

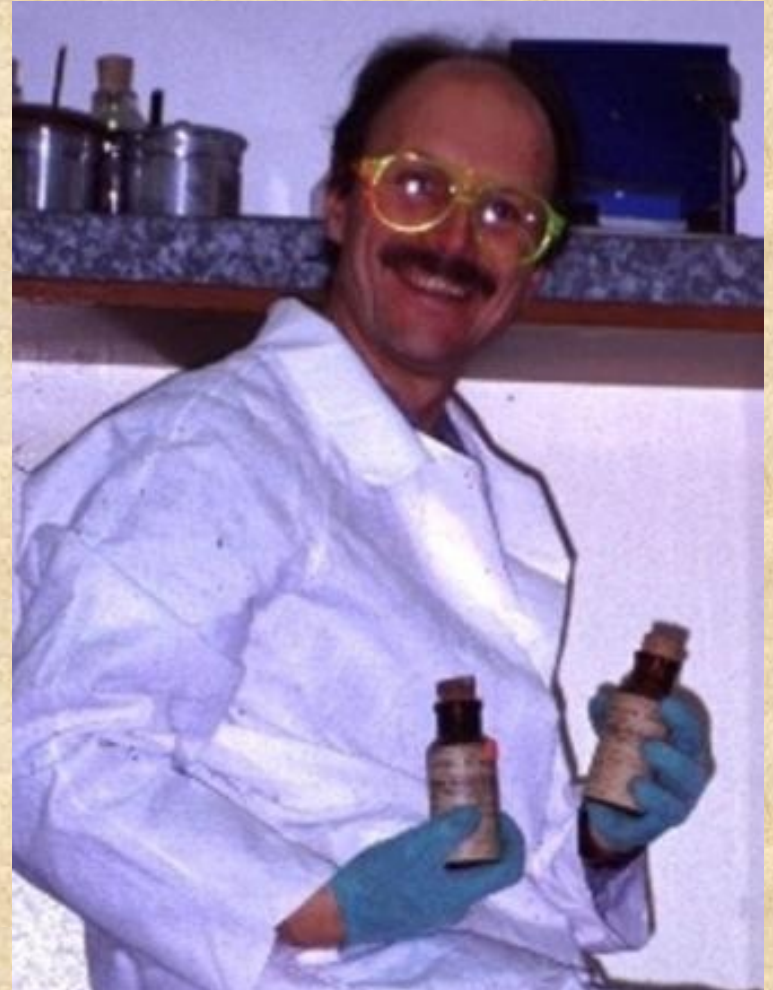
School Science and Safety

Making the Connection

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www.waddellenviro.com



Today's Topics

- The culture of laboratory safety
- Chemical hazard evaluation
- Proper chemical management
- Identifying and fixing unsafe situations
- Integrated chemical management & safety plan
- Responding to a spill
- Environmental health & safety requirements
- Getting assistance

OSHA – the lead agency for workplace safety

code of federal regulations

Labor

29

PART 1910 (§1910.1000 TO END)
Revised as of July 1, 1999



OSHA Laboratory Standard

29 CFR 1910.1450

PART 1910-OCCUPATIONAL SAFETY AND HEALTH STANDARDS

1. The authority citation for part 1910, subpart Z is amended by adding the following citation at the end. (Citation which precedes asterisk indicates general rulemaking authority.)

Authority: Secs. 6 and 8, Occupational Safety and Health Act, 29 U.S.C. 655, 657; Secretary of Labor's Orders Nos. 12-71 (36 FR 8754), 8-76 (41 FR 25059), or 9-83 (48 FR 35736), as applicable; and 29 CFR part 1911.

* * * Section 1910.1450 is also issued under sec. 6(b), 8(c) and 8(g)(2), Pub.L. 91-596, 84 Stat. 1593, 1599, 1600; 29 U.S.C. 655, 657.

2. Section 1910.1450 is added to subpart Z, part 1910 to read as follows:

191.1450 Occupational exposure to hazardous chemicals in laboratories.

(a) *Scope and application.* (1) This section shall apply to all employers engaged in the laboratory use of hazardous chemicals as defined below.

(2) Where the section applies it shall supersede, for laboratories, the requirements of all other OSHA health standards in 29 CFR part 1910, subpart Z, except as follows:

(i) For any OSHA health standard, only the requirement to limit employee exposure to the specific permissible exposure limit shall apply for laboratories, unless that particular standard states otherwise or unless the conditions of paragraph (a)(2)(iii) of this section apply.

(ii) Prohibition of eye and skin contact where specified by any OSHA health standard shall be observed.

(iii) Where the action level (or in the absence of action level, the permissible exposure limit) is routinely exceeded for an OSHA

(i) are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace and (ii) meets the requirements of paragraph (e) of this section.

"Combustible liquid" means any liquid having a flashpoint at or above 100 °F (37.8 °C), but below 200 °F (93.3 °C), except any mixture having components with flashpoints of 200 °F (93.3 °C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

"Compressed Gas" means"

(i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 °F (21.1 °C); or

(ii) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 °F (54.4 °C) regardless of the pressure at 70 °F (21.1 °C); or

(iii) A liquid having a vapor pressure exceeding 40 psi at 100 °F (37.8 °C) as determined by ASTM D-323-72.

"Designated Area" means an area which may be used for work with "select carcinogens" reproductive toxins or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood.

"Emergency" means any occurrence such as, but not limited to, equipment failure, rupture or containers or failure of control equipment which results in an uncontrolled release of a hazardous chemical into the workplace.

"Employee" means an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.

"Explosive" means a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

"Flammable" means a chemical that falls into one of the following categories:

The Laboratory Safety Standard

- Designate a chemical hygiene officer
- Write and implement an effective site-specific chemical hygiene plan
- Provide worker training and guidelines
- We'll revisit this later today in greater detail

OSHA Hazard Communication Standard

29 CFR 1910.1200

- It is worker's right to have access to information about the chemical hazards in their workplace
- Workers must be made aware and trained on all chemical hazards encountered in the workplace

Bloodborne Pathogens

29 CFR 1910.1030

- Protecting workers from infectious agents
- Training required if risk of exposure

Why should schools be concerned?

- Schools must provide a safe workplace
- Science labs have inherent risks
 - High heat, extreme cold
 - Toxic, corrosive, flammable and reactive chemicals
 - Electricity, gas lines, water lines
 - Dozens of hormone-driven, distracted students
- Fixing safety problems is much more expensive than preventing them

Roles and Responsibilities

District level (4 T's)

- Create, maintain & administer the safety plan
- Stress safety & compliance as priorities
- **T**rainning provided, **T**ime allocated
- **T**ools in place, **T**echnical assistance if needed

School level (4 S's)

- **S**chool-specific plan in place, **S**afety stressed
- **S**upplies provided, **S**upport safety officers

Science lab level (4 I's)

- Task-specific enforcement of the plan
- **I**nspect regularly, **I**nventory updated
- **I**dentify issues, **I**nform administration

Encouraging a culture of safety

- Administration sets the tone
- Facilities designed with safety in mind
- Safety huddles and trainings
- Regular review of equipment and chemicals
- Incorporated in lesson and experimental design

Cues help guide behavior



Model and enforce safe behavior

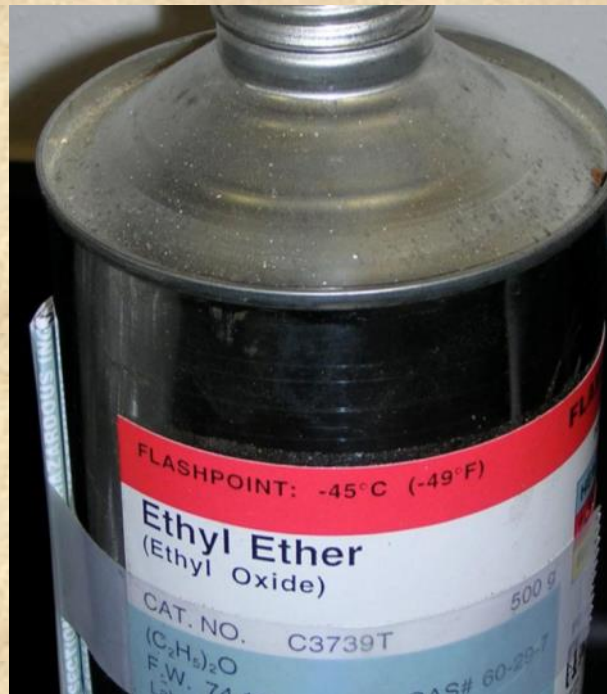
Chemicals of concern

- Potential explosives
- Water and air reactives
- Carcinogens, teratogens & neurotoxins
- Poisons via skin contact & inhalation

Peroxide formers

Cap's threads hold peroxide crystals

One pint of ether: 25 foot fireball



Others peroxide formers

- 1,4-Dioxane
- Tetrahydrofuran
- Acetaldehyde

Not all peroxide formers are solvents

Potassium Metal (K_2) – Color Key

- Silver – Potassium metal -Water Reactive
- White – P. Hydroxide – Corrosive
- Yellow/Orange – P. Superoxide
 - Water reactive, corrosive, unstable
- Red – P. Ozonide - Highly reactive, explosive



Biology's the place for nitro-organics

- 2,4-dinitrotoluene
- Dinitrophenol
- Nitroaniline

Picric acid (trinitrophenol)

Primary constituent in Bouin's Fluid



Air reactive compounds

Yellow and white phosphorus

Burn this pyrophoric, get water reactive
phosphorus pentoxide smoke

Water reactive compounds

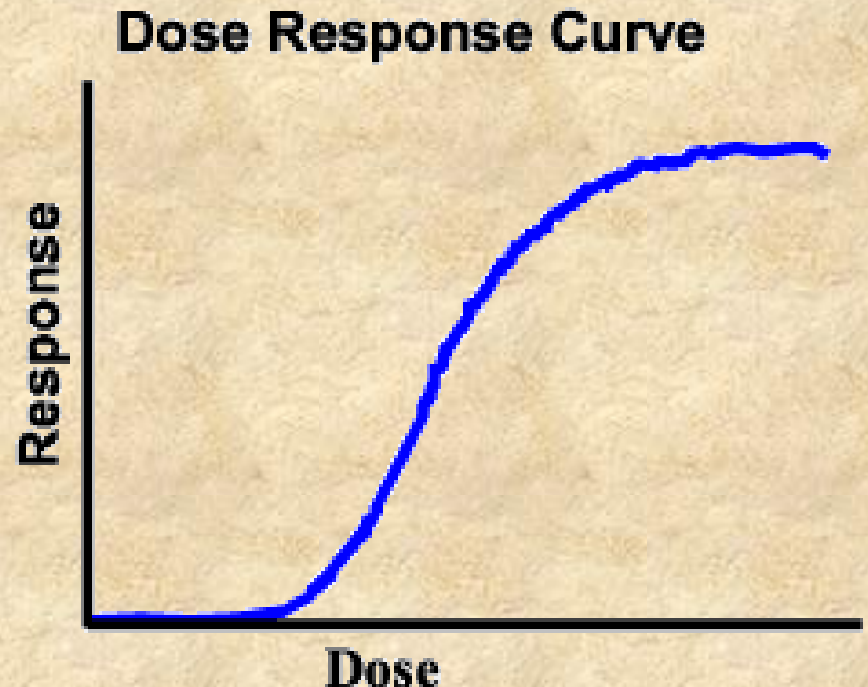
- Alkali metals
 - Sodium
 - Lithium
 - Potassium
 - Calcium carbide

Peroxidized sodium



Dose and response

- Very low exposures often show no effect
- Above a certain dose, response won't increase
- That response could be death, of course...



