N.C. Department of Labor
OSH Division

- ***Laboratory Safety and Health***
  29 CFR 1910.1450

NCDOL
N.C. Department of Labor

Frankenstein's Lab, SIC 8731…

Course Objectives

29 CFR 1910.1450

- Provide overview of the “Occupational exposure to hazardous chemicals in laboratories” (a.k.a. “The Lab Standard”)
- Enable CSHO to correctly cite lab standard by:
  - Defining laboratory use
  - Identifying the types of laboratories covered by the standard
  - Identifying exceptions (when to cite the other health standards in Subpart Z or the lab standard)
- Know what to look for in a lab by understanding the employer’s Chemical Hygiene Plan.
- Identify other “shall’s” of the lab standard

NCDOL
N.C. Department of Labor

Objective 1

Correctly Cite the Lab Standard

29 CFR 1910.1450(a)(1)

- **Scope and application**
  - This section shall apply to all employers engaged in the **laboratory use** of hazardous chemicals.

NCDOL
N.C. Department of Labor

Scope and Application

29 CFR 1910.1450(a)

- **Exceptions to citing the lab standard**

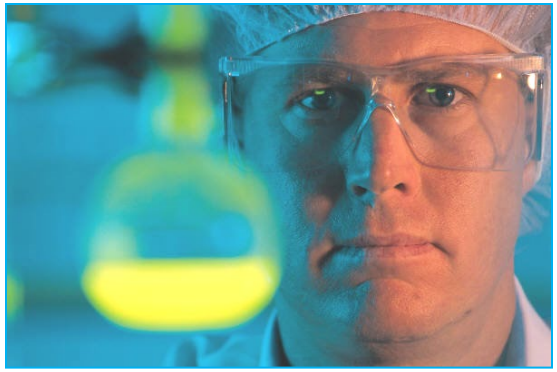
- Supersedes all OSHA health standards in 29CFR 1910, Subpart Z, ***except***:
  - Employee exposure shall not exceed PEL's already set by other standards
  - Prohibition of skin and eye contact set by other standards shall be observed
  - Where an action level is routinely exceeded for an OSHA regulated substance, the exposure monitoring and m surveillance requirements paragraphs (d) and (g)(1)(i this section shall apply.

NCDOL
N.C. Department of Labor

Scope and Application

29 CFR 1910.1450(a)

- Does not apply to:
  - Use of hazardous chemicals which do not meet the definition of laboratory use
  - Lab use of hazardous chemicals having no potential for exposure, such as:
    - Chemically-impregnated test media
    - Commercially prepared kits such as those used to perform pregnancy testing



NCDOL
N.C. Department of Labor

Definitions

29 CFR 1910.1450(b)

- **Laboratory use**
  - Handling or use of such chemicals in which ALL the following conditions are met:
    - » Chemical manipulations are carried out on a “laboratory scale”
    - » Multiple chemical procedures or chemicals are used
    - » The procedures involved are NOT part of a production process
    - » “Protective laboratory practices and equipment” are available and in common use

NCDOL
N.C. Department of Labor

Definitions

29 CFR 1910.1450(b)

- **Laboratory scale**
  - Containers used for reactions, transfers, and other handling of substances are designed to be *easily and safely manipulated by one person.*

(Excludes those workplaces whose function is to *produce commercial quantities of materials*.)

Definitions

29 CFR 1910.1450(b)

- **Laboratory**
  - A facility where the "*laboratory use* of hazardous chemicals" occurs.
  - It is a workplace where *relatively small quantities* of hazardous chemicals are used on a *non-production basis.*

Definitions

29 CFR 1910.1450(b)

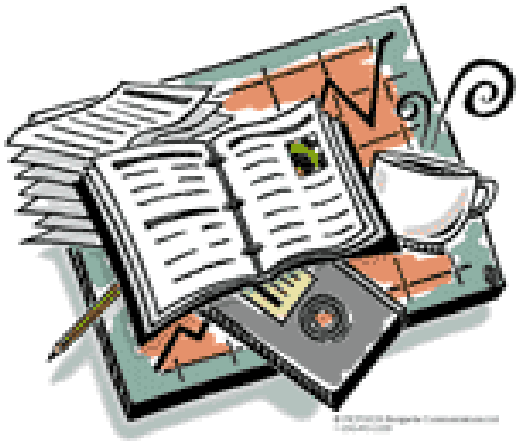
- **Chemical hygiene officer**
  - Employee designated by employer that has the training or experience to provide technical guidance in the development and implementation of the Chemical Hygiene Plan.
    - » Definition not intended to place limitations on the position description or job classification that the designated individual holds within the employer's organizational structure.

NCDOL
N.C. Department of Labor

Definitions

29 CFR 1910.1450(b)

- **Chemical hygiene plan**
  - Written program developed and implemented that sets forth procedures, equipment, personal protective equipment and work practices that protect employees from health hazards presented by hazardous chemicals used in the workplace



NCDOL
N.C. Department of Labor

Definitions

29 CFR 1910.1450(b)

- **Hazardous chemical**
  - Chemical that has statistically significant evidence that acute or chronic health effects may occur in exposed employees.
  - “Health hazard" includes carcinogens, toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, those that damage the lungs, skin, eyes, or mucous membranes.

NCDOL
N.C. Department of Labor

When are employees covered?

- At least one employee doing analysis
- Laboratory use
- At least one chemical
- Must be a potential for employee exposure
  - Examples of conditions of no exposure
    - » Dip and read tests
    - » Commercially prepared kits

NCDOL
N.C. Department of Labor

The Formaldehyde Exception

- The use of formaldehyde in **histology, pathology and anatomy labs** will remain under the formaldehyde standard, as directed by that standard.

- All other uses of formaldehyde will be covered by the lab standard.
  - Found in the Federal Register, Vol. 55, No. 21 Supplementary Information, Summary of Issues and Explanations of Provisions of the Final Standard, Paragraph (a) Scope and Application, Preemption by Other OSHA Health Standards.

NCDOL
N.C. Department of Labor

Does the lab standard apply?

Wastewater Lab
Yes

QC Lab
No

Does the lab standard apply?

R & D
Yes

Physical Testing Lab
No

Does the lab standard apply?

Computer Lab
No

NASA Bio-Technology Lab
Yes

Does the lab standard apply?

Physical Testing Lab
No

Clandestine Lab
Yes

Does the lab standard apply?

Medical Research
Yes

Clandestine Methamphetamine Lab
Yes

NCDOL
N.C. Department of Labor

Does the lab standard apply?

Physician's Clinic Lab
No? Maybe Yes

Water Treatment Labs
No

NCDOL
N.C. Department of Labor

Does the lab standard apply?

NC Regional Response HazMat Team 4 (RRT 4)

Yes!

NCDOL
N.C. Department of Labor

Does the lab standard apply?

NCDOL
N.C. Department of Labor

PELs

29 CFR 1910.1450(c)

- For laboratory uses of OSHA regulated substances, the employer shall assure the employees' exposures to such substances do not exceed the permissible exposure limits specified in **29 CFR 1910**, **Subpart Z**.

NCDOL
N.C. Department of Labor

Employee Exposure Determination 29 CFR 1910.1450(d)

- **Initial monitoring**
  - Employer *shall* measure exposure for *any chemical with a standard* if there is reason to believe that exposure exceed, routinely, the action level or PEL

- **Periodic monitoring**
  - If the initial monitoring show exposure over the action level or PEL, the employer shall comply with monitoring requirements of the relevant standard

NCDOL
N.C. Department of Labor

Employee Exposure Determination 29 CFR 1910.1450(d)

