Nogales Unified School District
Chemical Management Plan

School Year: 2012-2013

Superintendent: Steve Zimmerman

Chemical Management Officer (CMO): Fernando Parra

Chemical Management Committee (CMC): TBA

Mission:

Nogales Unified School District is committed to fostering a safe and nurturing environment for children, faculty and the surrounded community. To further advance our efforts, we have developed this chemical management plan to provide and promote a safe and healthy environment for school children and employees; to minimize hazardous chemicals and associated waste; to promote environmental consciousness; and to educate faculty and staff on proper chemical handling, storage, and disposal procedures. This plan is compiled specifically for relevant district administrators, faculty, and contractors using chemicals in and around school facilities.

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Introduction:

This Chemical Management Plan has been created to provide the schools within the Nogales Unified School District (NUSD) with the basic information and resources needed to remove unnecessary, outdated, or unknown chemicals; prevent chemical mismanagement or incidents in schools; and heighten awareness in the school community of the importance of proper chemical management. Our schools use a variety of chemicals for maintenance and cleaning, and for pest control, as well as in classrooms like science labs and art and trade classes. When they are mismanaged, these chemicals can put students and school personnel at risk from spills, fires, and other accidental exposures and contamination of air in schools.

To avoid potentially hazardous chemical incidents at our schools, we have developed this plan to identify, manage, and prevent hazards through all stages of chemical purchasing, storage, use, and disposal. Such a program can also help to reduce the quantity and toxicity of chemicals used in our school's curriculum and in the in cleaning and maintenance of the school grounds and landscape; and to prevent the buildup of a surplus chemical inventory.

NUSD issues the following Policy Statements affirming our commitment to the proper management of chemicals, to the reduction of generated regulated waste, and to promote a safe and healthy learning environment in our schools. It is the policy of NUSD to:

- ✓ Routinely review existing operating procedures to identify and prevent actions or activities that may lead to unnecessary exposure to chemicals, by any route (i.e. ingestion, absorptions, and inhalation), by students, faculty, and staff.
- ✓ Establish new and review existing safety procedures to control behavior and personal conduct around chemicals; including providing guidelines for appropriate clothing, footwear, and personal protective equipment (PPE).
- ✓ Ensure operating procedures encompass all relevant areas of the school, including science labs, art classes, trade (Career and Technical Education) classes, custodial services, facility maintenance, on-site health office/clinics, etc.
- ✓ Establish training protocols for staff members working with and around chemicals, including responding to spills, incidents and emergency situations.

- ✓ Review existing curricula for opportunities to reduce the use of hazardous chemicals, and increase the use of green chemistry, micro-scale chemistry, demonstration labs, video instruction, and other alternative teaching techniques.
- ✓ Establish concise management practices for handling regulated hazardous chemicals from time of purchase, during use and storage, up to time of disposal; and assign responsibility at all relevant levels to ensure proper chemical management procedures are followed.
- ✓ Refuse any unapproved chemical donations.
- ✓ Review relevant Material Safety Data Sheets (MSDS) for proper storage, disposal, and handling procedures; as well as for recommended safety information (see Appendix D).
- ✓ Inventory all existing chemicals annually; dispose of all expired or unnecessary chemicals; and ensure chemicals are stored in a manner that complies with the local, state, and federal requirements and reduces the risk of exposure by students, faculty, staff, and visitors.
- ✓ Establish purchasing and use procedures to ensure that only appropriate chemicals are located and used on campuses. Many state and federal organizations (e.g. The Arizona School Retention Trust) provide lists of chemicals that should not be purchased for or brought unto school campuses (see Appendix A).
- ✓ Establish an audit plan and frequency for reviewing and updating this chemical management plan.

Responsibilities:

Superintendent

The Superintendent holds the ultimate responsibility of overseeing that the Chemical Management Plan is enforced and followed continually. He or she will serve as the main champion of the plan for the entire district. S/he will also select the Chemical Management Officer, whose responsibilities are described below.

Chemical Management Officer (CMO)

The Superintendent will appoint a Chemical Management Officer, or CMO, who will annually review chemical inventories and monitor adherence to established policies and procedures and limit purchases to two-year supplies, as required by the US Department of Education (see Appendix B).

Duties of the CMO are as follows:

- ✓ Work with administrators and district officials to reduce and dispose of hazardous chemicals within the schools
- ✓ Maintain Material Safety Data Sheets (MSDS) for all chemicals stored in the district at information and shall be kept on file (see Appendix D)
- ✓ Ensure faculty and staff are trained on chemical purchasing, handling, storage, and disposal procedures (see Appendix G and Appendix H)
- ✓ Ensure that proper Personal Protective Equipment (PPE) is available for all students, faculty, and school staff who will be working with or around chemicals
- ✓ Stay up to date with hazardous waste storage practices, disposal, and shipping regulations
- ✓ Oversee all hazardous waste disposals (see Appendix E and Appendix I)
- ✓ Oversee annual inventories to make sure chemicals are used and stored properly
- ✓ Review the Chemical Management plan every six months

The CMO reports directly to the superintendent and oversees the Chemical Management Committee as well as providing direction to site administrators and their faculty regards to chemical management.

Chemical Management Committee (CMC)

The CMO will appoint up to 20 members for the Chemical Management Committee, or CMC, by the end of August each school year. These members shall include 1-2 representatives from each elementary school (administrator, teacher, or custodial staff member); three representatives from each middle school (administrator, science teacher, and custodial staff member); one representative from the alternative high school (administrator, science teacher or custodial staff member); 5 representatives from the traditional high school (administrator, science teacher, CTE, ART, and custodial staff member); and 4 district staff members (superintendent or designee, school improvement, student services, and maintenance). The CMC will meet a minimum of 1 time each quarter.

The CMC will work with the CMO to:

- ✓ Oversee and monitor implementation the District chemical management plan
- ✓ Review any chemical purchase requests from faculty at the site level

- ✓ Review science curricula annually to ensure the minimization of chemical use and generated waste
- ✓ Audit the Chemical Management Plan annually
- ✓ Review National Fire Protection Association (NFPA) and make sure signage is up to date and clearly posted at each site (see Appendix J)
- ✓ Review and make any necessary modifications to the Chemical Management Plan annually

Principal

The Principal will monitor Science Department Chair and Faculty compliance with the Chemical Management Plan at the site level.

Additionally, the Principal selects, monitors, and collaborates with the Science Department Chair to ensure that duties such as annual inventories and safety equipment inspections are carried out. Together, the Principal and Department Chair:

- ✓ Ensure faculty and staff are trained on chemical purchasing, handling, storage, and disposal procedures (see Appendix G)
- ✓ Ensure that proper Personal Protective Equipment (PPE) is available for all students, faculty, and school staff who will be working with or around chemicals

Science Department Chair

The Science Department Chair oversees chemical purchasing, inventory, and monitor chemical storage. The Department Chair will work collaboratively with the Principal to ensure that eyewashes, showers, hoods, and vents are inspected annually to ensure that they are functioning properly. Additionally, the Science Department Chair or designee will:

- ✓ Complete an annual inventory to identify expired chemicals to be disposed by May 1st and disposal Inventory laboratory chemicals and submit completed inventories to the CMO and by September 1st (or next working day if that date falls on a Saturday or Sunday) and May 1st (or next working day if that date falls on a Saturday or Sunday) each year
- ✓ Complete an inspection of storage areas every six months for leaks, peeling labels, expiration dates, improper segregation, and any other problems
- ✓ Ascertain that all chemicals are labeled, handled, stored, and disposed of properly
- ✓ Submit site purchase justification request forms in a timely manner to the CMC for review and approval (see Appendix F)

- ✓ Obtain MSDS sheets for any new chemicals being purchased, keeping one copy for site records and submitting one copy for district records (see Appendix D)
- ✓ Ensure that chemical storage areas are equipped with chemical spill clean-up supplies

Faculty

Teachers and staff are required to maintain compliance with proper hazardous chemical use, storage, and disposal procedures and policies. Teachers and staff must also review the Chemical Management Plan and receive training on using Personal Protective Equipment (PPE) and safety equipment and procedures on an established frequency annually.

In order to ensure proper chemical management within the classroom, Teachers and staff must:

- ✓ Replace hazardous chemicals with greener alternatives, where determined to be suitable
- ✓ Report the depletion of a chemical completely used up by a teacher by recording of the name chemical on a list so that a new order may be placed.
- ✓ Educate students about proper chemical management, chemical alternatives, and PPE. Refer to MSDS for PPE information
- ✓ Supervise students when they are around chemicals
- ✓ Keep chemical storage areas secure to prevent unauthorized access
- ✓ Assist the Science Department Chair in the annual inventory to identify expired chemicals to be disposed by May 1st and disposal occur during June or July.
- ✓ Examine storage areas and report leaks, peeling labels, expiration dates, improper segregation, and any other problems to the Science Department Chair
- ✓ Make certain that all chemicals are labeled, handled, stored, and disposed of properly
- ✓ Submit purchase justification request forms in a timely manner to the Science Department Chair, who will provide them to the CMC for review and approval
- ✓ Obtain MSDS sheets for any new chemicals being purchased, keeping one copy for site records and submitting one copy for district records (NOTE: free MSDS can be found at www.msds.com)
- ✓ Use good classroom chemical management practices (see *Proper Handling s*ection)

Purchasing Procedures:

NUSD bans the purchase and/or use of any prohibited chemicals on its school campuses (see Appendix A). Only chemicals deemed appropriate by this Chemical Management Plan are acceptable for purchase

and use. **No prohibited or unauthorized (which is defined as acquisition without following the process described in this section) chemicals will be purchased, procured, or otherwise brought onto any school campus or facility.** All NUSD faculty and staff will use procedures described in this section for the purchasing and acquisition of all chemicals, including any chemicals to be donated to a school or the district from an outside entity.

First, it must be determined that the chemical needs to be purchased. When deciding if a chemical needs to be purchased staff shall:

- ✓ Check with other departments and schools to see if the chemical is already in stock and available. Science teachers, with administrative approval from both sites, may be able to exchange chemicals for use at other schools depending upon the chemical and following state/federal guidelines.
- ✓ Consider substituting a less toxic/hazardous form of the product if available. For example, high quality spirit or digital thermometers are as accurate as mercury thermometers without the associated toxic releases when broken.
- ✓ Purchase only the amount needed. When the cost of disposing excess chemicals is factored in, the economy size may not be the most economical choice.
- ✓ Determine if there are any special handling or storage requirements for the chemical and, if so, if these requirements can be met. Consider also whether staff has the training and supplies to respond to a spill of the material.
- ✓ Consider whether the chemical or product, when discarded, will be a regulated hazardous waste requiring special disposal or a non-hazardous waste that can be disposed of in the trash or down the drain. If it will be a regulated hazardous waste, include the cost of disposal when evaluating the costs of using the material.
- ✓ Confirm that the school's ventilation system is adequate for using the product safely. Some chemicals need to be handled only in a functioning fume hood. Opening a window does not constitute adequate ventilation. Utilize MSDS for chemical specific information.

Additionally, faculty or staff should:

- ✓ Review current site inventory to avoid duplicate purchases
- ✓ Review curriculum to ensure minimal hazardous chemicals are used
- ✓ Generate list of requested chemicals
- ✓ Obtain MSDS for any chemical purchases to be requested
- ✓ Highlight any hazardous chemicals

Purchasing of chemicals in the following volumes based on these considerations:

- ✓ Purchasing in bulk (concentrated or alternative delivery systems)
- ✓ Purchasing in as needed volumes (i.e. microscale)
- ✓ Purchasing in pre-diluted amounts

Next, once it has been determined that there is grounds for purchase or procurement of a chemical, a Chemical Purchasing Justification Form (see Appendix F) must be completed and submitted to the CMC for review and approval. If approval is not given a requisition for purchase cannot be submitted.
When written recommendation for the chemical purchase or procurement from the CMC is obtained, a requisition can then be submitted and a copy of the CMC recommendation for the purchase will be provided to the business office. Approvers in the purchasing queue will then allow the purchasing of recommended purchases from appropriate funding sources.

Last, once chemicals have been received, faculty or staff must:

- ✓ verify that all new chemicals are labeled with their purchase date
- ✓ ensure proper storage
- ✓ maintain the school's chemical inventory
- ✓ provide an updated information to the CMO for the district inventory
- ✓ include this updated inventory in the Emergency Management Plan for the school.

On-Site Chemical Management:

Storage

All chemicals will be stored in designated, locked and labeled areas; and in a manner that prevents unauthorized access. The Principal is ultimately responsible for the proper security and maintenance of these storage areas. To help ensure proper security and maintenance of storage areas, the Principal must annually identify and provide a list of personnel authorized to be in storage areas to the CMO.

NUSD will sort chemicals by organic and inorganic groupings as set forth in The Flinn Chemical Catalog Reference Manual (see Appendix C). NUSD will adhere to the suggested compatible families shelving patterns, and will use the incompatibility information for further segregation, as needed or appropriate (see Appendix C).

Authorized **flammable** chemicals will be stored using the following procedures:

- ✓ Alphabetically in an independently vented, approved yellow labeled "Flammable" cabinet

Authorized **acids** will be stored using the following procedures:

- ✓ Alphabetically in an independently vented, approved blue plastic labeled "Acid" cabinet by color coded reactivity

Authorized **bases** will be stored using the following procedures:

- ✓ Alphabetically in a separately labeled "Base" cabinet by color coded reactivity

Remaining chemicals will be stored using the following procedures:

- ✓ Alphabetically by color coded reactivity

All **prepared solutions** will be stored in approved designated areas and will require proper chemical labeling that includes:

- ✓ Formula, concentration, reactivity coding, date of preparation, preparer's initials

Compressed gas handling and storage procedures are as follows:

- ✓ Cylinders must be handled at high-energy sources. Always transport cylinders with the safety cap installed and use a cylinder cart. Do not roll them by hand along the floor or transport them on forklifts.
- ✓ Always store cylinders upright and secure them using an approved lock-down device.
- ✓ Always use the correct pressure regulator for the specific gas.
- ✓ Do not store cylinders or lecture bottles with the regulator in place. If the regulator fails, the entire contents of the cylinder may be discharged.
- ✓ CGA fittings differ for inert gases (e.g., He, Ar, N_2), flammable gases (e.g., H_2) and oxidizers (e.g., O_2, N_20)
- ✓ Compressed gas cylinders, which contain acutely toxic gases, must be stored in a designated area
- ✓ All compressed gas cylinders must be clearly marked with the correct chemical name
- ✓ All cylinders should be labeled to indicate if the container is *full* or *empty*.

Designated chemical storage areas must also satisfy the following guidelines:

- ✓ Chemical containers must isolated (i.e. not be touching) and must be stored no more than 3 containers deep
- ✓ Do not store chemicals on the floor (except for gas cylinders) or above eye level
- ✓ Inspect storage areas routinely (establish specific frequency) for leaks, proper storage practices, and peeling labels

If chemicals will be stored in a classroom or other satellite areas, the faculty or staff is responsible for:

- ✓ Maintaining an organized and uncluttered work area
- ✓ Labeling of all chemicals transferred to other containers
- ✓ Returning all chemicals to proper storage

All chemicals must be labeled with the following information:

- ✓ Chemical name
- ✓ Purchase date
- ✓ Expiration date
- ✓ Hazard warnings (available on original label or MSDS)
- ✓ If possible, maintain original chemical labels

Inventory

The CMO will be provided a current inventory of laboratory chemicals used through the District through the submission of site inventories to be collected every May 1st unless otherwise

designated by the CMO. Inventories will be used to keep an accurate account of stored chemicals; reduce poor storage practices; remove expired chemicals; and ensure proper labeling procedures. Each site will identify a person(s) to complete their chemical inventory. Substitute teachers will be provided as necessary to enable the teacher(s) to complete the inventory.

Annually (May 1st unless otherwise designated by the CMO), the CMO and CMC will oversee updates to the chemical inventory, using the district inventory worksheet (see Appendix I). Additionally, inventories at the main storage areas will be updated whenever new chemicals are received or chemicals are removed for distribution or disposal. Semi-annual inventories will be reconciled against the rolling inventory. Chemicals which need to be disposed of shall be identified and submitted to the CMO by May 1st so that arrangements can be made to have the items safely removed.

When conducting the inventory, staff should bear in mind that the inventory serves several purposes:

- ✓ To remove from schools excess, unused, deteriorated or outdated
- ✓ chemicals
- ✓ To identify potentially dangerous chemicals that should not be present
- ✓ or used
- ✓ To ensure that all chemicals are managed appropriately
- ✓ To comply with all local, state and federal regulatory requirements

When conducting an original inventory or updating an inventory there is a process that should be followed. The steps in this process are as follows:

1. PLAN BEFORE YOU START.
   - Never work alone
   - Don't involve students
   - Use appropriate personnel protective equipment
   - Have spill materials available and insure that emergency equipment are operational
   - Know whom to call for help if needed. Have phone numbers of the fire department and state contacts handy

2. TAKE THE INVENTORY. CAUTION: AVOID TOUCHING OR MOVING CONTAINERS AS OLD CHEMICALS MAY BECOME UNSTABLE, AND SOME CHEMICALS FORM EXPLOSIVE COMPOUNDS AS THEY AGE. FOR EACH SUBSTANCE RECORD:
   - The full name
   - The CAS number
   - Manufacturer's name
   - Size of the container
   - Type of container i.e., metal, glass, gas cylinder
   - The color of the container, i.e., clear, tinted, amber, opaque
   - Amount of the substance in liters/ml, grams/kg, or cubic feet for gases

- Characteristics, i.e., percent solid and/or liquid, presence of crystals on lid or inside bottle, presence of and % of emersion oil covering/not covering metal salts, presence of paraffin coating around lid, contents are flowable /non-flowable, color of contents
- Expiration date or approximate age of the substance, and
- Storage situation and location, i.e. shelf, refrigerator, cabinet (locked or not locked, fire approved or not), chemistry/biology/storage room location and shelf.

3. ORGANIZE YOUR LIST.
- Once you have recorded the inventory information, assign compatible family designations and hazard data to each listing. Enter family and hazard designation to Inventory Worksheet in designated columns

4. DECIDE WHAT STAYS AND WHAT GOES.
- Determine the hazardous characteristics and storage requirements for each chemical
- Plan to eliminate all chemicals that are beyond their shelf life
- Plan To eliminate all chemicals that are unusable or unneeded
- Plan to eliminate all chemicals identified as shock sensitive, explosive, highly toxic, carcinogenic, mutagenic or teratogenic
- Identify which substances stay or go on the Inventory Worksheet in designated column.

NOTE: Before disposing of any chemical be sure that you have made a hazardous waste determination and have confirmed that your disposal method is safe and in compliance with all applicable regulations. Additionally:

- CONTACT YOUR LOCAL FIRE DEPARTMENT FOR ASSISTANCE.
- DO NOT DISPOSE OF ANY MATERIALS OR WASTES DOWN SINKS OR DRAINS WITHOUT PRIOR APPROVAL FROM THE LOCAL WASTE WATER TREATMENT DEPARTMENT.
- DO NOT DISPOSE OF ANY CHEMICALS INTO THE TRASH WITHOUT CONTACTING YOUR SOLID WASTE DISPOSAL COMPANY FOR APPROVAL.

5. CHEMICAL DISPOSAL
- The Chemical Management Committee will provide final approval of the list of items identified to be disposed of during a chemical removal.
- The following chain of custody procedures apply whenever a chemical is removed from a storage area:
  - ✓ A list will be provided to the company contracted for removal of the chemicals to be removed
  - ✓ The company removing the chemicals will in turn provide verification of the chemicals which they removed for reconciliation of the records.

