,alpha-dimethyl-	122–09–8	P046
2,4-Dimethylphenol	Phenol, 2,4-dimethyl-	105–67–9	U101
Dimethyl phthalate	1,2-Benzenedicarboxylic acid, dimethyl ester	131–11–3	U102
Dimethyl sulfate	Sulfuric acid, dimethyl ester	77–78–1	U103
Dimetilan	Carbamic acid, dimethyl-, 1- [(dimethylamino) carbonyl]-5-methyl-1H-pyrazol-3-yl ester	644–64–4	P191
4,6-Dinitro-o-cresol	Phenol, 2-methyl-4,6-dinitro-	534–52–1	P047
4,6-Dinitro-o-cresol salts	----------		P047
2,4-Dinitrophenol	Phenol, 2,4-dinitro-	51–28–5	P048
2,4-Dinitrotoluene	Benzene, 1-methyl-2,4-dinitro-	121–14–2	U105
2,6-Dinitrotoluene	Benzene, 2-methyl-1,3-dinitro-	606–20–2	U106
Dinoseb	Phenol, 2-(1-methylpropyl)-4,6-dinitro-	88–85–7	P020
Di-n-octyl phthalate	1,2-Benzenedicarboxylic acid, dioctyl ester	117–84–0	U017
1,2-Diphenylhydrazine	Hydrazine, 1,2-diphenyl-	122–66–7	U109
Di-n-propylnitrosamine	1-Propanamine, N-nitroso-N-propyl-	621–64–7	U111
Disulfoton	Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl] ester	298–04–4	P039
Dithiobiuret	Thioimidodicarbonic diamide [(H2 N)C(S)]2NH	541–53–7	P049
Endosulfan	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide	115–29–7	P050
Endothall	7-Oxabicyclo[221]heptane-2,3-dicarboxylic acid	145–73–3	P088
Endrin	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octa-hydro-,(1aalpha,2beta,2abeta,3alpha,6alpha, 6abeta,7beta,7aalpha)-	72–20–8	P051
Endrin metabolites	----------		P051
Epichlorohydrin	Oxirane, (chloromethyl)-	106–89–8	U041
Epinephrine	1,2-Benzenediol, 4-[1-hydroxy-2-(methylamino)ethyl]-, (R)-	51–43–4	P042
Ethyl carbamate (urethane)	Carbamic acid, ethyl ester	51–79–6	U238

Common name	CAS Name	Cas No.	HW Code
Ethyl cyanide	Propanenitrile	107–12–0	P101
Ethylenebisdithiocarbamic acid	Carbamodithioic acid, 1,2-ethanediylbis-	111–54–6	U114
Ethylenebisdithiocarbamic acid, salts and esters	----------		U114
Ethylene dibromide	Ethane, 1,2-dibromo-	106–93–4	U067
Ethylene dichloride	Ethane, 1,2-dichloro-	107–06–2	U077
Ethylene glycol monoethyl ether	Ethanol, 2-ethoxy-	110–80–5	U359
Ethyleneimine	Aziridine	151–56–4	P054
Ethylene oxide	Oxirane	75–21–8	U115
Ethylenethiourea	2-Imidazolidinethione	96–45–7	U116
Ethylidene dichloride	Ethane, 1,1-dichloro-	75–34–3	U076
Ethyl methacrylate	2-Propenoic acid, 2-methyl-, ethyl ester	97-63-2	U118
Ethyl methanesulfonate	Methanesulfonic acid, ethyl ester	62–50–0	U119
Famphur	Phosphorothioic acid, O-[4-[(dimethylamino)sulfonyl]phenyl] O,O-di-methyl ester	52–85–7	P097
Fluoranthene	Same	206–44–0	U120
Fluorine	Same	7782–41–4	P056
Fluoroacetamide	Acetamide, 2-fluoro-	640–19–7	P057
Fluoroacetic acid, sodium salt	Acetic acid, fluoro-, sodium salt	62–74–8	P058
Formaldehyde	Same	50–00–0	U122
Formetanate hydrochloride	Methanimidamide, N,N-dimethyl-N'-[3-[[(methylamino) carbonyl]oxy]phenyl]-, monohydrochloride	23422–53–9	P198
Formic acid	Same	64–18–6	U123
Formparanate	Methanimidamide, N,N-dimethyl-N'-[2-methyl-4-[[(methylamino) carbonyl]oxy]phenyl]-	17702–57–7	P197
Glycidylaldehyde	Oxiranecarboxyaldehyde	765–34–4	U126
Heptachlor	4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-	76–44–8	P059

Common name	CAS Name	Cas No.	HW Code
Hexachlorobenzene	Benzene, hexachloro-	118–74–1	U127
Hexachlorobutadiene	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	87–68–3	U128
Hexachlorocyclopentadiene	1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-	77–47–4	U130
Hexachloroethane	Ethane, hexachloro-	67–72–1	U131
Hexachlorophene	Phenol, 2,2'-methylenebis[3,4,6-trichloro-	70–30–4	U132
Hexachloropropene	1-Propene, 1,1,2,3,3,3-hexachloro-	1888–71–7	U243
Hexaethyl tetraphosphate	Tetraphosphoric acid, hexaethyl ester	757–58–4	P062
Hydrazine	Same	302–01–2	U133
Hydrogen cyanide	Hydrocyanic acid	74–90–8	P063
Hydrogen fluoride	Hydrofluoric acid	7664–39–3	U134
Hydrogen sulfide	Hydrogen sulfide H2 S	7783–06–4	U135
Indeno[1,2,3-cd]pyrene	Same	193–39–5	U137
Isobutyl alcohol	1-Propanol, 2-methyl-	78–83–1	U140
Isodrin	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-,(1alpha,4alpha,4abeta,5beta, 8beta,8abeta)-	465–73–6	P060
Isolan	Carbamic acid, dimethyl-, 3-methyl-1-(1-methylethyl)-1H-pyrazol-5-yl ester	119–38–0	P192
Isosafrole	1,3-Benzodioxole, 5-(1-propenyl)-	120–58–1	U141
Kepone	1,3,4-Metheno-2H-cyclobuta[cd]pentalen-2-one, 1,1a,3,3a,4,5,5,5a,5b,6-decachlorooctahydro-	143–50–0	U142
Lasiocarpine	2-Butenoic acid, 2-methyl-,7-[[2,3-dihydroxy-2-(1-methoxyethyl)-3-methyl-1-oxobutoxy]methyl]-2,3,5,7a-tetrahydro-1H-pyrrolizin-1-yl ester, [1S-[1alpha(Z),7(2S*,3R*),7aalpha]]	303–34–1	U143
Lead acetate	Acetic acid, lead(2+) salt	301–04–2	U144
Lead phosphate	Phosphoric acid, lead(2+) salt (2:3)	7446–27–7	U145
Lead subacetate	Lead, bis(acetato-O)tetrahydroxytri-	1335–32–6	U146
Lindane	Cyclohexane, 1,2,3,4,5,6-hexachloro-, (1alpha,2alpha,3beta,4alpha, 5alpha,6beta)-	58–89–9	U129

Common name	CAS Name	Cas No.	HW Code
Maleic anhydride	2,5-Furandione	108–31–6	U147
Maleic hydrazide	3,6-Pyridazinedione, 1,2-dihydro-	123–33–1	U148
Malononitrile	Propanedinitrile	109–77–3	U149
Manganese dimethyldithiocarbamate	Manganese, bis(dimethylcarbamodithioato-S,S')-,	15339–36–3	P196
Melphalan	L-Phenylalanine, 4-[bis(2-chloroethyl)aminol]-	148–82–3	U150
Mercury	Same	7439–97–6	U151
Mercury fulminate	Fulminic acid, mercury(2+) salt	628–86–4	P065
Methacrylonitrile	2-Propenenitrile, 2-methyl-	126–98–7	U152
Methapyrilene	1,2-Ethanediamine, N,N-dimethyl-N'-2-pyridinyl-N'-(2-thienylmethyl)-	91–80–5	U155
Methiocarb	Phenol, (3,5-dimethyl-4-(methylthio)-,methylcarbamate	2032–65–7	P199
Methomyl	Ethanimidothioic acid, N-[[(methylamino)carbonyl]oxy]-, methyl	16752–77–5	P066
Methoxychlor	Benzene, 1,1'-(2,2,2-trichloroethylidene)bis[4-methoxy-	72–43–5	U247
Methyl bromide	Methane, bromo-	74–83–9	U029
Methyl chloride	Methane, chloro-	74–87–3	U045
Methyl chlorocarbonate	Carbonochloridic acid, methyl ester	79–22–1	U156
Methyl chloroform	Ethane, 1,1,1-trichloro-	71–55–6	U226
3-Methylcholanthrene	Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-	56–49–5	U157
4,4'-Methylenebis(2-chloroaniline)	Benzenamine, 4,4'-methylenebis[2-chloro-	101–14–4	U158
Methylene bromide	Methane, dibromo-	74–95–3	U068
Methylene chloride	Methane, dichloro-	75–09–2	U080
Methyl ethyl ketone (MEK)	2-Butanone	78–93–3	U159
Methyl ethyl ketone peroxide	2-Butanone, peroxide	1338–23–4	U160
Methyl hydrazine	Hydrazine, methyl-	60–34–4	P068
Methyl iodide	Methane, iodo-	74–88–4	U138
Methyl isocyanate	Methane, isocyanato-	624–83–9	P064

Common name	CAS Name	Cas No.	HW Code
2-Methyllactonitrile	Propanenitrile, 2-hydroxy-2-methyl-	75–86–5	P069
Methyl methacrylate	2-Propenoic acid, 2-methyl-, methyl ester	80–62–6	U162
Methyl parathion	Phosphorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester	298–00–0	P071
Methylthiouracil	4(1H)-Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-	56–04–2	U164
Metolcarb	Carbamic acid, methyl-, 3-methylphenyl ester	1129–41–5	P190
Mexacarbate	Phenol, 4-(dimethylamino)-3,5-dimethyl-,	315–18–4	P128
Mitomycin C	Azirino[2',3':3,4]pyrrolo[1,2-a]indole-4,7-dione,6-amino-8-[[(aminocarbonyl)oxy]methyl]-1,1a,2,8,8a,8b-hexahydro-8a-methoxy-5-methyl-, [1aS-(1aalpha,8beta,8aalpha,8balpha)]-	50–07–7	U010
MNNG	Guanidine, N-methyl-N'-nitro-N-nitroso-	70–25–7	U163
Naphthalene	Same	91–20–3	U165
1,4-Naphthoquinone	1,4-Naphthalenedione	130–15–4	U166
alpha-Naphthylamine	1-Naphthalenamine	134–32–7	U167
beta-Naphthylamine	2-Naphthalenamine	91–59–8	U168
alpha-Naphthylthiourea	Thiourea, 1-naphthalenyl-	86–88–4	P072
Nickel carbonyl	Nickel carbonyl Ni(CO)4, (T-4)-	13463–39–3	P073
Nickel cyanide	Nickel cyanide Ni(CN)2	557–19–7	P074
Nicotine	Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-	54–11–5	P075
Nicotine salts	----------		P075
Nitric oxide	Nitrogen oxide NO	10102–43–9	P076
p-Nitroaniline	Benzenamine, 4-nitro-	100–01–6	P077
Nitrobenzene	Benzene, nitro-	98–95–3	U169
Nitrogen dioxide	Nitrogen oxide NO2	10102–44–0	P078
Nitroglycerin	1,2,3-Propanetriol, trinitrate	55–63–0	P081
p-Nitrophenol	Phenol, 4-nitro-	100–02–7	U170
2-Nitropropane	Propane, 2-nitro-	79–46–9	U171