One tequila



Two tequila



Three tequila



Effects of size on response



Routes of exposure

Swallow It

Breathe It

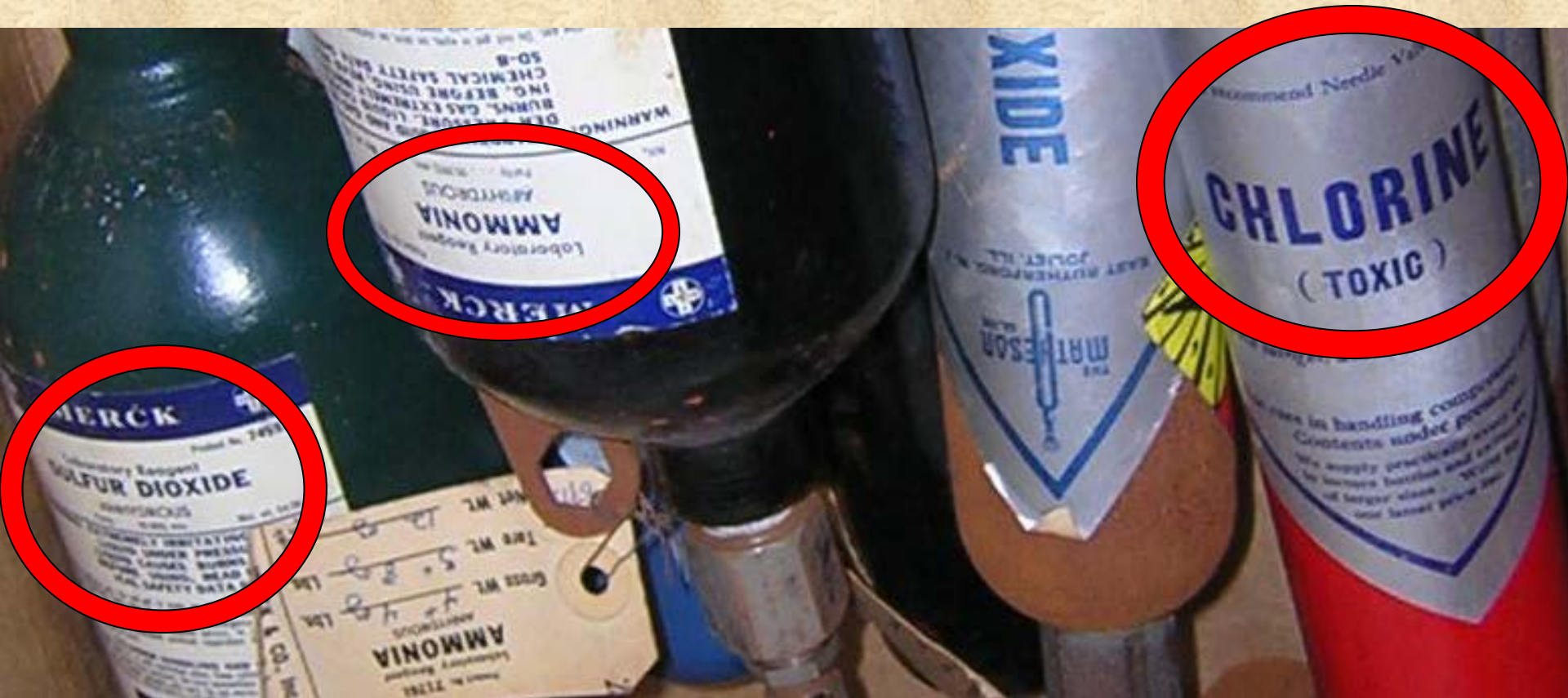
Touch It

Toxic by inhalation

- Simplest way to get exposed
- Dusts, liquids or gases

Avoid powdered metals

Toxic and corrosive by inhalation



Use chlorine or bromine water instead

Hazardous by skin contact

- Toxins absorbed through the skin
- Corrosive liquid and solids

Toxic organics that absorb thru skin

- Aniline compounds
- Phenol

Be wary around Amines – toxic, corrosive, absorbs through skin, may be flammable

Funky looking acid bottles
This is NOT normal



Hydrofluoric Acid (HF)

Absorbs quickly through skin

- Glass etchant
- Toilet stain remover
- Anesthetic
- Bone disintegration
- Extreme pain
- Gangrene, amputation
- 250 mls = death

Hydroxides preferentially damage eyes

They also eat black plastic caps

Nitric acid

Corrosive, oxidizer, toxic

Oxidizers degrade organics

Nitric caps usually degraded in 7-10 years

Good reason to save intact caps

Nitric acid is very toxic by inhalation

- Fuming nitric acid
 - Red nitrogen dioxide
- Inhalation of vapors
 - Intense irritation
 - Feel better for awhile
 - Then can have depressed lung function, coma, death



Carcinogens and teratogens

- Chronic exposure can lead to cancer, birth defects and other reproductive harm

Formaldehyde

Carcinogen and teratogen (birth defects)

Readily inhaled & absorbed thru skin

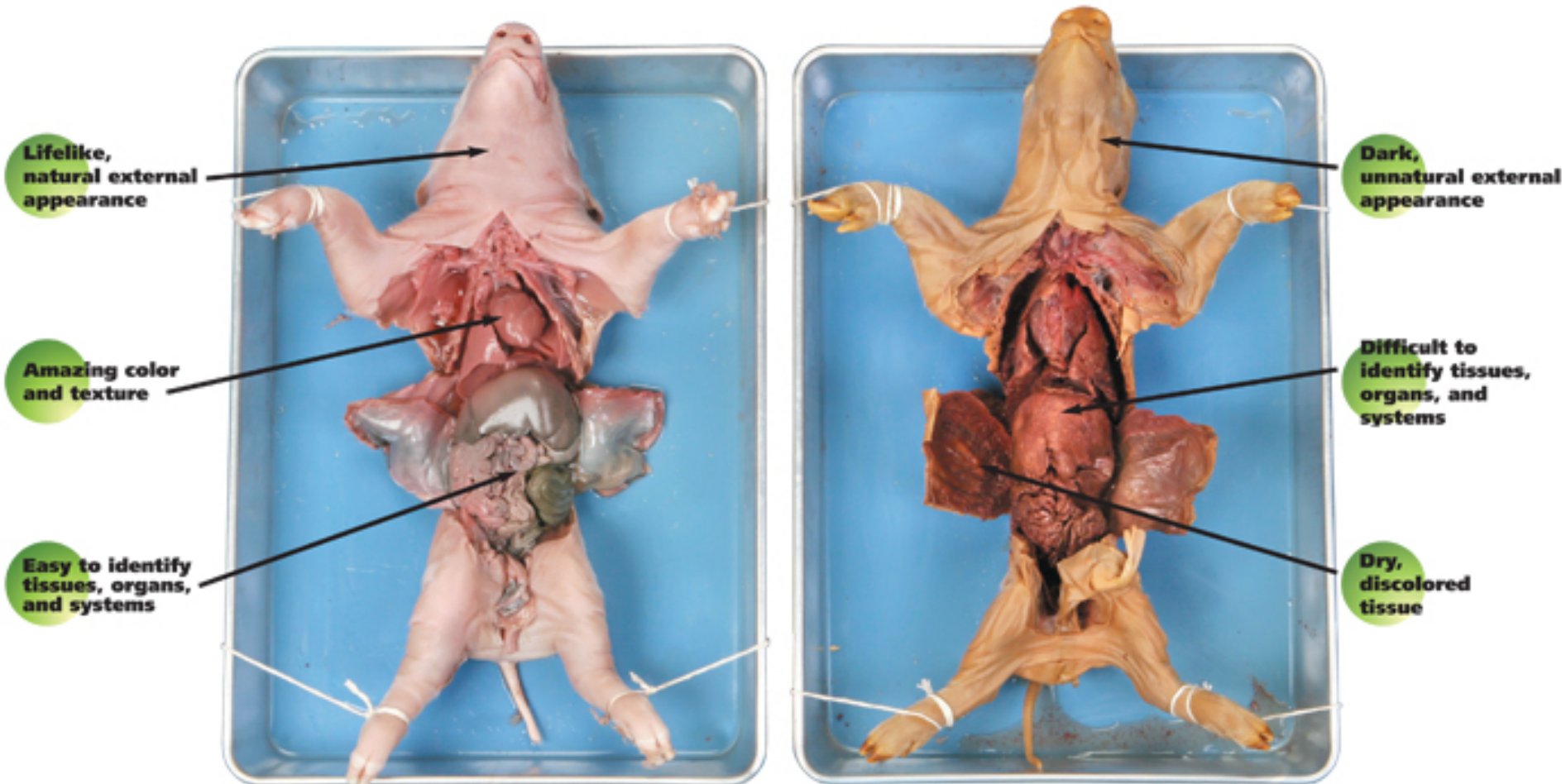
Formaldehyde exposure reduction

- Odor detection of formaldehyde is 0.8 ppm
- OSHA action level is 0.5 ppm
- Purchase formalin-free specimens
- Assume old specimens contain formalin
- Wear gloves

Which Specimen Looks More Natural to You?

Carolina's Perfect Solution® Specimen

Competitor's Specimen



Avoid powdered carcinogens

- Nickel compounds
- Cobalt compounds
- Arsenic compounds
- Cadmium compounds

Chromates & dichromates

Corrosive, oxidizing and carcinogenic

Avoid chlorinated solvents
Most are reproductive hazards

Other organic carcinogens

- Acetaldehyde
- Benzene
- Naphthalene

Highly dangerous poisons

- Cyanides
- Azides

Toxic metal compounds

- Lead compounds
- Mercury compounds

Other toxic metals

- Antimony
- Beryllium
- Cadmium
- Cobalt
- Nickel
- Selenium

Your highest risk chemical?



School chemicals database

- Inventory spreadsheet
- Prioritizes chemicals for removal
- Links chemicals to grade level
- Describes hazards & storage codes

www.schoolchemlist.org

Tips on Use

Page 5 of 1		
<u>Chemical Name</u>	<u>Physical Hazard</u>	<u>Health Hazard</u>
Cobalt Sulfate	--	Harmful if swallowed May cause allergy or asthma symptoms or breathing difficulties if inhaled May cause an allergic skin reaction May cause cancer May damage fertility or the unborn child Suspected of causing genetic defects
Congo Red	--	May cause cancer Suspected of damaging fertility or the unborn child

- Search partial words:
 - “**Canc**” gets carcinogens
 - “**Explo**” gets explosive & explodes
- Download to Excel
- Click header titles to sort by category
- Click on a name for in-depth info

Then play with it as you see fit

Hazardous Chemicals in Schools

[Home](#) >> [Resources for Schools](#) >> [Schools Chemical List](#)

--- Download --- 

explo

Search

Clear

Page 1 of 4 | View All 37 records |

<u>Chemical Name</u>	<u>Physical Hazard</u>	<u>Health Hazard</u>	<u>Environmental Hazard</u>	<u>Lowest Grade Allowed</u>	<u>Storage Category</u>	<u>Experiments Where Used</u>	<u>Disposal Method</u>
Acetal	Highly flammable liquid and vapour May form explosive peroxides	Causes serious eye irritation Causes skin irritation	--	Ban Candidate	O-3 Flam Cabinet	NONE	Dispose as hazardous waste
Acetaldehyde	Extremely flammable liquid and vapour May form explosive peroxides	Causes serious eye irritation May cause respiratory irritation Suspected of causing cancer	--	Ban Candidate	O-3 Flam Cabinet	NONE. Formerly used as: Organic substrate in organic reactions.	Highly reactive chemical - assessment required before disposal
Acetylene	Explosive with or without contact with air Extremely flammable gas	--	--	Purchase restricted to use in welding shop.	Gas - Flammable	Fuel. Calorimetry. Often created in small amounts in class for	Return to gas cylinder vendor or dispose as hazardous waste

Haz Rankings Link to Grade Levels

- Hazard Rank – **All Grades**
 - Safe for all grades
 - 26 chemicals

Hazard Rank – **Elementary Demos**

- Elementary teacher use & above
- 19 chemicals

Hazard Rank – **Middle School**

- Grade 6 and higher
- 368 chemicals

Hazard Rank – **High School**

- High school & above
- 257 chemicals

Hazard Rank –

High School w/ hygiene officer approval

- Advanced placement chemistry, international baccalaureate programs
- 114 chemicals w/ limited utility & high hazards
- Needs chemical hygiene plan & independent OK
- Suggested quantity restrictions

Ban Candidates

What's needed? **vs.** What's cool?

We used a third party to decide

- Washington Science Teachers Association
 - Decide if it is **Needed**
- School chemical suppliers
 - See if they even sell it any more



Ban Candidates

Your first priority for removal

- High hazard
- Not sold by Flinn, Carolina Bio Supply, etc
- Unnecessary per WSTA for teaching
- Already banned

Dangerous chemical mixtures

- Trouble when incompatibles meet

Keep acids away from bases

Separate nitric & acetic acids

Put glacial acetic acid in flam cabinet

Cheap way to separate nitric acid



Separate water reactives and alcohol

Troubles with bleach?

- Great disinfectant
- Not very toxic
- Many incompatibilities

Bleach mixed with ammonia =
poisonous chloramine gas

Bleach mixed with acids =
toxic chlorine gas

Sulfuric acid dehydrates other acids

Toxic gas generator

Sulfuric acid + hydrochloric acid = chlorine

Issues with metals/elements storage

Bromine is often by aluminum

- Both are elements
- May be delivered together in a box of metals

Four goals of chemical storage

- Don't store what you won't use
- Keep things from degrading
- Keep incompatibles apart
- Protect human health & environment

Keep storerooms securely locked

Common storage issues

Science lab kits

Remove acids over 1.0 molar

Remove all flammables

Keep containers closed

No chemical storage by drains

Use secondary containment

- 110% of capacity of largest bottle
- Compatible with the contents
- Clean up spills when you find them

No flammables in electrical apparatus

No food with chemicals in refrigerator

Venting of flammables cabinets is not
recommended

Excellent storage

- Locking cupboards
- Labeled with contents
- Dilute solutions in secondary containment

Use secondary containment

Holds 110% of largest container

I'm a big fan of SciMatCo cabinets

- Wood w/ plastic hinge
- Spill containment trays
- Dividers (bottom one)

Storage Pattern for Chemicals Where Space is Limited

Inorganic Reactives & Metals (I-1, I-10)

Sulfur, Phosphorus (double packaged), Arsenic, Solid Metals, Hydrides, Lithium, Sodium

Inorganic Salts (I-2)

Chlorides, Iodides, Fluorides, Bromides, Sulfates, Sulfites, Thiosulfates, Phosphates.

Inorganic Oxidizers (I-3, I-6, I-8)

Nitrates, Nitrites, Borates, Chromates, Manganates, Permanganates, Chlorates, Chlorites, Peroxides, Azides

Inorganic Corrosive Bases (O-4) (Dry Chemicals)

Dry Hydroxides, Oxides, Silicates, Carbonates, Carbon

Inorganic #5 and #7 Toxins

Arsenates, Cyanides, Sulfides, Selenides, Phosphides, Carbides, Nitrides

Corrosive Base Storage Cabinet (I-4 Liquids)

>1.0 molar Ammonium Hydroxide, Sodium Hydroxide, Calcium Hydroxide (limewater), Potassium Hydroxide, Oxides, Silicates

Organic Toxins (O-5, O-7)

Epoxy Compounds, Isocyanates, Sulfides, Polysulfides

Organic Reactives #6

Peroxides, Azides, Hydroperoxides

Flammable Storage Cabinet (O-2, O-3, O-4, O-8 & concentrated organic bases)

Alcohols, Glycols, Phenol, Hydrocarbons, Cresols, Esters, Ethers, Propionic Acid, Formic Acid, Glacial Acetic Acid, Lactic Acid

Dry and Dilute Organic Acids & Anhydrides (O-1)

Citric Acid, Anhydrides, Peracids, etc.

Miscellaneous

Household chemicals (vinegar, baking soda, vegetable oils), Dyes, Stains, Agars, Sugars, Gels

Non-metal Corrosive Acid Storage Cabinet (I-9 Liquids)

Hydrochloric Acid, Sulfuric Acid, Hydrobromic Acid, Phosphoric Acid, Perchloric Acid. Nitric acid separately stored to prevent contact. Limit Nitric Acid to a 5 year supply.

Good cupboard labeling

Storage area 7
top shelf:

Inorganic 9

acids (weak and/or powdered)
[see also area 1]

Inorganic 10

sulfur, arsenic
phosphorus (and P pentoxide)

bottom shelf:

Inorganic 6

chlorates, perchlorates, chlorites
perchloric acid, hypochlorites
peroxides (except hydrogen peroxide)
~~[see also area 10]~~ bromates

Proper refrigerator signs



Inventory control

- Tracking inventory
- Assessing comparative hazards
- Selecting safer substitutes

Chemical Inventories Are Required

Who should do the inventory?

- Person knowledgeable about school chemicals
- Risk manager or science teacher
- Contractor
- **Never a student**

Preparing to do an inventory

- Have at least one assistant
- Don appropriate personal protective gear
- Have someone check on you periodically

Items to have nearby

- Spill supplies
- Fire extinguisher handy and operative
- Telephone, eyewash and shower

Helpful tools

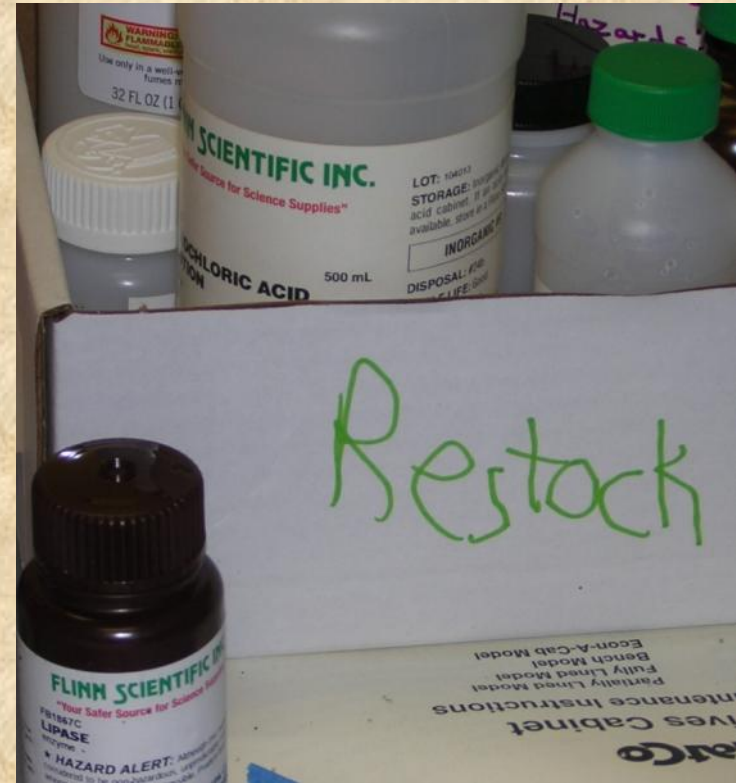
- Parafilm
- Disposable gloves
- Paper
- Slide lock bags (lg.)
- Ban candidate list

Four step process

- Find the chemicals
- Track via an inventory list
- Decide what to keep
- Prep the rest to go

Three tips for easier inventorying

- Do it electronically
- Track as full containers
- Put empty bottles in the restock box
 - If replaced, no change



How much to keep in stock?

- 5 year supply or smallest available size
- Whichever is largest

Assess your actual rate of usage

No zip code? Purchased before 1965

Initial inventory = initial inspection

- Identify unsafe situations
- Take corrective steps
- Set up long-term systems

Protect yourself during the lab inspection

- Lab coat/long-sleeve shirt
- Goggles & glasses
- Closed-toed shoes
- Gloves
- Camera
- Partner
- Well rested senses

Start by evaluating the room

- Safety equipment functional?
- Ventilation in place?
- Odd or harsh odors?
- Itchy eyes?
- Do staff have concerns?

Labels

- Name matches MSDS
- Primary hazard

Hazardous waste disposal

What is waste?

- Don't want it
- Can't use it
- Unknown
- Orphaned
- Spilled

What's “hazardous” mean?

Defined by Federal and State Regulations

- Resource Conservation & Recover Act (CFR 40)
- Search “*state name* hazardous waste regulations”
- Characteristics
 - Hazardous qualities
- Designation
 - Listed chemicals or processes

What's **not** hazardous waste?

- Something someone else can use
- Something you can still use
- Empty container residues

Empty container exemptions

For almost all chemical wastes

- Emptied using all normal means, **and**
- Contains less than 3% of container capacity

Basic regulatory requirements

- Know what it is
 - Can't dispose of unknowns
- Handle & store it safely
- Dispose or recycle it properly
- Document everything in writing

Non hazardous materials can go in
dumpster or down the sewer drain

- Risk rating of All Grades in database
- Saves you lots of money

Some non-hazardous wastes

- Sugar
- Starch
- CarosafeTM
- Water
- Vinegar
- Plaster of Paris
- Epsom salts
- pH paper

Hazardous chemicals must be disposed as hazardous waste

- Most schools are conditionally exempt small quantity generators
 - Under 220 pounds of hazardous waste per month
 - Under 2.2 pounds of P-Listed waste per month
- P-listed waste must be discarded products
 - www.safety.vanderbilt.edu/waste/p-listed-wastes.php
- School chemicals list has common P-listed chemicals in schools www.schoolchemlist.org

Thinning the unnecessary

- Is it being used?
- Dispose of useless chemicals
- Remove ban candidates first

Set aside chemicals for later disposal
Isolate them on existing shelves
One sides goes, other stays