6. UPDATE INVENTORY AND REORGANIZE WHAT IS LEFT.
- Reorganize the remaining substances for future storage into chemical families ensuring vertical and horizontal compatibility and compliance with local fire code. Please refer to

the School Chemistry Laboratory Safety Guide, published by the Council of State Science Supervisors, association with the U.S. Consumer Product Safety Commission and the National Institute for Occupational Safety and Health, for suggested shelf storage patterns for Inorganics and Organics.

- Inventories will be completed by the department chair, provide to the site administration, and submitted to the CMO as an electronic spreadsheet document. Store copies of annual inventories with:
  - ✓ Chemical Management Officer
  - ✓ School Administration
  - ✓ Fire Department (Nogales Fire Department and/or Rio Rico Fire Department)
  - ✓ Emergency Management Plan for the site and district

Proper Handling

The CMO will identify a list of personnel authorized and trained to transport chemicals on school premises. Proper PPE and transportation equipment will be obtained, maintained, and used to ensure chemicals are transported in a safe and responsible manner.

The following procedures must be followed when chemicals are being transported on campus:

- ✓ Refer to MSDS requirements
- ✓ Chemical sign-out/in sheet indicating time to be used
- ✓ Materials need to be secured properly for transport
- ✓ All chemical materials need to be returned upon completion
- ✓ If chemicals are left in the classroom, they need to be stored securely
- ✓ Volatile or corrosive chemicals must be returned to appropriate storage daily

Waste and Disposal

The primary issues related to chemical waste and disposal are related to acids, bases, heavy metals, and organic waste.

To address disposal of acids and bases in each classroom, the acid or base waste will be collected and neutralized so that it may be safely disposed of down the sewage drain.

For heavy metal waste, the material will be collected and precipitated through appropriate methods so that they can be separated and stored in the science storeroom. However, it should be noted that accumulation of heavy metals beyond a legal threshold as defined by local, state and federal regulations is prohibited. As such a point is reached, professional removal of the material would be necessary.

There is also organic waste which can be generated through the use of organic solvents. These materials are recyclable and can be stored in the science storeroom.

Waste is also created when chemicals are beyond their shelf life and must therefore be disposed of appropriately.

Specific hazardous waste accumulation areas must be designated at each school in a location that provides for adequate security, and allows for access for routine inspections and pick-up by permitted disposal contractor. All sites are prohibited from storing regulated hazardous waste greater than 180 days, but recyclable waste (up to 1 ton) can be stored longer and disposed once a year.

The following minimum standards and labeling requirements apply to all containers located in the accumulation areas:

- ✓ The container must be closed during storage, except when adding or removing waste
- ✓ The container must be structurally sound

Properly store and label all generated waste with the following:

- ✓ "Hazardous Waste"
- ✓ Chemical name(s)
- ✓ Date waste was produced
- ✓ Date waste was designated for disposal

The Science Department will monitor the accumulation and storage of waste. The Chair will notify the Principal when accumulation levels necessitate removal so that the Principal can notify the CMO. The CMO or designee is responsible for all hazardous waste manifests and associated paperwork. Pick-ups of chemical waste by professional waste disposal company will not be scheduled during school hours and typically will be scheduled during the winter break and the summer break when school is not in session.

Annual training will be conducted for all science teachers utilizing chemicals relating to hazardous waste generation and disposal, as well as laboratory safety, chemical operating procedures, and. The site level Chemical Management Committee members will oversee and facilitate regular department meetings to discuss the labs being planned throughout the school year and address the issues outlined above.

Chemical Spill:

Major Chemical Spill

A minor chemical spill is one that faculty or staff is capable of handling safely without the assistance of emergency personnel--all other chemical spills are considered major.

If you determine that a spill is major and the clean-up cannot be managed internally, faculty or staff should call 911 and notify the Principal, who will in turn notify the CMO and/or superintendent. Contact with 911 will initiate the proper action according to the Emergency

Response Plan. If the material is extremely toxic, reactive, flammable, or volatile, indicate to 911 and first responders that assistance from a hazardous material response team may be necessary. Treat all unknown substances generated from a spill as hazardous waste.

In the event of a major chemical spill or incident, the Nogales Unified School District will notify:

- Nogales Fire Department: 911

If directed by first responders to make contact with other members of the Emergency Response Team members for our county, additional emergency numbers for regulatory agencies that may be needed are:

- Santa Cruz County Office of Emergency Management: (520) 375-8000
- ADEQ Emergency Response Team: (602) 771-4106
- National Response Center: (800) 424-8802
- Poison Control: (800) 222-1222

Minor Chemical Spill

If you determine that a spill is minor enough to manage the clean-up internally, and then follow these guidelines:

Cleaning up small spills of neutral liquids

Follow proper PPE for any liquid involved. If a drain is nearby, block it to prevent entry of the chemical. If the chemical is flammable, turn off all sources of ignition. If the chemical container is still leaking, place it inside a tub, set it upright, or rotate it so that the puncture from which it is leaking is uppermost. To contain the spill, make a dam around the spill with absorbent and then cover the spill with the absorbent. Work from the outside edges of the spill to the center, taking care not to step in the spill. If stepping in the spill is unavoidable, be sure you are wearing protective footwear, that you do not spread the spill to uncontaminated areas, and that you properly decontaminate or dispose of your footwear. Pick up the absorbent/chemical mixture using the dustpan and brush. Place this mixture inside a plastic bag. If broken glass is involved, pick up the pieces with tongs and place the glass inside the plastic bag. Wipe the tools with paper towels and place the towels inside the bag. Wash the area of the spill with detergent and water; absorb the wash water with paper towels that can also go into the bag. Wash the tools, goggles, and gloves with detergent. If the used PPE is disposable, dispose of it in the plastic bag containing the spill.

Cleaning up small spills of liquid acids and bases

Cleanup technique is the same as for neutral spills, except that sodium bicarbonate is used as both an absorbent and a neutralizing agent. Sodium bicarbonate is a buffer; it will neutralize both acids and bases: $HCO_3^{-1}+OH^{-1} \rightarrow H_2O + CO_3^{-2}$.

A great deal of heat is generated when sodium bicarbonate comes in contact with concentrated acids. Add it slowly and use extreme care to avoid contact with skin. For acids and bases comprised of nontoxic ions, the resulting mixture can be disposed of in the trash once it is neutral. If toxic ions are involved, such as in chromic acid, the mixture must be disposed of as hazardous waste.

Cleaning up spills of solids

Always follow proper PPE for all spilled substances. Carefully sweep up solids into the dustpan. Avoid stirring up chemical dust. Place the chemical inside plastic bags. Wash the spill area with detergent, wipe up with paper towels, and place the paper towels in the plastic bag. Wash tools and PPE with detergent. If they are disposable, place them inside the plastic bag with the other spill-related material.

Cleaning up mercury spills

If mercury is present in your school, you must be prepared to respond to a spill. You can safely clean up spills of small amounts of mercury, such as is present in a thermometer. Any spill larger than one gram must be cleaned up by a professional (EPA Kentucky Department of Environmental Protection).

Chemical spill kit

There will be a chemical spill kit located in the science storeroom which consists of a chemical fire extinguisher, metal bucket for broken glassware, a plastic bucket containing sand, a plastic bucket containing absorbent with a scoop, sodium bicarbonate, broom, dustpan, and plastic bags.

A basic first aid kit will also be provided and stored in the science storeroom to address immediate medical needs.

First Aid

Below are some general guidelines for administration of first aid until emergency personnel arrives at the scene of a chemical exposure or overexposure. Also included in this section are suggestions for critical information to be gathered and provided to first responders which can assist in the treatment of injured faculty, staff, or students as a result of a chemical exposure or overexposure.

Handling Exposures and Overexposures
A. Survey Scene and determine:

(1) What happened?
(2) How many people are injured?
(3) Are there bystanders who can help?

B. Responding to Overexposures
(1) Primary Survey (A, B, C's) - Search for life threatening injures
(a) Airway - Is the airway open?
(b) Breathing - Is the person breathing?
(c) Circulation - Is there a heartbeat? Severe bleeding?
(2) Secondary Survey - General head-to-toe exam. Is there:
(a) Airway obstruction - sign of bleeding
(b) Fluid leaking from ears or nose?
(c) Pulse or fractures in arms and legs?
(d) Abnormalities of the chest or abdomen
(e) Sensory feelings - Do they feel your touch?

C. First Aid for over-exposures
(1) Chemical burns
(a) Stop the exposure
(b) Refer to first-aid section of MSDS
(c) Flush with water 15-30 minutes, if appropriate
(d) Remove affected clothing and jewelry
(e) Cover area with loose dry bandage
(f) Treat for shock
(2) Shock
(a) Place victim on back
(b) Elevate feet 8-12 inches; IF AND ONLY IF there is no head, neck or back injury
(c) Place victim on side, if vomiting
(d) Maintain body temperature; do not overheat
(3) Poisoning
NOTE: Contact Emergency Medical Services and the Poison Control Center immediately
(a) Swallowed poison
(1) Place victim on side if vomiting
(2) Monitor A,B,Cs
(3) Save poison container(s) and any vomit
(b) Inhaled Poison
(1) Remove victim from source to fresh air
(2) Monitor A,B,Cs
(3) Save poison container(s) and any vomit
(c) Absorbed Poison
(1) Remove victim from source of poison
(2) Wash or brush poison from skin
(3) Remove clothing or affected article

D. Basic information to be provided to emergency responders

1. Location of emergency - Address and area within location
2. Telephone number from where the call is being placed
3. Name of caller
4. How many people are injured?
5. Condition of victim(s)
6. What first aid is being administered?
7. Hang up AFTER the emergency responder hangs up – Let responder determine when they have all that they need.

Appendix A

Chemicals That Should Not Be On Campus - EXHIBIT C

Acetaldehyde	1,2,3,6	Ethylene dibromide	6
Aniline	1A,3,6	Ethylene oxide	2
Arsenic trioxide	3,6	Ethyleneimine	6
Asbestos	6	Formaldehyde	6
Aluminum chlorate	1B,2	Formalin	3,6
Ammonium perchlorate	1B,2	Hydrofluoric acid	3,5
All alcohol based ethers	2	Hydrogen sulfide solution	3
2-Acetylaminofluroene	6	Hydrazine	6
Alpha-naphthylamine	6	Isobutyl Peroxide	2
4-Aminodiphenyl	6	Lead chromate	6
Benzene	6	Lithium	2,4
Benzidine	6	Meruric (II) chloride	3
Benzol	1,3,7	Mercurous nitrate	1B,3
Benzoyl chloride	1A,3,4,5	Mercury	3
Benzoyl peroxide	1,2	Methylene chloride	3
Beryllium	6	Methyl chloromethyl ether	6
Beta-naphthylamine	6	Methylene (bis) 2-chloroaniline	6
Beta-propiolactone	6	4-Nitrobiphenyl	6
Bischloromethyl ether	6	N-nitrosodimethylamine	6
1,3-Butadiene	6	Perchloric acid	2,5
2-Butanone peroxide	2	Phenol	3
Cadmium acetate	6	Phosphorus (red)	1,2
Cadmium chloride	6	Picric acid	2,3,5
Cadmium nitrate	2,3,6	Potassium (metal lump)	2,3
Cadmium sulfate	6	Potassium chlorate	1B,2
Carbon tetrachloride	6	Potassium cyanide	3
Chlorobenzene	2,3	Potassium perchlorate	1B,2
Chloretone (chlorobutanol)	3	Sodium metal	1,4
Chloroform	6	Sodium cyanide	3
Chromium oxide	3,6	Sodium peroxide	1,1B,2
Chromium sesquioxide oxide	3,6	Strontium nitrate	1B,3
Chromite	6	Sodium chlorate	1,1B
Colchicine	3	Thermit	1,2,4
Collodion	1	Thioacetamide	3,6
1,4-Dioxane	2,3,6	Tolidine	6
3,3-Dichlorobenzidine (& its salts)	6	Toluene	3
Diethylene oxide	2,3,6	Uranyl nitride	2
4-Dimethylaminoazobenzene	6	Vinyl chloride	6
2,4-Dinitrophenol	2	Zinc chromates	6

Key to Potential Hazards

1=highly flammable	3=toxic
1A=combustible	4=reactive
1B=oxidizer	5=corrosive
2=fire/explosion risk, peroxide formation	6=carcinogen

Notes

See also 40 CFR 261.22(e), EPA Acute Hazardous Waste List

This is not a comprehensive list of all possible explosives, carcinogens, or other chemicals that should not be on campus.

Angelina Canto
School Improvement Director
Nogales Unified School District #1
310 W. Plum Street
Nogales, AZ 85621

Chemicals Which *Should Not* Be Found on School Premises

CHEMICAL	POTENTIAL HAZARD(S)	CHEMICAL	POTENTIAL HAZARD(S)	CHEMICAL	POTENTIAL HAZARD(S)	CHEMICAL	POTENTIAL HAZARD(S)
Acetaldehyde	1, 2, 3, 6	Cadmium Chloride	6	Formaldehyde	6	Phenol	3
Aniline	1A, 3, 6	Cadmium Nitrate	2, 3, 6	Formalin	3, 6	Phosphorous (red or white)	1, 2
Arsenic trioxide	3, 6	Cadmium Sulfate	6			Picric Acid	2, 3, 5
Asbestos	6	Carbon Disulfide	1, 3	Hydrofluoric Acid	3, 5	Potassium (metal, lump)	2, 3
Aluminum Chlorate	1B, 2	Carbon Tetrachloride	6	Hydrogen Sulfide (solution)	3	Potassium Chlorate	1B, 2
Ammonium Perchlorate	1B, 2	Chlorobenzene	1, 3	Hydrazinc	6	Potassium Cyanide	3
All Alcohol-based Ethers	2	Chloretone (Chlorobutanol)	3			Potassium Perchlorate	1B, 2
2-Acetylaminofluorene	6	Chloroform	6	Iodine Chloride	1B, 2, 4	Potassium Permanganate	2
Alpha-naphthlamine	6	Chromium Oxide	3, 6	Isobutyl Peroxide	2		
4-Aminodiphenyl	6	Chromium Sesquioxide Oxide	3, 6			Sodium (metal)	1, 4
		Chromite	6	Lead Chromate	6	Sodium Cyanide	3
Benzene	6	Colchicine	3	Lithium	2, 4	Sodium Peroxide	1, 1B, 2
Benzidene	6	Collodion	1			Strontium Nitrate	1B, 3
Benzol	1 ,3 ,7			Mercury	3	Sodium Chlorate	1, 1B
Benzol Chloride	1A, 3, 4, 5	Dioxane	2, 3, 6	Mercuric (II) Chloride	3	Sulfuric Acid (fuming)	1B, 2, 4
Benzol Peroxide	1, 2	3, 3-Dichlorobenzidine (& its salts)	6	Mercurous Nitrate	1B, 3		
Beryllium	6	Diethylene Oxide	6	Methylene Chloride	3	Thermit	1, 2, 4
Beta-naphthylamine	6	4-Dimethylaminoazo-benzene	2, 3, 6	Methyl Chloromethyl Ether	6	Thioacetamide	3, 6
Beta-propiolactone	6	2, 4-Dinitrophenol	2	Methylene (bis) 2-Chloroaniline	6	Tolidine	6
Bischloromethyl ether	6			4-Nitrobiphenyl	6		
1, 3-Butadiene	6	Ethyl Ether	1,2	N-Nitrosodimethylamine	6	Uranyl Nitride	2
2-Butanone peroxide	6	Ethylene Dibromide	6	Nitric Acid, Fuming	1B, 2, 4	Vinyl Chloride	6
		Ethylene Oxide	2				
Cadmium acetate	6	Ethyleneimine	6	Perchloric Acid	2, 5	Zinc Chromates	6

Key To Potential Hazards

1	= Highly Flammable
1A	= Combustible
1B	= Oxidizer
2	= High Fire Explosion Risk/Peroxide Formation
3	= Toxic/Narcotic
4	= Reactive
5	= Corrosive
6	= Carcinogen

Notes:

(1) See also 40 CFR 261.22 (e) – EPA Acutely Hazardous Waste List

(2) This may not be an all-inclusive list of all possible explosives, carcinogens, or other chemicals which should not be found at schools

Appendix B

05-071 DEPARTMENT OF EDUCATION

Chapter 161: PURCHASE AND STORAGE OF HAZARDOUS CHEMICALS

Summary: This rule establishes standards for the purchase and storage of hazardous chemicals in all public schools of the state.

1. DEFINITIONS

As used in this chapter, unless the context otherwise indicates, the following terms have the following meanings:

Hazardous chemical: "Hazardous chemical" means a chemical which is a physical hazard or a health hazard, as listed by the (Maine Department of Labor) Bureau of Labor Standards.

Health hazard: "Health hazard" means a chemical which is:

a. Listed in the Toxic and Hazardous Substance section of the regulations of the Occupational Health and Safety Act labeling standard in the United States Code of Federal Regulations 29, Part 1910, Subpart Z;

b. Listed in the Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment, American conference of Governmental Industrial Hygienists, latest edition;

c. A carcinogen or potential carcinogen, listed in The Registry of Toxic Effects of Chemical Substances, published by the National Institute for Occupational Safety and Health, latest edition based on the National Toxicology Program Annual Report on Carcinogens or the International Agency for Research on Cancer Monographs:

d. Listed as radioactive material in regulations promulgated by the United States Nuclear Regulatory Commission;

e. Contained on a list established by the director (of the Bureau of Labor Standards) by rule after consultation with the Bureau of Health and which meets any of the following criteria:

(1) Has a median lethal oral dose of not more than 500 milligrams per kilogram of body weight;

(2) Has a median lethal dermal dose of not more than 1,000 milligrams per kilogram of body weight;

(3) Has median inhalation lethal concentration in air of not more than 2,000 parts per million by volume of gas or vapor, or more than 2 milligrams per liter but not more than 20 milligrams per liter of mist, fume or dust; or

(4) Has been found by the director (of the Bureau of Labor Standards), based on established scientific principles, to have significant potential to cause adverse, acute or chronic health effects; or

f. A mixture which is a health hazard based on application of the criteria a through e to the mixture as a whole, or which contains more than 1% by weight or volume of a chemical which is a health hazard or which contains more than 0.1% by weight or volume of a carcinogen identified in accordance with paragraph c.

Material Safety Data Sheet: "Material Safety Data Sheet" means a form containing information concerning a hazardous chemical substantially equivalent in content to Form 20 of the United States Occupational Safety and Health Administration, but which includes both acute and chronic health hazard information.

Physical hazard: "Physical hazard" means a chemical which is:

a. Listed in the United States Department of Transportation Hazardous Materials Table, 49 Code of Federal Regulations 172,101;

b. Contained on a list established by the director (of the Bureau of Labor Standards) after consultation with the State Fire Marshal and which meets any of the following criteria:

(1) Is a combustible liquid, i.e., any liquid with a flash point above 100 degrees F, and below 200 degrees F.;

(2) Is a compressed gas (other than air), i.e., any chemical having in the container an absolute pressure exceeding 40 PSI at 70 degrees F. or having an absolute pressure exceeding 104 PSI at 130 degrees F. or any liquid having a vapor pressure exceeding 40 PSI absolute pressure at 100 degrees F.;

(3) Is an explosive, i.e., any chemical that causes a sudden, almost instantaneous release of pressure, gas and heat when subjected to sudden shock, pressure or high temperature;

(4) Is a flammable substance, i.e., any liquid with a flash point of below 100 degrees F., solid that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change or retained heat from manufacturing or processing or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard,

or gas which at atmospheric temperature or pressure forms a flammable mixture with air when present at a concentration of 13% or less by volume or that forms a range of flammable mixtures with air wider than 12% by volume regardless of the lower limit;

(5) Is an organic peroxide, i.e., an organic compound that contains the bivalent -0-0- structure and which is a derivative of hydrogen peroxide where one or more hydrogen atoms have been replaced by organic radicals;

(6) Is an oxidizer, i.e., a chemical that initiates or promotes combustion in other materials thereby causing fire;

(7) Is pyrophoric, i.e., a chemical that will ignite spontaneously in air at a temperature of 130 degrees F. or below;

(8) Is unstable (reactive), i,e., a chemical which will vigorously react under conditions of shock, pressure or temperature, or

(9) Is water reactive, i.e., a chemical that reacts with water to release a gas that is either flammable or presents a health hazard; or

c. A mixture which is a physical hazard based on applicability of the criteria of paragraphs a and b to the mixture as a whole.