Common name	CAS Name	Cas No.	HW Code
N-Nitrosodi-n-butylamine	1-Butanamine, N-butyl-N-nitroso-	924–16–3	U172
N-Nitrosodiethanolamine	Ethanol, 2,2'-(nitrosoimino)bis-	1116–54–7	U173
N-Nitrosodiethylamine	Ethanamine, N-ethyl-N-nitroso-	55–18–5	U174
N-Nitrosodimethylamine	Methanamine, N-methyl-N-nitroso-	62–75–9	P082
N-Nitroso-N-ethylurea	Urea, N-ethyl-N-nitroso-	759–73–9	U176
N-Nitroso-N-methylurea	Urea, N-methyl-N-nitroso-	684–93–5	U177
N-Nitroso-N-methylurethane	Carbamic acid, methylnitroso-, ethyl ester	615–53–2	U178
N-Nitrosomethylvinylamine	Vinylamine, N-methyl-N-nitroso-	4549–40–0	P084
N-Nitrosopiperidine	Piperidine, 1-nitroso-	100–75–4	U179
N-Nitrosopyrrolidine	Pyrrolidine, 1-nitroso-	930–55–2	U180
5-Nitro-o-toluidine	Benzenamine, 2-methyl-5-nitro-	99–55–8	U181
Octamethylpyrophosphoramide	Diphosphoramide, octamethyl-	152–16–9	P085
Osmium tetroxide	Osmium oxide OsO4, (T-4)-	20816–12–0	P087
Oxamyl	Ethanimidothioc acid, 2-(dimethylamino)-N-[[(methylamino)carbonyl]oxy]-2-oxo-, methyl ester	23135–22–0	P194
Paraldehyde	1,3,5-Trioxane, 2,4,6-trimethyl-	123–63–7	U182
Parathion	Phosphorothioic acid, O,O-diethyl O-(4-nitrophenyl) ester	56–38–2	P089
Pentachlorobenzene	Benzene, pentachloro-	608–93–5	U183
Pentachloroethane	Ethane, pentachloro-	76–01–7	U184
Pentachloronitrobenzene (PCNB)	Benzene, pentachloronitro-	82–68–8	U185
Phenacetin	Acetamide, N-(4-ethoxyphenyl)-	62–44–2	U187
Phenol	Same	108–95–2	U188
Phenylmercury acetate	Mercury, (acetato-O)phenyl-	62–38–4	P092
Phenylthiourea	Thiourea, phenyl-	103–85–5	P093
Phosgene	Carbonic dichloride	75–44–5	P095
Phosphine	Same	7803–51–2	P096

Common name	CAS Name	Cas No.	HW Code
Phorate	Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester	298–02–2	P094
Phthalic anhydride	1,3-Isobenzofurandione	85–44–9	U190
Physostigmine	Pyrrolo[2,3-b]indol-5-01, 1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethyl-,methylcarbamate (ester), (3aS-cis)-	57–47–6	P204
Physostigmine salicylate	Benzoic acid, 2-hydroxy-, compd with (3aS-cis) –1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethylpyrrolo [2,3-b]indol-5-yl methylcarbamate ester (1:1)	57–64–7	P188
2-Picoline	Pyridine, 2-methyl-	109–06–8	U191
Potassium cyanide	Potassium cyanide K(CN)	151–50–8	P098
Potassium silver cyanide	Argentate(1-), bis(cyano-C)-, potassium	506–61–6	P099
Promecarb	Phenol, 3-methyl-5-(1-methylethyl)-, methyl carbamate	2631–37–0	P201
Pronamide	Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)-	23950–58–5	U192
1,3-Propane sultone	1,2-Oxathiolane, 2,2-dioxide	1120–71–4	U193
n-Propylamine	1-Propanamine	107–10–8	U194
Propargyl alcohol	2-Propyn-1-ol	107–19–7	P102
Propham	Carbamic acid, phenyl-, 1-methylethyl ester	122–42–9	U373
Propoxur	Phenol, 2-(1-methylethoxy)-,methylcarbamate	114–26–1	U411
Propylene dichloride	Propane, 1,2-dichloro-	78–87–5	U083
1,2-Propylenimine	Aziridine, 2-methyl-	75–55–8	P067
Prosulfocarb	Carbamothioic acid, dipropyl-, S-(phenylmethyl) ester	52888–80–9	U387
Pyridine	Same	110–86–1	U196
Reserpine	Yohimban-16-carboxylic acid, 11,17-dimethoxy-18-[(3,4,5-trimethoxybenzoyl)oxy]-smethyl ester,(3beta,16beta,17alpha,18beta,20alpha)-	50–55–5	U200
Resorcinol	1,3-Benzenediol	108–46–3	U201
Saccharin	1,2-Benzisothiazol-3(2H)-one, 1,1-dioxide	81–07–2	U202
Saccharin salts	----------		U202

Common name	CAS Name	Cas No.	HW Code
Safrole	1,3-Benzodioxole, 5-(2-propenyl)-	94–59–7	U203
Selenium dioxide	Selenious acid	7783–00–8	U204
Selenium sulfide	Selenium sulfide SeS2	7488–56–4	U205
Selenourea	Same	630–10–4	P103
Silver cyanide	Silver cyanide Ag(CN)	506–64–9	P104
Sodium cyanide	Sodium cyanide Na(CN)	143–33–9	P106
Streptozotocin	D-Glucose, 2-deoxy-2-[[(methylnitrosoamino)carbonyl]amino]-	18883–66–4	U206
Strychnine	Strychnidin-10-one	57–24–9	P108
Strychnine salts	----------		P108
1,2,4,5-Tetrachlorobenzene	Benzene, 1,2,4,5-tetrachloro-	95–94–3	U207
1,1,1,2-Tetrachloroethane	Ethane, 1,1,1,2-tetrachloro-	630–20–6	U208
1,1,2,2-Tetrachloroethane	Ethane, 1,1,2,2-tetrachloro-	79–34–5	U209
Tetrachloroethylene	Ethene, tetrachloro-	127–18–4	U210
Tetraethyldithiopyrophosphate	Thiodiphosphoric acid, tetraethyl ester	3689–24–5	P109
Tetraethyl lead	Plumbane, tetraethyl-	78–00–2	P110
Tetraethyl pyrophosphate	Diphosphoric acid, tetraethyl ester	107–49–3	P111
Tetranitromethane	Methane, tetranitro-	509–14–8	P112
Thallic oxide	Thallium oxide Tl2 O3	1314–32–5	P113
Thallium(I) acetate	Acetic acid, thallium(1+) salt	563–68–8	U214
Thallium(I) carbonate	Carbonic acid, dithallium(1+) salt	6533–73–9	U215
Thallium(I) chloride	Thallium chloride TlCl	7791–12–0	U216
Thallium(I) nitrate	Nitric acid, thallium(1+) salt	10102–45–1	U217
Thallium selenite	Selenious acid, dithallium(1+) salt	12039–52–0	P114
Thallium(I) sulfate	Sulfuric acid, dithallium(1+) salt	7446–18–6	P115
Thioacetamide	Ethanethioamide	62–55–5	U218
Thiodicarb	Ethanimidothioic acid, N,N'-[thiobis [(methylimino) carbonyloxy]] bis-, dimethyl	59669–26–0	U410

Common name	CAS Name	Cas No.	HW Code
	ester		
Thiofanox	2-Butanone, 3,3-dimethyl-1-(methylthio)-, 0-[(methylamino)carbonyl] oxime	39196–18–4	P045
Thiomethanol	Methanethiol	74–93–1	U153
Thiophanate-methyl	Carbamic acid, [1,2-phyenylenebis (iminocarbonothioyl)] bis-, dimethyl ester	23564–05–8	U409
Thiophenol	Benzenethiol	108–98–5	P014
Thiosemicarbazide	Hydrazinecarbothioamide	79–19–6	P116
Thiourea	Same	62–56–6	U219
Thiram	Thioperoxydicarbonic diamide [(H2 N)C(S)]2 S2, tetramethyl-	137-26-8	U244
Tirpate	1,3-Dithiolane-2-carboxaldehyde, 2,4-di-methyl-, O-[(methylamino) carbonyl] oxime	26419–73–8	P185
Toluene	Benzene, methyl-	108–88–3	U220
Toluenediamine	Benzenediamine, ar-methyl-	25376–45–8	U221
Toluene diisocyanate	Benzene, 1,3-diisocyanatomethyl-	26471–62–5	U223
o-Toluidine	Benzenamine, 2-methyl-	95–53–4	U328
o-Toluidine hydrochloride	Benzenamine, 2-methyl-, hydrochloride	636–21–5	U222
p-Toluidine	Benzenamine, 4-methyl-	106–49–0	U353
Toxaphene	Same	8001–35–2	P123
Triallate	Carbamothioic acid, bis(1-methylethyl)-, S-(2,3,3-trichloro-2-propenyl) ester	2303–17–5	U389
2,4,6-Tribromophenol	Tribromophenol, 2,4,6–	118–79–6	U408
1,1,2-Trichloroethane	Ethane, 1,1,2-trichloro-	79–00–5	U227
Trichloroethylene	Ethene, trichloro-	79–01–6	U228
Trichloromethanethiol	Methanethiol, trichloro-	75–70–7	P118
Trichloromonofluoromethane	Methane, trichlorofluoro-	75–69–4	U121
Triethylamine	Ethanamine, N,N-diethyl-	121–44–8	U404
1,3,5-Trinitrobenzene	Benzene, 1,3,5-trinitro-	99–35–4	U234
Tris(2,3-dibromopropyl) phosphate	1-Propanol, 2,3-dibromo-, phosphate (3:1)	126–72–7	U235

Common name	CAS Name	Cas No.	HW Code
Trypan blue	2,7-Naphthalenedisulfonic acid, 3,3'-[(3,3'-dimethyl[1,1'-biphenyl]-4,4'-diyl)bis(azo)]-bis[5-amino-4-hydroxy-, tetrasodium salt	72–57–1	U236
Uracil mustard	2,4-(1H,3H)-Pyrimidinedione, 5-[bis(2-chloroethyl)amino]-	66–75–1	U237
Vanadium pentoxide	Vanadium oxide V2 O5	1314–62–1	P120
Vinyl chloride	Ethene, chloro-	75–01–4	U043
Warfarin	2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl)-, when present at concentrations less than 03%	81–81–2	U248
Warfarin	2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl)-, when present at concentrations greater than 03%-	81–81–2	P001
Warfarin salts, when present at concentrations less than 03%	----------		U248
Warfarin salts, when present at concentrations greater than 03%	----------		P001
Zinc cyanide	Zinc cyanide Zn(CN)2	557–21–1	P121
Zinc phosphide	Zinc phosphide Zn3 P2, when present at concentrations greater than 10%	1314–84–7	P122
Zinc phosphide	Zinc phosphide Zn3 P2, when present at concentrations of 10% or less	1314–84–7	U249
Ziram	ZInc, bis(dimethylcarbamodithioato-S,S')-,(T–4)-	137–30–4	P205

FN1 CAS Number given for parent compound only.

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APPENDIX B
BEST MANAGEMENT PRACTICES

Container Management

RECORD KEEPING CHECKLIST FORMS

- Hazardous Waste / Universal Waste Storage Area Checklists (CESQG; LQG 90-day and SQG 180-day)
- Satellite Accumulation Areas

Hazardous Waste / Universal Waste Storage Area Checklist

Bldg. Name:		Inspector	
Room / Area	**90-day Hazardous Waste Storage Area**		
Dept. or Unit:			

Type of wastes located in the area and general description: Reference specific Waste Profiles or internal Codes.

Hazardous Waste Storage Standards

Completing this checklist on a weekly basis will provide compliance assurance for all classes of generators.

- **Large Quantity Generator (LQG) -** LQGs produce more that 1,000 kg (2,200 lbs) in a calendar month, or more than 1 kg (2.2 lbs) of acutely hazardous waste in a calendar month.