- **Termination of monitoring**
  - Per the applicable standard

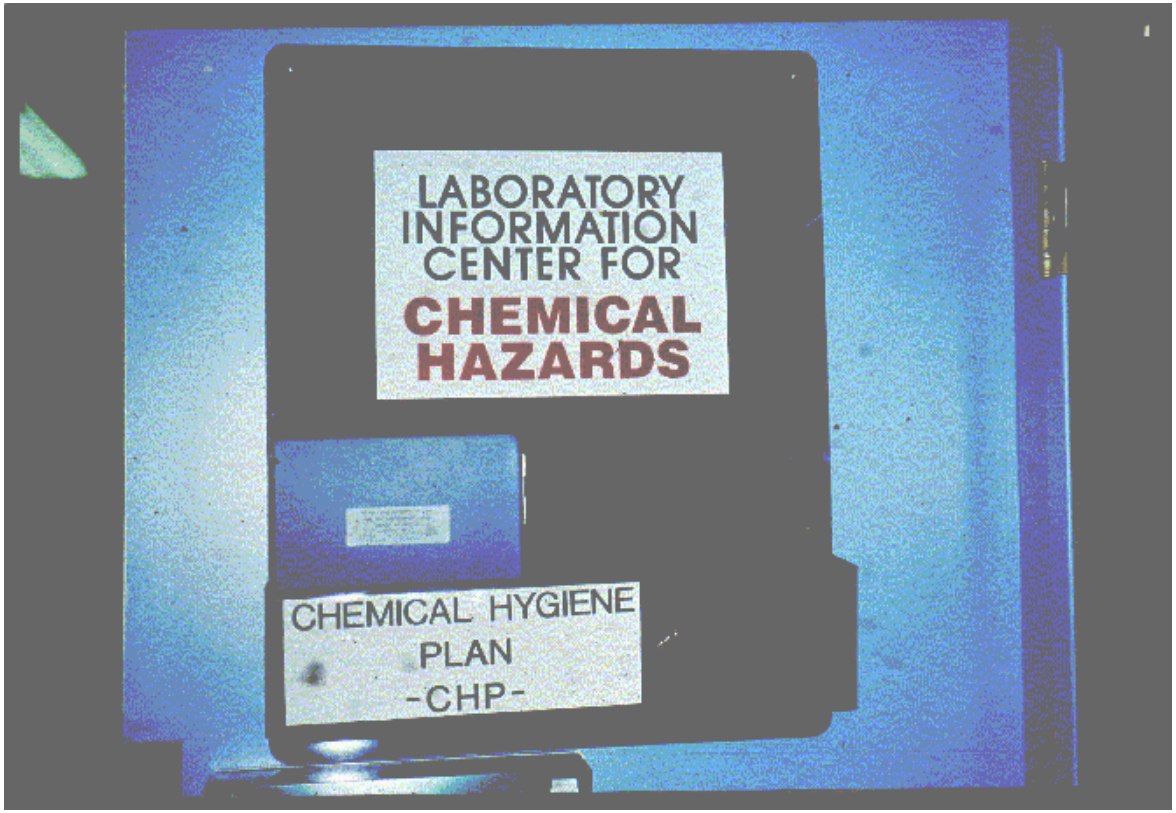
- **Employee notification of monitoring**
  - Within 15 working days of getting results, notify employees in writing individually or by posting in appropriate, accessible location

NCDOL
N.C. Department of Labor

Objective 2

Chemical Hygiene Plan

29 CFR 1910.1450(e)

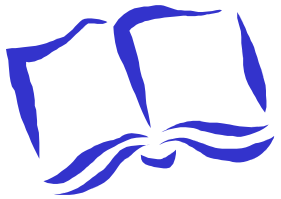


Chemical Hygiene Plan 29 CFR 1910.1450(e)(1)-(2)

- The employer shall develop and carry out provisions of a plan where hazardous chemicals are used in the workplace to:
  - Protect employees from health hazards, ***and***
  - Keep exposures below PELs

- The Plan must be readily accessible to employees and others as defined

Please note: Non-mandatory Appendix A of the Lab Standard 1910.1450 provides guidance to assist employers in plan development.



NCDOL
N.C. Department of Labor

Chemical Hygiene Plan 29 CFR 1910.1450(e)(3)(i)

- The plan **shall** include the following elements and and **shall** indicate specific measures to ensure employee protection:
  - Standard Operating Procedures (SOPs) , Safe Work Practices (SWPs), or Standard Operating Guidelines (SOGs)
    - » Developed to ensure employees are protected from all potentially hazardous chemicals in use in their work area

NCSU's Chemistry Department

Chemical explosion

NCDOL
N.C. Department of Labor

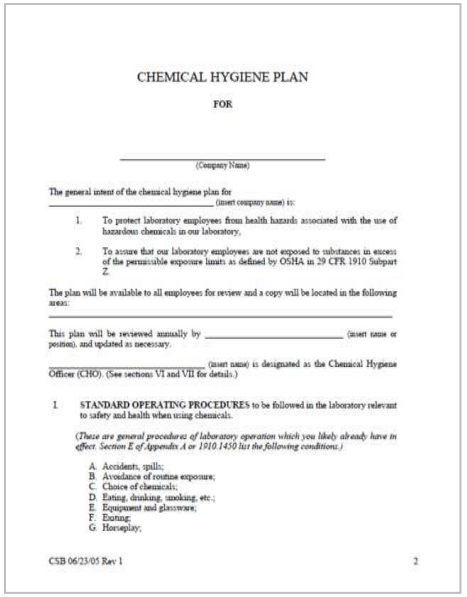
SOP's = Chemical Explosion

NCDOL
N.C. Department of Labor

Chemical Explosion

How can the employer ensure safety and health through SOPs?

- The employer must write in the SOP/SWP what the procedure is, how to perform the procedure (what materials are needed), what reagents are used, what reactions will take place, (all from a safety perspective)
  - What PPE is required
  - How to order the chemical
  - How to store and dispose of the chemicals



CHEMICAL HYGIENE PLAN

FOR

_____
(Company Name)

The general intent of the chemical hygiene plan for _____ (insert company name) is:

1. To protect laboratory employees from health hazards associated with the use of hazardous chemicals in our laboratory,
2. To assure that our laboratory employees are not exposed to substances in excess of the permissible exposure limits as defined by OSHA in 29 CFR 1910 Subpart Z.

The plan will be available to all employees for review and a copy will be located in the following areas:

_____

This plan will be reviewed annually by _____ (insert name or position), and updated as necessary.

_____ (insert name) is designated as the Chemical Hygiene Officer (CHO). (See sections VI and VII for details.)

I. **STANDARD OPERATING PROCEDURES** to be followed in the laboratory relevant to safety and health when using chemicals.

(These are general procedures of laboratory operation which you likely already have in effect. Section E of Appendix A or 1910.1450 list the following conditions.)

A. Accidents, spills;
B. Avoidance of routine exposure;
C. Choice of chemicals;
D. Eating, drinking, smoking, etc.;
E. Equipment and glassware;
F. Exiting;
G. Horseplay;

CSB 06/23/05 Rev 1 2

NCDOL
N.C. Department of Labor

Chemical Hygiene Plan
Control Measures

29 CFR 1910.1450(e)(3)(ii)

- Criteria that will be used to determine and implement control measures to reduce employee exposure to hazardous chemicals including:
  - Engineering controls
  - PPE and hygiene practices
  - Control measures for chemicals that are known to be extremely hazardous

NCDOL
N.C. Department of Labor

Chemical Hygiene Plan
Control Measures

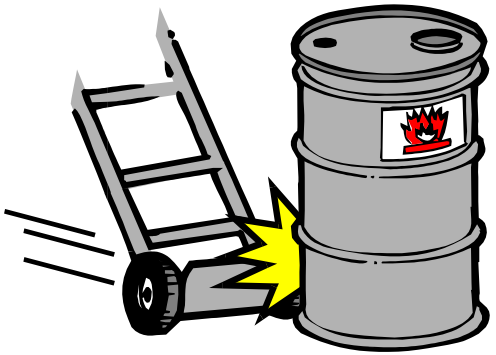
29 CFR 1910.1450(e)(3)(ii)

- Criteria that will be used to determine and implement control measures to reduce employee exposure to hazardous chemicals including:
  - Engineering controls
  - PPE and hygiene practices
  - Control measures for chemicals that are known to be extremely hazardous

NCDOL
N.C. Department of Labor

Examples of Engineering Controls

- How often are fume hoods inspected?
- Who certifies the hoods?
- What if the hood doesn't pass inspection?
- Are there BSC's (biological safety cabinets)?
- Eyewash and safety shower inspections?
- Fire extinguisher inspections?
- Chemical stockrooms/ storerooms?
- Ventilated storage cabinets?
- Power failure controls?



- What happens to the exhausted air from BSC's, isolation rooms, stockrooms, etc?….

NCDOL
N.C. Department of Labor

Examples of Engineering Controls

- Laboratory ventilation
  - Facility's heating and air conditioning system
  - Fume hoods (are NOT biological safety cabinets!!)
- Transport of chemicals
- Flammable storage
- Sharps use?