2. PURCHASE OF HAZARDOUS CHEMICALS

A. A Hazardous Chemical Screening Process shall be established in each school administrative unit to review and approve the purchase of any hazardous chemical required by any department, academic as well as service function. The process will be conducted under the direction of the superintendent of the school unit (or his or her representative) in consultation with school employees in speciality areas in which the hazardous chemicals are to be used,

B. Requests for the purchase of a hazardous chemical shall include at least the following information:

1. The common and chemical name of the chemical;

2. The amount of the chemical needed for the year;

3. The storage requirements, curricular use and waste disposal procedures for the chemical; and

4. The amount and age of any existing quantities of the chemical.

C. When purchasing hazardous chemicals that have a shelflife of greater than two years, the school unit shall order quantities which can be fully consumed under normal conditions and use within two years of the purchase date. If the hazardous chemical has a shelflife of less than two years, the quantity purchased must be consumable under normal conditions and use within the stated shelf-life period.

3. STORAGE OF HAZARDOUS CHEMICALS

A. Inventory lists of all hazardous chemicals shall be submitted to the Director of the Bureau of Labor Standards, Department of Labor. Those lists shall be updated annually.

B. Chemicals which are beyond their published shelf-life or expiration date or which are chemical wastes (including unwanted and unneeded chemical or chemicals) shall be disposed of in accordance with applicable state (38 MRSA Section 1301 et seq. and Chapters 850857 of the Maine Department of Environmental Protection's Hazardous Waste Management Rules) and federal (Title 40 Code of Federal Regulations, Chapters 260-266) laws and regulations.

C. Quantities of hazardous chemicals in storage shall be limited to that expected to be used in a two year period.

D. Hazardous chemicals shall be stored in accordance with the specifications described on the Material Safety Data Sheets, consistent with an acceptable compatibility classification system and shall be accurately and appropriately labeled in accordance with 26 MRSA Section 1713.

E. Storage areas shall be secure and accessible only to trained personnel. Storage shall be on steel or wood shelving with acid-resistant paint with safety lips to prevent spillage. Shelves shall be securely anchored to the floor, wall and/or ceiling and shall be clearly labeled to indicate the kind of chemicals that are to be stored there.

F. It is recommended that a continuous flow (plumbed) eyewash station, which is capable of providing fifteen (15) minutes of continuous irrigation of both eyes, and a deluge shower be readily accessible from the storage area.

G. There shall be an ABC fire extinguisher, or its equivalent, of at least 10 pounds and preferably 20 pounds capacity within fifty (50) feet of the storage area,

H. Material and equipment for spill control shall be provided,

I. It is recommended that chemical storage areas should be vented to provide four (4) room changes per hour to the outside of the building away from air intakes,

Vents shall be in operation whenever school is in session or whenever school personnel are in attendance.

4. MONITORING

A. The Department of Education shall monitor the school unit's compliance with these rules as part of the Comprehensive School Review required in 20-A MRSA § 4504 (2).

B. Other monitoring visits may be scheduled at the discretion of the Commissioner.,

5. ENFORCEMENT MEASURES

A. The superintendent of any school or school unit which fails to comply with the above standards shall be notified in writing pending enforcement action by the Commissioner. Such notice shall include a statement of the laws and regulations with which the school or school unit fails to comply.

B. School units failing to comply with the above standards shall be given notice and the opportunity for a hearing. The Commissioner may withhold subsidy and other state funds from a school unit until compliance is achieved. If compliance is not achieved within a time determined by the Commissioner, the Commissioner may refer the matter to the Attorney General for legal action.

STATUTORY AUTHORITY: 20-A MRSA § 15613 (14)

EFFECTIVE DATE: September 1, 1991

EFFECTIVE DATE (ELECTRONIC CONVERSION): May 19, 1996

Appendix C

FLINN COMPATIBLE CHEMICAL FAMILY CODES

When you assign compatible chemical family data you may wish to use the system created by Flinn. The family designations are listed below and in more detail on the following pages. Family designations for individual chemicals are found in the individual chemical listings of this Catalog/Reference Manual.

Flinn Organic Compatible Family Codes

O1 – Acids, Amino Acids, Anhydrides, Peracids

O2 – Alcohols, Glycols, Sugars, Amines, Amides, Imines, Imides

O3 – Hydrocarbons, Esters, Aldehydes, Oils

O4 – Ethers, Ketones, Ketenes, Halogenated Hydrocarbons, Ethylene Oxide

O5 – Epoxy Compounds, Isocyanates

O6 – Peroxides, Hydroperoxides, Azides

O7 – Sulfides, Polysulfides, Sulfoxides, Nitriles

O8 – Phenols, Cresols

O9 – Dyes, Stains, Indicators

OM – Miscellaneous

Flinn Inorganic Compatible Family Codes

I1 – Metals, Hydrides

I2 – Acetates, Halides, Iodides, Sulfates, Sulfites, Thiosulfates, Phosphates, Halogens

I3 – Amides, Nitrates (except Ammonium Nitrate), Nitrites, Azides

I4 – Hydroxides, Oxides, Silicates, Carbonates, Carbon

I5 – Sulfides, Selenides, Phosphides, Carbides, Nitrides

I6 – Chlorates, Bromates, Iodates, Chlorites, Hypochlorites, Perchlorates, Perchloric Acid, Peroxides, Hydrogen Peroxide

I7 – Arsenates, Cyanides, Cyanates

I8 – Borates, Chromates, Manganates, Permanganates

I9 – Acids (except Nitric)
(Nitric Acid is isolated and stored by itself.)

I10 – Sulfur, Phosphorus, Arsenic, Phosphorous Pentoxide

IM – Miscellaneous

You have now provided a secure container for this unwanted substance. You may now assign an area in the storeroom where such hazards will be safe until you investigate and ultimately exercise your disposal or removal options. You will find that plastic bags and cans can be among your best friends for isolating and containing hazards during your investigation.

The cans will serve to protect against breakage and even act as a miniature fire cabinet to prevent these hazards from being directly involved in a conflagration.

Those substances which remain on your shelves can now be reorganized into their compatible chemical families. We urge that you review all the details of appropriate and safe storage in the section of this Catalog/Reference Manual dedicated to that subject.

Avoid distractions.

For the first time you know exactly the substances and their quantities in your chemical stores area. It is from this base of knowledge that you can begin to manage this matter of chemicals on school premises. You needed to take this first, important step. You may need further help and advice. If you do, call Flinn.

SUGGESTED SEQUENCE OF STEPS TO MORE SAFELY ORGANIZE YOUR SCHOOL'S CHEMICAL STORES AREA

Take an inventory of all the chemicals in your school. You will never know the extent of your problem until you know exactly what you have. Record the inventory. You may want to consider the purchase of the FLINN CHEMICAL INVENTORY SYSTEM to facilitate this task.

Decide what products you will need for the next year (at best, two years). Ruthlessly rid yourselves of the remainder of the accumulated materials.

Reorganize the remaining products into their compatible chemical families (see our Suggested Chemical Storage Pattern on page 1169). The actual sequence of compatible families on your shelves is not critical. What is important is to keep the compatible families separate and to keep the organic and inorganic families as far apart as possible. The Suggested Shelf Storage Pattern shown on pages 1170–1171 is only one suggested sequence you can use. If shelf space is a problem, you are permitted to place more than one compatible family on a shelf. Make sure you either have a physical divider or leave a 3" space between each family.

Hundreds of teachers who have reorganized their shelves, using these patterns, tell us products are easier to find versus the alphabetical system previously used. When you reorganize, you may need some estimate of the percentage of shelf space each family might occupy. If yours is a "typical" high school, the following profile may be a helpful guide:

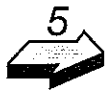
Inorganic Families

Families	Percentage of Shelf Space Occupied
Acids (Inorganic 9)	Store away from all other items. Store in a dedicated acid cabinet. Store nitric acid away from all other materials.
Metals, etc. (Inorganic 1)	Less than 5%
Halides, Sulfates, Phosphates, Acetates, etc. (Inorganic 2)	Could be 35–40% of available space. This is usually the largest family.
Nitrates, etc. (Inorganic 3)	Approximately 8–10%
Hydroxides, Oxides, etc. (Inorganic 4)	Approximately 10%

Families	Percentage of Shelf Space Occupied
Sulfides, etc. (Inorganic 5)	Less than 1%
Chlorates, Perchlorates, etc. (Inorganic 6)	5+%
Arsenates, etc. (Inorganic 7)	Less than 1%
Borates, Chromates, etc. (Inorganic 8)	Less than 1%
Sulfur, Phosphorus, etc. (Inorganic 10)	Approximately 3%

And Organic Families

Organic acids (Organic 1) will probably occupy about 5+% of your organic shelf space except for acetic acid which should be stored with the inorganic acids (hydrochloric, etc.) in a dedicated acid cabinet. Keep acetic acid *away* from nitric acid. If your school is "typical," the remainder of your organic materials may occupy about 15–20% of your total shelf space. You should store all flammable organics in a dedicated flammables cabinet.



And Other Materials

There may be some very large space consumers in 2-kilogram (5-lb.) containers; i.e., calcium chloride, calcium hydroxide, etc. Certainly you may wish to extend family storage in a separate location for such large volumes of large packages.

Congratulations! You have now reorganized your chemical stores facility to:

- store compatible products together
- separate acids into dedicated storage
- separate flammables into dedicated storage
- lock up all poisons
- record all inventory
- rid yourselves of excess materials

YOU NOW HAVE A SAFER FACILITY

SUGGESTED CHEMICAL STORAGE PATTERN

Storage of laboratory chemicals presents an ongoing safety hazard for school science departments. There are many chemicals that are incompatible with each other. The common method of storing these products in alphabetical order sometimes results in incompatible neighbors. For example, storing strong oxidizing materials next to organic chemicals can present a hazard.

A possible solution is to separate chemicals into their organic and inorganic families and then to further divide the materials into related and compatible families. Below is a list of compatible families. On the next page you will find this family arrangement pictured as shelf areas in your chemical stores area. The pictured shelf arrangement will easily enable you to rearrange your inventory into a safer and more compatible environment.

Inorganic

1. Metals, Hydrides
2. Acetates, Halides, Iodides, Sulfates, Sulfites, Thiosulfates, Phosphates, Halogens, Oxalates, Phthalates, Oleates
3. Amides, Nitrates (except Ammonium Nitrate), Nitrites, Azides
4. Hydroxides, Oxides, Silicates, Carbonates, Carbon
5. Sulfides, Selenides, Phosphides, Carbides, Nitrides
6. Chlorates, Bromates, Iodates, Chlorites, Hypochlorites, Perchlorates, Perchloric Acid, Peroxides, Hydrogen Peroxide
7. Arsenates, Cyanides, Cyanates
8. Borates, Chromates, Manganates, Permanganates, Molybdates, Vanadates
9. Acids (except Nitric) (Nitric Acid is isolated and stored by itself.)
10. Sulfur, Phosphorus, Arsenic, Phosphorus Pentoxide
11. Inorganic miscellaneous

Organic

1. Acids, Amino Acids, Anhydrides, Peracids
2. Alcohols, Glycols, Sugars, Amines, Amides, Imines, Imides
3. Hydrocarbons, Esters, Aldehydes, Oils
4. Ethers, Ketones, Ketenes, Halogenated Hydrocarbons, Ethylene Oxide
5. Epoxy Compounds, Isocyanates
6. Peroxides, Hydroperoxides, Azides
7. Sulfides, Polysulfides, Sulfoxides, Nitriles
8. Phenols, Cresols
9. Dyes, Stains, Indicators
10. Organic miscellaneous

NOTE: If you store volatile materials (ether, hydrocarbons, etc.) in a refrigerator, the refrigerator must be explosion-proof. The thermostat switch or light switch in a standard refrigerator may spark and set off the volatile fumes inside and thus cause an explosion.

This list is not complete and is intended only to cover the materials possibly found in an average school situation. This is not the only method of arranging these materials and is only offered as a suggestion.

See the next three pages for detailed inventory and storage steps you might follow to vastly improve the safety profile of your chemical storage.

SUGGESTED SHELF STORAGE PATTERN—INORGANIC

INORGANIC #10
Sulfur, Phosphorus, Arsenic, Phosphorus Pentoxide

INORGANIC #2
Halides, Sulfates, Sulfites, Thiosulfates, Phosphates, Halogens, Acetates, Oxalates, Phthalates, Oleates

INORGANIC #3
Amides, Nitrates (not Ammonium Nitrate), Nitrites, Azides
(Store Ammonium Nitrate away from all other substances—*ISOLATE IT!*)

INORGANIC #1
Metals & Hydrides
(Store away from any water.)
(Store flammable solids in flammables cabinet.)

INORGANIC #4
Hydroxides, Oxides, Silicates, Carbonates, Carbon

If possible avoid using the floor.

INORGANIC #7
Arsenates, Cyanides, Cyanates
(Store away from any water.)

INORGANIC #5
Sulfides, Selenides, Phosphides, Carbides, Nitrides

INORGANIC #8
Borates, Chromates, Manganates, Permanganates, Molybdates, Vanadates

INORGANIC #6
Chlorates, Bromates, Iodates, Chlorites, Hypochlorites, Perchlorates, Perchloric Acid, Peroxides, Hydrogen Peroxide

MISCELLANEOUS

Storage Suggestions

1. Avoid storing chemicals on the floor (even temporarily).
2. No top shelf chemical storage.
3. No chemicals stored above eye level.
4. Shelf assemblies are firmly secured to walls. Avoid island shelf assemblies.
5. Provide anti-roll-off lips on all shelves. (Catalog No. SE1069)
6. Ideally, shelving assemblies would be of wood construction.
7. Avoid adjustable metal shelf supports and clips. Better to use fixed, wooden supports.
8. Store acids in a dedicated acid cabinet. Store nitric acid in the same cabinet **only** if isolated from other acids. Store both inorganic and some organic acids in the acid cabinet.
9. Store flammables in a dedicated flammables cabinet.
10. Store severe poisons in a dedicated poisons cabinet.

OTHER STORAGE SUGGESTIONS ARE CONTAINED THROUGHOUT THIS CATALOG/REFERENCE MANUAL.

INORGANIC #9

Acids, except Nitric
(Acids are best stored in dedicated cabinets.)

Store nitric acid away from other acids unless your acid cabinet provides a separate compartment for nitric acid.

SUGGESTED SHELF STORAGE PATTERN—ORGANIC

ORGANIC #2
Alcohols, Glycols, Sugars, Amines, Amides, Imines, Imides
(Store flammables in a dedicated cabinet.)

ORGANIC #3
Hydrocarbons, Oils, Esters, Aldehydes
(Store flammables in a dedicated cabinet.)

ORGANIC #4
Ethers, Ketones, Ketenes, Halogenated Hydrocarbons, Ethylene Oxide
(Store flammables in a dedicated cabinet.)

ORGANIC #5
Epoxy Compounds, Isocyanates

ORGANIC #7
Sulfides, Polysulfides, etc.

If possible avoid using the floor.

ORGANIC #8
Phenols, Cresols

ORGANIC #6
Peroxides, Azides, Hydroperoxides

ORGANIC #1
Acids, Amino Acids, Anhydrides, Peracids
(Store certain organic acids in acid cabinet.)

ORGANIC #9
Dyes, Stains, Indicators
(Store alcohol-based solutions in flammables cabinet.)

MISCELLANEOUS

ORGANIC #2
Alcohols, Glycols, etc.

ORGANIC #3
Hydrocarbons, etc.

ORGANIC #4
Ethers, Ketones, etc.

ORGANIC #9
Alcohol-based Indicators, etc.

Store severe poisons in locked Poisons Cabinet.

How To

Maximize Storage Space

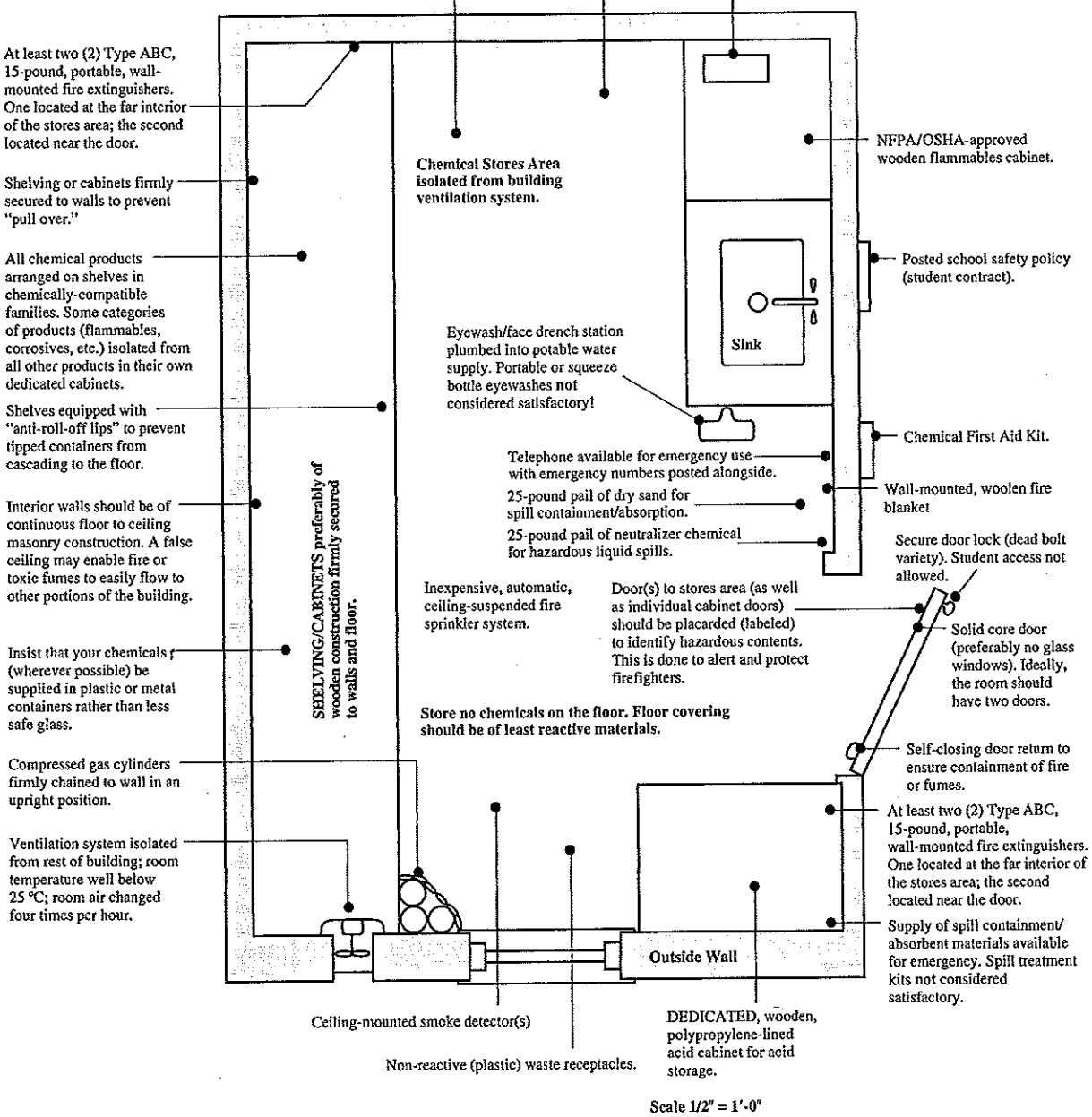
If shelf space is a problem, you are permitted to place more than one compatible chemical family on a shelf. Make sure you either have a physical divider or leave a 3" space between each family. This will maximize your tight shelf space while keeping each compatible chemical family separate from one another.