You can box your waste in advance

Or wait and let the contractor do it

Then have them drum & remove them

Separate unlike wastes

Don't drive with chemicals in the cab

Much better under a pickup canopy

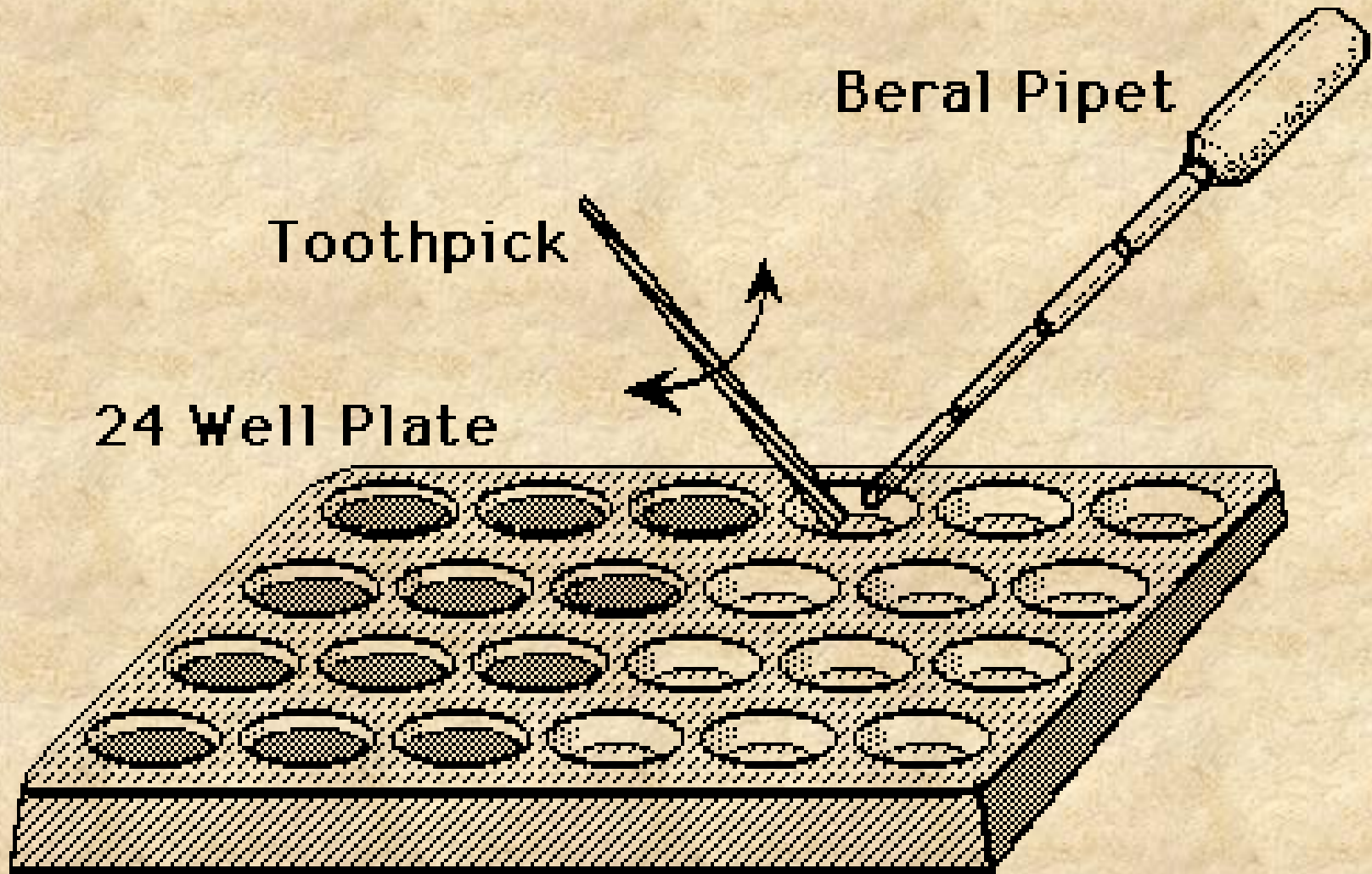
If a waste is not generated, it...

- Won't need to be handled, recycled or disposed
- Won't impact human health or the environment
- Isn't regulated
- Can't come back to haunt you

If it's useful, it's not waste

- Only true if you don't have to modify it first

Reduce the scale of experiments



Small scale chemistry is plastic-based

National Small-Scale Chemistry Center



Colorado State University
Dept. of Chemistry
CSMATE



- What is Small Scale Chemistry?
- Why Small Scale Chemistry?
- Benefits of Small Scale Chemistry
- How to use Small Scale Chemistry
- Small Scale Chemistry Equipment

"The molecule is the medium and the message."
Dr. Stephen Thompson



Hot Topics

Exciting New way to bring Small-Scale Chemistry even closer to the Point of Learning

The advent of the Tablet PC opens an exciting new world of possibilities for small-scale science experimentation. A new 20 minute video previews just a small sample of the benefits of conducting science experiments **directly on** the screen of a pen-based Tablet PC.

[Watch Now](#)
(requires QuickTime)

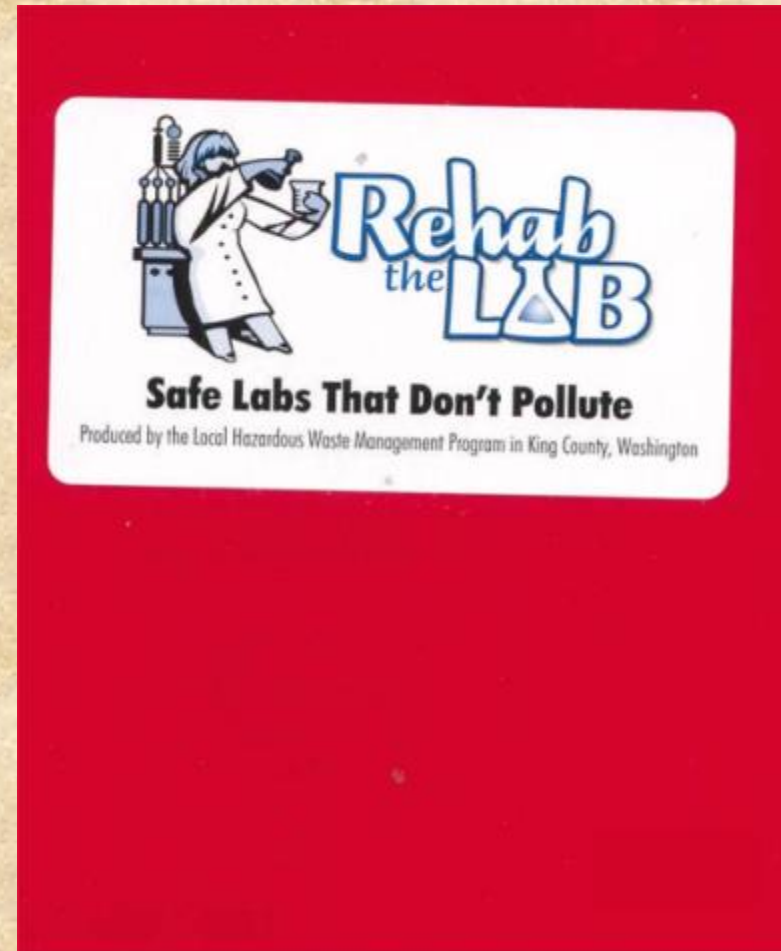
Resources

— Publication Information	— Regional Centers
— Videos	— Sample Experiments
— Video Order (Free)	— Join our E-Mail List
— Feedback	— Ask Dr. Stephen Thompson
— CHEMTREK Lab Manual	— Frequently Asked Questions
— Powerful Pictures	— Resources
— Labtop	— Dr. Thompson's Blog

Reduce the concentration

Less hazardous labs & safety videos

- 10 teacher and student labs provided
- Authored by high school science teacher
- This and others are on your flash drive



Small Scale Chemistry Exercise

Addressing Unsafe Situations

Put Parafilm over glass stoppers

<http://www.youtube.com/watch?v=X2mB-q2NQXY>

Chemical fume hoods

Don't block the flow

One night limit on chemical storage

Test fume hood flow rate with
anemometer or velometer

Mark 100 fpm laminar flow sash height

Determining Whether to Pass a Hood

These conditions must all be met:

1. Average face velocity with sash open 18 inches must be at least 100 fpm.
2. Average face velocity with sash open six inches can't exceed 300 fpm.
3. Smoke can not come out of the hood when the sash height is at 18 inches.