Apply to the storage of hazardous waste that is generated on site, for a period not exceeding 90 days. Storage of liquid hazardous waste may not exceed 8,800 gallons unless the area meets the secondary containment requirements of NYS 373-2.9(f)(1).

- **Small Quantity Generator (SQG) -** SQGs produce less than LQG quantities but more than 100 kg (220 lbs) of hazardous waste, and accumulate less than 6,000 kg (13,200 lbs) of hazardous waste at any time.
- **Conditionally Exempt Small Quantity Generator (CESQG) -** CESQGs are those that generate less than 100 kg (220 lbs) of hazardous waste in a calendar month, or less than 1 kg (2.2 lbs) of acutely hazardous waste in a calendar month. Additionally, CESQGs must limit storage/accumulation to less than 1,000 kg (2,200 lbs) of listed and / or characteristic hazardous waste, or 1 kg (2.20 lbs) of acute hazardous waste at any time.

Containers are marked with the words “Hazardous Waste” and other words identifying the contents? Yes ____ No _____

If no, describe finding: _____

The accumulation start date is clearly marked and visible for inspection on each container? Yes ____ No _____

If no, describe finding: _____

Prior to shipment, containers are marked and labeled in accordance with DOT requirements? Yes ____ No _____

If no, describe finding: _____

A label or sign stating “Hazardous Waste” is posted in the area? Yes _____ No _____

If no, describe finding: _____

Containers are in good condition (not leaking or corroding)? Yes _____ No _____

If no, describe finding: _____

Containers are compatible with contents (refer to compatibility table)? Yes _____ No _____

If no, describe finding: _____

Containers are closed (containers must be kept closed except when adding or removing waste)?

Yes _____ No _____ If no, describe finding: _____

Containers holding ignitable or reactive waste are located at least 50 feet from the facility property line?

Yes ___ No _____ If no, describe finding: _____

Adequate precautions are taken to prevent the accidental ignition or reaction of ignitable or reactive waste? "No Smoking" signs are conspicuously placed (if there is a hazard from ignitable or reactive waste)?

Yes ___ No _____ Not Applicable _____ If no, describe finding: _____

Incompatible wastes and materials are properly segregated, separated (by dike, wall, berm, etc.) and managed?

Yes _____ No _____ If no, describe finding: _____

Sufficient aisle space is provided between containers to allow the unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment? Yes _____ No _____

If no, describe finding: _____

Storage area is inspected at least weekly to identify leaking containers and deterioration of containers and containment system? Records of inspections are maintained (recommended)? Yes _____ No _____

If no, describe finding: _____

All hazardous wastes are shipped off site to a state approved and federally authorized treatment, storage, or disposal facility in 90 days or less? (LQG)

All hazardous wastes are shipped off site to a state approved and federally authorized treatment, storage, or disposal facility in 180 days or less? (SQG)

Yes _____ No _____ If no, describe finding: _____

Posted Emergency Response Information at Hazardous Waste Storage area: Yes _____ No _____

- Name of Emergency Coordinator and designated alternates; Telephone: Work / Home / Mobile
- The location of fire extinguishers, alarm systems, spill abatement, containment and cleanup equipment
- Internal emergency incident notification procedures
- External emergency response procedure and resources (Fire, Police, Emergency Response Contractor)

The following equipment is readily accessible, tested, and maintained:

Internal communication or alarm system to provide immediate emergency instruction to personnel? Yes _____ No _____

Device (such as telephone or two-way radio) capable of summoning emergency assistance? Yes _____ No _____

Portable fire extinguishers, spill control equipment, and decontamination equipment? Yes _____ No _____

Water at adequate volume and pressure, or foam-producing equipment, or automatic sprinklers? Yes _____ No _____

If no, describe finding: _____

2.1.1 *The emergency response procedures and information will be kept current and updated in the facility Hazardous Waste emergency contingency plan.*

Universal Waste Storage (Universal waste may be accumulated for up to one year from the date the universal waste is generated.)

Containers holding universal waste are closed, structurally sound, compatible with the contents, and lack evidence of leakage, spillage, or damage? Yes _____ No _____ NA _____

If no, describe finding: _____

Universal waste is properly marked or labeled? Yes _____ No _____
If no, describe finding: _____

Universal waste is accumulated for no more than one year (unless facility has demonstrated that more time is needed to accumulate sufficient quantities as necessary to facilitate proper recovery, treatment, or disposal?
Yes _____ No _____ If no, describe finding: _____

2.1.1 *Training*

Personnel involved with the accumulation point are aware of the applicable requirements? Yes _____ No _____

If no, describe finding:

_____

Other Issues

Are there other issues of concern, such as chemical management / handling, air quality, wastewater discharges?

Yes _____ No _____ If no, describe finding:

_____

Weekly Inspection Risk Classification: Level I – Major_____ Level II - Moderate_____ Level III – Minor_____

Level I – Major: Significant risk for spill, fire, explosion or technical non compliance with waste management requirements.

Level II – Moderate: risk for spill, fire, explosion or technical non compliance with waste management requirements.

Level III – Minor: risk for spill, fire, explosion or technical non compliance with waste management requirements.

Inspection results conveyed to:

Name _____

Dept. _____

Phone _____

Date : _____Time :_____

Satellite Point Checklist Form

Bldg. Name: _____ Date: _____

Room / Area Name / No.: _____ Time: _____

Room / Area Description: _____ Auditor: _____

PI or Unit: _____ Insp. Contact: _____

Type of waste streams and general description of satellite accumulation points: _____

_____

_____

Hazardous Waste Point of Generation Accumulation Standards - apply to up to 55 gallons of hazardous waste or one quart of acutely hazardous waste in containers at or near any point of generation where wastes initially accumulate, which is under the control of the operator of the process generating the waste.

Satellite container(s) are marked with the words "Hazardous Waste" and other words identifying the contents?

Note: EH&S waste label properly completed will fully comply with this requirement.

Yes _____ No _____ If no, describe finding:

_____

All wastes at or near the point of generation?

Yes _____ No _____ If no, describe finding:

_____

Container(s) are in good condition (not leaking or corroding)? Yes _____ No _____

If no, describe finding: _____

Container(s) are compatible with contents? Yes _____ No _____

If no, describe finding:

_____

Container(s) are closed (containers must be kept closed except when adding waste)? Yes _____ No _____

If no, describe finding: _____

If more than 55 gallons of hazardous waste, or one quart of acutely hazardous waste, are in storage, container(s) holding the excess accumulation are marked with the date the excess amount began accumulating?

Yes _____ No _____ If no, describe finding: _____

Training

Personnel have received EH&S Chemical Waste Disposal training? Yes _____ No _____

If no, describe finding: _____

Personnel involved with waste generation and accumulation:

1) are aware of the accumulation limitations and proper procedures ? Yes ____ No ____ Correct _____

2) treat waste in lab? Yes ____ No ____ Correct _____

3) dispose of chemicals to the sanitary sewer? Yes ____ No ____ Correct _____

4) dispose of chemicals into the trash? Yes ____ No ____ Correct _____

5) dispose of chemicals through EH&S? Yes ____ No ____ Correct _____

6) are aware of the contents and location of Cornell's General Chemical Waste Rules? Yes ____ No _____

If no, describe finding(s): _____

Did area perform a self-audit? Yes ____ No ____ Don't know _____

Universal Waste Standards - apply to certain batteries, pesticides, mercury thermostats, and fluorescent lamps.

Universal wastes are properly marked with waste name and initial accumulation date? Yes ____ No ____ NA ___
If no, describe finding: _____

Personnel are adequately trained in the proper identification of universal waste? Yes _____ No _____
If no, describe finding: _____

Waste batteries, pesticides, thermostats, and fluorescent lamps are managed in a way that prevents releases to the environment? Yes _____ No _____ If no, describe finding: _____

Other Issues

Are chemical containers in storage in good condition? Yes _____ No _____
If no, describe finding: _____

Were any perishable chemicals observed beyond their expiration date? Yes _____ No _____
If yes, describe finding: _____

Are other types of "inherently waste-like" or speculatively accumulated containers present? Yes _____ No _____
If yes, describe finding: _____

Are there other issues of concern, such as chemical management / handling, air quality, wastewater discharges?

Yes _____ No _____ If no, describe finding: _____

Inspector Classification: **Level I** ____ **Level II** ____ **Level III** _____

Inspection results conveyed to: Name _____

Dept. _____

Phone _____

APPENDIX C

POTENTIALLY REGULATED CHEMICALS

x	EPA Regulated Hazardous Waste
+	EPA Known Carcinogen
**	Persistent Bio-Accumulative Toxins (PBT's) PBT's are a class of toxins that accumulate in fatty tissue. Even low-exposure to PBT's are hazardous as the health effects develop and increase over time.

1,1,1 Trichloroethane**x
1,1,1 Trichlorethane 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.

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

Acetone x
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 do not 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 will develop dermatitis.

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 x
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. Generally ammonia solutions are alkaline corrosives.

Antimony **
Antimony is a silvery-white metal that is often alloyed with other metals to form compounds. 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 **x
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+
Asbestos is a 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 Carbonate x
Barium is a silvery-white, shiny metal that burns in the air and reacts violently with water. Due to its high reactivity, it is often 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.

Benzene +x
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.

Cadmium+ **x
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 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 x
Carbon tetrachloride is a clear, colorless liquid with a sweet smell. It was removed from the consumer market once information 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.

Chlorine x
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 and dizziness. Severe exposure can be fatal by causing the airways to close. Chlorine solutions may be alkaline corrosive.

Chloroform**x
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.

Chromium**x
Chromium is a naturally occurring element in 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 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 not unhealthy in these small amounts, but high level exposure can cause asthma, pneumonia and vomiting. Cobalt has been shown to cause cancer in animals.

Creosote x
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.

Cyanide x
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 breathing 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 it 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 x
Formaldehyde is a colorless gas that has a pungent odor. It is a strong eye and respiratory track 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.

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

Hydroquinone x
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. It is widely used in some photo processing chemicals.

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

Lithium x
Lithium is a soft, silvery-white metal that turns yellow when exposed to the air or moisture. It is flammable and can cause violent combustions. Lithium is toxic by inhalation and ingestion causing damage to the respiratory and gastrointestinal tracks. 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 term. Chronic exposure can cause damage to the central nervous system with symptoms similar to Parkinson's disease.

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

Methylene Chloride (synonym: **Dichloromethane)** x
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.

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

N-hexane x
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.

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 x
Nitric acid is corrosive and poisonous. In vapor form it 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**x
Pentachlorophenol is a colorless crystal that is extremely toxic by ingestion causing circulatory and heart failure which can cause 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.

Phenol x
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.

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

Silica
Silicon dioxide is one of the most common materials found in the earth's crust. It accounts 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 x
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.

Sulfuric Acid x
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 x
Toluene is flammable and may cause irritation of the skin, respiratory tract and eyes. It is also toxic by ingestion.

Trichlorethylene x
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 the fat, 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.

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 and lung irritation.

Xylene x
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.

Zinc**
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.

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APPENDIX D

LIST OF ART MATERIALS SUPPLIERS

Note: This list is provided to assist you in locating vendors who carry art materials that are marketed as less toxic and, therefore, more "environmentally-friendly." The list is not exhaustive and does not mean that other products are less preferable. There are many companies that simply choose not to label products as non-toxic for a variety of reasons.

Daniel Smith

P.O. Box 84268

Seattle, WA 98124-5568

Tel (800) 426-6740

Fax (206) 224-0404

Daniel Smith offers non-toxic paints, primers and other art supplies with an AP rating that have passed certified toxicity tests. Their website http://www.danielsmith.com has product information relating to general information (paints, colors, etc), with very little emphasis on toxicity.

More specific product information relating to toxicity can be found in their catalog.

Orders can be placed on-line or by calling 1-800-426-7923.