See page 1172 for complete instructions on organizing your chemical stores area.

MODEL CHEMICAL STORES AREA

Please compare your facility to this model.

- Never store chemicals in a fume hood.
- No chemicals routinely stored in classrooms.
- VARIOUS SCIENCE DEPARTMENTS (chemistry, biology) should store their chemicals in one dedicated area.



Scale 1/2" = 1'-0"

MANY REASONS WHY WE ENCOURAGE YOU NOT TO STORE CHEMICALS IN ALPHABETICAL ORDER

PRODUCTS STORED TOGETHER	POSSIBLE REACTIONS
Acetic acid + acetaldehyde	small amounts of acetic acid will cause the acetaldehyde to polymerize, releasing great amounts of heat
Acetic anhydride + acetaldehyde	reaction can be violently explosive
Aluminum metal + ammonium nitrate	potentially explosive
Aluminum metal powder + antimony trichloride	aluminum metal burns in the presence of antimony trichloride
Aluminum metal + any bromate, chlorate or iodate	finely divided aluminum metal in contact with a bromate, chlorate or iodate can be easily detonated by heat, shock or friction
Aluminum + bromine vapor	aluminum foil reacts with bromine vapor at room temperature and incandesces
Aluminum chloride, anhydrous	$AlCl_3$, anhydrous is constantly generating hydrochloric acid. After long storage, tightly closed containers have been known to explode when opened.
Ammonia vapor + bromine vapor	unstable nitrogen tribromide is formed and explosion may result
Ammonium nitrate + acetic acid	a mixture may result in ignition especially if the acetic acid is concentrated.
Antimony + bromine	antimony is spontaneously flammable in the presence of any halogen vapor
Arsenic + any bromate, chlorate or iodate	a potentially explosive combination if detonated by heat, shock or friction
Barium + carbon tetrachloride	a violent reaction may occur
Calcium hypochlorite + charcoal	a mixture can result in an explosion if heated
Carbon + any bromate, chlorate or iodate	a potentially explosive combination if detonated by heat, shock or friction
Carbon disulfide + aluminum	finely divided aluminum will spontaneously burst into flame in the presence of carbon disulfide
Chromium trioxide and glycerol	violent reaction may cause mixture to ignite
Copper + bromate, chlorate or iodate	a potentially explosive combination if detonated by heat, shock or friction
Hydrogen peroxide (6% or more) + iron(II) sulfide	a vigorous, highly exothermic reaction
Hydrogen peroxide (6% or more) + lead(II) or (IV) oxide	violent, possibly explosive reaction
Lead sulfide + hydrogen peroxide (6% or more)	vigorous, potentially explosive reaction
Magnesium hydroxide + maleic anhydride	potentially explosive reaction
Mercury(II) nitrate + methyl alcohol	may form mercury fulminate—an explosive
Mercury(II) oxide + magnesium metal	an explosion may result if heated
Mercury(II) oxide + phosphorus	percussion may ignite this mixture
Nitric acid + magnesium metal powder	will react with explosive force
Nitric acid + phosphorus	phosphorus will burn spontaneously in the presence of nitric acid
Potassium cyanide + potassium nitrite	a potentially explosive mixture if heated
Silver metal + tartaric acid	an explosive mixture
Silver oxide + sulfur	a potentially explosive mixture
Sodium + sulfur	under the right conditions the reaction can proceed with explosive violence
Sodium nitrate + sodium thiosulfate	a mixture of dry materials can result in explosion
Tin(IV) chloride + turpentine	a flame-producing, exothermic reaction

Review of Chemical Disposal Procedures

Responsible management of the chemical resources of school science labs encompasses best practices for the purchase, storage, use, and disposal of chemicals. It is a shared responsibility of the school administration, science teachers, and staff. Chemical disposal procedures require knowledge of and compliance with a variety of federal, state, and local laws and regulations, and are therefore a particular challenge for many schools.

The Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act, or RCRA, is the key law dealing with the identification, management, and disposal of hazardous waste. All schools are required to have a policy for identifying hazardous waste and complying with the requirements of RCRA, which was enacted in 1976. The overarching goals of the law are to reduce the amount and toxicity of hazardous waste and thus protect human health and the environment. As part of its role in writing the regulations to ensure that the goals of RCRA are achieved, the Environmental Protection Agency (EPA) also has the mandate to promote methods to minimize the amount of hazardous waste and reduce its environmental impact. These methods include source reduction, reuse and recycling of wastes, and chemical treatment that will eliminate hazardous waste characteristics.

Knowing Your RCRA Status and Requirements

In most cases authority for implementing and enforcing the law has been delegated to individual states that have adopted the RCRA guidelines. Some states may be more restrictive or impose additional conditions than federal guidelines require. Federal EPA recognizes three classes of hazardous waste generators, based on the amount and kinds of hazardous waste generated in one month. The storage and reporting regulations become increasingly more stringent as the amount of hazardous waste increases. Schools that generate less than 100 kg (220 lbs) of hazardous waste per month, and no more than 1 kg of *acutely hazardous* waste in any month, would fall into the least regulated, "conditionally exempt small quantity generator," class. (The definitions for these types of waste are summarized below.) The EPA defines hazardous waste as a subset of solid waste, where solid waste is anything that will be discarded or may enter the environment—by burning, for example. (It's confusing, but the term solid waste thus includes solids, liquids or gases!) Obviously, all schools produce solid waste. Regardless of their RCRA status, *all* schools are required to determine which types of solid waste must be classified as hazardous waste.

Identifying Hazardous Waste

The first step in managing chemical disposal is identifying which discarded chemicals, as well as chemical reaction mixtures or byproducts that will not be reused, must be considered hazardous waste. There are two broad categories of hazardous waste—characteristic wastes and listed wastes. *Characteristic wastes* have one or more of the following properties:

- *Ignitable* wastes include flammable or combustible liquids (flash point <140 °F) as well as flammable compressed gases and solid oxidizers. Organic solvents such as acetone or toluene, compressed gases such as hydrogen, and solid ammonium nitrate are examples of ignitable wastes.
- *Corrosive* wastes are acidic or basic solutions that have a pH <2 or >12.5, respectively.
- *Reactive* wastes are substances that react violently with air or water, are capable of detonation, or can generate toxic gases under relatively neutral conditions. Examples include the alkali metals sodium and potassium, diethyl ether and other peroxide-forming organic compounds, and cyanides or sulfides.
- *Toxic* chemical wastes are substances that, if disposed in a landfill, are capable of leaching threshold amounts of specific chemicals into groundwater. There are 40 substances in this category (also known as toxicity characteristic wastes). Although many of the substances on this list are pesticides, the list does include some common laboratory chemicals, including lead, barium, and silver.

There are four categories of *listed wastes*. Two categories include chemical byproducts from manufacturing processes and do not generally apply to schools. The other two categories, designated by the codes P and U, specifically identify by name certain discarded commercial chemical products. Schools should be aware of the chemicals on the P- (acutely toxic) and U- (toxic) lists. The P-listed, or *acutely toxic,* wastes are especially important because any school generating more than 1 kg (2.2 pounds or approx. one quart of liquid) of acutely hazardous waste per month will be subject to the most stringent generator requirements for listing, storing, and reporting all their hazardous waste. In our experience, most schools do not use many P-list chemicals. The exceptions, which some schools might use, are sodium cyanide, potassium cyanide, arsenic trioxide, sodium azide, ammonium vanadate, and carbon disulfide. Recall that listed wastes refer to *discarded* or unused commercial chemical products where the chemical is not mixed with anything else. Make sure your school has effective chemical purchasing and inventory controls in place if you use P-listed chemicals in your science labs. This will prevent the school from accumulating excess chemicals that will not be used and must be discarded.

Treating Chemicals in the Lab

The EPA encourages all waste generators, including schools and laboratories, to minimize the amount of hazardous waste. Treating materials in the lab to reduce or eliminate chemical and physical hazards is one strategy for accomplishing this goal. Chemicals or chemical byproducts that are stored in the lab or remain in the lab after a lab activity is finished are not generally regulated as solid waste. The treatment of hazardous waste without a permit is generally not allowed. To avoid restrictions on treating hazardous waste, **always incorporate treatment or disposal of excess reagents or chemical byproducts from a chemical reaction into the lab procedure itself.** The Flinn Suggested Disposal Methods described on pages 1177–1203 may frequently be used to treat chemicals and eliminate potential hazards. Before undertaking any of these methods it is important to read, review, and understand the general principles and guidelines governing the disposal of laboratory chemicals:

- Check all federal, state, and local guidelines that may apply.
- All procedures should be carried out by skilled and trained personnel who are familiar with the physical and chemical properties of the chemicals and understand the procedure.
- Observe all safety precautions, including the requirements for personal protective equipment.
- Carry out all reactions that may generate gases in the hood.
- Provide secondary containment to protect against spills.
- Consult current Material Safety Data Sheets for storage, handling, and disposal information.
- Wear chemical splash goggles, chemical-resistant gloves, and chemical-resistant apron.

Examples of generally allowed chemical treatment methods include neutralization of acids and bases (Flinn Suggested Disposal Methods #24a, b and #10, respectively); redox reactions for oxidizing agents and reducing agents (Flinn Suggested Disposal Methods #12a and 12b); and precipitation reactions for metals (Flinn Suggested Disposal Methods #11 and 27h).

As an example of this strategy, some experiments or demonstrations, such as the iodine clock reaction or an oscillating chemical reaction, produce small amounts of iodine or bromine byproducts. Incorporate reduction of the halogens, which are oxidizers, at the conclusion of the experiment. (Halogens may be reduced with sodium thiosulfate

Appendix D

WHAT IS A MATERIAL SAFETY DATA SHEET?

Material Safety Data Sheets (MSDS) contain information regarding the proper procedures for handling, storing, and disposing of chemical substances.

- An MSDS accompanies all chemicals or kits that contain chemicals.
- If an MSDS does not accompany a chemical, many web sites and science supply companies can supply one.
- Save all MSDSs and store in a designated file or binder using a system that is organized and easy to understand.
- Place the MSDS collection in a central, easily accessible location known to all workers and emergency personnel or make them available electronically (e.g. on a school's intranet).

STANDARDIZED MSDS FORMAT

Section 1 gives details on what the chemical or substance is, CAS number, synonyms, the name of the company issuing the data sheet, and often an emergency contact number.

Section 2 identifies the OSHA hazardous ingredients, and may include other key ingredients and exposure limits.

Section 3 lists the major health effects associated with the chemical. Sometimes both the acute and chronic hazards are given.

Section 4 provides first aid measures that should be initiated in case of exposure.

Section 5 presents the fire-fighting measures to be taken.

Section 6 details the procedures to be taken in case of an accidental release. The instructions given may not be sufficiently comprehensive in all cases, and local rules and procedures should be utilized to supplement the information given in the MSDS sheet.

Section 7 addresses the storage and handling information for the chemical. This is an important section as it contains information on the flammability, explosive risk, propensity to form peroxides, and chemical incompatibility for the substance. It also addresses any special storage requirements for the chemical (i.e., special cabinets or refrigerators).

Section 8 outlines the regulatory limits for exposure, usually the maximum permissible exposure limits (PEL). The PEL, tells the concentration of air contamination a person can be exposed to for 8 hours a day, 40 hours per week over a working lifetime (30 years) without suffering adverse health effects. It also provides information on personal protective equipment.

Section 9 gives the physical and chemical properties of the chemical. Information such as the evaporation rate, specific gravity, and flash points are given.

Section 10 gives the stability and reactivity of the chemical with information about chemical incompatibilities and conditions to avoid.

Section 11 provides both the acute and chronic toxicity of the chemical and any health effects that may be attributed to the chemical.

Section 12 identifies both the ecotoxicity and the environmental fate of the chemical.

Section 13 offers suggestions for the disposal of the chemical. Local, state, and Federal regulations should be followed.

Section 14 gives the transportation information required by the Department of Transportation. This often identifies the dangers associated with the chemical, such as flammability, toxicity, radioactivity, and reactivity.

Section 15 outlines the regulatory information for the chemical. The hazard codes for the chemical are given along with principle hazards associated with the chemical. A variety of country and/or state specific details may be given.

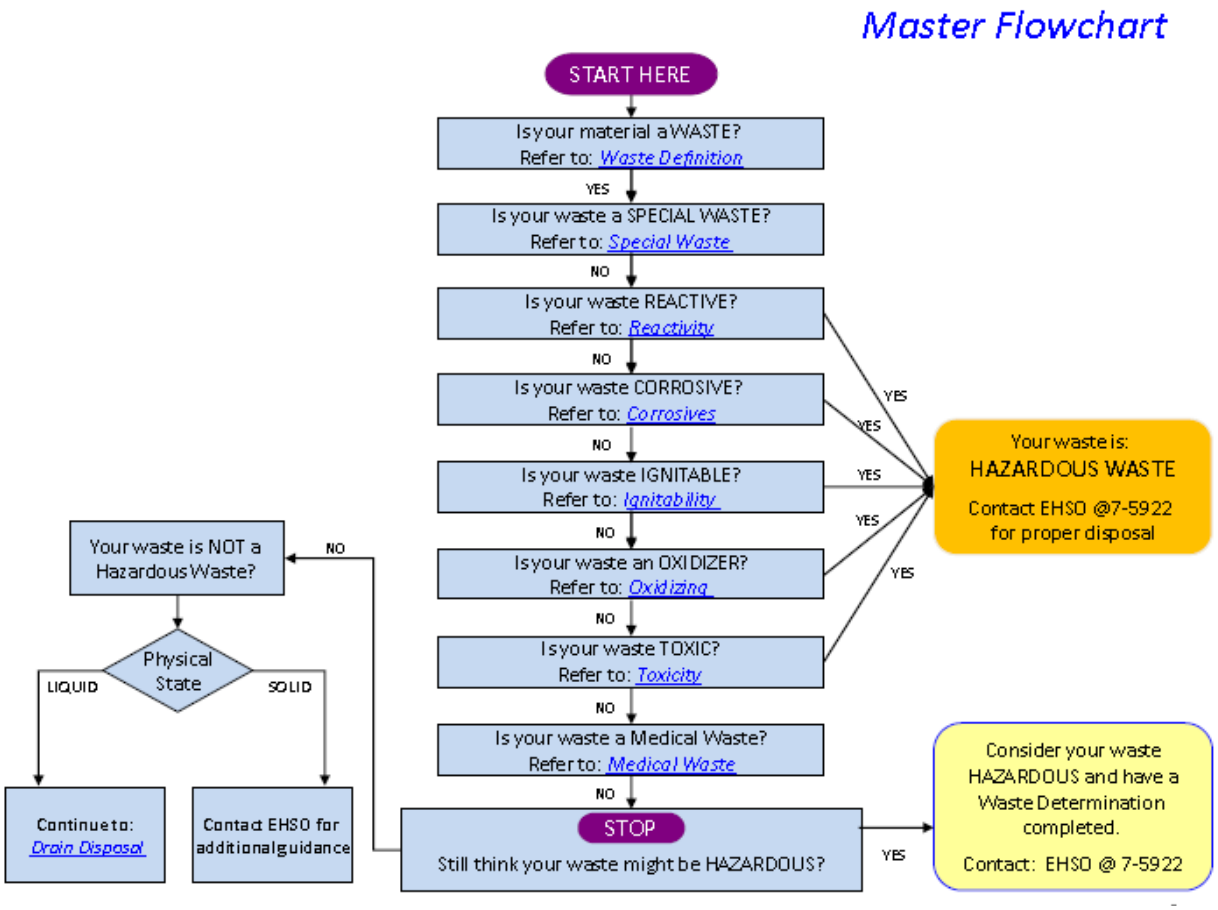
Section 16 provides additional information such as the label warnings, preparation and revision dates, name of the person or firm that prepared the MSDS, disclaimers, and references used to prepare the MSDS.

