

Welcome
TM/CC Update
October 17, 2011

Fire Alarm & Severe Weather

- Familiarize yourself with exits
- Upon Fire Alarm activation, you will receive voice instructions, exit via South stairway
- Severe Weather, follow instructions, if instructed, go to shelter located in basement

Tripartite Finding

- Recent assessment in AD
- Finding is applicable throughout the lab
 - Pre-job briefings required
 - T&M workers coming to Fermilab for the first time, not given clear expectations by the organizations to which they are assigned

Welcome Paul Satti

Health Hazards in Construction

Paul A. Satti

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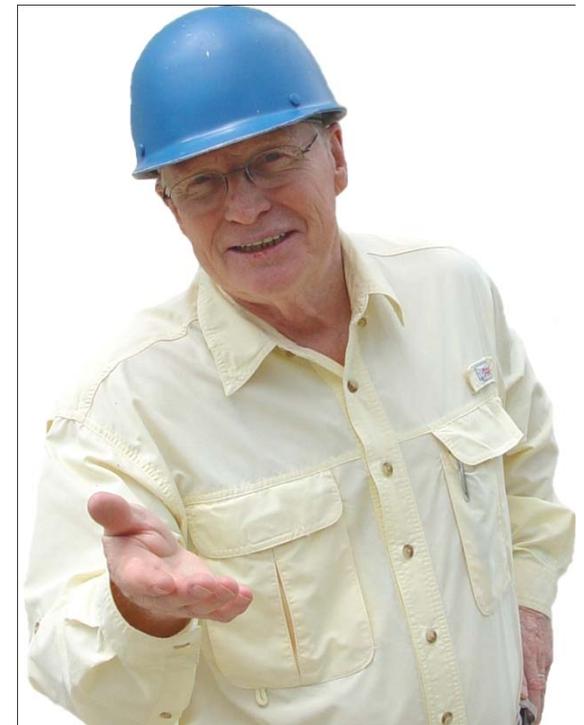
Welcome to...

Health Hazards in Construction

Construction & utility workers are exposed to a variety of health hazards everyday. These men and women have the potential for becoming sick, ill and disabled for life.

Learn the health hazards on your job and know how to protect yourself...

Sadly, these health hazards (e.g., dangerous dust and other chemicals) can be unexpectedly brought home...



Course Contents

- The purpose for the Occupational Safety and Health Administration (OSHA) and its enforcement duty under law.
- Common health hazards found in construction.
- An explanation Industrial Hygiene and toxicology.
- Important terms and definitions used in health standards and toxicology.
- Procedures for how to anticipate, recognize, evaluate and control health hazards in construction.
- Hazard communication program for contractors & the Globally Harmonized System for Hazard Communication.
- Respiratory protection program for contractors.
- Hearing conservation program for contractors.

The Construction Safety Council will like to thank the following for their contributions and support:

- The Occupational Safety and Health Administration (OSHA)
- The National Institute for Occupational Safety and Health (NIOSH)
- The United States Environmental Protection Agency (EPA)
- Chicago Area Laborers – Employer Cooperation and Education Trust (LECET)
- United Union of Roofers, Waterproofers and Allied Workers
- elcoshimages.org
- LeBlanc Building Co., Inc.
- Milton R. Chicas
- David Allie (4-Safety.com)
- John Dimos, MS, CIH

OSHA Disclaimer

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Course Overview

- Prepare an employer or its designated representative (job-site competent person) to understand and react to occupational health hazards in construction.
- Learn how to *anticipate, recognize, evaluate* and *control* occupational health hazards
- Learn how and when to make managerial decisions regarding health issues in construction.

Responsibility to Self & