



This document is one section from EPA's "Chemical Management Resource Guide for School Administrators," published in December 2006. The reference number is EPA-747-R-06-002. You can find the entire document at <http://www.epa.gov/opptintr/chemmgmt/index.htm>.

Chemical Management Resource Guide for School Administrators

Section II Hazardous Chemicals and Products in Schools

II. Hazardous Chemicals and Products in Schools

II.A. Chemicals and Products of Concern

Approximately 75,000 chemical substances are in commercial use today.³ Many of these chemical substances are considered toxic or otherwise hazardous to humans and other living beings. Toxic chemicals are associated with a variety of serious health problems, including cancer, brain and nervous system disorders, reproductive disorders, organ damage, as well as asthma. Toxic chemicals that are persistent in the environment and bioaccumulate through the food chain can make exposure during childhood and adolescence especially dangerous. Chemicals also can irritate the skin, eyes, nose, and throat. Some chemicals pose significant safety hazards, such as fire or explosion risks.








The risks associated with exposure to a chemical are dependent on many factors, including the chemical's hazard level (degree of flammability, toxicity, etc.), the route of exposure (e.g., absorbed through skin, inhaled, consumed, injected), and the duration of exposure.

Many hazardous chemicals can be found in school facilities. Material Safety Data Sheets (MSDS), comprehensive fact sheets prepared by chemical manufacturers, describe the physical properties, health effects, and other characteristics of chemicals, as well as procedures for handling, storing, and disposing of these substances.⁴ Chemical manufacturers should supply MSDSs along with each shipment of chemicals delivered to your school. The proper use and management of these substances, as well as the products that contain them, are critical to maintaining a healthy atmosphere for school occupants and the surrounding environment. The term “hazardous chemicals” may include (but is not limited to) the following:

- Laboratory chemicals used or stored in science laboratories and preparation areas;
- Art supplies, including paints, stains, inks, glazes, and photo processing chemicals, used in (visual and performing) art and shop;
- Cleaning products utilized by custodial, cafeteria, and maintenance staff;
- Pesticides, fertilizers, and de-icers/salts/sands used for grounds maintenance, as well as pesticides used for building maintenance;
- Paints, solvents, fuels, degreasers, and lubricants used in building operation and maintenance;
- Oils, fuels, paints, antifreeze, and other chemicals used to maintain and repair equipment for transportation, school maintenance, and shop classes;
- Inks, solvents, and adhesives used for printing in school offices; and
- Chemicals used to treat water associated with drinking water and swimming pools.

II.B. Chemical Categories

Chemicals can be grouped based on the type of hazard they pose. Understanding the different types of chemicals in a school is important for developing an effective chemical management policy. Hazardous substances in schools may fall into one or more of the following categories: flammables/explosives, corrosives (the majority of which in high school laboratories are acids and bases), oxidizers/reactives, toxics, and compressed gases. Federal agencies and legislative authorities have developed specific definitions for each of those categories; however, the hazards can be described generally as follows:⁵

Chemical Type		Description and Examples
Flammables/ Explosives		Chemicals that have the potential to catch fire rapidly and burn in the air. Liquids, gases, and solids (in the form of dusts) can be flammable and/or explosive. <i>Examples: paint thinner; laboratory solvents (acetone, alcohols, acetic acid, hexane); adhesives (some)</i>
Corrosives		Chemicals that can burn, irritate, or destroy living tissue or corrode metal through direct chemical action. This category includes strong acids and bases (alkalines), as well as dehydrating agents and oxidants. <i>Examples: sulfuric, nitric, and hydrochloric acids; potassium, ammonium, and sodium hydroxides (bases); hydrogen peroxide or chlorine (oxidants); acetic acid</i>
Oxidizers/ Reactives		Chemicals that react violently when combined with heat, light, water, or atmospheric oxygen, causing explosions or violent chemical reactions. <i>Examples: nitrates; chlorates; nitrites; peroxides; picric acid (crystallized); ethyl ether (crystallized); water reactive metals (e.g., sodium)</i>
Toxics		Any substances that, even in small amounts, can injure living tissue when ingested, inhaled, or absorbed into the skin. <i>Examples: mercury; arsenic; lead; asbestos; cyanide</i>
Compressed Gases		Gases stored under high pressure such that cracks or damage to the tanks and valves used to control these gases could cause significant physical harm to those in the same room. <i>Examples: acetylene; helium; nitrogen</i>



Check It Out

Improper storage practices may increase the risks associated with certain chemicals, particularly those that are flammable, corrosive, or reactive. The King County Laboratory Waste Management Guide (<http://www.govlink.org/hazwaste/publications/LabGuidelinesRevAugust06.pdf>) provides suggestions for safe and effective chemical storage, including shelf storage patterns for small stockrooms (see Table 1).

EPA's "No More 'Methyl Something': Improving Management of Curriculum Chemicals in Schools" presentation provides examples of dangerous storage scenarios: <http://www.epa.gov/epaoswer/osw/conservation/clusters/schools/pdfs/chemsafe.pdf>.