NCDOL
N.C. Department of Labor

Engineering Controls
Laboratory Ventilation

- Types of laboratory hoods
  - Enclosure hoods
    - » Exhaust hoods with HEPA filters (ex. For use with asbestos)
    - » Perchloric acid hoods
    - » Walk-in hoods
- Capturing type hoods
  - Slot vents
- Flex ducts
- Glove box

Engineering Controls
Laboratory Ventilation

Good Flow

Bad Flow

Engineering Controls
Laboratory Ventilation

- **Perchloric acid hoods**
  - Constructed of stainless steel
  - Have water rinse-down (wash-down) capabilities plumbed into them to remove perchloric acid or perchlorates from the duct work.
  - Exhaust passes through a water-scrubber on the roof to remove acid vapors

NCDOL
N.C. Department of Labor

Engineering Controls

Transport of Chemicals

Move with a cart

Move without a cart

Engineering Controls
Transport of Chemicals

Transport in hallways, etc.

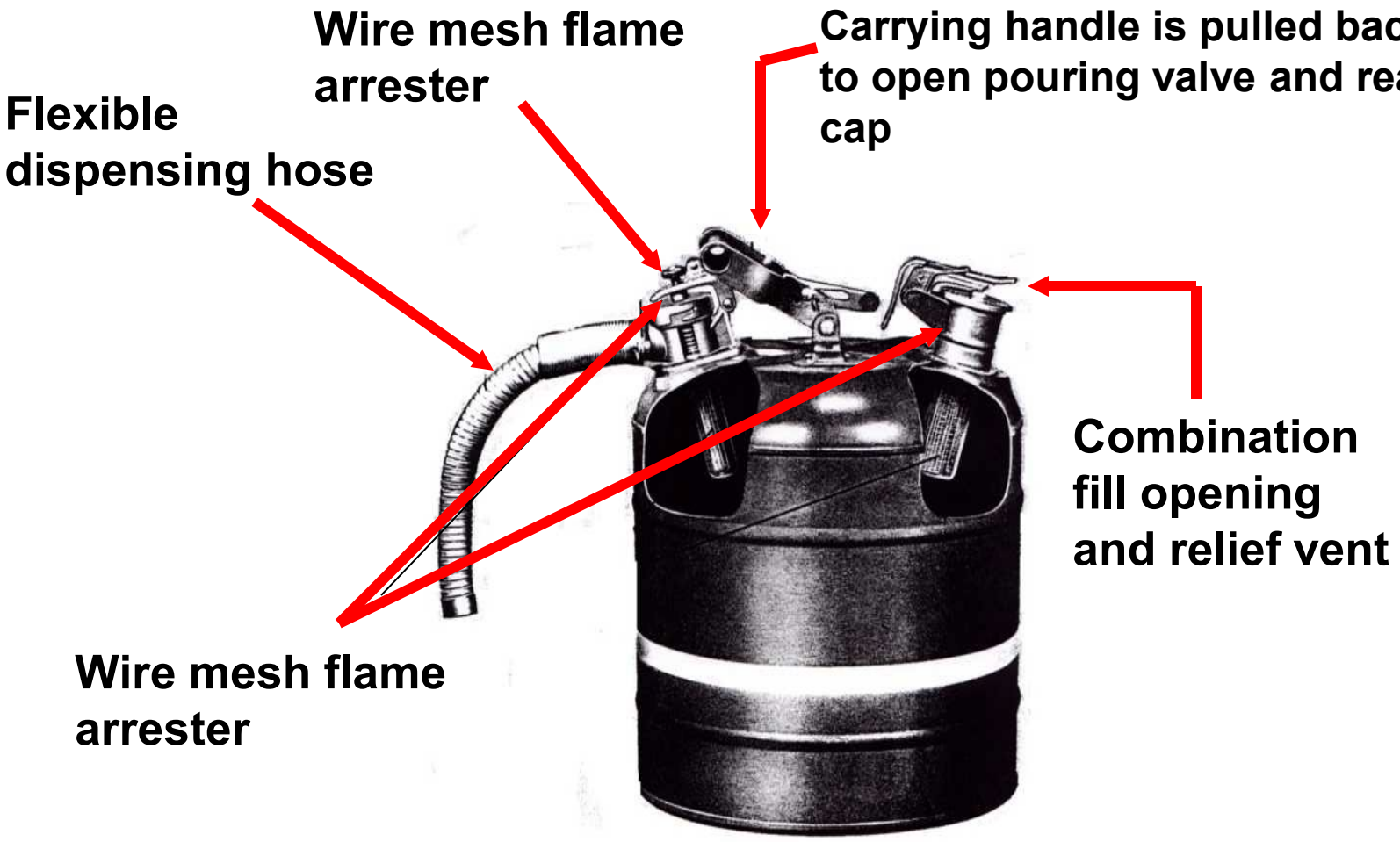
NCDOL
N.C. Department of Labor

Engineering Controls
Flammable Storage

NCDOL
N.C. Department of Labor

Engineering Controls
Flammable Storage

Engineering Controls
Flammable Storage

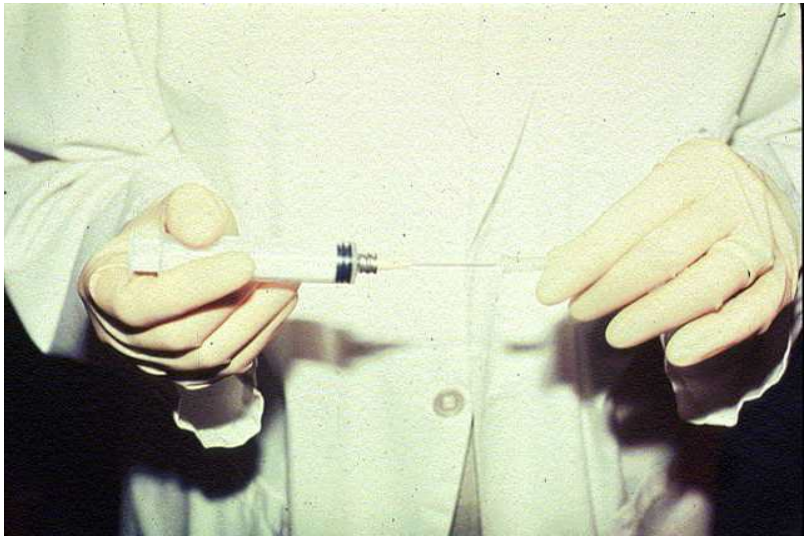


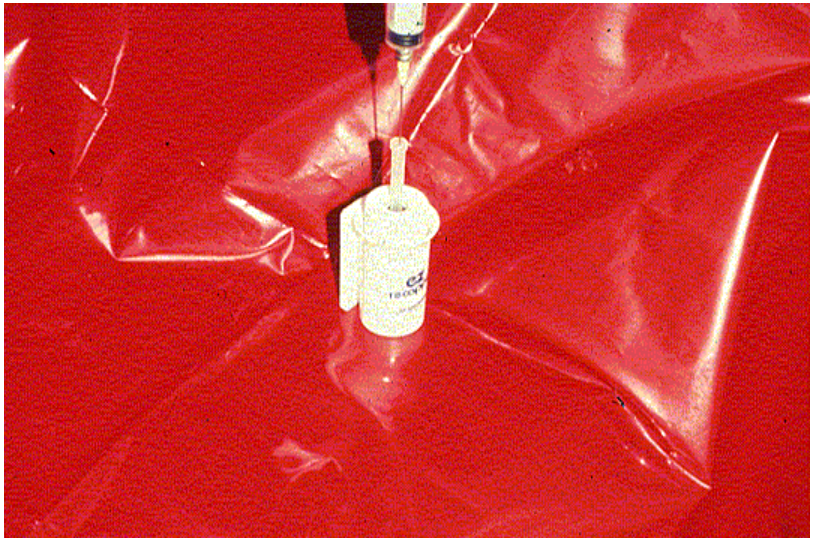
Engineering Controls
Flammable Storage

Flammable/explosion proof refrigerators

Engineering Controls

Sharps Use



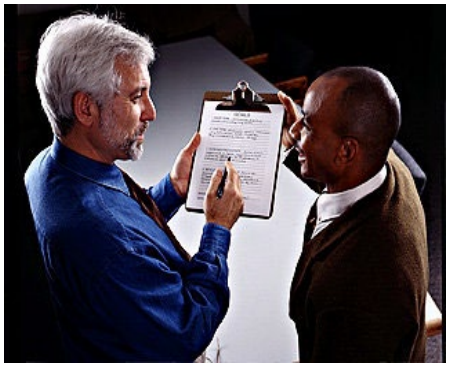


NCDOL
N.C. Department of Labor

Chemical Hygiene Plan
Control Measures

29 CFR 1910.1450(e)(3)(ii)

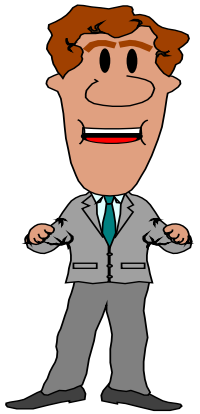
- Criteria that will be used to determine and implement control measures to reduce employee exposure to hazardous chemicals including:
  - Engineering controls
  - PPE and hygiene practices
  - Control measures for chemicals that are known to be extremely hazardous



NCDOL
N.C. Department of Labor

PPE and Hygiene Practices

- What is the employer's position on providing PPE at no cost?
- What are the employer's requirements for PPE?
  - **What** PPE is required (eye protection, hand protection, etc.)?
  - What **type** of PPE (goggles vs. face shield, nitrile vs. butyl gloves, etc.)?
  - **Where** is it required?
  - **When** is it required?
- Contamination and laundering considerations



NCDOL
N.C. Department of Labor

PPE and Hygiene Practices

- **PPE**
  - Hand protection
  - Eye/face protection
  - Skin protection
  - Foot protection
- **Hygiene**
  - Wash hands
  - Never eat, drink, … in lab

NCDOL
N.C. Department of Labor

Why we need the right glove…

Dartmouth Researcher

Karen Wetterhahn
1948-1997

PPE
Hand Protection

- **What material is best in glove selection?**
  - Low permeation rate
  - High breakthrough time

The amount of a chemical (steady state flow or highest flow) which is passed through a given area of glove material per unit time (mg/m2/sec)

The elapsed time from initial contact of the chemical to the outside of the glove to the first detection of the chemical on the inside glove surface

NCDOL
N.C. Department of Labor

PPE
Hand Protection

- **Keep in mind…**
  - Temperature need greater protection
  - Double glove = quadruple duration of protection
  - Solubility of chemical in the glove material
- **Remember…**
  - No “impermeable glove”
  - No one glove material works for all chemicals
  - For certain chemicals, no glove available which will provide > 1 hour protection

NCDOL
N.C. Department of Labor

PPE
Hand Protection

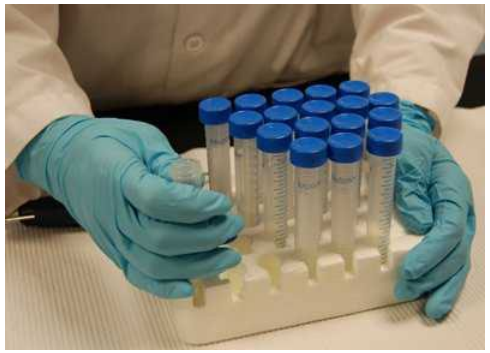
- What other factors are important?
  - Resistance to physical damage
  - Flexibility
  - Heat resistance
  - Incompatibilities

NCDOL
N.C. Department of Labor

PPE

Hand Protection

- Resources for glove selection
  - Glove manufacturer
  - MSDS's
  - "Prudent Practices in the Laboratory"



- Web sites

www.bestglove.com

www.superiorglove.com/product.review/index.htm

http://www.ansellpro.com/specware/index.asp

NCDOL
N.C. Department of Labor

PPE
Eye and Face Protection

- Various types of eye protection in order of increasing effectiveness:
  - Ordinary spectacles
  - Safety glasses with side shields
  - Protective goggles
  - Face shields
  - Head shields, which protect all of the head and throat
- What is the company's policy on contact lenses?

NCDOL
N.C. Department of Labor

PPE

Skin Protection

ATTENTION

Lab coats must be worn when working at benches

NCDOL
N.C. Department of Labor

PPE

Foot Protection

Hygiene Practices

NCDOL
N.C. Department of Labor

Hygiene Practices

Ingestion

Contamination

NCDOL
N.C. Department of Labor

Chemical Hygiene Plan
Control Measures

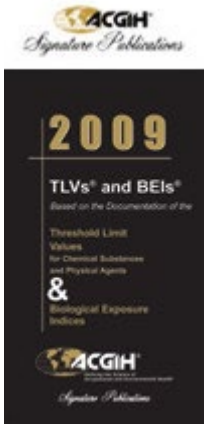
29 CFR 1910.1450(e)(3)(ii)

- Criteria that will be used to determine and implement control measures to reduce employee exposure to hazardous chemicals including:
  - Engineering controls,
  - PPE and hygiene practices,
  - Control measures for chemicals that are known to be extremely hazardous

NCDOL
N.C. Department of Labor

Extremely Hazardous Chemicals

- What is an extremely hazardous chemical?
  - Resources for finding what is an extremely hazardous chemical:
    - » ACGIH TLVs, NIOSH, etc.
    - » Genium “Right to Know Pocket Guide for Laboratory Employees”
    - » Van Nostrand & Reinhold “ Condensed Chemical Dictionary”



National Institute for Occupational Safety and Health
NIOSH

NCDOL
N.C. Department of Labor

Extremely Hazardous Chemicals

- What are the specific **control measures** in place for these chemicals?
  - Chemical procurement
  - Safe handling practices
  - Description of PPE
  - Air monitoring
  - Emergency eyewash/shower facilities
  - Working alone

NCDOL
N.C. Department of Labor

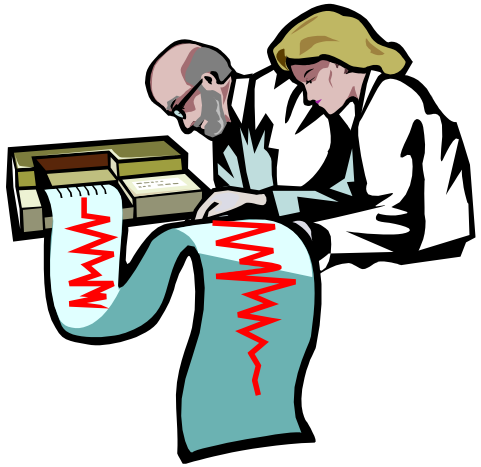
Chemical Hygiene Plan

29 CFR 1910.1450(e)(3)(iii)

Fume Hoods/Other Protective Equipment

- Specific measures to ensure that fume hoods and other protective equipment are functioning properly and are maintained

- How often do you test / inspect to verify flow rate and other parameters?



NCDOL
N.C. Department of Labor

Chemical Hygiene Plan

Information and Training

29 CFR 1910.1450(e)(3)(iv)

- Provisions for employee information and training refer to paragraph (f) of the lab standard
- **For example:**
  - When will training be provided?
  - Who will provide the training?
  - How will the training be implemented (format)?
  - What will the training include?

NCDOL
N.C. Department of Labor

Chemical Hygiene Plan

Prior Approval

29 CFR 1910.1450(e)(3)(v)

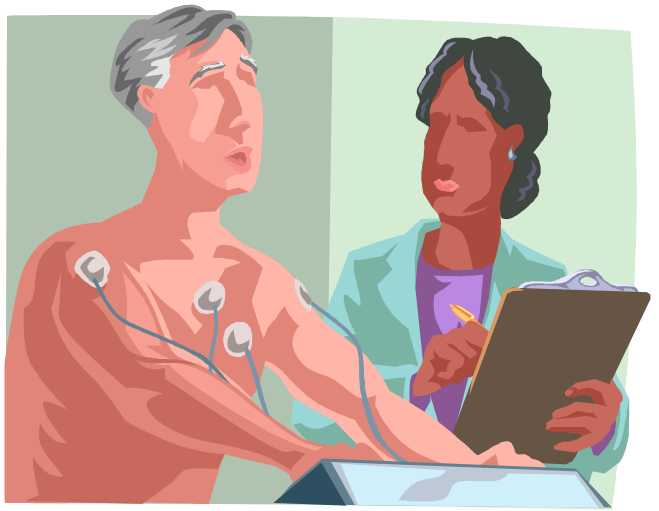
- Circumstances under which a particular lab operation, procedure, or activity requires prior approval from the employer
- Describe when a particular laboratory operation requires prior approval
  - Non-routine tasks that may introduce additional hazards into the workplace?
  - New methods, analysis?