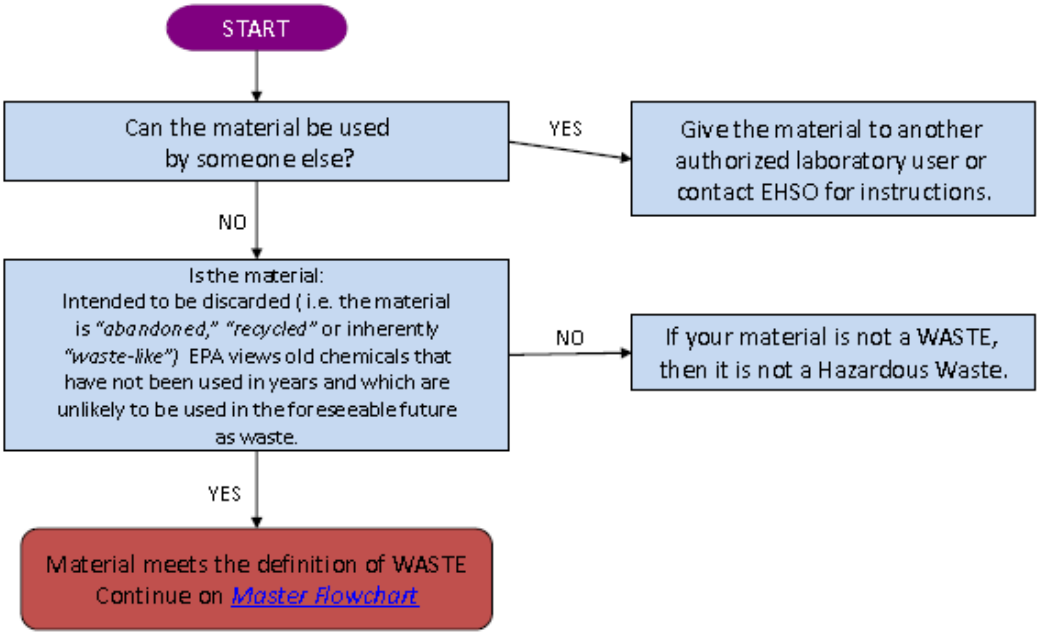
Appendix E

EMORY UNIVERSITY | Environmental Health and Safety Office

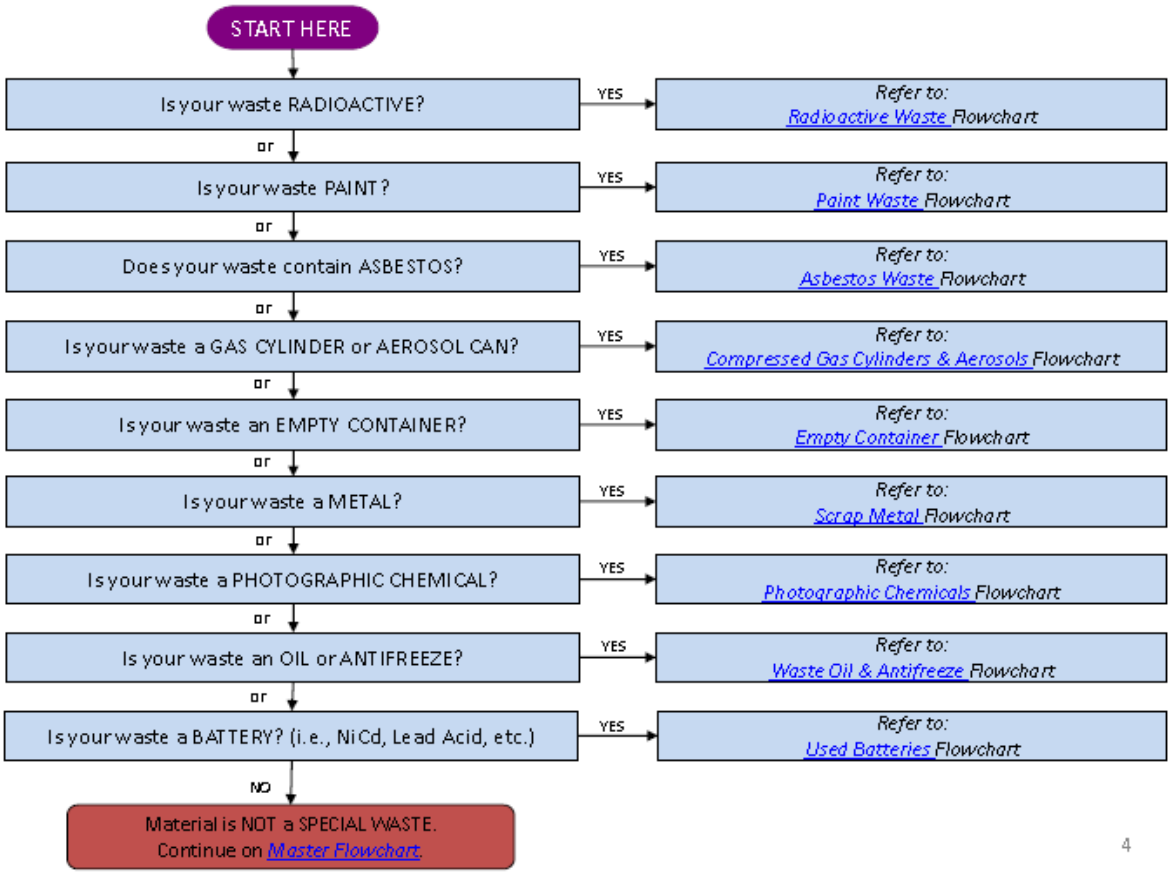
www.ehso.emory.edu 404-727-5922

Waste Determination Flowchart

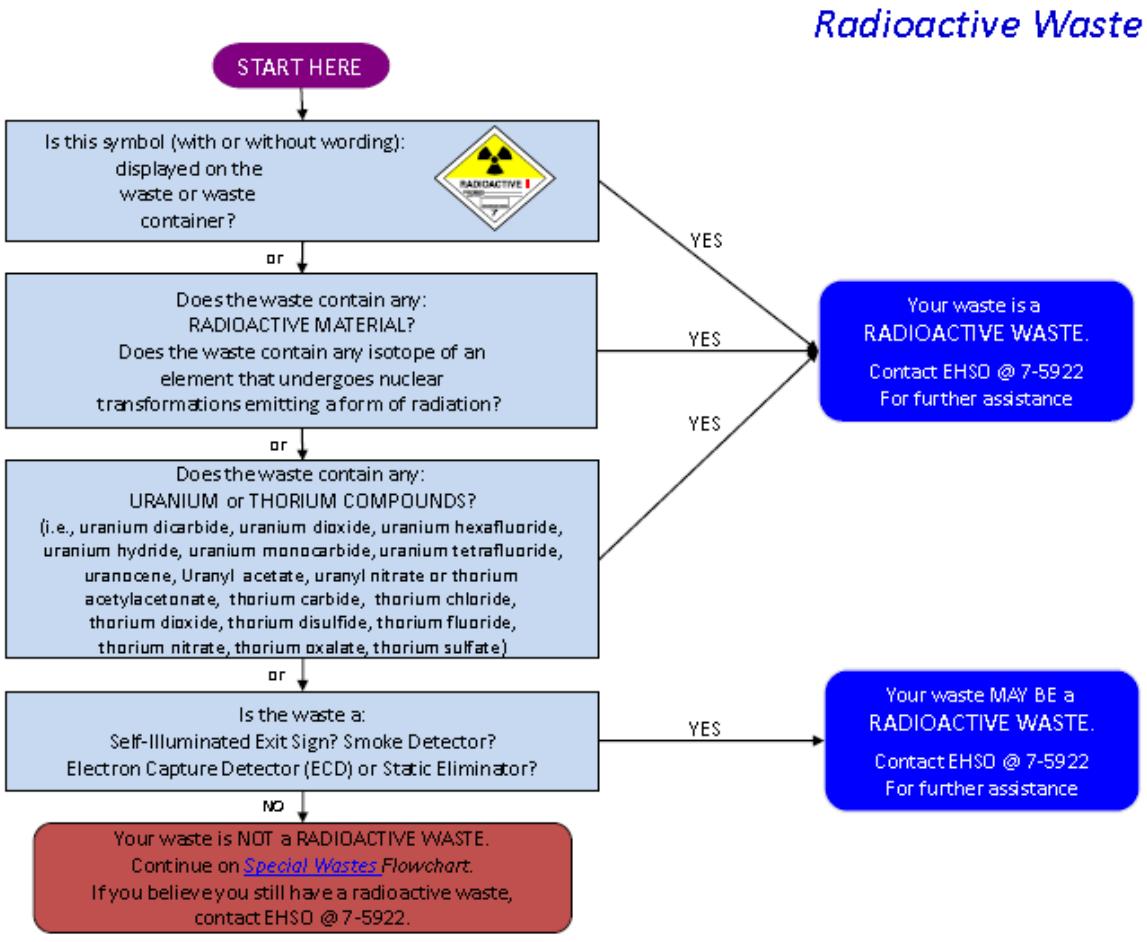

Master Flowchart
START HERE
Is your material a WASTE?
Refer to: Waste Definition
YES
Is your waste a SPECIAL WASTE?
Refer to: Special Waste
NO
Is your waste REACTIVE?
Refer to: Reactivity
NO
Is your waste CORROSIVE?
Refer to: Corrosives
NO
Is your waste IGNITABLE?
Refer to: Ignitability
NO
Is your waste an OXIDIZER?
Refer to: Oxidizing
NO
Is your waste TOXIC?
Refer to: Toxicity
NO
Is your waste a Medical Waste?
Refer to: Medical Waste
NO
STOP
Still think your waste might be HAZARDOUS?
YES
Consider your waste HAZARDOUS and have a Waste Determination completed.
Contact: EHSO @ 7-5922
YES
YES
YES
YES
YES
Your waste is:
HAZARDOUS WASTE
Contact EHSO @7-5922 for proper disposal
NO
Your waste is NOT a Hazardous Waste?
Physical State
LIQUID
SOLID
Continue to: Drain Disposal
Contact EHSO for additional guidance


START
Can the material be used by someone else?
YES
Give the material to another authorized laboratory user or contact EHSO for instructions.
NO
Is the material:
Intended to be discarded (i.e. the material is *"abandoned," "recycled"* or inherently *"waste-like")* EPA views old chemicals that have not been used in years and which are unlikely to be used in the foreseeable future as waste.
NO
If your material is not a WASTE, then it is not a Hazardous Waste.
YES
Material meets the definition of WASTE
Continue on *Master Flowchart*

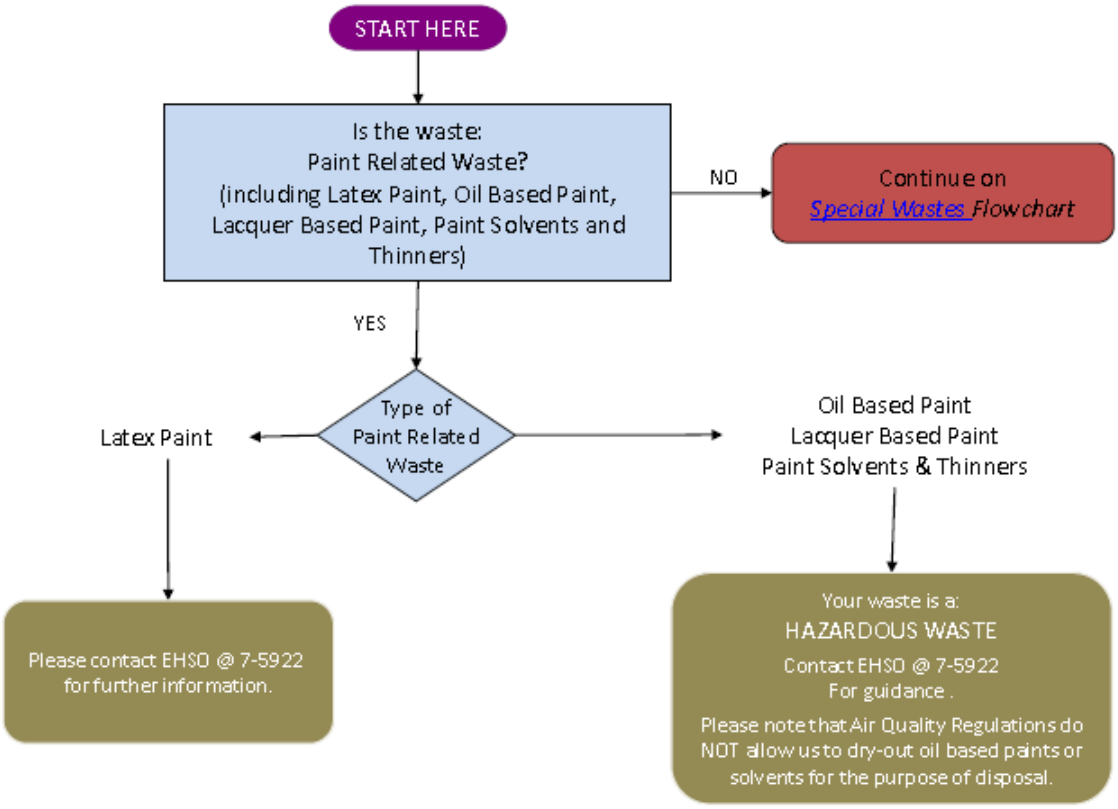
Special Waste



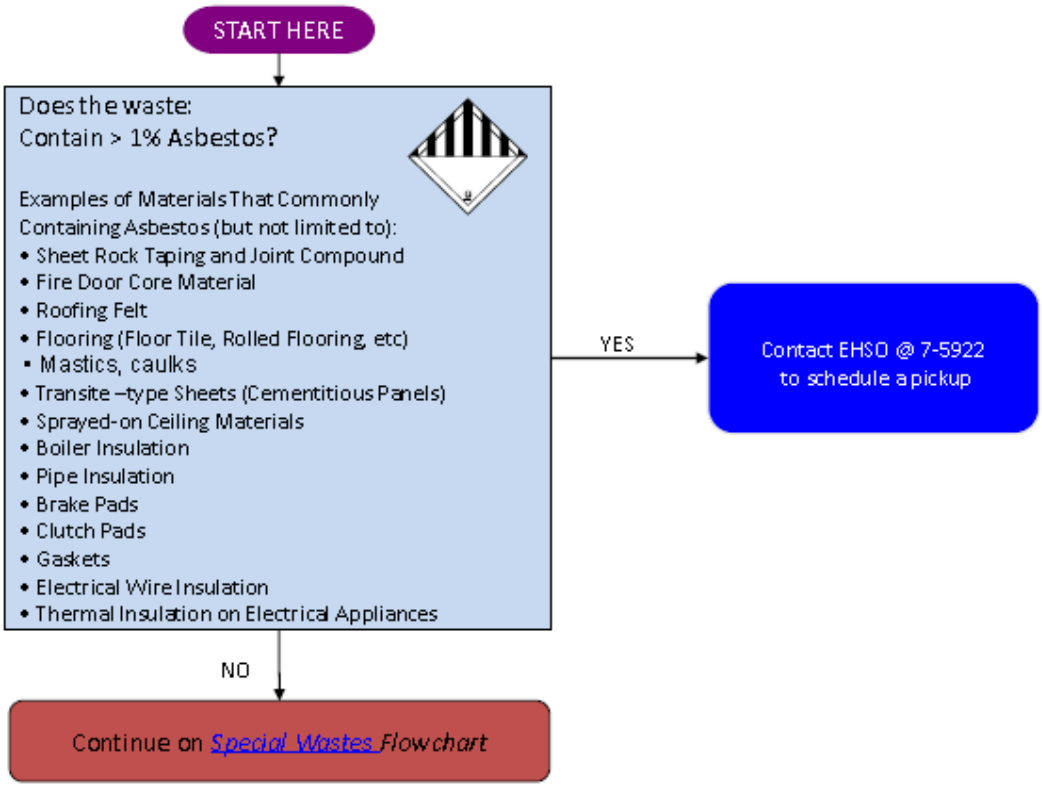
4


Radioactive Waste
START HERE
Is this symbol (with or without wording): displayed on the waste or waste container?
RADIOACTIVE
YES
or
Does the waste contain any: RADIOACTIVE MATERIAL? Does the waste contain any isotope of an element that undergoes nuclear transformations emitting a form of radiation?
YES
or
Does the waste contain any: URANIUM or THORIUM COMPOUNDS? (i.e., uranium dicarbide, uranium dioxide, uranium hexafluoride, uranium hydride, uranium monocarbide, uranium tetrafluoride, uranocene, Uranyl acetate, uranyl nitrate or thorium acetylacetonate, thorium carbide, thorium chloride, thorium dioxide, thorium disulfide, thorium fluoride, thorium nitrate, thorium oxalate, thorium sulfate)
YES
Your waste is a RADIOACTIVE WASTE. Contact EHSO @ 7-5922 For further assistance
or
Is the waste a: Self-Illuminated Exit Sign? Smoke Detector? Electron Capture Detector (ECD) or Static Eliminator?
YES
Your waste MAY BE a RADIOACTIVE WASTE. Contact EHSO @ 7-5922 For further assistance
NO
Your waste is NOT a RADIOACTIVE WASTE. Continue on Special Wastes Flowchart. If you believe you still have a radioactive waste, contact EHSO @ 7-5922.
5

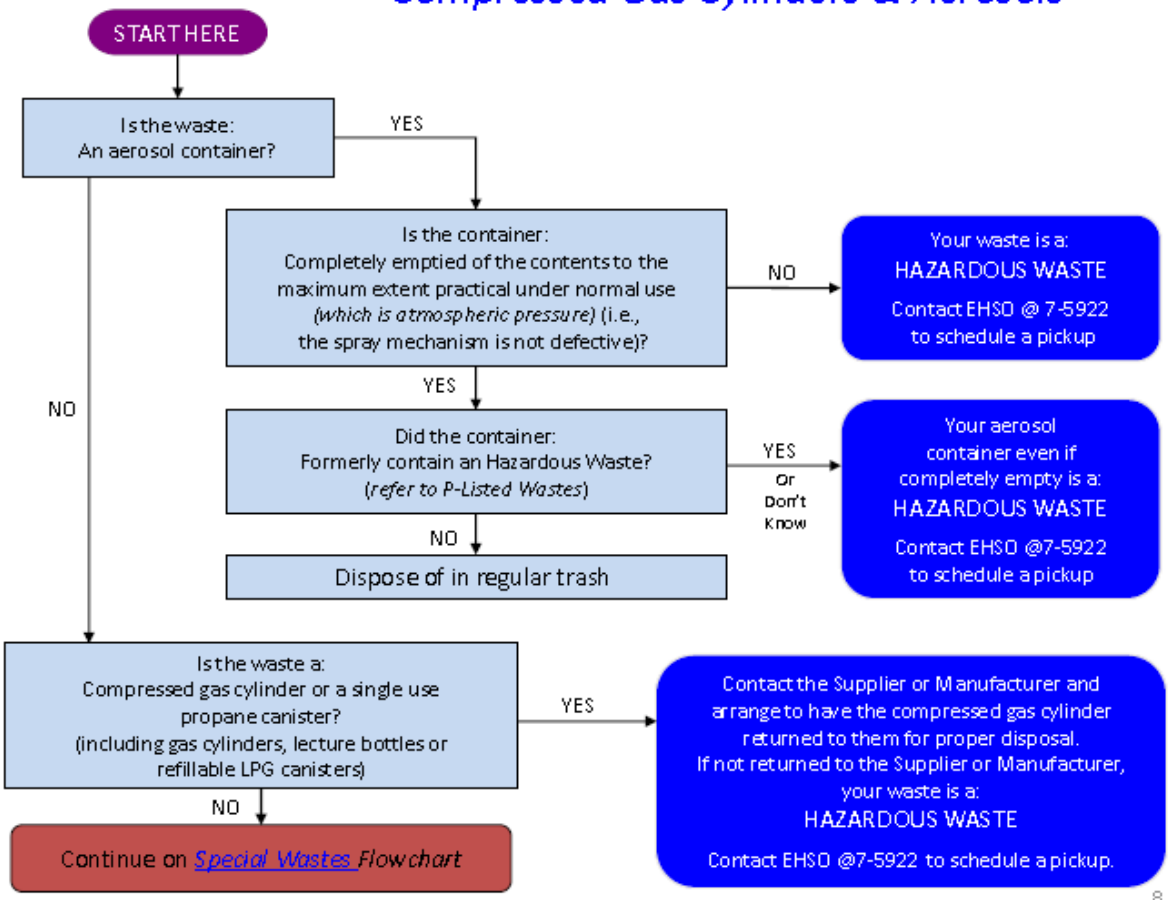
Paint Waste

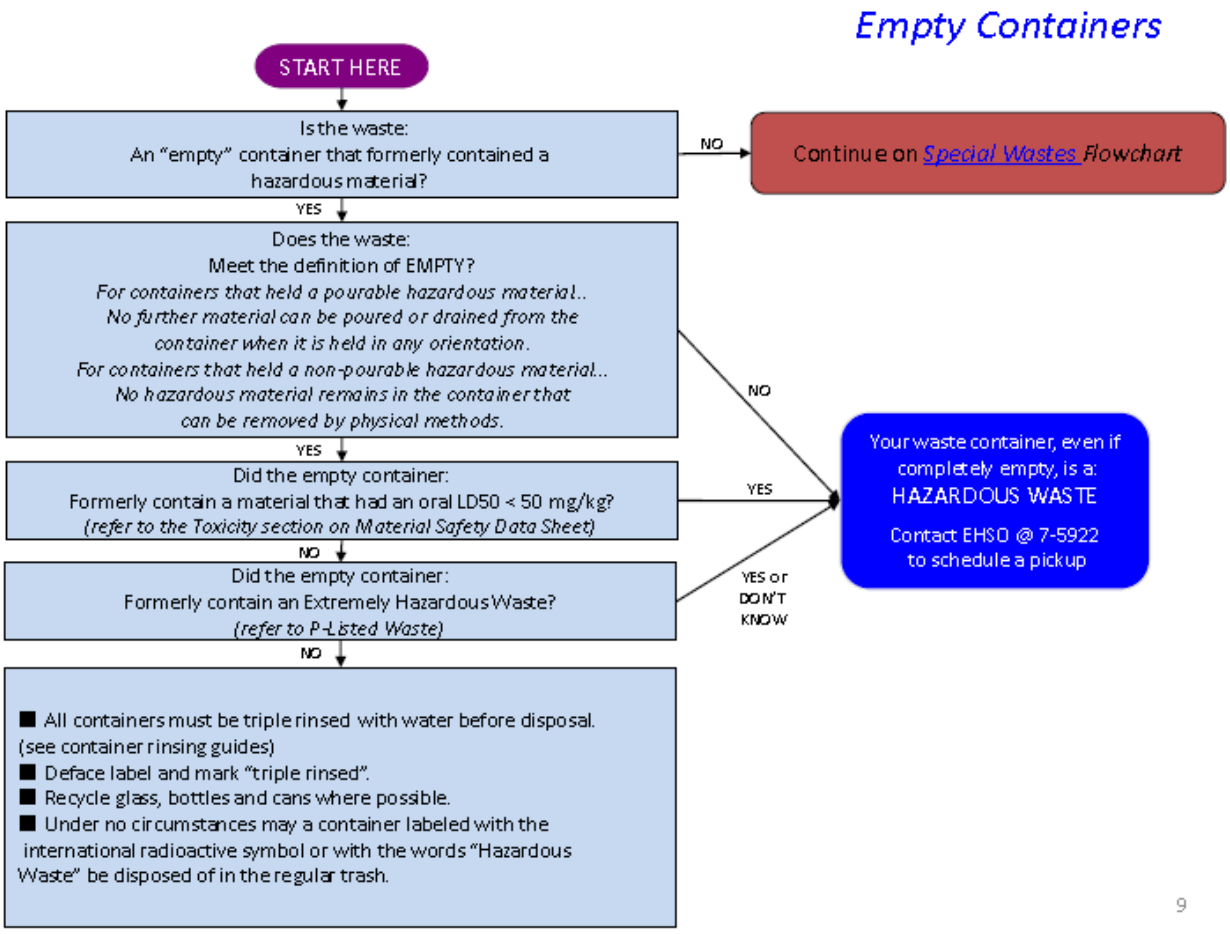

START HERE
Is the waste:
Paint Related Waste?
(including Latex Paint, Oil Based Paint, Lacquer Based Paint, Paint Solvents and Thinners)
NO
Continue on
Special Wastes Flowchart
YES
Type of Paint Related Waste
Latex Paint
Oil Based Paint
Lacquer Based Paint
Paint Solvents & Thinners
Please contact EHSO @ 7-5922 for further information.
Your waste is a:
HAZARDOUS WASTE
Contact EHSO @ 7-5922
For guidance .
Please note that Air Quality Regulations do NOT allow us to dry-out oil based paints or solvents for the purpose of disposal.