II.C. Where Chemicals and Products are Found

Chemicals can be found throughout a school. They are used in both the maintenance of schools and the curriculum taught. Chemicals help students to perform experiments and learn new skills, among other benefits. In the absence of chemicals, schools would lack certain fundamental tools needed to educate students. Despite their useful purposes, chemicals can be dangerous to students and staff when managed improperly. Hazardous chemicals are found in classrooms, laboratories, storerooms, maintenance sheds, and numerous other areas. High schools usually have larger inventories and more hazardous chemicals than middle and elementary schools. Chemicals may have been purchased by the school or brought in by employees or students for their personal use.

The table on the following page lists some specific locations in which chemicals and products of concern might be found in a typical school. Please keep in mind that this list is by no means all-inclusive, and that chemicals, when used appropriately, can be important to the educational process.



Hazardous chemicals are found in classrooms, laboratories, studios, maintenance areas, and numerous other areas. The photo above depicts one location where chemicals and products of concern might be found in a typical school. This photo also demonstrates a properly organized chemical storage area.

*Photo Credit: Rehab the Lab Program,
Local Hazardous Waste Management,
King County, Washington*



Check It Out

Types and Locations of Hazardous Chemicals/Products in Schools:

- EPA, Chemical Management and Usage, http://www.epa.gov/Region7/education_resources/teachers/ehsstudy/ehs1.htm and "No More 'Methyl Something': Improving Management of Curriculum Chemicals in Schools," <http://www.epa.gov/epaoswer/osw/conservation/clusters/schools/pdfs/chemsafe.pdf>
- Colorado Department of Public Health and Environment, One Hundred Most Commonly Found Explosive and Shock-Sensitive Materials, www.cdph.state.co.us/cp/Institutions/Schools/ChemInSchools/ExplosiveTop40.PDF

Alternatives to Products of Concern:

- EPA, Environmentally Preferable Purchasing, [http://www.epa.gov/epp/Massachusetts Environmentally Preferable Purchasing Program, Product and Service Information, http://www.mass.gov/epp/products.htm](http://www.epa.gov/epp/Massachusetts%20Environmentally%20Preferable%20Purchasing%20Program,%20Product%20and%20Service%20Information,%20http://www.mass.gov/epp/products.htm)
- Maryland State Department of Education, Safety in Ordering, Storing, Using and Disposing of Chemicals, <http://www.mdk12.org/instruction/curriculum/science/safety/chemicals.html>

Location	Product Type	Hazardous Ingredient Examples
Science laboratories	Concentrated Acids (undiluted)	Hydrochloric acid Nitric acid
	Concentrated Bases (undiluted)	Sodium hydroxide
	Solvents	Methanol Methylene chloride
	Oxidizers	Lead nitrate
	Compressed gases	Oxygen
	Toxics	Cyanides Chromates (VI) Lead salts Mercury salts
Vocational and trade shops (can also be referred to as Career and Technical Education)	Solvents (used in paints, paint thinners, adhesives, lacquers, primers, and other products)	Petroleum naphtha Turpentine
	Cleaning supplies/detergents	Phosphoric acid Sodium silicate
	Compressed gases	Acetylene Nitrogen
	Fuels, transmission, and brake fluids	Gasoline
Visual and performing art studios	Solvents (used in paints, inks, paint thinners, adhesives, lacquers, primers, and other products)	Toluene Mineral spirits
	Pottery clear coating glaze	Lead Other heavy metals
	Pigments for paints and coatings	Cadmium Manganese Chromium
	Dry clay for ceramics and jewelry	Silica
	Acids for etching	Nitric acid Hydrochloric acid
Custodial/maintenance areas	Cleaning supplies/detergents	2-Butoxyethanol Trisodium phosphate
	Drain cleaners (alkaline) Drain cleaners (acidic)	Potassium hydroxide Sulfuric acid
	Pesticides (including disinfectants/sterilizers)	Permethrin Sodium hypochlorite
	Paint thinners	Toluene
	Solvents (used in paints, paint thinners, adhesives, lacquers, primers, and other products)	Xylene
	Water treatment chemicals for swimming pools	Chlorine tablets
Kitchens/cafeterias	Pesticides (including disinfectants/sterilizers)	Permethrin Sodium hypochlorite
	Refrigerants	CFCs Ammonia
	Cleaning supplies/detergents	Ammonium hydroxide
Nurses' offices	Medical equipment	Mercury (thermometers and blood pressure manometers)
Photography laboratories	Intensifiers/reducers	Potassium dichromate Hydrochloric acid
	Developers	Hydroquinone Lactic acid
	Stop baths and fixer	Acetic acid Chrome alum (potassium chromium sulfate)
School grounds/athletic fields	Pesticides	2,4-D
	De-icers	Sodium chloride
	Fertilizers	Ammonium nitrate
Administrative offices	Correction fluid	Ethylene glycol Trichloroethane
	Solvents (used in paints, inks, paint thinners, adhesives, lacquers, primers, and other products)	Methyl ethyl ketone Petroleum distillates
	Printer/copier toners	Carbon black