NCDOL
N.C. Department of Labor

Chemical Hygiene Plan
Medical Consultation

29 CFR 1910.1450(e)(3)(vi)

- Provisions for medical consultation and medical examinations in accordance with paragraph (g) of the lab standard
  - Each employee entitled, Why/for what reasons?
  - At no cost
  - Without loss of pay
  - At a reasonable time and place
  - Where? When? Who?



NCDOL
N.C. Department of Labor

Chemical Hygiene Plan

Chemical Hygiene Officer

29 CFR 1910.1450(e)(3)(vii)

- Designate who is responsible to implement plan
  - May use a committee
    - » A Chemical Hygiene Officer must be qualified by training or experience, ***and***
    - » To provide technical guidance in the development and implementation of the provisions of the CHP.

NCDOL
N.C. Department of Labor

Chemical Hygiene Plan 29 CFR 1910.1450(e)(3)(viii)

Particularly Hazardous Substances

- Provisions for additional employee protection for “select carcinogens”, reproductive toxins, and substances with a high degree of acute toxicity.
  - Establish designated area
  - Use of containment devices
  - Disposal/removal of waste
  - Decontamination procedures

Note: This section with (e)(3)(ii) regarding extremely hazardous substances, and (e)(3)(iv) regarding prior approval may all be combined in the CHP.

NCDOL
N.C. Department of Labor

Chemical Hygiene Plan

Review

29 CFR 1910.1450(e)(4)

- Review **AND** evaluate the effectiveness of the Chemical Hygiene Plan at least **annually** and update as necessary

Objective 3
Information and Training

29 CFR 1910.1450(f)

- **Purpose**
  - To ensure employees are apprised of the hazards of chemicals in their work area

- **When**
  - Initial assignment
  - Prior to assignments involving new exposure situations
  - Frequency of refresher training TBD by the employer

NCDOL
N.C. Department of Labor

Employee Information

29 CFR 1910.1450(f)(3)

- Contents of standard and appendices; shall be made available
- Location and availability of Chemical Hygiene Plan
- The **PELs or RELs** (NIOSH) for substances with no OSHA PEL

Informed of What?

NCDOL
N.C. Department of Labor

Employee Information

29 CFR 1910.1450(f)(3)(iv)-(v)

- **Signs and symptoms** associated with exposures to chemicals used in the laboratory
- Location and availability of **reference materials** on hazards, safe handling, storage and disposal, **BUT not limited to MSDSs!!**

NCDOL
N.C. Department of Labor

Employee Training

29 CFR 1910.1450(f)(4)

- Methods and observations to **detect presence or release** of hazardous chemical
- BOTH **physical** and **health** hazards of chemicals used
- **Methods to protect** from hazards inc. specific procedures, work practice, emergency procedures, and PPE

Training shall include WHAT?

NCDOL
N.C. Department of Labor

Employee Training

29 CFR 1910.1450(f)(4)(ii)

- The **applicable details** of the employer's written **chemical hygiene plan**, which includes:
  - Standard operating procedures
  - Prior approval protocols, and procedures for handling select carcinogens, reproductive toxins, and substances with a high degree of acute toxicity (particularly hazardous substances).

Medical Consultation and Medical Examinations

29 CFR 1910.1450(g)(1)

- All employees must be provided with an opportunity to receive medical attention, including any follow-up examinations, under the following circumstances:

Medical Consultation and Medical Examinations

29 CFR 1910.1450(g)(1)(i)-(ii)

- An employee **develops signs or symptoms** associated with chemical

- **Exposure monitoring reveals** an *exposure level routinely above* the AL or PEL
  - For an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements
  - Follow the procedure as prescribed by the particular standard

NCDOL
N.C. Department of Labor

Medical Consultation and Medical Examinations

29 CFR 1910.1450(g)(1)(iii)

- Whenever **an event** such as a spill, leak, explosion, or other occurrence **resulting in exposure**

Also when...

Medical Consultation and Medical Examinations

29 CFR 1910.1450(g)(3)(i)-(iii)

- Identity of chemical
- Description of conditions (inc. quantitative exposure data, if available)
- Description of signs and symptoms

Information provided to the physician

NCDOL
N.C. Department of Labor

Medical Consultation and Medical Examinations

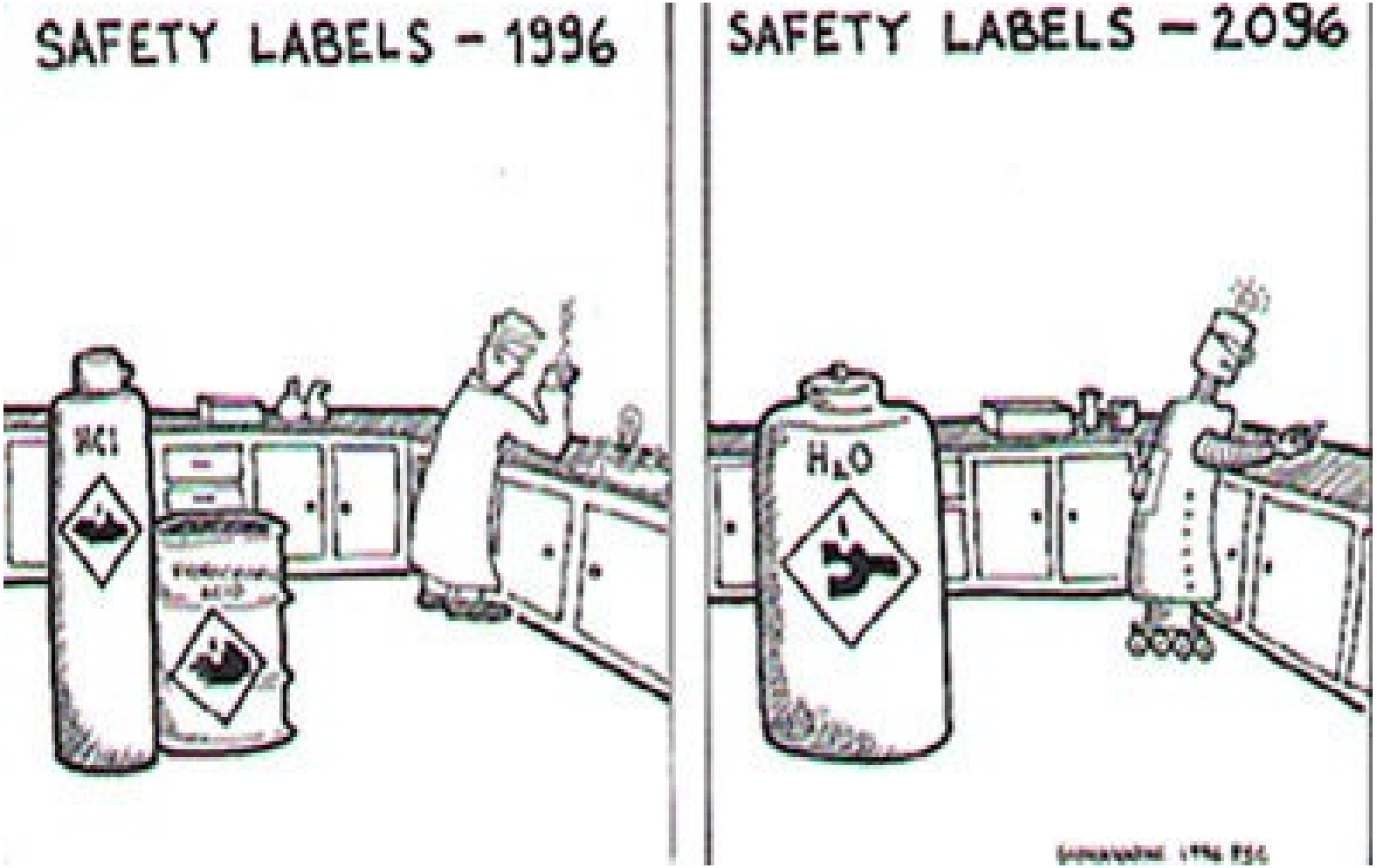
29 CFR 1910.1450(g)(4)(i)-(ii)

- Physician's written opinion shall include:
  - Any recommendation for medical follow-up
  - Results of exams/tests
  - Any **medical condition** revealed that may **increase risk** as result of exposure to chemical
  - A statement that the employee has been notified of findings
  - Shall ***NOT*** reveal any specific findings unrelated to occupational exposure

NCDOL
N.C. Department of Labor

Hazard Identification

29 CFR 1910.1450(h)



Hazard Identification

29 CFR 1910.1450(h)(1)

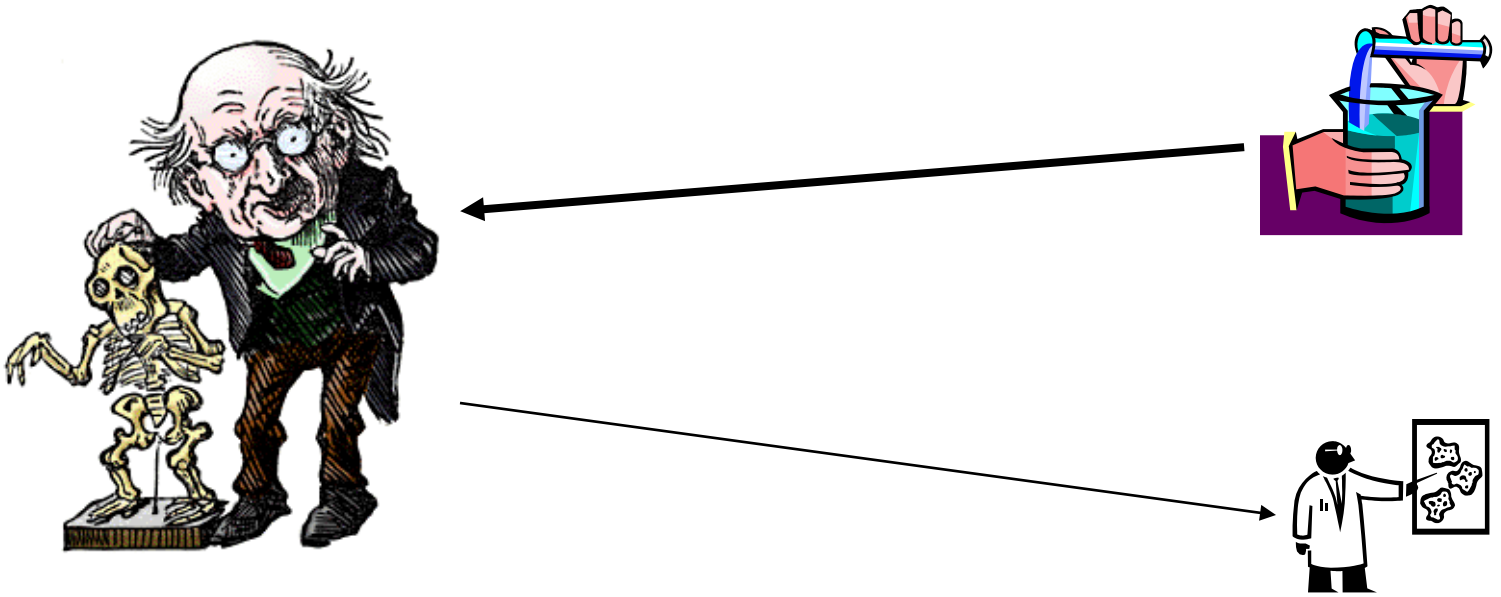
- With respect to labels and MSDSs
  - Employers shall ensure that labels on **incoming** containers are **not removed or defaced**
  - Employers shall maintain any MSDSs received on **incoming** chemicals and ensure that they are readily accessible

NCDOL
N.C. Department of Labor

Hazard Identification

29 CFR 1910.1450(h)(2)(i)

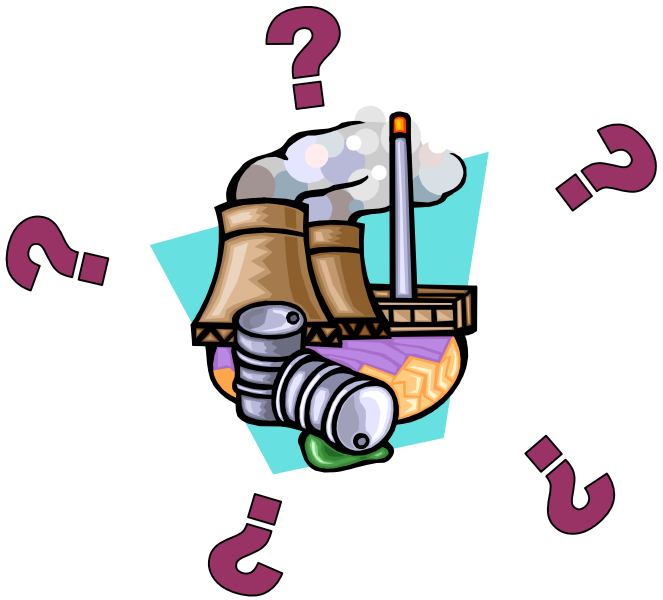
- For chemicals developed in the lab
  - If chemical is produced exclusively for the lab's use, and the composition is known, the employer shall provide appropriate training as required by paragraph (f)



Hazard Identification

29 CFR 1910.1450(h)(2)(ii)

- For chemical developed in the lab
  - Chemical produced is a byproduct whose composition is not known, assume hazardous, and implement paragraph (e) (Chemical Hygiene Plan)



Hazard Identification

29 CFR 1910.1450(h)(2)(iii)

- For chemical developed in the lab
  - If chemical is produced for another user **outside** of the laboratory, the employer shall comply with the Haz Com standard (1910.1200), including the preparation of MSDSs and labeling

NCDOL
N.C. Department of Labor

Use of Respirators

29 CFR 1910.1450(i)

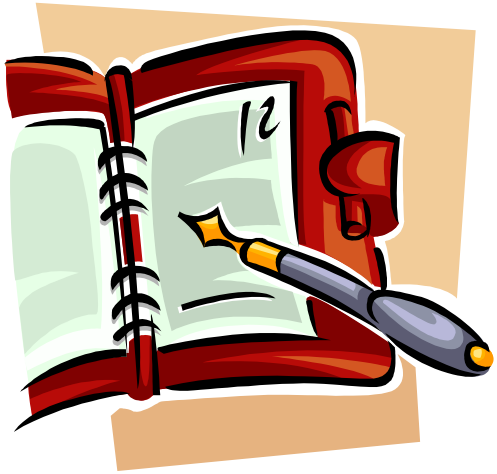
- Where the use of respirators is necessary to maintain exposures below the PELs, the employer must **comply with** the requirements in the **respiratory protection standard, 29 CFR 1910.134**

NCDOL
N.C. Department of Labor

Recordkeeping

29 CFR 1910.1450(j)(1)-(2)

- The employer shall establish and maintain an accurate record of any exposure monitoring **and** medical consultation/ examination
- Employer shall ensure records are kept per 1910.1020
- Employment plus 30 years



What else do we look for, and Why?

NCDOL
N.C. Department of Labor

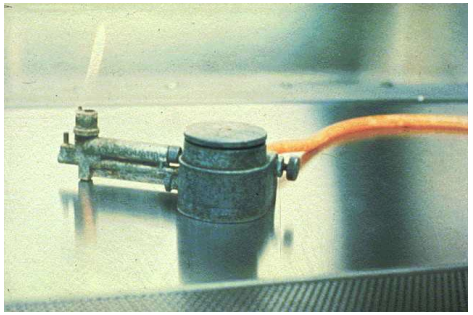
What else do we look for, and Why?

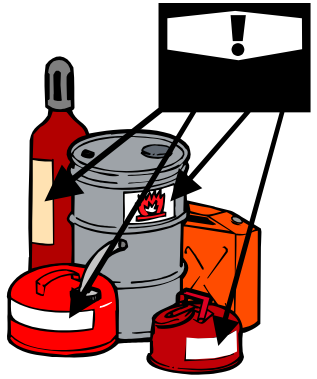
- Please ask for additional information, if interested.
- I only included a few extra slides due to the limited time of the presentation.