Kremer Pigments Inc.
228 Elizabeth Street
New York NY 10012
Tel: 1-800-995-5501 or (212) 219 2394
Fax: (212) 219 2395

Kremer Pigments offers raw art supplies and products that require mixing by a trained professional, this line of product is not intended generally for school use. Further information can be found at the web-site http://www.kremer-pigmente.com. Orders can be placed using the order form on the web site.

Hyatt's

910 Main Street, Buffalo, NY 14202

(716) 884-8900 x637

(716) 884-3943

art@hyatts.com

The only non-toxic line of paints and primers that Hyatt's carries is Temptrapaint (poster paint).

Product Questions & Orders:

Customer Service Department: USA & Canada Toll-Free: Phone 1-800-234-9288 ext 301

Liquitex

Liquitex offers a student line of relatively non-toxic paints and art supplies intended for educational use.

Robert Anderson (888 4ACRYLIC X 7725) is the technical information specialist at Liquitex. He is a good resource for information on the toxicity of the paints and art supplies in The Basics Student line, and other Liquitex products.

Liquitex makes a companion paint for metals that is metal free. For example, a "cobalt blue hue" color is identical to the cobalt blue color as found with the metal cobalt blue. The "hue" on the end of the name indicates that it is metal free and non-toxic. This type of nomenclature is common throughout the Liquitex Basics Student Line for paints that have metals associated with them.

A list of retailers of Liquitex (including the Basics Student, Basics Matt Student, and Glossies Enamel Color lines) in New York is listed below. To find other retailers in New York or in other parts of the county, visit their site: http://www.liquitex.com/products/retailers.cfm

List of Retailers in New York that Sell Liquitex Products		
Ai Friedman 44 West 18th Street New York, NY 10011 212-243-9000	**Irving Berlin** 14 East 37th Street New York, NY 10016 212-532-3600	**Pearl Paint** 308 Canal Street New York, NY 10013 212-431-7932
Art Station 307 7th Ave New York, NY 10001 212-807-8000	**Janoffs Type & Stationery** 2870 Broadway/111st New York, NY 10025 212-866-5747	**Plaza Artist Materials** 173 Madison Avenue New York, NY 10016 212-689-2870
Arthur Brown 2 West 46th Street New York, NY 10036 212-575-5555	**Joseph Fischl** 1397 3rd Ave New York, NY 10021 212-288-0633	**Sam Flax Corp** 425 Park Ave At 55th Street New York, NY 10011 212-620-3000
Blaker & Kooby 1204 Madison Ave 88th Street New York, NY 10028 212-369-8308	**Lee's Art Shop** 220 West 57th Street New York, NY 10019 212-247-0110	**Sam Flax Corp** 12 West 20th Street New York, NY 10022 212-620-3000
Columbia Omni Corp 14 West 33rd Street New York, NY 10001 212-279-6161	**New York Central Supply** 62 Third Avenue @11th Street New York, NY 10003 212--47-7705	**The Art Store** 1 - 5 Bond Street New York, NY 10012 212-533-2444
Empire Artist Materials 851 Lexington Avenue New York, NY 10021 212-737-5002	**New York Central Supply - Warehouse** 130 East 12th Street New York, NY 10003 212-477-0400	
Exec. Accessories DBA Arts & Letter 21 West 38th Street New York, NY 10017 212-687-5841	**Pearl @ School of Visual Arts** 207 East 23rd Street New York, NY 10010 212--59-2179	

Golden Artist Colors, Inc.
188 Bell Road
New Berlin, NY 13411-9527 USA
607-847-6154
800-959-6543
Fax: 607-847-6767
Goldenart@Goldenpaints.Com
www.Goldenpaints.Com

Golden Artist Colors, Inc. offers a line of heavy body paints and glazes that they sell for educational purposes. There are SDS's available for all the colors upon request.

You can order a catalogue packet complete with complete information on their products. On-line pricing and ordering is not available through the website; pricing and ordering information can only be obtained through the catalog.

Gamblin Artists Colors Co.

P. O. Box 625

Portland, OR 97207 USA
Telephone: 503.235.1945

Fax: 503.235.1946

E-mail: gamblin@gamblincolors.com

Web-site: http://www.gamblincolors.com

Gamblin Artist Colors primarily sells oil-based paints for fine arts and oil painting mediums. Gamblin sells artist grade oils, varnishes, solvents, art sketching oils, and etching inks targeted more for the professional artist than for educational purposes. A list of stores that the sell Gamblin products is available via the internet: http://www.gamblincolors.com/stores.html.

Dick Blick Art Materials
P.O. Box 1267
Galesburg, IL 61402-1267

E-mail info@dickblick.com
Phone (800) 828-4548
Fax (800) 621-8293

Customer Service (800) 723-2787
Product Info (800) 933-2542
International (309) 343-6181

Dick Blick offers a line of art supplies called Grumbacher Academy Acrylics that is ideal for the art student, offering near professional quality at a uniform and affordable price.

All 24 colors are certified AP Non-Toxic by the Art and Creative Materials Institute.

Dick Blick stores are located in Connecticut, Georgia, Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, Nevada, Ohio, and Pennsylvania. There are no stores located in New York. In addition, Grumbacher Acrylic's can be ordered through the Dick Blick website (www.dickblick.com). Please see attached for pricing information.

Windsor and Newton

http://www.winsornewton.com/index2.php

Windsor and Newton sells art supplies targeted for the professional artist, not typically intended for educational use.

Binney and Smith

Corporate Headquarters
1100 Church Lane
Easton, Pennsylvania 18044-0431
Phone: (610) 253-6271
Fax: (610) 250-5768

http://www.binney-smith.com/

Portfolio Series, one of Binney & Smith's newest brands, is designed to help future art professionals (students and amateur artists) who are developing their portfolios learn the basics of working with different mediums.

Portfolio Series products offer high performance, color excellence, ease of use and safety and were designed specifically with older students in mind. The line includes drawing and coloring pencils, oil pastels and acrylic paints. Students and teachers appreciate this line of high quality products from a name that has been trusted for years: Crayola®. The Portfolio Series can be ordered through the website: http://www.crayola.com/store/search.cfm?&DID=6&search=portfolio%20series Crayola® products can also be purchased on this website at the above address as well.

Note that in more detailed information about the Portfolio Series, there in no mention of non-toxic or AP Approval.

APPENDIX E

INTERNET RESOURCES

EDUCATIONAL RESOURCES

Campus Safety Heath and Environmental Management Association (CSHEMA)
http://www.cshema.org/
A website dedicated to the CSHEMA vision of "excellent health, safety, and environmental protection understood and integrated into teaching, research, and service throughout higher education".

Cornell
http://cfe.cornell.edu/cfe/greening.cfm
Cornells' "Greening of the Campuses" website contains links to Cornell's statement of the environment, Sustainable Development on Campus, Second Nature, Education for Sustainability, National Wildlife Federation, Campus Ecology, EELink: Environmental Education on the Internet as well as the Environmental Organization Web Directory, K-12 Education.

Environmental Organization Web Directory - Education
http://www.webdirectory.com/Education/
A large database on environmental information and links, some of which are specifically targeted towards education at middle school, high school and college levels.

MIT - Environmental Virtual Campus
http://www.c2e2.org/evc/home.html
MIT has developed an "Environmental Virtual Campus" ("EVC") to assist students, staff, and researchers with campus environmental management practices, including both regulatory compliance and non-regulatory "green" environmental practices. The site is organized around nine typical areas on a campus that are normally subject to environmental regulations.

North American Association for Environmental Education (NAAEE)
http://www.naaee.org/npeee/
The North American Association for Environmental Education (NAAEE) is a network of professionals, students, and volunteers working in the field of environmental education throughout North America and in over 55 countries around the world. This website is dedicated to this mission and provides information for interested citizens.

National Clearinghouse for Educational Facilities (NCEF)
http://www.edfacilities.org/rl/art.cfm
This website has NCEF's resource list of links, books, and journal articles on the design and planning of school art facilities, including resources on funding and art supply safety issues.

Pacific Lutheran University Art and Architecture
http://www.plu.edu/~libr/web/art.html
A website by the Pacific Lutheran University, this is a resource for all information relating to architecture, artists, museums, photography, sculpture, schools and miscellaneous other art information.

Princeton University Environmental Health and Safety
http://web.princeton.edu/sites/ehs/artsafety/
This training guide provides basic information for working safely with chemicals and operations in Visual Arts. The guide is intended to supplement, but not replace, the safety orientation for faculty and students in Visual Arts.

University of Scranton - Greening Across the Chemistry Curriculum
http://academic.scranton.edu/faculty/CANNM1/organic.html
Green chemistry has gained a strong foothold in the areas of research and development in both industry and academia. This website focuses on the history of green chemistry as well as the curriculum.

GOVERNMENT RESOURCES

HAZMAT Safety
http://hazmat.dot.gov/hazhome.htm
A general informational website with links to other sites relating to HAZMAT Safety.

National Institute for Occupational Heath and Safety (NIOSH)
http://www.cdc.gov/niosh/topics/chemical-safety/default.html
A comprehensive website containing information and links to chemical information, specially relating to NIOSH databases, Personal Protective Equipment, MSDS's, and links to other government agency regulations.

National Institute for Occupational Health and Safety (NIOSH)
http://www.cdc.gov/niosh/npptl/topics/respirators/
All pertinent information and links to other sites regarding respirator use.

National Institute for Occupational Health and Safety (NIOSH)
http://www.cdc.gov/niosh/ipcs/icstart.html
International Programme on Chemical Safety – Information on International Chemical Safety Cards (ICSCs).

National Paint and Coatings Association (NPCA)
http://www.paint.org/hmis/index.cfm
The NPCA Hazardous Materials Identification System (HMIS®) is a result of a unique effort on the part of health and safety managers in the chemical and coatings industries to combine their collective experiences to design a practical, effective warning system that ensured "recognition at a glance" of the hazards associated with materials used every day in industry. The NPCA HMIS® program, warnings, and training have been the "Gold Standard" in the field. This website contains information about the NPCA.

National Resources Defense Counsel
http://www.nrdc.org/health/kids/qleadsch.asp
This FAQ website addressed the topic of lead paint in schools.

NOAA – The Chemical Reactivity Worksheet
http://www.response.restoration.noaa.gov/chemaids/react.html
The Chemical Reactivity Worksheet is a free program you can use to find out about the reactivity of substances or mixtures of substances (reactivity is the tendency of substances to undergo chemical change). This website contains a database of reactivity information as well as a way for you to virtually "mix" chemicals.

U.S. Department of Energy
http://www.eere.energy.gov/
A gateway to hundreds of websites and thousands of online documents on energy efficiency and renewable energy.

U.S. Department of Energy – Clean Cities
http://www.eere.energy.gov/cleancities/vbg/
A "Vehicle Buyers Guide" with information relating to energy efficiency and renewable energy in terms of alternative fuel vehicles.

U.S. Department of Energy – Energy Efficiency and Renewable Energy
http://www.rebuild.org/index.asp
Rebuild America is a growing network of community-driven voluntary partnerships that foster energy efficiency and renewable energy in commercial, government and public-housing buildings. At the federal level, it is the largest, most established technology deployment program within DOE's Office of Energy Efficiency and Renewable Energy (EERE). The program's goals are to: conserve energy, accelerate use of the best energy technologies, save money, reduce air pollution, lower U.S. reliance on energy imports, help revitalize aging city and town neighborhoods, and create "smart energy" jobs. This informational website describes in detail the Rebuild America program.

U.S. Department of Energy – Science Education Initiative
http://www.energy.gov/engine/content.do
Multiple links targeted for kids, adults, educators, researchers and consumers on such topics as national security, energy sources, energy efficiency, and the environment.

U.S. Department of Environmental Protection - NYC
http://www.nyc.gov/html/dep/
The official DEP website for NYC.

U.S. Department of Homeland Security – Federal Emergency Management Agency
http://www.fema.gov/
Links to disaster communities, emergency personnel, education and training, and news media are covered under this website.