Asbestos Waste

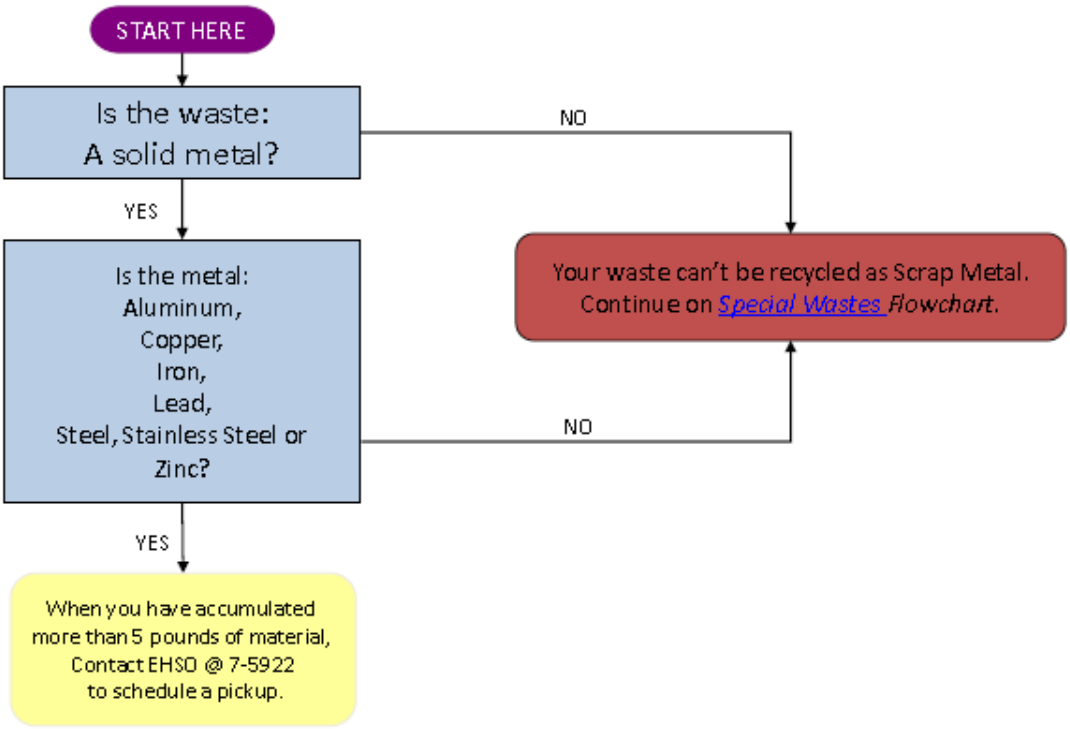


Compressed Gas Cylinders & Aerosols

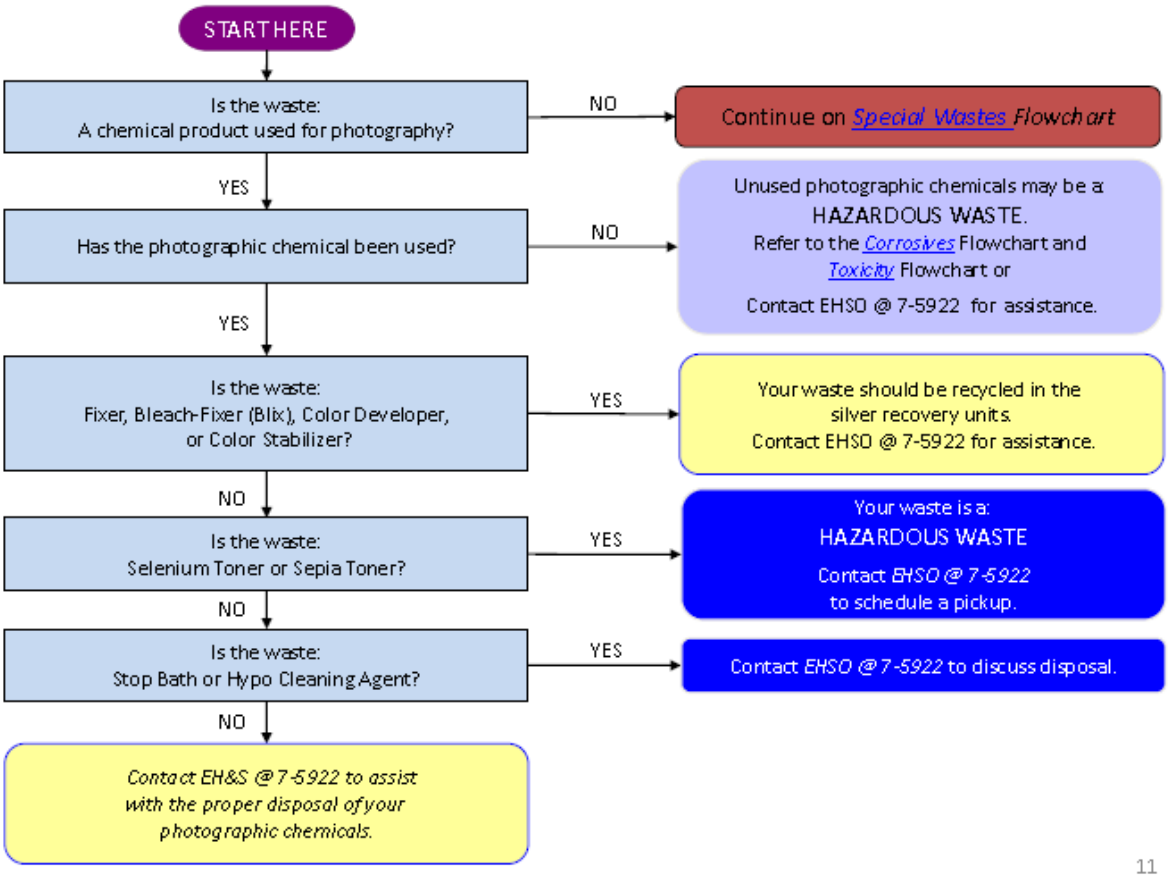



Empty Containers
START HERE
Is the waste:
An "empty" container that formerly contained a hazardous material?
NO
Continue on Special Wastes Flowchart
YES
Does the waste:
Meet the definition of EMPTY?
For containers that held a pourable hazardous material..
No further material can be poured or drained from the container when it is held in any orientation.
For containers that held a non-pourable hazardous material...
No hazardous material remains in the container that can be removed by physical methods.
NO
YES
Did the empty container:
Formerly contain a material that had an oral LD50 < 50 mg/kg?
(refer to the Toxicity section on Material Safety Data Sheet)
YES
NO
Did the empty container:
Formerly contain an Extremely Hazardous Waste?
(refer to P-Listed Waste)
YES or DON'T KNOW
NO
Your waste container, even if completely empty, is a:
HAZARDOUS WASTE
Contact EHSO @ 7-5922 to schedule a pickup
■ All containers must be triple rinsed with water before disposal. (see container rinsing guides)
■ Deface label and mark "triple rinsed".
■ Recycle glass, bottles and cans where possible.
■ Under no circumstances may a container labeled with the international radioactive symbol or with the words "Hazardous Waste" be disposed of in the regular trash.
9

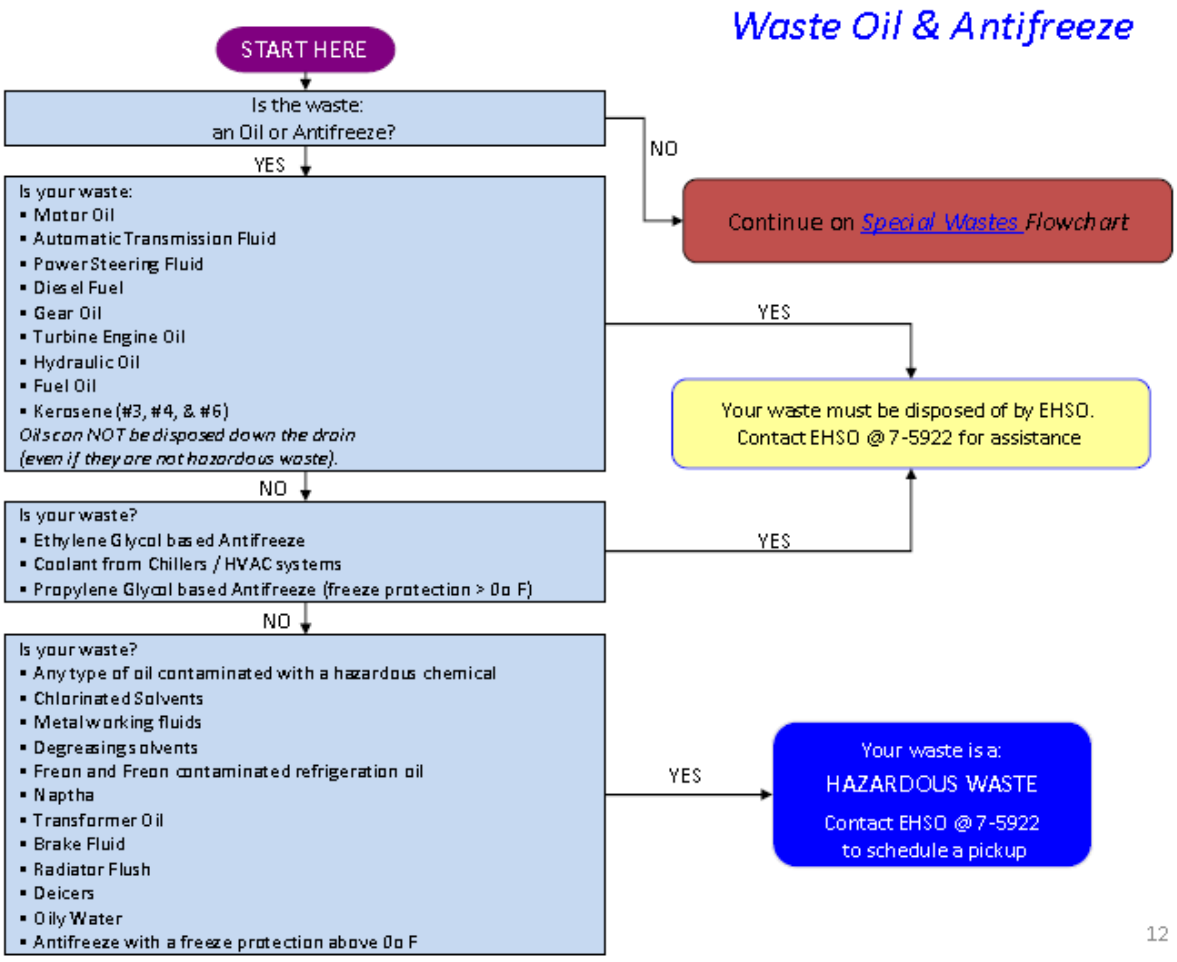
Scrap Metal


START HERE
Is the waste:
A solid metal?
NO
YES
Your waste can't be recycled as Scrap Metal.
Continue on Special Wastes Flowchart.
Is the metal:
Aluminum,
Copper,
Iron,
Lead,
Steel, Stainless Steel or
Zinc?
NO
YES
When you have accumulated
more than 5 pounds of material,
Contact EHSO @ 7-5922
to schedule a pickup.

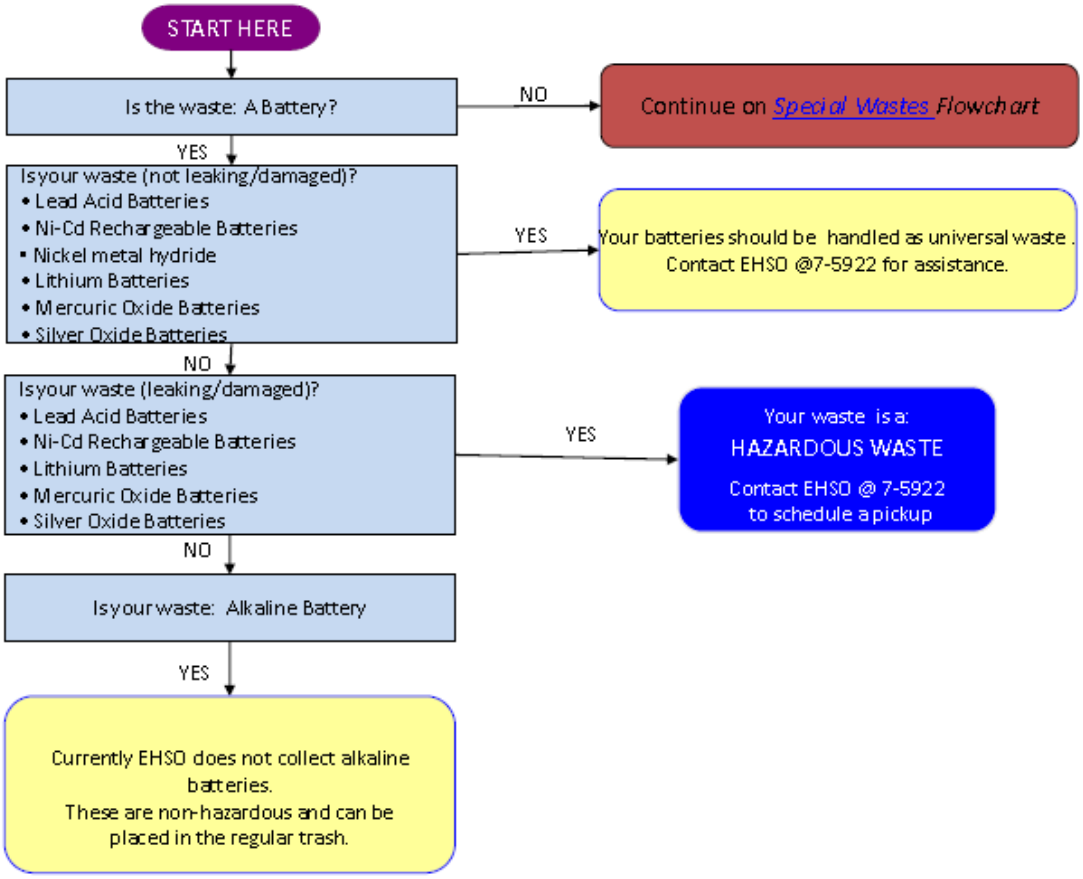
Photographic Chemicals



11

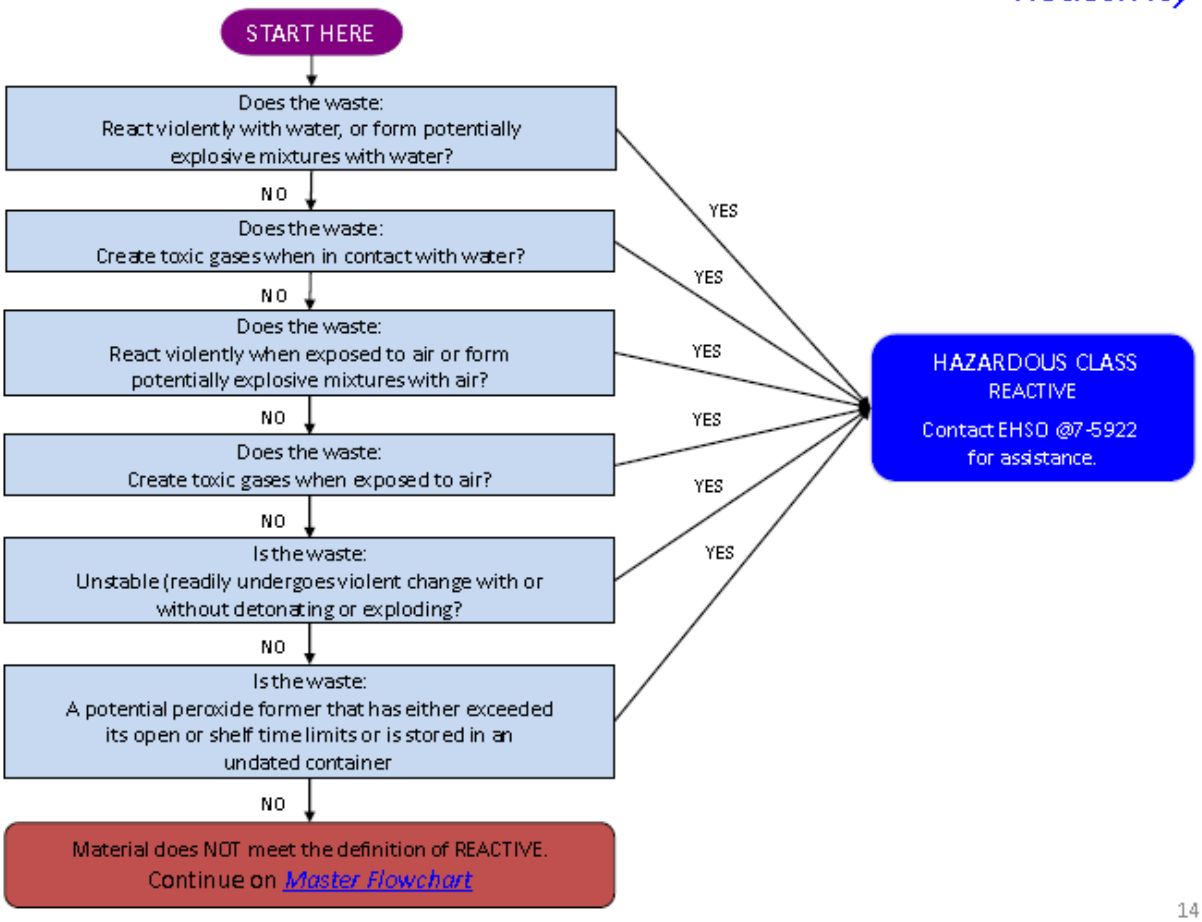

Waste Oil & Antifreeze
START HERE
Is the waste:
an Oil or Antifreeze?
NO
Continue on Special Wastes Flowchart
YES
Is your waste:
• Motor Oil
• Automatic Transmission Fluid
• Power Steering Fluid
• Diesel Fuel
• Gear Oil
• Turbine Engine Oil
• Hydraulic Oil
• Fuel Oil
• Kerosene (#3, #4, & #6)
Oil can NOT be disposed down the drain
(even if they are not hazardous waste).
YES
Your waste must be disposed of by EHSO.
Contact EHSO @ 7-5922 for assistance
NO
Is your waste?
• Ethylene Glycol based Antifreeze
• Coolant from Chillers / HVAC systems
• Propylene Glycol based Antifreeze (freeze protection > 0o F)
YES
NO
Is your waste?
• Any type of oil contaminated with a hazardous chemical
• Chlorinated Solvents
• Metal working fluids
• Degreasing solvents
• Freon and Freon contaminated refrigeration oil
• Naptha
• Transformer Oil
• Brake Fluid
• Radiator Flush
• Deicers
• Oily Water
• Antifreeze with a freeze protection above 0o F
YES
Your waste is a:
HAZARDOUS WASTE
Contact EHSO @ 7-5922
to schedule a pickup
12