NCDOL
N.C. Department of Labor

General Handling and Storage of Flammable Chemicals

- Never heat with an open flame
- Do not expose to sources of ignition (electric motors, bunsen burner flames, etc)
- All containers must be labeled
- Beware of static electricity…

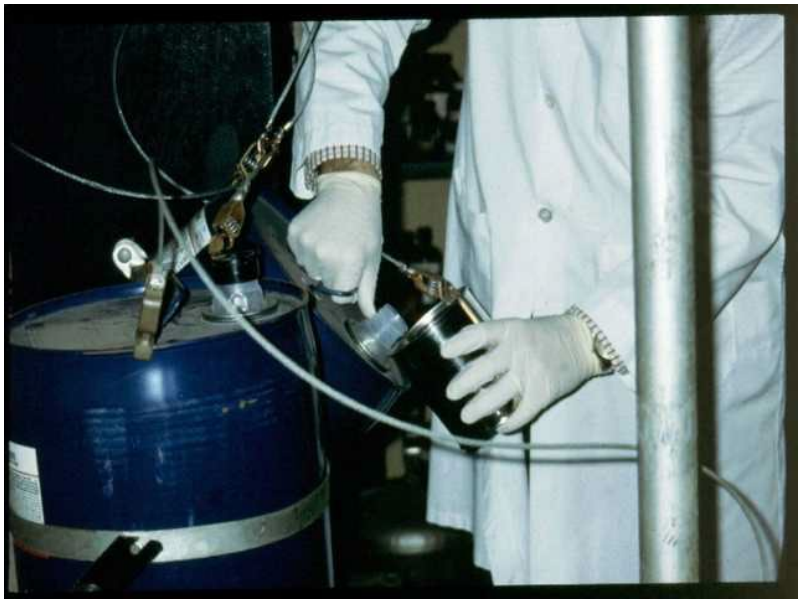




NCDOL
N.C. Department of Labor

General Handling and Storage of Flammable Chemicals

- When dispensing flammable liquids (metal to metal), the dispensing container and safety can must be well grounded and bonded



NCDOL
N.C. Department of Labor

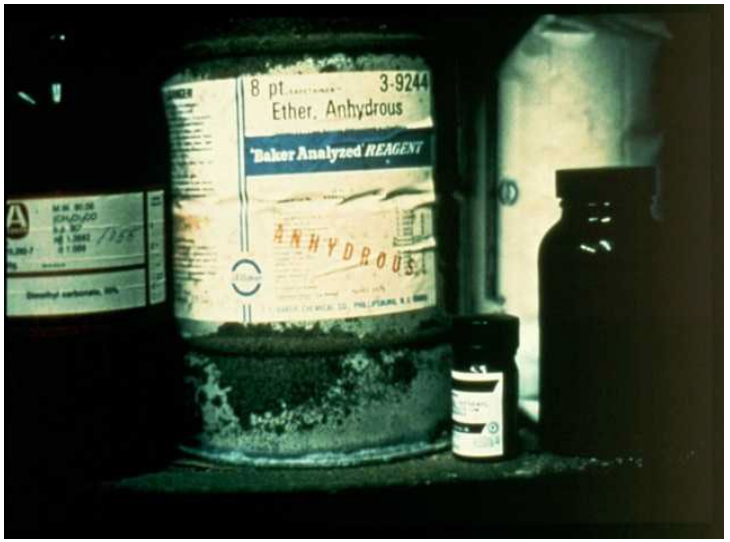
Specific Hazards of Organic Peroxides

- **Explosive chemicals**
  - Some types of peroxides can be handled with relative safety, an insidious and treacherous hazard concerning peroxides is their formation from certain classes of compounds **AFTER exposure to air**
    - » **Examples:**
      - 1,4-dioxane, ethyl ether, isopropyl ether, THF, tetralin, cylcohexane, decalin

NCDOL
N.C. Department of Labor

Specific Hazards of Ethers…

- **Explosive chemicals**
  - Ethyl Ether preferably stored in metal cans
    - » Inhibited grades can be used longer - no more than 6 months
    - » Pure, non-inhibited - dispose w/in a few weeks of exposure to air

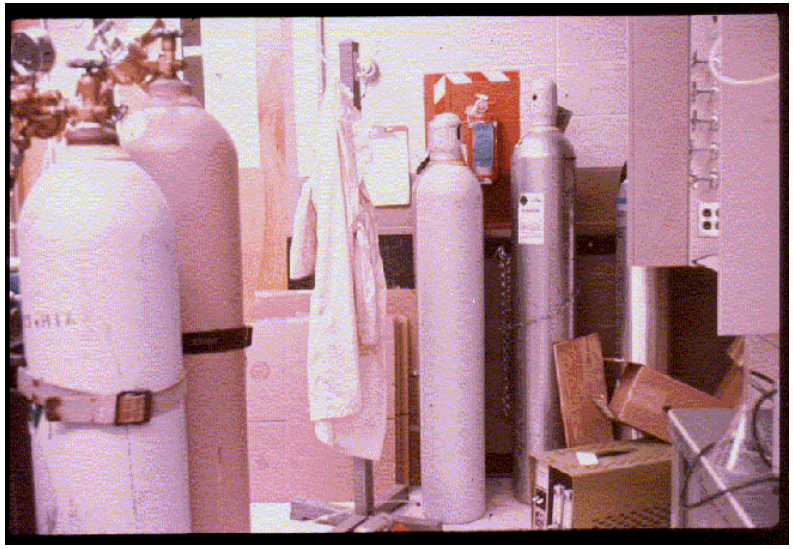


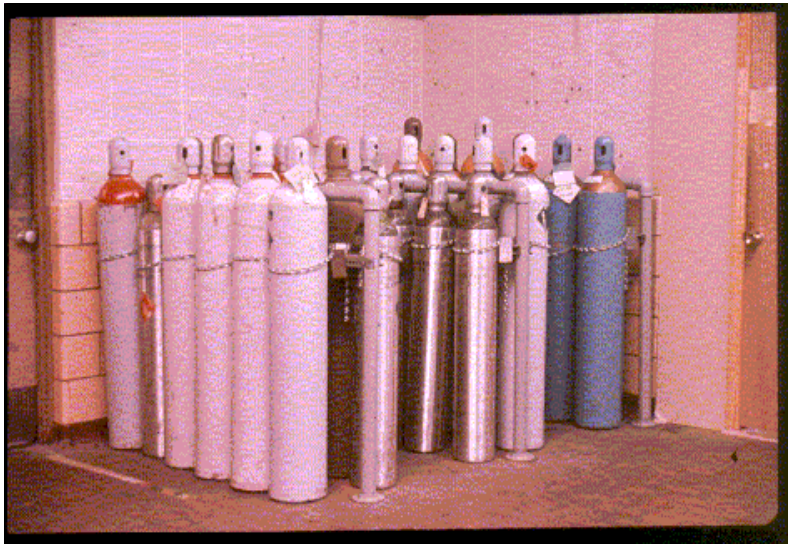
NCDOL
N.C. Department of Labor

Other Hazards: Compressed Gases

- Protective caps should be kept on cylinders when not in use

- Secured by straps, chains, or stand (more than halfway up the cylinder)

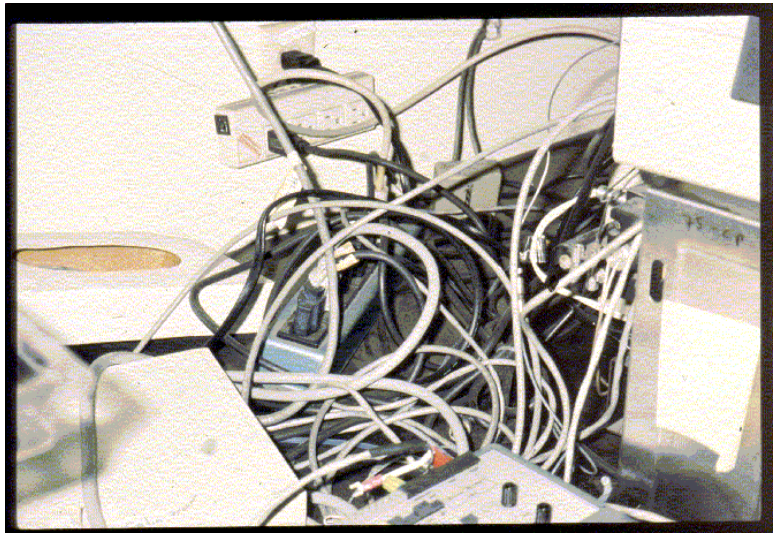




NCDOL
N.C. Department of Labor

Other Hazards: Electrical Safety

- Grounding
- Protect from static electricity
- High voltage equipment caged or completely insulated