U.S. Department of Housing and Urban Development - Homes and Communities
http://hud.esri.com/egis/
Map your community using GIS with this website

U. S. Department of Labor – Occupational Safety and Health Administration (OSHA)
http://www.osha.gov/
OSHA's mission is to assure the safety and health of America's workers by setting and enforcing standards; providing training, outreach, and education; establishing partnerships; and encouraging continual improvement in workplace safety and health. This official OSHA website contains all pertinent information about the administration.

U.S. Department of Labor – Occupational Safety and Health Administration – Hazard Communication
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10099&p_text_version=FALSE
The purpose of this website is to ensure the hazards of all chemicals produced or imported are evaluated, and that information concerning their hazards is transmitted to employers and employees. This transmittal of information is to be accomplished by means of comprehensive hazard communication programs, which are to include container labeling and other forms of warning, safety data sheets and employee training.

U.S. EPA - Colleges and Universities
http://www.epa.gov/sectors/colleges/

U.S. EPA - Compliance and Enforcement
http://www.epa.gov/compliance/
A resource in compliance assistance, compliance incentives and auditing, and compliance monitoring for the environment. Working in partnership with state governments, tribal governments and other federal agencies, EPA ensures compliance with the nation's environmental laws. There are a series of links associated with this site that contain other important environmental information relating to compliance issues.

U.S. EPA - Design for the Environment (DfE)
http://www.epa.gov/dfe/pubs/pdf/tools/ctsa/index.html
This publication presents the methods and resources needed to conduct a Cleaner Technologies Substitutes Assessment (CTSA), a methodology for evaluating the comparative risk, performance, cost, and resource conservation of alternatives to chemicals currently used by specific industry sectors. The CTSA methodology was developed by the U.S. Environmental Protection Agency (EPA) Design for the Environment (DfE) Program, the University of Tennessee Center for Clean Products and Clean Technologies, and other partners in voluntary, cooperative, industry-specific pilot projects.

U.S. EPA and colleges and universities work together to achieve sector-wide environmental gains through innovative actions. The Sector Strategies point-of-contact is working with six Colleges and Universities sector Partners to develop sector-specific approaches to assist colleges and universities in advancing the use of environmental management systems, reduce regulatory performance barriers, and measure environmental progress.

U.S. EPA – EnviroFacts
http://www.epa.gov/enviro/html/rcris/rcris_query_java.html
This website contains information on the Resource Conservation and Recovery Act. The Hazardous Waste Query Form allows you to retrieve selected data from the Resource Conservation and Recovery Act Information (RCRAInfo) database in Envirofacts. Specify a facility using any combination of facility name, geographic location, and standard industrial classification.

U.S. EPA - EnviroSense
http://es.epa.gov/
Enviroene, part of the U.S. EPA's website, provides a single repository for pollution prevention, compliance assurance, and enforcement information and databases. This search engine searches multiple websites (inside and outside the EPA), and offers assistance in preparing a search.

U.S. EPA - Global Warming Site
http://yosemite.epa.gov/oar/globalwarming.nsf/content/index.html
Information on climate, emissions, impacts, actions, news and events, where you live as well as a series of other useful links to global warming for concerned citizens and educators as well as for small businesses and industries.

U.S. EPA - Healthy School Environments
http://cfpub.epa.gov/schools/index.cfm
The Healthy School Environments Web pages are intended to serve as a gateway to online resources to help facility managers, school administrators, architects, design engineers, school nurses, parents, teachers and staff address environmental health issues in schools.

U.S. EPA - Information Sources
http://www.epa.gov/epahome/hotline.htm
A large database of environmental information and links relating to hot lines and clearinghouses.

U.S. EPA - Laws and Regulations
http://www.epa.gov/epahome/laws.htm
A website with more than a dozen major statutes or laws that form the legal basis for the programs of the Environmental Protection Agency.

U.S. EPA Memorandum - RCRA Policy Statement: Clarification of the Land Disposal Restrictions' Dilution Prohibition and Combustion of Inorganic Metal-Bearing Hazardous Wastes
http://www.epa.gov/epaoswer/hazwaste/combust/general/memorcra.txt
This memorandum sets out a Statement of Policy under the Resource Conservation and Recovery Act clarifying the application of the Land Disposal Restrictions (LDR) prohibition on dilution to combustion of certain inorganic metal-bearing hazardous wastes.

U.S. EPA - Pollution Prevention
http://www.epa.gov/p2/
This website provides general information about Pollution Prevention practices, describes the array of Pollution Prevention programs and initiatives administered by EPA and other organizations, and provides contacts for further information.

U.S. EPA - RCRA Online
http://yosemite.epa.gov/osw/rcra.nsf/topics?OpenView&count=5000
Topic search for RCRA Information.

U.S. EPA - RCRA, Superfund and EPCRA Call Center
http://www.epa.gov/epaoswer/hotline/index.htm
The RCRA, Superfund and EPCRA Call Center is a publicly accessible service that provides up-to-date information on several Environmental Protection Agency (EPA) programs. The Call Center responds to factual questions on federal EPA regulations.

U.S. EPA - Wastes
http://www.epa.gov/epaoswer/hazwaste/data/form8700/forms.htm
This booklet will help you determine if you are subject to the requirements under the Resource Conservation and Recovery Act (RCRA) for notifying authorized state agencies or EPA of your regulated waste activities.

U.S. EPA – Waste and Recycling
http://epa.gov/highschool/waste.htm
Provides information on how to reduce waste, where it goes, how waste affects the environment, and the laws that regulate waste and its cleanup.

U.S. EPA – Waste Minimization
http://www.epa.gov/wastemin/
The National Waste Minimization Program supports efforts that promote a more sustainable society, reduce the amounts of waste generated, and lower the toxicity and persistence of those wastes that are, of necessity, generated. This website contains information about this program.

ART AND PAINT SUPPLY MANUFACTURERS

Artist's Materials
http://www.trueart.info/materials.htm
Primarily information from the book entitled *Art Hardware* by Steven Saitzyk, pertaining to artist's materials.

Binney & Smith
http://www.binney-smith.com/
Portfolio Series, one of Binney & Smith's newest brands, is designed to help future art professionals who are developing their portfolios learn the basics of working with different mediums. The website contains more information on the Portfolio Series as well as links to ordering information.

Crayola
http://www.crayola.com/educators/techniques/specialty_markers.cfm
A supplier of Crayola art and paint supplies. Also contains links for arts and crafts ideas, lesson plans and coloring ideas targeted for educational purposes.

Daniel Smith
http://www.danielsmith.com
A supplier of paint and art supplies for adults and children. Contains links to hobbies and arts and crafts ideas as well. Products can be ordered online or through the catalog.

Gamblin Artist Colors
http://www.gamblincolors.com/howtp.html
A supplier of paint and art supplies for the professional artist.

Genesis Artists Colors
http://www.arttalk.com/Genesis/artistcolors.htm
A line of odorless and non-toxic paint and art supplies for educational purposes.

Golden Artist Colors, Inc.
www.goldenpaints.com
Golden Artist Colors, Inc. offers a line of heavy body paints and glazes that they sell for educational purposes, however, not all the supplies are non-toxic. There are SDS's available for all the colors upon request. On the website, there is product information and supplies can be ordered online.

Grumbacher Academy Acrylics
info@dickblick.com
Grumbacher Academy Acrylics are available through the Dick Blick Art Materials website. Grumbacher's line is ideal for the art student, offering near professional quality at a uniform and affordable price. All 24 colors are certified AP non-toxic by the Art and Creative Materials Institute.

Hyatt's
art@hyatts.com
A manufacturer of paint and art supplies. The only line of paints and primers that Hyatt's carries that is non-toxic is Temtrapaint (poster paint), but there are other lines of products that Hyatt produces that are targeted for the intermediate artist.

Kremer Pigments
http://www.kremer-pigmente.de/englisch/homee.htm
A manufacturer of art and paint supplies in New York. Mineral and organic pigments ordering information online or through the catalog.

Liquitex
www.liquitex.com
Liquitex offers BASIC, a student line of paints and art supplies that are non-toxic and intended for educational use. The website offers more in-depth information about this product line and contains ordering information as well. There are a number of stores located within the New York area (see Appendix D).

Manufacturers
http://www.trueart.info/manufacturers.htm
An alphabetical listing of links to manufacturers of artist and framing materials.

National Association of Printing Ink Manufacturers
http://www.napim.org/
This website provides information on pigment and ink suppliers with membership information and scheduled meetings.

New Pig - Absorbents for Oil Spill Cleanup
http://www.newpig.com/splashPage.jhtml;jsessionid=FYSQ44XVQ1FU2CTGIQVSFEQKMZCCWJVC?_requestid=29148
New Pig Corporation manufactures the world's largest selection of industrial absorbents for oil spill cleanup: absorbent pads and mats, also known as sorbents, plus socks, oil booms, pillows, pans, wipes, and spill kits. In addition to sorbents for cleaning up oil spills and leaks, they also offer a huge selection of innovative products and industrial supplies. This website contains ordering information as well as general information on these products.

Pigments Through the Ages
http://webexhibits.org/pigments/intro/paintings7.html
An informational webpage about paintings (oil paint and linseed oil, how to make your own oil paint, types of oil paint, consistence of oil paint, etc.).

Sherwin-Williams Company
http://www2.sherwin.com/IM/default.asp
A manufacturer of paints and art supplies.

Windsor and Newton
http://www.winsornewton.com/index2.php
Windsor and Newton sells art supplies targeted for the professional artist, not typically intended for educational use.

NEW YORK CITY/STATE RESOURCES

Environmental Advocates of New York
http://www.envirolink.org/external.html?www=http%3A//www.eany.org&itemid=20011023101449488121
Environmental Advocates of New York is the voice of New York State's environmental community, devoted to the protection of the state's wildlife, land and people. This official informational website provides all information about this program.

New York City Department of Cultural Affairs
http://www.nyc.gov/html/dcla/html/mfta/mfta_main.shtml
Headquartered in a spacious warehouse in Long Island City, MFTA collects reusable items from a host of reliable donors, and distributes them free of charge to non-profit arts organizations, city agencies, public schools, and social, health and community service organizations that have arts programs in New York City.

New York City Department of Environmental Protection
http://www.nyc.gov/html/dep/html/educres.html
This website is an educational resource for students and teachers on protecting the environment in the New York City area. There are links to guided field trips, and environmental resources. DEP has developed a wide variety of materials to encourage and stimulate environmental education that are included on the website.

New York City Fire Department
http://nyc.gov/html/fdny/html/rcny_legal/rcny_final.shtml
Contains a comprehensive listing of the Title 3 rules of New York City for FDNY.

New York City Major's Office of Environmental Coordination
http://www.nyc.gov/html/moec/html/resource.html
City Environmental Quality Review, or CEQR, is a process by which agencies and other instrumentalities of the New York City review proposed discretionary actions for the purpose of identifying the effects those actions may have on the environment. This website provides information on this effort for the interested citizen.

New York Love Business – Pollution Prevention and Recycling
http://www.nylovesbiz.com/Productivity_Energy_and_Environment/Environmental_Assistance/pollution_prevention.asp
A list of main services that are offered relating to pollution prevention and recycling.

New York State Art Teachers Association
http://www.nysata.org/
The New York State Art Teachers Association (NYSATA) is a non-profit professional organization founded in 1948 for the purpose of advancing the cause of art education. This website is dedicated to this organization and provides relevant information for interested citizens.

New York State Department of Environmental Conservation
http://www.dec.state.ny.us/website/der/spills/spillfaqs.html#reporting
New York State's informational website on spill response and remediation; contains frequently asked questions.

New York State Department of Environmental Conservation - Dismantlers and Recyclers of Used Electronics
http://www.dec.state.ny.us/website/dshm/hzwstman/dismantl.htm
Contains a list of contact information for dismantlers and recyclers of used electronics, compiled as a public service on this website for the New York area.