Used Batteries

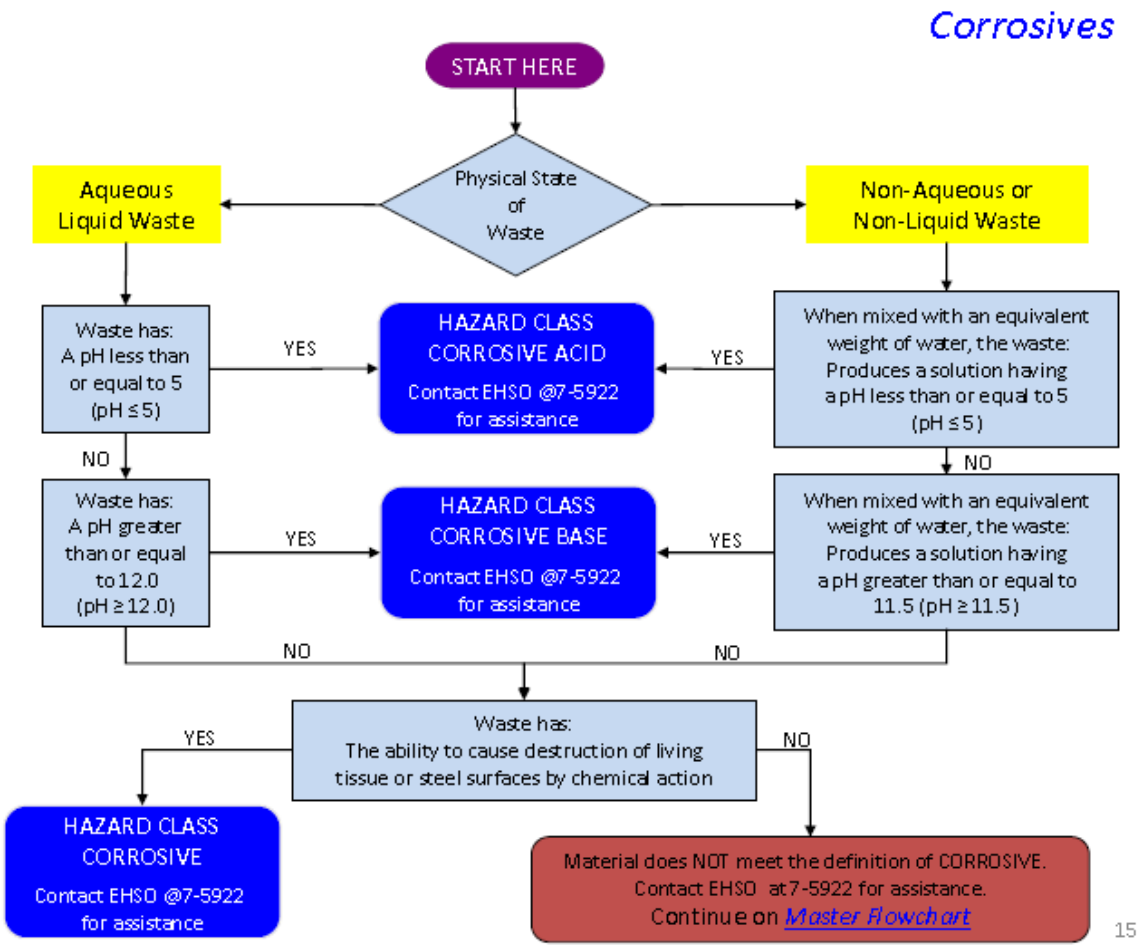


13

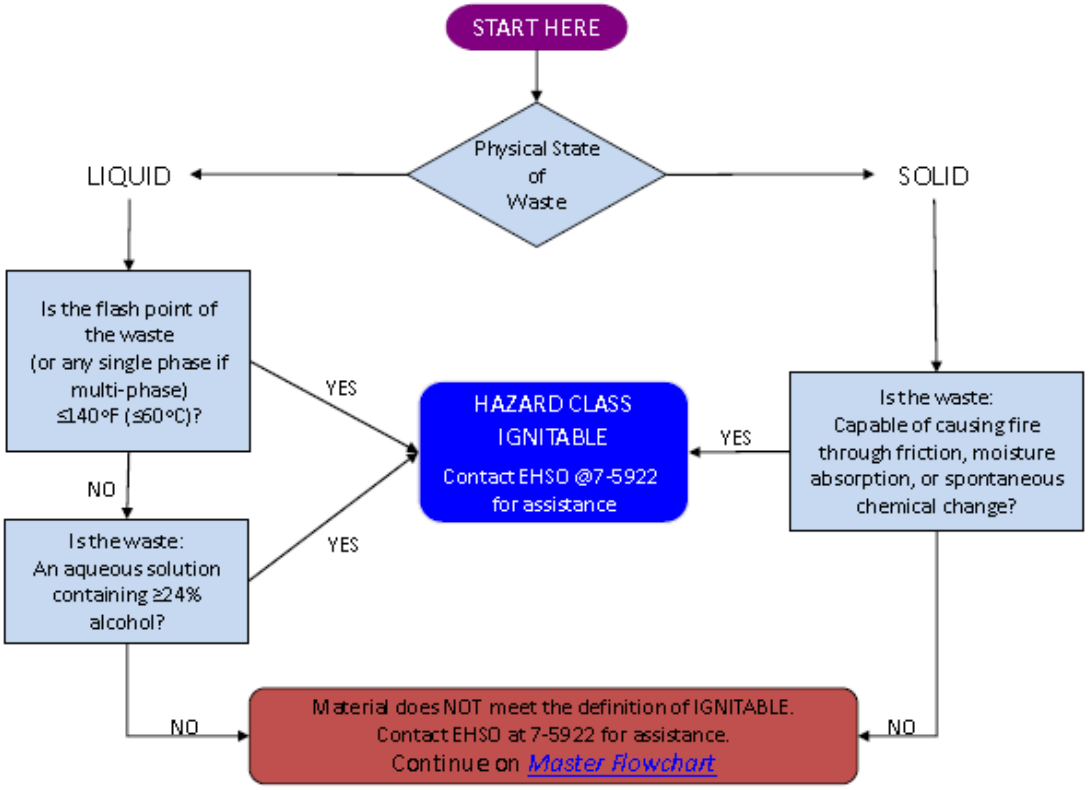
Reactivity



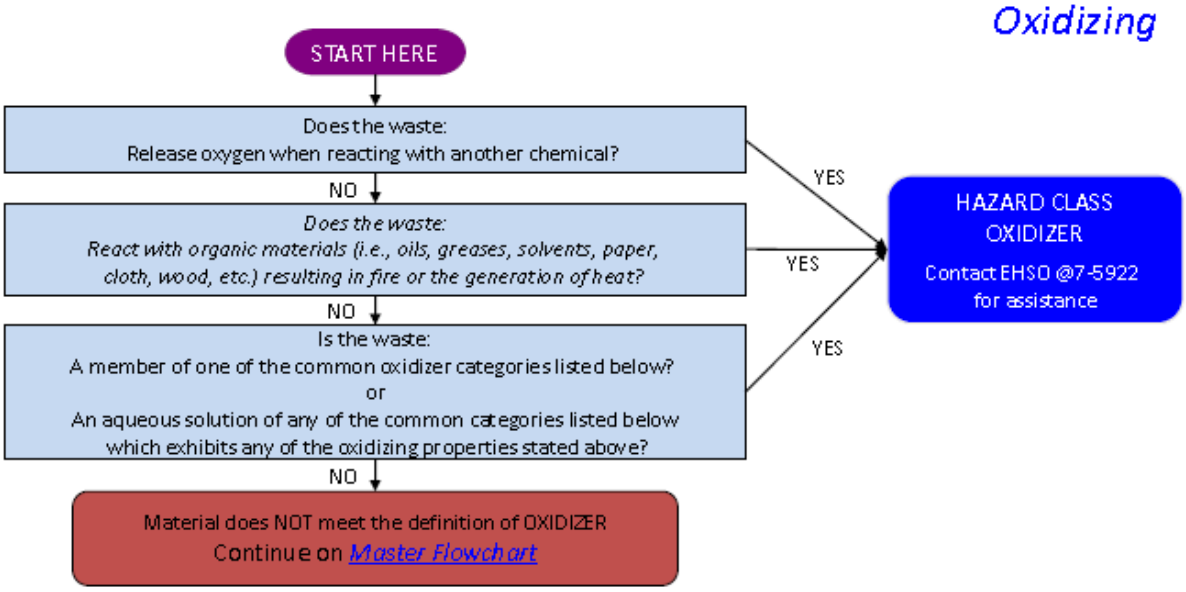
14


Corrosives
START HERE
Physical State of Waste
Aqueous Liquid Waste
Non-Aqueous or Non-Liquid Waste
Waste has: A pH less than or equal to 5 (pH ≤ 5)
YES
HAZARD CLASS CORROSIVE ACID
Contact EHSO @7-5922 for assistance
YES
When mixed with an equivalent weight of water, the waste: Produces a solution having a pH less than or equal to 5 (pH ≤ 5)
NO
NO
Waste has: A pH greater than or equal to 12.0 (pH ≥ 12.0)
YES
HAZARD CLASS CORROSIVE BASE
Contact EHSO @7-5922 for assistance
YES
When mixed with an equivalent weight of water, the waste: Produces a solution having a pH greater than or equal to 11.5 (pH ≥ 11.5)
NO
NO
Waste has: The ability to cause destruction of living tissue or steel surfaces by chemical action
YES
NO
HAZARD CLASS CORROSIVE
Contact EHSO @7-5922 for assistance
Material does NOT meet the definition of CORROSIVE. Contact EHSO at 7-5922 for assistance.
Continue on Master Flowchart
15

Ignitability



Oxidizing



Examples:

SOLIDS

- Bismuthates
- Bromates
- Chlorates
- Chlorites
- Chromates
- Chromium trioxide
- Dichromates
- Ferric sulfate
- Ferric chloride
- Ferric trioxide
- Ferricyanides
- Hypochlorites
- Iodates
- Iodine
- Manganese dioxide
- Nitrates
- Perborates
- Perchlorates
- Periodic acid
- Permanganates
- Permangic acid
- Peroxides
- Persulfates

LIQUIDS

- Bromine
- Chromic acid (pH< 2)*
- Hydrogen peroxide
- Nitric acid (pH< 2)*
- Perchloric acid (pH< 2)*
- Sulfuric acid (pH < 2)*

* Oxidizing mixtures having a pH < 2 are classified as corrosive.

17

Toxicity

START HERE

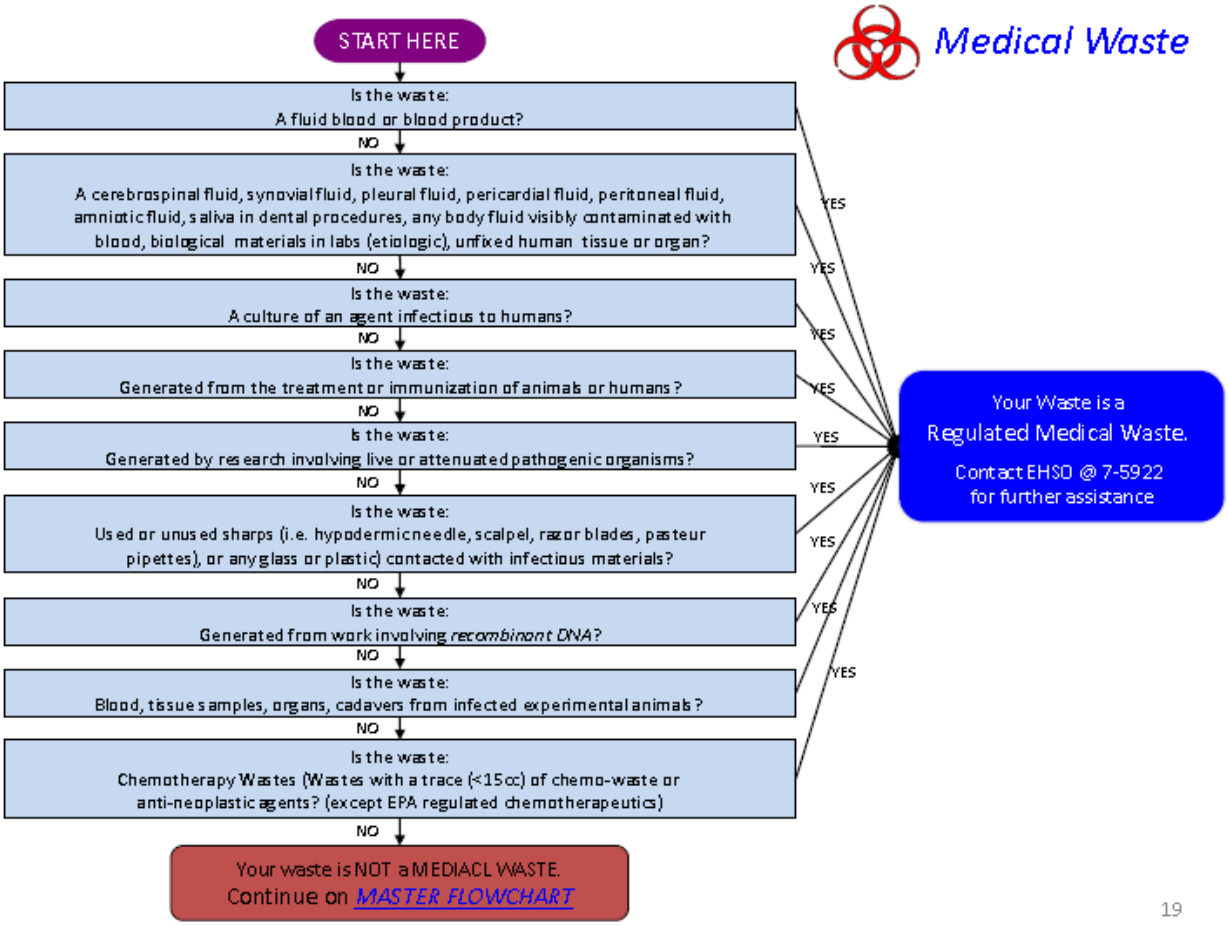
- Waste displays the toxicity characteristic if it exceeds certain concentration levels using specified test methods.
- The toxicity characteristic leaching procedure (TCLP) is the specified test method for determining if a waste is a toxic hazardous waste.
- The TCLP simulates the conditions in a landfill and then analyzes the concentrations of specifically listed chemicals and heavy metals that could potentially leach into the groundwater.
- **Examples** of the most common toxic materials, their regulatory limits, and their corresponding waste codes are listed right.

Material does NOT meet the definition of TOXICITY.
Continue on *Master Flowchart*

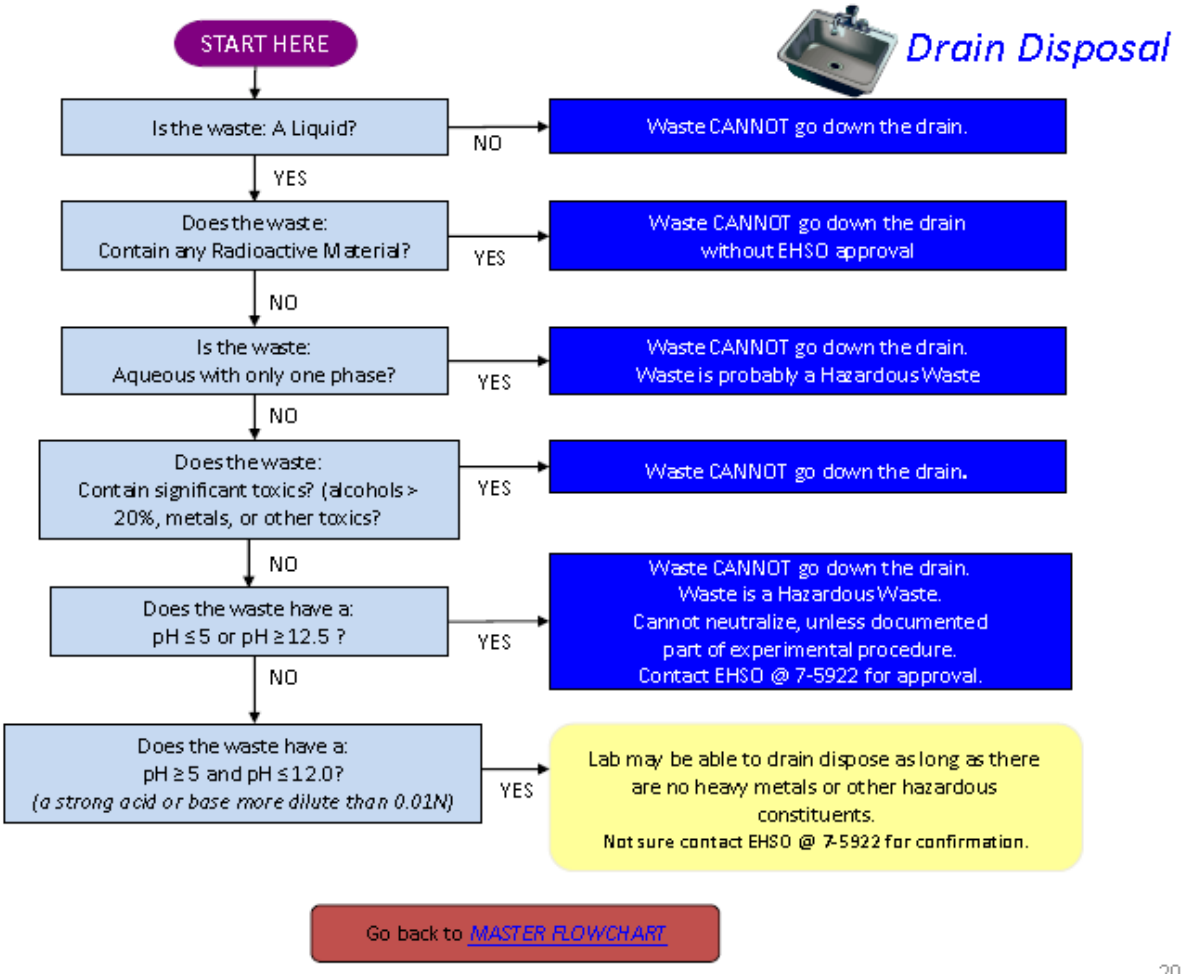
Toxic Hazardous Waste

Arsenic	5.0 ppm	D004
Barium	100 ppm	D005
Benzene	0.5 ppm	D018
Cadmium	1.0 ppm	D006
Chloroform	6.0 ppm	D022
Chromium	5.0 ppm	D007
Lead	5.0 ppm	D008
Mercury	0.2 ppm	D009
Methyl Ethyl Ketone (MEK)	200 ppm	D035
Selenium	1.0 ppm	D010
Silver	5.0 ppm	D011
Tetrachloroethylene	0.7 ppm	D039
Trichloroethylene	0.5 ppm	D040
Vinyl Chloride	0.2 ppm	D043
Chloroform	6.0 ppm	D022

NOTE: The 8 compounds that appear in boldface are referred to as the "RCRA 8 metals" and are among the most common toxic wastes generated.