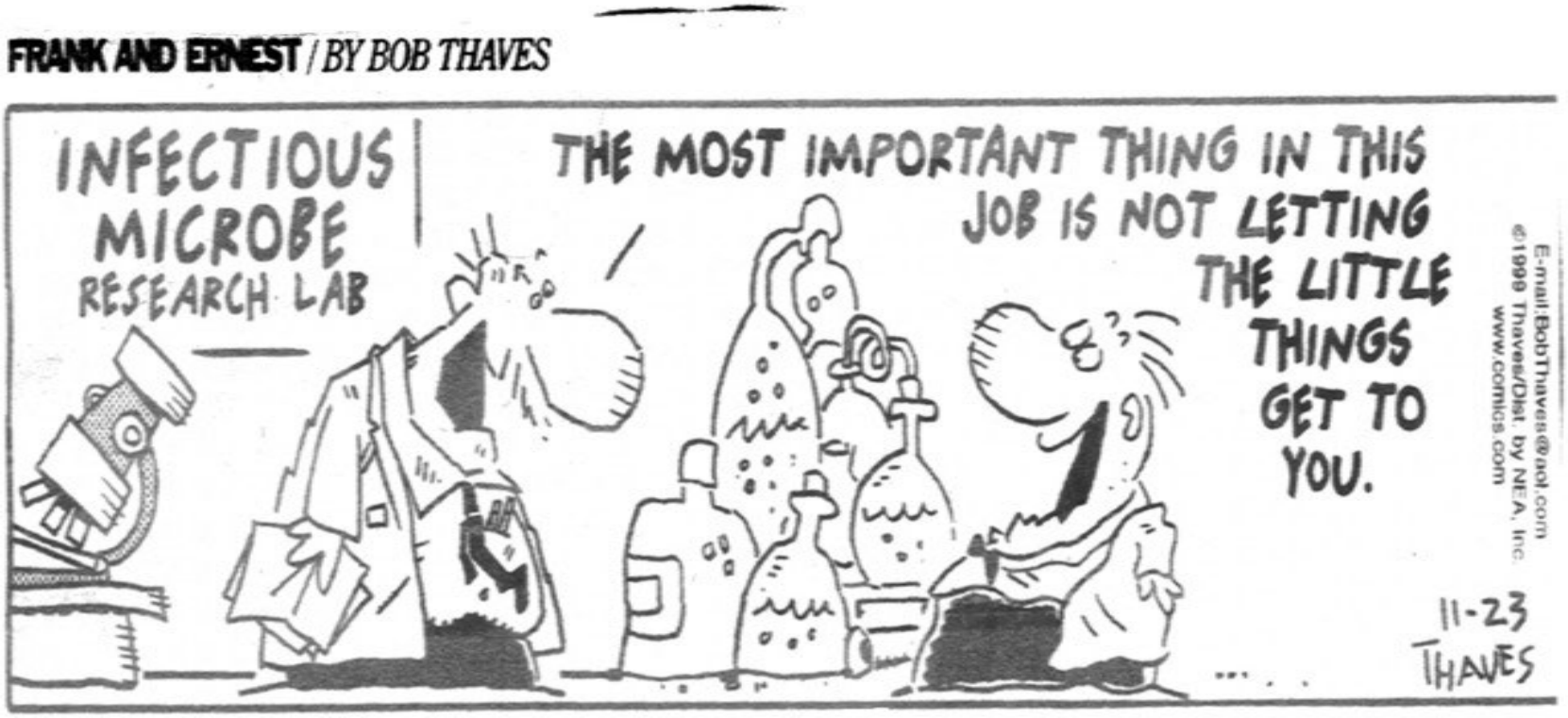


NCDOL
N.C. Department of Labor

Other Hazards: Radiation Safety and Lasers

NCDOL
N.C. Department of Labor

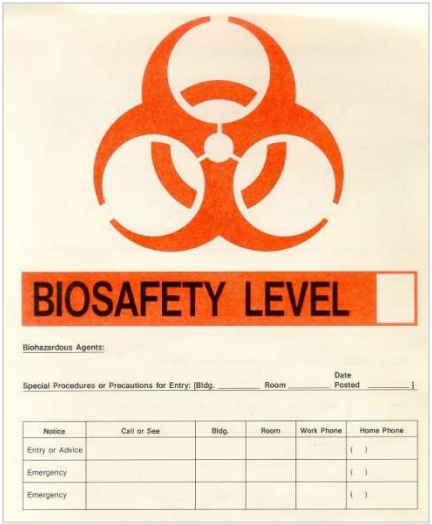
Other Hazards: Biological Safety



NCDOL
N.C. Department of Labor

Other Hazards: Biological Safety

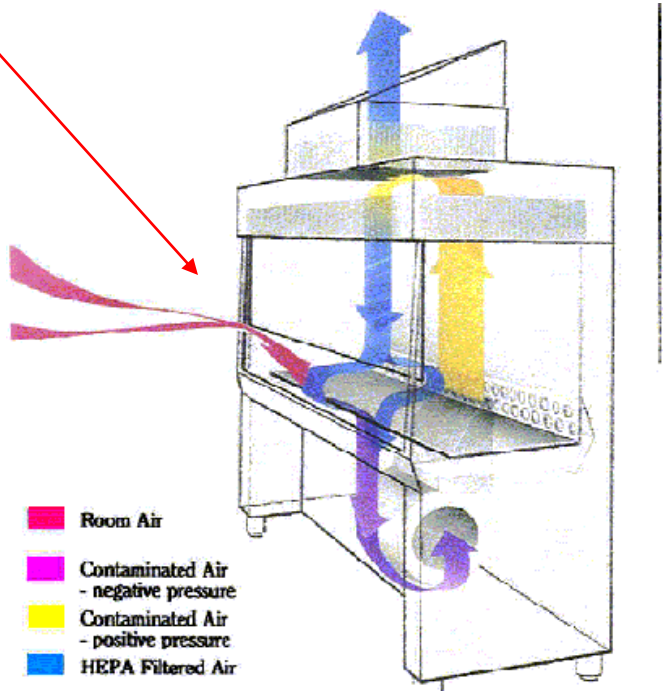
- Containment
  - Biosafety Levels (1,2,3,4)
- Who's on First?



NCDOL
N.C. Department of Labor

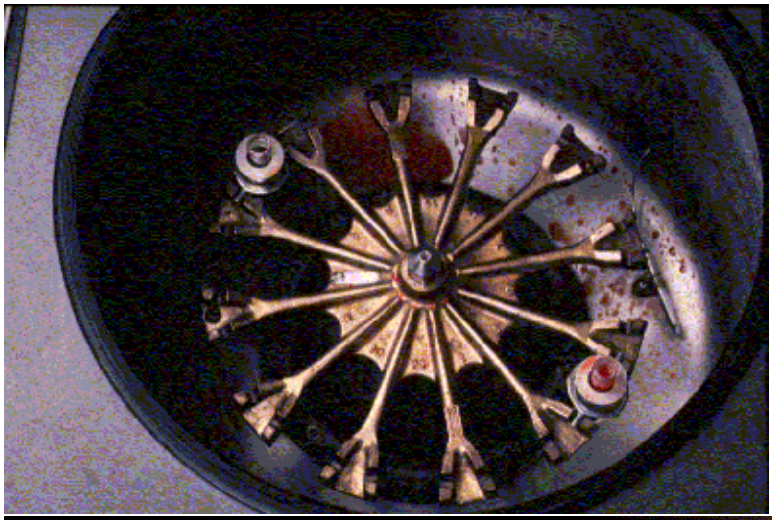
Other Hazards: Biological Safety, cont'd

- Pipetting safety
- Biosafety cabinet



NCDOL
N.C. Department of Labor

Other Hazards: Centrifuge Safety



NCDOL
N.C. Department of Labor

Thank You For Attending!

Final Questions?

1-800-NC-LABOR

(1-800-625-2267)

www.nclabor.com

NCDOL
N.C. Department of Labor

NCDOL
N.C. Department of Labor