New York State Department of Environmental Conservation - Fluorescent or HID Lamp Recyclers
http://www.dec.state.ny.us/website/dshm/hzwstman/lamprecy.htm
A list of fluorescent lamp recyclers that New York State Department of Environmental Conservation (NYSDEC) maintains for the purpose of public education.

New York State Department of Environmental Conservation – Rules and Regulations
http://www.dec.state.ny.us/website/regs/index.html
An online resource for the environmental rules and regulations in New York State with links to the Chapter Index and the Regulations Index.

New York State Department of Labor
http://www.labor.state.ny.us/business_ny/employer_responsibilities/safety/coderule.htm
A list of the regulations that come under the jurisdiction of the Division of Safety and Health.

OTHER WEB RESOURCES

Alliance to Save Energy
http://www.ase.org/section/program/greenschl
This website presents information about the Green School Program - about using energy efficiency to strengthen schools. To help free up more resources for education while strengthening academic learning, the Alliance's Green Schools Program engages students in creating energy-saving activities in their schools, using hands-on, real-world projects.

Building Green
http://www.buildinggreen.com/index.cfm
This website contains such information as policy and content, land use and community, site and water, energy, resources and materials, and environmental indoor air quality. Building Green received the 2004 Lewis Mumford Award for the Environment.

Chemfinder
http://chemfinder.cambridgesoft.com/
A database and internet searching tool allowing the user to research a specific chemical for information and links on its biochemistry, heath effects, MSDS's, physical properties, regulations, structure, chemical exchange and usage.

Electronics Exchange System
http://electronics.exchangesystem.net/
This site is a free buy/sell/trade listing system for electronics, computer and telecommunication items, with links to such items as used computers and electronics, electronics scrap recovery, phone recycling and used telephones, as well as used TV, cable and video equipment.

Energy Star
http://208.254.22.6/index.cfm?c=business.bus_index
"Energy management is an important aspect of environmental management which will show healthy dividends for your business. ENERGY STAR has the strategies to make you a leader and set your organization apart."

Environmental Yellow Pages
http://www.enviroyellowpages.com/listings/Central_America/Panama/7772b48a6b7b6464d53a35424c61a84b/
Search engine to links for environmental work/businesses/industries. Over 350,000 listings worldwide.

General Safety and Health Standards of Toxic Substances
http://www2.state.id.us/dbs/safety_code/300.html
A website containing comprehensive general and specific information relating to safety and health standards of toxic and hazardous substances.

GUILD
http://www.guild.com/
GUILD, the leading source for original art and fine crafts, direct from the studios of artists nationwide. From studio furniture to art glass vases, from ceramics and jewelry to prints and oil paintings, inspirations.

Health and Safety in the Arts
http://www.ci.tucson.az.us/arthazards/medium.html
Contains a searchable database of health and safety information for artists.

Health and Safety Introduction
http://www.usa829.org/USA/health.html
This site contains an article by Monona Rossol, M.S., M.F.A., Industrial Hygienist, Health and Safety Business Representative about health and safety in the workplace. There are a series of links to other health and safety information at the end of the article that are informative as well.

HSIA – Solvent Applications
http://www.hsia.org/applications.htm
An informational website on solvent applications.

Joint Service Pollution Prevention Technical Library
http://p2library.nfesc.navy.mil/P2_Opportunity_Handbook/alpha_sec.html
Alphabetical listing of topics relating to pollution prevention.

Kodak Environmental Services
http://msds.kodak.com/ehswww/external/index.jsp
A search engine for SDS's to provide guidance on chemical safe use and disposal.

Medical Dictionary - Definitions, Medical Terms, Disease, Treatment, Drugs and Pharmaceuticals
http://www.books.md/index.html
This medical dictionary provides detailed information including medical definitions, specific medical terms, and descriptions of any disease and its treatment. Also included is information on drugs and pharmaceutical products.

SDS Search 2004
http://www.msdssearch.com/
A comprehensive website with links to all pertinent information on SDS's.

National Center for Manufacturing Sciences – Solv DB
http://solvdb.ncms.org/solvdb.htm
A large database of solvent information.

National Toner Recycling and Supply
http://www.nationaltoner.com/
This website stocks products at a discounted price for thousands of different machines including but not limited to: Epson, Apple, Brother, Canon, HP, IBM, NEC, Sharp and Xerox.

Recycler's World
http://www.recycle.net/
A list of recyclable objects and relevant information – a trading site for information related to recyclable commodities, by-products, used and surplus items.

Rohm and Haas Paint Quality Institute
http://www.paintquality.com/library/index.html
The PQI Paint Resource Library has extensive information on paints and painting to help in achieving success in painting projects, solving paint-related problems, and answering your questions about paints and coatings. An extensive glossary and information on the ingredients of paint and impacts on paint performance are all included in the comprehensive section.

Scorecard
http://www.scorecard.org/
Answers questions about pollution control. Topics include (Air, Water, Agriculture, Environmental Justice, and Health Hazards).

Scorecard
http://www.scorecard.org/chemical-profiles/other-web-sites.tcl?edf_substance_id=7439%2d92%2d1&edf_chem_name=LEAD
Other websites that offer searchable chemical databases, recommended by Scorecard.

Small Business Environmental Home Page
http://www.smallbiz-enviroweb.org/Default.htm
A webpage dedicated to helping small businesses access environmental compliance and pollution prevention information.

This to That
http://www.thistothat.com/index.shtml
A website with instructions for gluing various items to other items; provides recommendations for successful adhesion.

Toxics Use Reduction Institute (TURI)
http://www.turi.org/
The Toxics Use Reduction Institute (TURI) provides toxics use reduction resources for industries, communities and institutions to make Massachusetts a safer place to live and work. Website provides links for reducing use, sector programs, calendar and information about TURI.

Waste to Energy Research and Technology (WTERT) Counsel
http://www.seas.columbia.edu/earth/wtert/
The WTERT Council is concerned with energy recovery from solid wastes, as well as all other means used in the Integrated Management of Wastes, such as waste reduction and recovery of materials by recycling. This website contains pertinent information on the Waste to Energy Program.

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APPENDIX F

SAFE HANDLING, TREATMENT AND DISPOSAL

Treatment and Disposal

General Category	Subcategory	Examples	Precautions	Disposal as Hazardous Waste	Treatment and Disposal Recommendations/ Comments
Ceramics	Clay		Premixed clays are commercially available, avoid creating dust; minimize hammering dry clay; wet materials to clean up or vacuum with HEPA vac.	Not hazardous waste	Place in normal trash in sealed plastic bags to minimize dust exposures. Clay is not listed as a RCRA hazardous waste
	Glazes		When applying glazes, wear appropriate PPE, apply in a spray booth if available, follow manufacturer's recommendations for safe use and handling.	Hazardous waste determination must be performed to identify the presence of regulated chemical constituents	Glazes containing toxic metal pigments or flammable or toxic organics require hazardous waste treatment and disposal.
Drawing	Pastels		Colorants and pigments containing toxic heavy metals are hazardous by ingestion or inhalation, avoid creating dust.	Hazardous waste determination must be performed to identify the presence of regulated chemical constituents	Obsolete or abandoned material containing listed metals should be managed as hazardous waste.
	Pencils, Graphite, Charcoal, and Chalks		Colorants and pigments containing toxic heavy metals are hazardous by ingestion or inhalation, avoid creating dust. Water-based drawing gums are available as a preferred alternative to solvent-based gums	Hazardous waste determination must be performed to identify the presence of regulated chemical constituents	Obsolete or abandoned material containing listed metals should be managed as hazardous waste.

Treatment and Disposal

General Category	Subcategory	Examples	Precautions	Disposal as Hazardous Waste	Treatment and Disposal Recommendations/ Comments
	Pen and Ink		Do not apply solvent based inks using spray application techniques such as air brushing. Use alcohol or water based markers instead of those containing flammable and or toxic organics.	Hazardous waste determination must be performed to identify the presence of regulated chemical constituents.	Flammable and toxic organic solvent-based inks are hazardous waste materials when disposed.
	Spray Fixatives		When applying fixative or surface mount adhesives, wear appropriate PPE, apply in a spray booth if available, follow manufacturer's recommendations for safe use and handling	Hazardous waste determination must be performed to identify the presence of regulated chemical constituents.	Ensure aerosol spray cans are completely empty. Spray cans with residues are fire and explosive hazards and are regulated waste materials.
Textile -Dyes	Powders		Avoid creating dust, use dyes in liquid or paste forms.	Hazardous waste determination must be performed to identify the presence of regulated chemical constituents.	If dye powders do not contain listed hazardous constituents, place in normal trash in sealed plastic bags to minimize dust exposures.
	Solutions			Spent or obsolete solutions having corrosive properties i.e., acidic (pH ≤ 2) or alkaline (pH ≥ 12.5) are regulated.	Determine if your local sewer authority accepts neutralized dye solutions or spent baths at the concentration levels to be discharged. Concentrated corrosive solutions and those with regulated listed metals should be managed as hazardous waste.
	Mordant baths			Chromium is regulated as a hazardous waste.	Baths or spent mordents containing dichromates require hazardous waste disposal.

Treatment and Disposal

General Category	Subcategory	Examples	Precautions	Disposal as Hazardous Waste	Treatment and Disposal Recommendations/ Comments
Jewelry	Soldering		Conduct soldering operations with adequate ventilation, switch to lead-free solders and non cadmium fluxes.	Obsolete lead-containing solder wire, cadmium and silver wire/fluxes are regulated.	Collect solder dross, silver for metal salvage /recycling.
	Enameling		Certain enamels may contain arsenic, barium, cadmium, chromium, lead, nickel, or selenium. Avoid creating dust or mist. If spraying, use a spray booth. Follow manufacturer's recommendations for safe use and handling. Acid Pickle solutions are corrosive and generate toxic fumes. Use appropriate PPE.	Hazardous waste determination must be performed to identify the presence of regulated chemical constituents.	Enamels containing toxic metal pigments or flammable or toxic organics require hazardous waste treatment and disposal.

Treatment and Disposal

General Category	Subcategory	Examples	Precautions	Disposal as Hazardous Waste	Treatment and Disposal Recommendations/ Comments
Metal Shop Welding Metalworking	Metals			Hazardous waste determination must be performed to identify the presence of regulated chemical constituents.	Recycled metals exemption exists for material that would otherwise be hazardous waste due to the presence of listed metals, i.e., lead, cadmium, chromium. 1. Metals not collected for salvage or reclamation may be considered hazardous waste if they FAIL TCLP analysis for metal constituents. 2. Beryllium powder is an acutely hazardous waste. 3. Metallic Mercury is a hazardous waste. 4. Scrap solders/welding rods containing lead, cadmium or silver are considered hazardous waste unless recycled or reclaimed. 5. Non RCRA ferrous and non ferrous metals and alloys may be placed in the trash, or recycled through a conventional metal recycling program, e.g., municipal collector (unless they are coated with hazardous [lead containing] paints, in which case they must be managed as hazardous waste).
	Acid Etching/ Photo Etching)		Wear appropriate PPE, i.e., gloves, goggles, protective apron; and NIOSH approved respiratory protection for acid gas and mist.	Spent or obsolete solutions having corrosive properties i.e., acidic (pH ≤ 2) or alkaline (pH ≥ 12.5) are regulated	Determine if your local sewer authority accepts neutralized dye solutions or spent baths at the concentration levels to be discharged. Concentrated corrosive solutions and those with regulated listed metals should be managed as hazardous waste.