Medical Waste
START HERE
Is the waste:
A fluid blood or blood product?
NO
Is the waste:
A cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid visibly contaminated with blood, biological materials in labs (etiologic), unfixed human tissue or organ?
NO
Is the waste:
A culture of an agent infectious to humans?
NO
Is the waste:
Generated from the treatment or immunization of animals or humans?
NO
Is the waste:
Generated by research involving live or attenuated pathogenic organisms?
NO
Is the waste:
Used or unused sharps (i.e. hypodermic needle, scalpel, razor blades, pasteur pipettes), or any glass or plastic) contacted with infectious materials?
NO
Is the waste:
Generated from work involving recombinant DNA?
NO
Is the waste:
Blood, tissue samples, organs, cadavers from infected experimental animals?
NO
Is the waste:
Chemotherapy Wastes (Wastes with a trace (<15cc) of chemo-waste or anti-neoplastic agents? (except EPA regulated chemotherapeutics)
NO
Your waste is NOT a MEDIACL WASTE.
Continue on MASTER FLOWCHART
YES
YES
YES
YES
YES
YES
YES
YES
Your Waste is a
Regulated Medical Waste.
Contact EHSO @ 7-5922
for further assistance

19



Go back to *MASTER FLOWCHART*

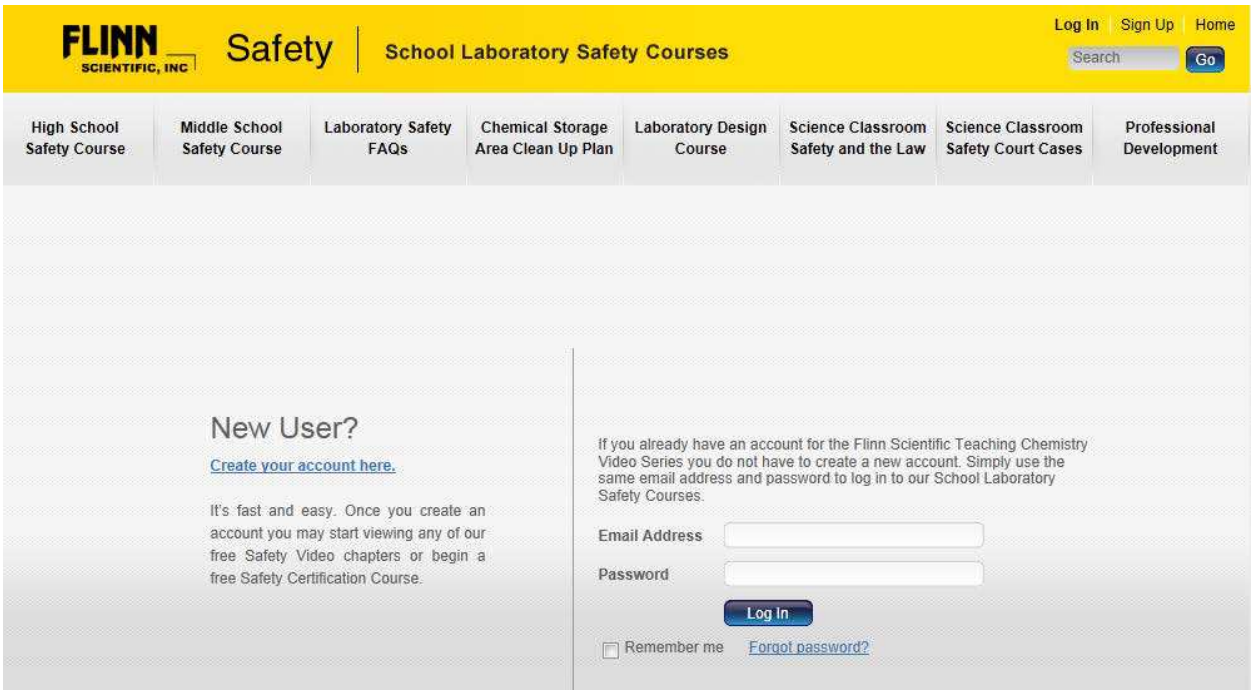
Appendix F

Chemical Purchasing Justification Form			
Requestor:		Phone:	Email:
School:	Dept:		Room:
MSDS Attached: □ Yes □ No		If not, why not?:	
Product name:		Manufacturer:	
Container size:		Proposed storage location:	
Maximum quantity (# of containers):		Average quantity (per container):	
Mission-Critical activity description (Why is this chemical necessary?):			
How and where will this product be used? (Maintenance, construction, lab experiments, pest control, etc.)			
Less toxic or hazardous substitute was not procured because it is not available (*select all that apply*): □ Within a reasonable timeframe □ At a reasonable price □ Within performance requirements □ Other (*explain*):			
Provide a detailed justification and attach supporting documentation for each indicated reason:			
Are special handling or storage procedures, beyond existing capabities, needed? □ Yes □ No Eplain why or why not:			
Are special training requirements or spill response materials needed? □ Yes □ No Explain why or why not:			
When discarded, will the waste be regulated as a hazardous waste? □ Yes □ No If yes, is the school equipped to store the waste appropriately until picked up by permitted contractor?			
Review by Chemical Management Officer (CMO)			
I have verified:			
□ Product is not a banned substance □ Proper PPE is available for students, faculty and staff □ Exisiting response procedures and equipment are sufficient for this product		□ School's ventilation system is adequate for using this product safely □ Waste disposal costs are reasonable	
I recommend this request be: □ **Approved** □ **Denied** Comments:			
Chemical Management Committee (CMC) Decision			
□ **Approved**			
□ **Conditionally Approved** (*Provide discussion on any imposed limitations/restrictions. Conditions may include limiting the quantity; restricitng use to a specific area, project or process; imposing stringent guidelines for its storage or use; etc.*)			
□ **Denied** (*Provide justification for denial. Justification may include product is not for mission critical purpose; a less hazardous substitute is available; associated risks outweigh potential benefit; etc.*)			

Appendix G

To obtain professional development, sign up for a free access to courses developed by Flinn Science using the website below:

http://labsafety.flinnsci.com/Login.aspx



Appendix H

GLOSSARY

Acid: A substance that dissolves in water and releases hydrogen ions (H+); acids cause irritation, burns, or more serious damage to tissue, depending on the strength of the acid, which is measured by pH.

Acute toxicity: Adverse effects resulting from a single dose, or exposure to a substance for less than 24 hours.

Asphyxiant: A substance that interferes with the transport of an adequate supply of oxygen to the body by either displacing oxygen from the air or combining with hemoglobin, thereby reducing the blood's ability to transport oxygen.

Base: A substance that dissolves in water and releases hydroxide ions (OH−); bases cause irritation, burns, or more serious damage to tissue, depending on the strength of the base, which is measured by pH.

Carcinogen: A substance that causes cancer.

CAS Registry number or CAS Number: An internationally recognized unique registration number assigned by the Chemical Abstracts Service to a chemical, a group of similar chemicals, or a mixture.

Chronic toxicity: Adverse effects resulting from repeated doses of, or exposures to, a substance by any route for more than three months.

Combustible liquid: A liquid with a flashpoint at a temperature lower than the boiling point; according to the National Fire Protection Association and the U.S. Department of Transportation, it is a liquid with a flash point of 100 °F (37.8 °C) or higher.

Compatible materials: Substances that do not react together to cause a fire, explosion, violent reaction or lead to the evolution of flammable gases or otherwise lead to injury to people or danger to property.

Compressed gas: A substance in a container with an absolute pressure greater than 276 kilopascals (kPa) or 40 pounds per square inch (psi) at 21 °C, or an absolute pressure greater than 717 kPa (40 psi) at 54 °C.

Corrosive: A substance capable of causing visible destruction of, and/or irreversible changes to living tissue by chemical action at the site of contact (i.e., strong acids, strong bases, dehydrating agents, and oxidizing agents).

Explosive: A substance that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

Exposure limits: The concentration of a substance in the workplace to which most workers can be exposed during a normal daily and weekly work schedule without adverse effects.

Flammable: A substance having a flashpoint above 20 °F (−6.7 °C) and below 100 °F (37.8 °C). An extremely flammable substance, is any substance with a flashpoint at or below 20 °F (−6.7 °C).

Flashpoint: The minimum temperature at which a liquid or a solid produces a vapor near its surface sufficient to form an ignitable mixture with the air; the lower the flash point, the easier it is to ignite the material.

Hazardous substance: Any substance or mixture of substances that is toxic, corrosive, an irritant, a strong sensitizer, flammable or combustible, or generates pressure through decomposition, heat, or other means, if it may cause substantial personal injury or illness during or as a proximate result of any customary or reasonably foreseeable handling or use, including reasonably foreseeable ingestion by children.

Ignitable: A substance capable of bursting into flames; an ignitable substance poses a fire hazard.

Incident: Any undesired or unplanned event which results in an unintended consequence, physical injury or damage of property,or the possibility of such injury or damage. Incidents do not necessarily result in injuries.

Incompatible materials: Substances that can react to cause a fire, explosion, violent reaction or lead to the evolution of flammable gases or otherwise lead to injury to people or danger to property.

Ingestion: Taking a substance into the body by mouth and swallowing it.

Inhalation: Breathing a substance into the lungs; substance may be in the form of a gas, fume, mist, vapor, dust, or aerosol.

Irritant: A substance that causes a reversible inflammatory effect on living tissue by chemical action at the site of contact.

Known human carcinogen: A substance for which there is sufficient evidence of a cause and effect relationship between exposure to the material and cancer in humans.

LC50 (Median Lethal Concentration 50): The concentration of a chemical that kills 50% of a sample population; typically expressed in mass per unit volume of air.

LD50 (Median Lethal Dose 50): The amount of a chemical that kills 50% of a sample population; typically expressed as milligrams per kilogram of body weight.

Mutagen: A substance capable of changing genetic material in a cell.

Neurotoxin: A substance that induces an adverse effect on the structure and/or function of the central and/or peripheral nervous system.

Oxidizer: A substance that causes the ignition of combustible materials without an external source of ignition; oxidizers can produce oxygen, and therefore support combustion in an oxygen free atmosphere.

Permissible Exposure Limit (PELs): The legally enforceable maximum amount or concentration of a chemical that a worker may be exposed to under OSHA regulations.

Personal Protective Equipment (PPE): Any clothing and/or equipment used to protect the head, torso, arms, hands, and feet from exposure to chemical, physical, or thermal hazards.

pH: A measure of the acidity or basicity (alkalinity) of a material when dissolved in water; expressed on a scale from 0 to 14.

Radioactive material: A material whose nuclei spontaneously give off nuclear radiation.

Reactivity: The capacity of a substance to combine chemically with other substances.

Secondary containment: An empty chemical-resistant container/dike placed under or around chemical storage containers for the purpose of containing a spill should the chemical container leak.

Short-Term Exposure Limit (STEL): The maximum concentration to which workers can be exposed for a short period of time (15 minutes).

Systemic: Affecting many or all body systems or organs; not localized in one spot or area.

Teratogen: A substance which may cause non-heritable genetic mutations or malformations in the developing embryo or fetus when a pregnant female is exposed to the substance.

Threshold Limit Value (TLV): Term used to express the recommended exposure limits of a chemical to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

Time-Weighted Average (TWA): The average concentration to which an average worker can be exposed for a normal, 8-hour workday.

Toxic substance: In general, any substance (other than a radioactive substance) that has the capacity to produce personal injury or illness to man through ingestion, inhalation, or absorption through any surface of the body.

Water reactive material: A substance that reacts with water that could generate enough heat for the item to spontaneously combust or explode. The reaction may also release a gas that is either flammable or presents a health hazard.

Appendix I

EPA Paperwork/Process

IX. OBTAINING AN EPA IDENTIFICATION NUMBER - EPA FORM 8700-12

Why Must an EPA Form 8700-12 be Submitted to ADEQ?

If you do not currently have an EPA Identification Number and you generate 220 or more pounds of hazardous waste in a single month, you must submit this initial notification form to ADEQ. If this is a one-time clean out effort, this required notification will be treated as a Provisional Notification; whereby the assigned EPA Identifiction Number will be temporary, expiring 90 days after issuance. To ensure your provisional status, you must identify yourself as a "short-term generator", (on page 2, Section 10, under Heading 1. Generator of Hazardous Waste), by checking the yes box for Short-Term Generator (10.A.1.d.) and providing an explanation in the comment section on page 4, Section 13.

NOTE: If an EPA ID number has previously been assigned to a particular location, the school must use the previously assigned number and indicate on the EPA Form 8700-12 that this is a Subsequent Notification (i.e Check second box under Section 1).

Associated Fees: Please be aware that there are two separate and distinct fees associated with the generation of hazardous wastes; and each fee will be billed separately and retroactively the following year (similar to taxes), as follows:

1. Generation Fee - A Generation Fee Invoice, which is based on the total amount of hazardous waste generated during a clean-out event, on a per ton bases, will be sent out by ADEQ and must be remitted with payment by February 15th of the following year. (Since most transporters provide amount collected in terms of pounds, you will need to convert pounds collected to tons; and 1 ton is equal to 2,000 pounds)

NOTE: Please be aware that registered LQGs will receive Generation Fee Invoices quarterly. The cumulative weight of all hazardous waste must be entered on the Generation Fee Invoice on line A in order to determine total amount owed.

NOTE: If less than 1 ton of waste has been generated, no fee will be owed; but the information must still be provided on the invoice and the invoice must be submitted to ADEQ by February 15th of the following year.

2. Registration Fee - A Registration Fee Invoice, which registers the generator's status (see definitions below) for a location, will be sent out by ADEQ and must be remitted with payment to ADEQ by March 1st of the following year. The registration fee, which is based on generator status, is broken down as follows:

- CESQG - No fee
- SQG - $100
- LQG - $300

Categories of Hazardous Waste Generators:
A. Large Quantity Generator (LQG)- Generates more than 2,200 lb (1,000 kg) of hazardous waste or more than 2.2 lb (1 kg) of acutely hazardous waste in any calendar month or 220 lb (100 kg) of acute spill residue.
B. Small Quantity Generator (SQG)- Generates between 220 lb (100 kg) and 2,200 lb (1,000 kg) of non-acute hazardous waste in any calendar month.
C. Conditionally Exempt Small Quantity Generator (CESQG) – Generates less than 220 lb (100 kg) of non-acute hazardous waste per month.

Section-by-Section instructions for EPA Form 8700-12

- Section 1 - Reason for Submittal - Check applicable box (Initial Notification or Subsequent Notification); remaining boxes are not applicable to schools.
- Section 2 - Leave blank; unless this is a Subsequent Notification, then provide existing EPA ID Number.
- Section 3 - Site Name (Actual school name, not name of District).
- Section 4- Site Address (Physical location of school, not District office).
- Section 5 - Site Land Type (Is property owned by private entity or District, state, County, etc.).
- Section 6 - NAICS Code - (Google search - NAICS High School, Middle School, Elementary school, Charter school, as applicable, to obtain appropriate NAICS Code).
- Section 7- Site Mailing Address - Where should correspondences be mailed (District office or School administrator as applicable).
- Section 8 - Site Contact Person (Identify on-site person with responsibility or control of Chemical Management).
- Section 9 (a) - Property Owner (Legal property owner as listed in County Assessors records and the actual date ownership became effective).
- Section 9 (b) - Site Operator (Name of organization, not an individual employed by organization; and date organization took control of facility).
- Section 10 - Type of Regulated Waste Activity (i.e. Identify Generator Status (see definitions above)).

  Subsection A.1 - Hazardous Waste Activities identify generator status.

  NOTE: Check the yes box under “d” for Short-Term Generator, if this is a Provisional Notification (See discussion above).

  A.2 - Transporter (must check yes or no)
  A.3 - TSDF (must check yes or no)
  A.4 - Recycler (must check yes or no)
  A.5 - Exempt Boiler/Industrial Furnace (must check yes or no)
  A.6 - Underground Injection Control (must check yes or no)
  A.7 - Receives Hazardous Waste off-site (must check yes or no)

Subsection B.1 - Large Quantity Handler of Universal Waste

NOTE: If you check any of the boxes listed in a-g, the EPA system will default this section of your Notification to a yes. It is imperative that you only check boxes a-g if the cumulative total of all universal waste meets or exceeds the 5,000 kg threshold.

B.2 - Destination Facility (must check yes or no)

Subsection C.1 - Used Oil Transporter (must check yes or no)
C.2 - Used Oil Processor/Re-refiner (must check yes or no)
C.3 - Off-Specification Used Oil Burner (must check yes or no)
C.4 - Used Oil Fuel Marketer (must check yes or no).

Subsection D - Eligible Academic Entities with Laboratories (Applies only to college or university related establishments).

NOTE: Leave blank for K-12 schools.

- Section 11 - Description of Hazardous Waste

  Subsection A - Federal waste codes for substance (obtain waste codes from MSDS or internet search; this information should already be captured in the Hazard Identification column of the worksheet).

  Subsection B - Arizona does not have State-specific codes, therefore this section does not apply; leave blank.

  Section 12 - Notification of Hazardous Secondary Material

  NOTE: unlikely to apply to schools; but yes or no must be checked.

  Section 13 - Comments. Include all relevant comments, including discussion on why this notification is a Provisional Notification.

  Section 14 - Certification. An original signature and printed name and title from a person authorized to legally obligate the organization must be submitted and received by ADEQ before the notification form can be processed and an EPA ID number is assigned. Photocopied, scanned or faxed copies cannot be accepted.

  Addendum
  Sections 1 and 2 must be left blank if the school does not manage secondary material.
  Section 3 must be completed indicating whether the school has financial assurance. Financial assurance is not required if the school does not manage secondary material.

Mail all correspondence to:
Arizona Department of Environmental Quality
1110 West Washington Street, Mail Code 4415 A-1
Phoenix, AZ 8500

Appendix J

THE ANSI/NFPA 704 HAZARD IDENTIFICATION SYSTEM

NOTE: The NFPA diamond is a quick visual review of the health hazard, flammability, reactivity, and special hazards a chemical may present.
The diamond is broken into four sections (blue, red, yellow, and white). The symbols and numbers in the four sections indicate the degree of hazard associated with a particular chemical or material as follows:

HEALTH HAZARD (BLUE)

4	Danger	May be fatal on short exposure. Specialized protective equipment required
3	Warning	Corrosive or toxic. Avoid skin contact or inhalation
2	Warning	May be harmful if inhaled or absorbed
1	Caution	May be irritating
0		No unusual hazard

FLAMMABILITY (RED)

4	Danger	Flammable gas or extremely flammable liquid
3	Warning	Combustible liquid flash point below 100 °F
2	Caution	Combustible liquid flash point of 100° to 200 °F
1		Combustible if heated
0		Not combustible

REACTIVITY (YELLOW)

4	Danger	Explosive material at room temperature
3	Danger	May be explosive if shocked, heated under confinement or mixed with water
2	Warning	Unstable or may react violently if mixed with water
1	Caution	May react if heated or mixed with water but not violently
0	Stable	Not reactive when mixed with water

SPECIAL NOTICE KEY (WHITE)

W	Water Reactive
OX	Oxidizing Agent

COMMON SAFETY SYMBOLS		
Domestic Symbol	International Symbol	Meaning
		Flammable
		Explosive
		Corrosive
		Corrosive
		Poison
		Radioactive
		Oxidizer
		Low Level Hazard
		Severe Chronic Hazard
		Environmental Hazard