Emergency gas shutoff

- Don't block
- Post sign prominently

Eye and skin flushing stations

- OSHA requires eye washes and safety showers where corrosive chemicals are used
- It doesn't specify performance standards
- ANSI standard Z358.1-1990 does
- Must be within 10 seconds of corrosives

Hands-free, tepid

Safety showers

- 20 gallons/minute for 15 minutes
- Access in 10 seconds
- Eye wash
 - Test weekly
- Showers
 - Test every six months
 - Consider a privacy curtain

Metal acid cabinets look nice

\$1,300 worth of rust in 7 years



08:39 / 12:16

School Laboratory Chemical Spill Control

FlinnScientific · 762 videos

1,501

<http://www.youtube.com/watch?v=ZiLbImUYk3I&feature=youtu.be>

Should we care about spill lips?

- I think they're over-rated & rarely done right
- Cupboards with doors, windows & latches are better

Cap eaters

- Nitric acid
- Liquid hydroxides
- Compromised containers spill when tipped

A note on Iodine

- Among most common “spilled” chemicals
- Crystal to fumes directly
- Fumes degrade cap
- Look for brown labels
- Store in a Ziploc bag



Minor Spills

Can you answer YES to these 4 questions?

— If so, it may be safe to clean up the spill

- Do you know what chemical was spilled?
- Do you know the hazards of the chemical?
- Do you have a chemical spill kit?
- Can you protect yourself from the hazards?

Creating an Integrated Safety Plan

The Laboratory Safety Standard

- Designate a chemical hygiene officer
- Write and implement an effective site-specific chemical hygiene plan
- Provide worker training and guidelines
- We'll revisit this later today in greater detail

Chemical hygiene plan components

- Safe work practices
- Methods to keep exposures below limits
- Training, medical consultation, hazard ID, respirator use and record keeping
- Task and chemical specific training

Administrative Controls

- Clean and organized work spaces
- Inventory control, less hazardous substitutes
- Safety equipment & supplies provided
- Safety training for staff
- Safe handling, disposal, decon procedures

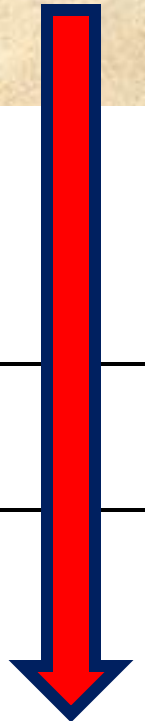
Show responsibilities on checklist

Science Laboratory Audit Checklist

School _____ Room _____

Inspector _____ Date _____

1. _____ **Two nearest fire alarms** – clear of obstructions
2. _____ **Tri-class fire extinguisher** – **done by Buildings and Grounds**
 - In date – door unlocked– sized properly
3. _____ **Fire blanket** – **done by Buildings and Grounds**
 - If inside cabinet, outside door posted. 100% wool
4. _____ **Chemical spill kit** – Fully stocked



Safety equipment & supplies

- Eye protection
- Hearing protection
- Skin protection
 - Clothing
 - Gloves
 - Shoes

I commonly use
disposable nitrile gloves

Things to look for in glove charts

- Breakthrough time
- Permeation rate

Goggles or glasses?

Hazardous liquids require goggles

NSTA guidelines for eye protection

www.nsta.org/portals/safety/eyeprotection.aspx

NSTA Portals

Safety in the Science Classroom

Eye Protection for Your Laboratory

What is your obligation?

An important obligation of science teachers is to provide students with appropriate eye protection. All safety goggles and glasses must comply with ANSI Z 87.1 – 2003. Only safety goggles and/or glasses marked with "Z 87.1" should be purchased; the "Z 87.1" mark will appear on the frame or the lens. As a responsible teacher, you must select eyewear that provides you and your students with the most appropriate protection for the hazards of your science activities. Many states have specific eye protection laws. Regardless, teachers owe their students a duty of care. A teacher must reasonably address all foreseeable dangers inherent in any laboratory experiment or demonstration that will be performed in the science laboratory or classroom. A teacher must also instruct and ensure that students demonstrate the proper use of protective equipment.

Use plastic coated bottles

- Contains liquids
- Reduces fragility

Acid carriers are good safety tools

Move items via lab carts

Using the hygiene plan template

- The chemical hygiene plan on the flash drive is a template for you to adapt to your school
- Must be site-specific for chemicals of concern, layout, emergency contacts, responsibilities

Chemical exposures to address in plan

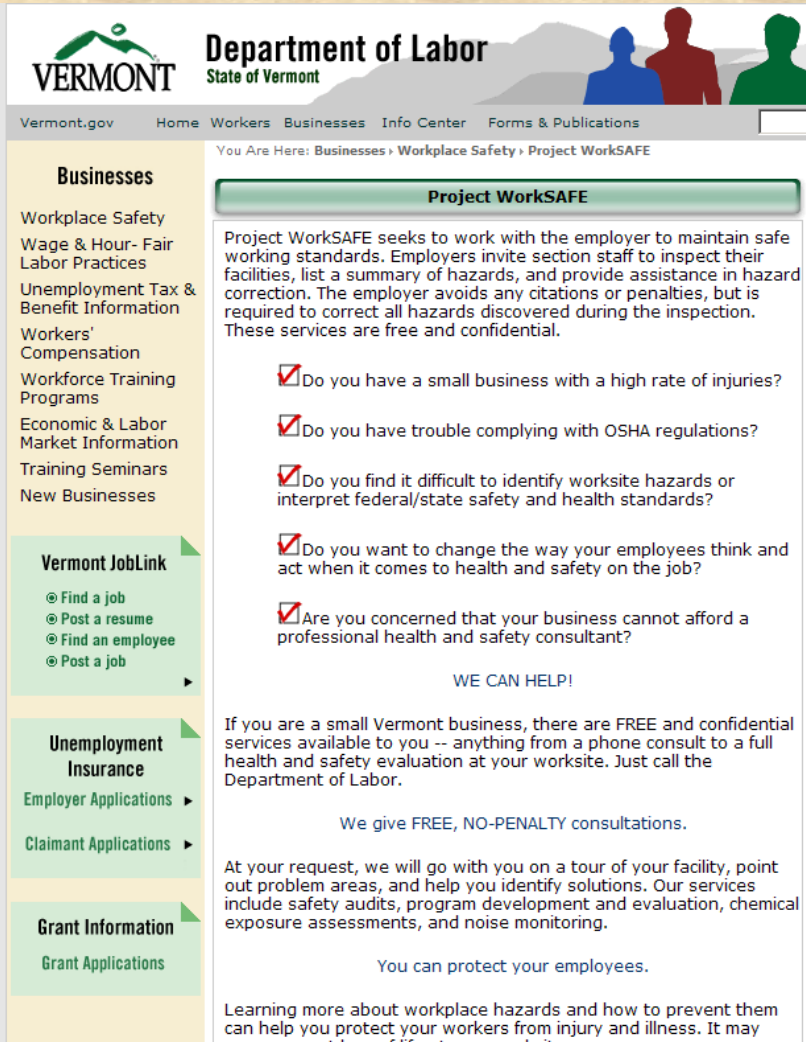
- Acids
- Formaldehyde
- Lead
- Hexavalent chromium
- Mercury
- Metal dusts & fumes
- Volatile solvents