Treatment and Disposal

General Category	Subcategory	Examples	Precautions	Disposal as Hazardous Waste	Treatment and Disposal Recommendations/ Comments
	Patinas/Metal Compounds		Avoid solvent degreasing, use safer alternative mineral spirits and/or detergent solutions. Properly dispose of older materials containing antimony/ arsenic/cyanide/ or mercury. Newer products are available that have low toxicity or are non toxic. Use appropriate PPE. Materials containing sulfates or sulfites may produce toxic sulfide fumes; avoid adding strong acids, and provide adequate local exhaust. Follow manufacturer's recommendations for safe use and handling. Pay close attention to chemical incompatibilities. Avoid creating dust or mist when using these materials.	Hazardous waste determination must be performed to identify the presence of regulated chemical constituents	1. Obsolete commercial chemical products containing Arsenic oxides, arsenic acid, phenyl mercuric acetate, strontium sulfide, and vanadium pentoxide are acutely hazardous wastes. 2. Calcium chromate, lead acetate, lead phosphate, selenious acid, selenium dioxide, and selenium sulfide are toxic hazardous wastes when not used for their intended purposes, e.g., unused product. 3. Metallic compounds are hazardous waste if they can not pass the acid leaching tests specified by EPA for arsenic, barium, cadmium, chromium, lead, nickel, or selenium
Surface Coating Paints, Enamels, Stains, Varnish	Water-based Coatings	Paints, varnishes, stains, finishes, sealants	Follow manufacturer's recommendations for safe use and handling. Provide adequate local exhaust.	Hazardous waste determination must be performed to identify the presence of regulated chemical constituents	1. Uncured wet paints containing lead, cadmium, chromate pigments, or mercury preservatives should be disposed of as hazardous waste. 2. Other water-based paints and coatings should be allowed to dry, and then placed in the trash.
	Solvent-based Coatings		Some oil or solvent based coatings may contain cadmium, chromium, lead, nickel or selenium. Avoid creating dust or mist. If spraying, use a spray booth. Follow manufacturer's recommendations for safe use and handling.	Hazardous waste determination must be performed to identify the presence of regulated chemical constituents	1. Solvent-based materials should be disposed of as hazardous waste. 2. Stains containing wood preservatives such as arsenic or phenol derivatives may be hazardous waste.

Treatment and Disposal

General Category	Subcategory	Examples	Precautions	Disposal as Hazardous Waste	Treatment and Disposal Recommendations/ Comments
	Watercolors		Follow Manufacturer's recommendations for safe handling and use. Avoid creating dust or mist. If spraying, use a spray booth.	Hazardous waste determination must be performed to identify the presence of regulated chemical constituents	Uncured wet paints containing lead, cadmium, chromate pigments, or mercury preservatives should be disposed of as hazardous waste. Other water-based paints and coatings should be allowed to dry, and then placed in the trash.
	Acrylic Paints (Water-Emulsion)				Oil based paints should be managed as regulated waste material
	Oil Paints				
	Aerosol Spray Paints		Avoid creating dust or mist. If spraying, use a spray booth. Follow manufacturer's recommendations for safe use and handling.		Ensure aerosol spray cans are totally used up until completely emptied. Cans may then be placed in the trash or sent off as recyclable metal. Spray cans with paint and propellant residues are fire and explosive hazards and are also regulated waste Spraying any unused material to empty containers constitutes improper and illegal disposal.
	Paint Strippers Removal/Cleaning	Calcium hydroxide (slaked lime), calcium oxide (lime), lithium oxide, potassium hydroxide (caustic potash), potassium carbonate (potash), sodium carbonate (soda ash, washing soda), sodium hydroxide (caustic soda), sodium silicate, trisodium phosphate.	Most paint strippers are corrosive and toxic. Follow manufacturer's recommendations for safe use, storage and handling.	Hazardous waste determination must be performed to identify the presence of regulated chemical constituents	Some formulations are extremely corrosive due to concentrated alkalis. They also may contain toxic organics such as methanol and dichloromethane and are considered hazardous. Test coatings removed for the presence of characteristic levels of lead or other toxic metals to determine proper disposal method.

General Category	Subcategory	Examples	Precautions	Disposal as Hazardous Waste	Treatment and Disposal Recommendations/ Comments
	Oils n.o.s. as vehicle for paint formulations	Linseed oil, safflower oil, tung oil	Oils and oil-soaked rags are combustible and create the potential for spontaneous combustion.	Hazardous waste determination must be performed to identify the presence of regulated chemical constituents.	Oil- or solvent-soaked rags may be cleaned at commercial laundry operations. The oil and organics are reclaimed for reuse or energy recovery and therefore are not considered hazardous waste. Oil-soaked rags (but not solvent-soaked rags) may be hung up to dry individually so that heat cannot accumulate, and then reused.
	Solvents and thinners, cleaners, degreasers.	Turpentine, acetone, mineral spirits, methyl ethyl ketone, xylene, toluene, glycol ethers	Volatile organics (flammable liquids) are readily absorbed by the body from all routes of exposure. Always use with adequate ventilation. Keep all ignition sources away from area. Keep containers tightly closed.	Hazardous waste determination must be performed to identify the presence of regulated chemical constituents.	Flammable and toxic organics are regulated hazardous waste.
Photography	Photochemicals	Obsolete and abandoned or off specification photochemical solutions, powders, toners, fixers, developers	Purchase and use liquid solutions when possible. When mixing dry powders, avoid creating dust. Provide for adequate ventilation. Wear an approved respirator and PPE. Ensure safe chemical mixing and handling areas, i.e., have emergency eyewash and shower available. Avoid direct skin contact with photoprocessing solutions. If solution splashes onto skin or in eyes, rinse immediately with copious amounts of water; Cover all baths when not in use; make sure acid is always added *to* water when diluting; do not add acid to, or heat, hypochlorite bleaches. Keep potassium persulfate away from flammable substances. Install ground fault circuit interrupters in electrical outlets.	Hazardous waste determination must be performed to identify the presence of regulated chemical constituents	Neutralize working solutions and rinse to drain if discharge is managed in a CWA authorized Publicly Owned Treatment system and concentrations are at or below acceptable sewer discharge limits. Spent fixatives must be managed to prevent the release of sulfide gas and silver Silver in concentrations greater than 5 mg/L is a regulated hazardous waste and must be treated to less than 5 mg/L by silver recovery or collected for off-site reclamation/disposal. Discharges of silver halide wastewaters are regulated by municipal sewer authorities.

General Category	Subcategory	Examples	Precautions	Disposal as Hazardous Waste	Treatment and Disposal Recommendations/ Comments
	Oxidizing Agents	Dichromates, chlorates, chromates, hypochlorites, nitric acid (concentrated), periodates, permanganates, persulfates	Highly reactive materials; use with extreme caution.	Spent or obsolete solutions having corrosive properties i.e., acidic (pH ≤ 2) or alkaline (pH ≥ 12.5) are regulated.	Collect obsolete product or concentrated solutions and manage as regulated waste.
Printmaking	Ink Pigments Other pigments		Use ready-made water based acrylics or non toxic inks.	Hazardous waste determination must be performed to identify the presence of regulated chemical constituents.	Uncured wet screen printing inks containing lead, cadmium, chromate pigments or mercury preservatives should be disposed as hazardous waste. Other water-based acrylics and coatings should be allowed to dry, and then placed in the trash.
	Etching (Acids)		Use ferric chloride solutions rather than nitric acid whenever possible. Refer to SDS for chemical incompatibilities. Wear appropriate PPE.	Spent or obsolete solutions having corrosive properties i.e., acidic (pH ≤ 2) or alkaline (pH ≥ 12.5) are regulated.	Keep baths covered. Neutralize working solutions and rinse to drain if discharge is managed in a CWA authorized Publicly Owned Treatment system and concentrations are at or below acceptable sewer discharge limits.
	Photoetching		Purchase and use pre-sensitized plates; provide for local exhaust ventilation; wear appropriate PPE. Be aware of UV radiation reflection, avoid carbon arcs, wear welding goggles.	Flammable and toxic organics are regulated. These include ether acetate, xylene and butyl cellosolve.	Volatile and flammable liquids must be kept in tightly closed containers except when adding or removing material.
	Lithography Screen Printing	Solvents Mineral spirits, toluene	Follow manufacturer's recommendations for safe use, storage and handling. Consider the use of water-based screen printing inks; Avoid skin contact with solvents. Perform airbrushing in spray booth.	Flammable and toxic organics are regulated.	
Sculpture	Plaster		Wear an approved dust mask. Avoid the creation of dust; work with wetted materials when possible; clean up dust by wet mopping or vacuuming with a HEPA vac.	Not hazardous waste.	Place in the trash, in sealed plastic bags.

Treatment and Disposal

General Category	Subcategory	Examples	Precautions	Disposal as Hazardous Waste	Treatment and Disposal Recommendations/ Comments
	Plastics/Plastic Resins		Volatile and reactive materials require local exhaust. Highly reactive and flammable materials. Some resins contain listed carcinogens. Follow manufacturer's recommendation for safe use and handling.	Flammable and toxic organics are regulated. These include epoxy, methyl methacrylate, phenol- or urea-formaldehyde, polyester and polyurethane.	Excess and obsolete resins should be reacted with a compatible catalyst to form a solid plastic, which can then be placed in the normal trash. Plasticizers, resins and catalyst should be disposed as hazardous waste. Solid plastics are not considered hazardous waste.
	Organic Peroxides	Methyl ethyl ketone peroxide, benzoyl peroxide	Organic peroxides can burn or explode if heated. They become unstable over time and can be extremely reactive. Rotate inventory regularly and avoid storing beyond its shelf life.	Flammable, toxic and reactive materials are regulated.	Follow manufacturer's recommendations for safe use, storage and handling. Keep minimal quantities on hand. Consider eliminating use to avoid risk.
Woodworking	Ordinary wood or wood waste			Not hazardous waste	Can be recycled, burned as a fuel, or placed in the trash.
	Wood that has been treated with wood preservatives such as chromated copper arsenate or other toxic chemicals		Avoid inhaling dust, wear PPE when cutting or sanding.	Hazardous waste determination must be performed to identify the presence of regulated chemical constituents.	Do not burn these materials in a fireplace, or woodstove.
	Glues and Cements		Most solvent-based glues are flammable; keep away from sparks, flames, or other ignition sources.	Flammable, toxic and reactive materials are regulated.	Dry water-based glues and cements, and place in trash. Small amounts of solvent-based glues and cements must be handled as hazardous waste.