Exercise: Inspecting a Science Stockroom

Overview of Environmental, Health & Safety Laws and Regulations



Getting Assistance



VERMONT Department of Labor
State of Vermont

Vermont.gov Home Workers Businesses Info Center Forms & Publications

You Are Here: Businesses > Workplace Safety > Project WorkSAFE

Businesses

- Workplace Safety
- Wage & Hour- Fair Labor Practices
- Unemployment Tax & Benefit Information
- Workers' Compensation
- Workforce Training Programs
- Economic & Labor Market Information
- Training Seminars
- New Businesses

Vermont JobLink

- Find a job
- Post a resume
- Find an employee
- Post a job

Unemployment Insurance

- Employer Applications
- Claimant Applications

Grant Information

- Grant Applications

Project WorkSAFE

Project WorkSAFE seeks to work with the employer to maintain safe working standards. Employers invite section staff to inspect their facilities, list a summary of hazards, and provide assistance in hazard correction. The employer avoids any citations or penalties, but is required to correct all hazards discovered during the inspection. These services are free and confidential.

- ☒ Do you have a small business with a high rate of injuries?
- ☒ Do you have trouble complying with OSHA regulations?
- ☒ Do you find it difficult to identify worksite hazards or interpret federal/state safety and health standards?
- ☒ Do you want to change the way your employees think and act when it comes to health and safety on the job?
- ☒ Are you concerned that your business cannot afford a professional health and safety consultant?

WE CAN HELP!

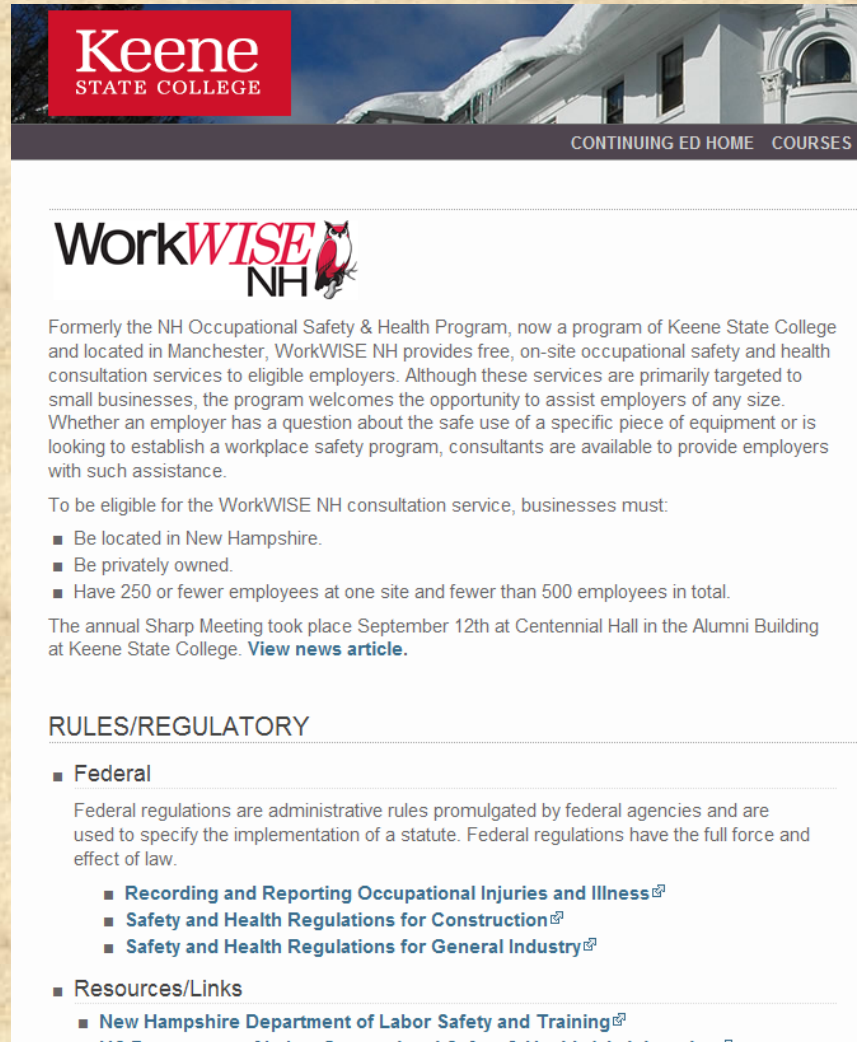
If you are a small Vermont business, there are FREE and confidential services available to you -- anything from a phone consult to a full health and safety evaluation at your worksite. Just call the Department of Labor.

We give FREE, NO-PENALTY consultations.

At your request, we will go with you on a tour of your facility, point out problem areas, and help you identify solutions. Our services include safety audits, program development and evaluation, chemical exposure assessments, and noise monitoring.

You can protect your employees.

Learning more about workplace hazards and how to prevent them can help you protect your workers from injury and illness. It may even prevent loss of life at your workplace.



Keene
STATE COLLEGE

CONTINUING ED HOME COURSES

WorkWISE NH

Formerly the NH Occupational Safety & Health Program, now a program of Keene State College and located in Manchester, WorkWISE NH provides free, on-site occupational safety and health consultation services to eligible employers. Although these services are primarily targeted to small businesses, the program welcomes the opportunity to assist employers of any size. Whether an employer has a question about the safe use of a specific piece of equipment or is looking to establish a workplace safety program, consultants are available to provide employers with such assistance.

To be eligible for the WorkWISE NH consultation service, businesses must:

- Be located in New Hampshire.
- Be privately owned.
- Have 250 or fewer employees at one site and fewer than 500 employees in total.

The annual Sharp Meeting took place September 12th at Centennial Hall in the Alumni Building at Keene State College. [View news article.](#)

RULES/REGULATORY

- Federal**

Federal regulations are administrative rules promulgated by federal agencies and are used to specify the implementation of a statute. Federal regulations have the full force and effect of law.

 - [Recording and Reporting Occupational Injuries and Illness](#)
 - [Safety and Health Regulations for Construction](#)
 - [Safety and Health Regulations for General Industry](#)
- Resources/Links**
 - [New Hampshire Department of Labor Safety and Training](#)
 - [US Department of Labor Occupational Safety & Health Administration](#)