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APPENDIX G

NEW YORK AND NEW JERSEY – REGULATORY DIFFERENCES SUMMARY

	NEW YORK Department of Environmental Conservation	NEW JERSEY Department of Environmental Protection
Contact Information	Division of Solid and Hazardous Materials 50 Wolf Road Albany, NY 12233-7251 518-489-8988 www.dec.state.ny.us	Solid and Hazardous Waste Management Program 401 E. State Street, P.O. Box 414 Trenton, NJ 08625-0414 609-633-1418 www.state.nj.us/dep
Hazardous Waste Management Program Requirements Summary		
Program Description	Same as federal with the addition of PCB wastes. Incorporates 40 CFR 260 through 273 by reference* (6NYCRR 370.1(e)), except as noted.	Same as federal. Incorporates 40 CFR 260-266, 268 & 270 by reference* (NJAC 7.26G-Subchapters 4 through 12, respectively), except as noted.
Generator Status	Same as federal with the addition of PCB wastes (NYCRR 371.4 (e)). Generators also subject to quarterly tax assessment, NYS Dept. of Taxation & Finance.	Same as federal except Appendix to Part 262 Uniform Hazardous Waste Manifest & Instructions for EPA form 8700-22 (NJAC 7.26 G-6.1(b) & (c)) only. Must use specified state instructions when completing a manifest (NJAC7.26G-6.2(a)) and facilities filing a biennial report (LQG'S) are subject to a manifest processing fee program (NJAC7.26G-3.3(b)).
The Hazardous Waste Generator categories, identification numbers and notification requirements for New York and New Jersey are the same as the federal ones.		
Universal Waste	Allows generators (NYSDEC Commissioner's MOU 5/8/06) of mercury containing equipment to follow federal Universal Waste Rules until state rules are promulgated. (40 CFR 273 & NYCRR 374-3). Net result is the same list of universal wastes as federal.	Universal waste handlers are subject to regulation under (NJAC 7.26 A-7). Adds oil-based finishes and consumer electronics, including computers, in addition to the federal list.
Waste Generation Limits		
CESQG	<100 kg month	same
SQG	100 to 1,000 kg month	same
LQG	>1,000 kg month	same

Accumulation Quantities and Time Limit Conditions for Exemption from Permitting		
All Categories	Same as federal: with the exception that it allows SQG's and LQG's to manage some wastes from offsite CESQG's (6 NYCRR 373-1.1(d)(1(i)).	Same as federal.
	Limits LIQUID hazardous waste storage to 8,800 gallons or less without a permit. (6NYCRR 373-1.1(D)(1(iii)).	
	For facilities located in the following counties: • Kings • Nassau • Queens • Suffolk Or, over the Schenectady /Niskayuna Aquifer system in the following counties: • Schenectady • Saratoga • Albany Or, over the Clinton St./Ball Park Valley Aquifer system in the following counties: • Broome • Tioga Regulations require secondary containment if hazardous waste accumulated exceeds: - LQG – 185 gallons or any amount in tanks; - SQG – 185 gallons liquid in containers and/or tanks, or any liquid in underground storage tanks - CESQG – storage in excess of 1000 kg (6NYCRR 373-1.1(d)(1(iv)) LQG's in the geographic areas specifically referenced above are advised to review 6NYCRR 373-1.1(d) in its entirety to ascertain if additional requirements may be applicable.	

Waste Shipments		
Rejected Loads	(6 NYCRR 372.2(b)(2 (iii)) Requires generator to contact DEC.	(NJAC7.26G-6.3) Specific procedures must be followed.
Licensed Transporters	SQG/LQG Required - (6 NYCRR-364) CESQG' s may transport their waste under specified conditions (<100kg./month).	SQG/LQG - Required (NJAC7.26G-6.1(c)(4)).
Regulatory Allowances for On Site Waste Minimization		
Domestic Sewage Exclusion	Exempts sanitary wastes/ industrial wastewater treatment discharges. See 6NYCRR 371.1 e 1.	Incorporates by reference federal requirements found at 40 CFR 261. See NJAC 7.26G-5.1.
Elementary Neutralization	Acid/alkaline buffering. See 6NYCRR 371.1 d 1 xii.	Incorporates by reference federal requirements found at 40 CFR 270. See NJAC 7.26G-12.1.
Recycling	Lead batteries, scrap metals on site reuse reclaim and recycle systems. See 6NYCRR 371.1 g 3.	Incorporates by reference federal requirements found at 40 CFR 261. See NJAC 7.26G-5.1.
Treatment in Accumulation Containers	See 6NYCRR 373.1.1d1 ix.	Conforms with EPA interpretation.
Small Boilers and Industrial Furnaces	See 6NYCRR 374-1.8 i.	Incorporates by reference federal requirements found at 40 CFR 266 with specified changes. See NJAC 7.26G-10.1.

*** What is "incorporated by reference"?**

Incorporation by reference allows state agencies to refer to documents already vetted and published elsewhere, such as federal regulations or ASTM standards, in lieu of writing duplicative language. This is often accompanied by additional statements citing applicable differences from or additions to the referenced requirements. The legal effect of incorporation by reference is that the referenced material is treated like any other state-issued rule, having the force and effect of law. In the items cited above, the result is that the federal regulations listed apply equally as state requirements, with further state requirements added for facilities within that state.

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APPENDIX H

LIST OF ACRONYMS AND DEFINITIONS OF KEY ENVIRONMENTAL TERMS

Agency/Term	Acronym/Definition
Agency for Toxic Substances and Disease Registry	ATSDR
American Council of Governmental Industrial Hygienists	ACGIH
American National Standards Institute	ANSI
American Society for Testing and Materials	ASTM
Clean Water Act	CWA
Code of Federal Regulations	CFR
Comprehensive Environmental Response, Compensation and Liability Act (Superfund)	CERCLA
Comprehensive Environmental Response, Compensation, and Liability Information System	CERCLIS
Conditionally Exempt Small Quantity Generator	CESQG
Department of Transportation	DOT
Emergency Planning and Community Right to Know	EPCRTK
Environmental Protection Agency	EPA
Federal Emergency Management Agency	FEMA
Federal Facility Agreement	FFA
Land Disposal Restriction	LDR
Large Quantity Generator	LQG
Local Emergency Planning Commission	LEPC
Safety Data Sheet	SDS
Medium Density Fibreboard	MDF
National Ambient Air Quality Standards	NAAQS
National Emission Standards for Hazardous Air Pollutants	NESHAP
National Institute for Occupational Safety and Health	NIOSH
National Pollutant Discharge Elimination System	NPDES
New York City Department of Environmental Protection	NYCDEP
Occupational Safety and Health Administration	OSHA
Parts Per Million	PPM
Permissible Exposure Limit	PEL

Agency/Term	Acronym/Definition
Personal Protective Equipment	PPE
Resource Conservation and Recovery Act	RCRA
Safe Drinking Water Act	SDWA
Small Quantity Generator	SQG
Standard Operating Procedures	SOPs
State Emergency Planning Commission	SEPC
Superfund Amendments and Reauthorization Act of 1986	SARA
Threshold Limit Value	TLV
Toxic Substances Control Act	TSCA
Toxicity Characteristic Leaching Procedure	TCLP
Ultraviolet	UV
U.S. Department of Transportation	DOT
U.S. Food and Drug Administration	FDA
CAS Registry Number	This number is given to a chemical by the Chemical Abstracts Service Division of the American Chemical Society.
LD_{50} and LC_{50} (species and routes)	These are the concentrations of a chemical which is expected to cause the death of 50 percent of an animal test. LD_{50} applies to a single dose of solids and liquids, normally given in a mass of chemical to mass of body ratio. LC_{50} applies to gases and corresponds to the concentration of the gas in the air that killed 50 percent of the population in the time indicated.
pH	This is a numerical expression on a scale from 0 to 14 of the extent of acidity or alkalinity of a product:
Flashpoint (°C) and Method	This is the minimum temperature, under specified test circumstances (closed-cup or open-cup), at which a liquid product gives off enough vapor to ignite in the presence of a source of ignition such as an open flame or spark. For a given test method, the lower the flashpoint, the more flammable the material.
Flammable Limits in Air	These are the upper (maximum) and lower (minimum) concentrations of a gas or vapor in air between which an explosion or propagation of flame will occur when an ignition source is present. The Upper Flammable Limit (UFL) is sometimes known as the Upper Explosive Limit (UEL) and the Lower Flammable Limit (LFL) is sometimes known as the Lower Explosive Limit (LEL).

Agency/Term	Acronym/Definition
Incompatibility	Two substances are incompatible if, on combination, they react dangerously and produce toxic or corrosive by-products, excessive heat or explosion. Such chemicals should be stored apart and handled so as to minimize the likelihood of contact with each other.
Hazardous Decomposition Products	This is a listing of dangerous products that may be released if the substance is exposed to aging, heating, burning or other chemical reactions. An example would be the formation of peroxides with the aging of various ethers and unsaturated cyclic compounds.
Route of Entry	A chemical can enter the body by several routes: Inhalation (breathing) Contact with skin or eyes (localized irritation) Absorption through the skin and eyes (systemic) Ingestion Injection with a needle or cuts from contaminated glassware
Exposure Limits	These are the legislated or recommended limits of an airborne substance to which a worker is allowed to be exposed. These limits generally represent conditions in which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect.
C, or Ceiling	The maximum allowable human exposure limit for an airborne substance; not to be exceeded, even momentarily. Also see "PEL" and "TLV."
Concentration	The amount of a substance in a stated unit of a mixture or solution. Example: 2 parts per million hydrogen sulfide in air, or a 50 percent caustic solution.
Effects of Overexposure	Clinical signs and symptoms that may occur or be experienced when one has been overexposed to concentrations of a particular substance above established exposure limits.
Exposure Limit	Limit set to minimize occupational exposure to a hazardous substance. Recommended occupational exposure limits used are American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs). Mandatory limits are the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs).
Flash Point	The minimum temperature at which a liquid gives off sufficient vapor to form, with air, an ignitable mixture.

Agency/Term	Acronym/Definition
Ignitable	A solid, liquid, or compressed gas that exhibits a "characteristic of ignitability," as defined by the Resource Conservation and Recovery Act (RCRA), and may be regulated (by the Environmental Protection Agency) as a hazardous waste.
Local Exhaust	A system for capturing and removing airborne contaminants (gases, particulates) at the point at which they are released. Not to be confused with general exhaust.
mg/m3	Milligrams per cubic meter of air; a unit for measuring concentrations of particulates in the air (a weight per unit volume).
Neutralize	To render chemically neutral or harmless; neither acid nor base; to counteract the activity or effect of. The addition of a base (sodium hydroxide) to an acid hydrochloric acid) results in water and a salt (sodium chloride); thus the acid has been "neutralized" or rendered harmless.
PEL	Permissible Exposure Limit: an exposure limit established by OSHA's regulatory authority. May be a time weighted average (TWA) limit or a ceiling concentration exposure limit.
NIOSH	National Institute for Occupational Safety and Health. Part of the Centers for Disease Control and Prevention in the U.S. Department of Health and Human Services (DHHS); a Federal agency which, in addition to other activities, tests and certifies respiratory protective devices and air sampling detector tubes, recommends occupational exposure limits for various substances, and assists OSHA in occupational safety and health investigations and research.
ppm	Parts per million: a unit for measuring the concentration of a gas or vapor in contaminated air. Also used to indicate the concentration of a particular substance in a liquid or solid.
Protective Cream (Barrier Cream)	A protective skin cream provides an invisible flexible protection for the hands from soils, solvents, dusts, powders, oils, greases, paints, epoxies, resins, inks, and irritants. It can be easily removed by washing with any cleansing product.

Agency/Term	Acronym/Definition
Reactivity -	The tendency of a substance to undergo a chemical change with the release of energy. Reactive chemicals are liable to cause fire or promote an explosion. Undesirable effects (pressure buildup, temperature increase, formation of noxious, toxic, or corrosive by-products) may occur because of a reaction to heating, burning, direct contact with other materials, or other conditions when in use or in storage.
Respiratory Protection	Devices for use in conditions exceeding the permissible exposure limits, which, when properly selected, maintained, operated, and worn by the user, will protect the user's respiratory system from exposure to airborne contaminants by inhalation.
Target Organ Effect -	Damage caused in a specific organ following exposure to certain chemicals. For example, a "neurotoxin" is a chemical, such as mercury, that product is its primary toxic effect on the nervous system.
TLV -	Threshold Limit Value: a term used by the American Conference of Governmental Industrial Hygienists (ACGIH) to express the airborne concentration of a material to which nearly all persons can be exposed day after day, for a normal 8-hour workday or 40-hour work-week, without adverse effects.
Toxicity -	Basic biological property of a material reflecting its inherent capacity to produce injury; adverse effects resulting from overexposure to a material, generally via the mouth, skin, eyes, or respiratory tract.
TWA -	Time Weighted Average exposure; the airborne concentration of a material to which a person is exposed, averaged over the total exposure time, generally the total workday (8 to 12 hours). It is calculated by multiplying measured concentration levels times the duration of exposure (in hours), adding these values together, then dividing by the total sampled time (in hours). Also see "TLV" and "PEL."
UEL or UFL	Upper Explosive Limit or Upper Flammable Limit - The highest concentration of a flammable vapor or gas in air (usually expressed in percent by volume) above which propagation of a flame will not occur in the presence of an ignition source. Also see "LEL."

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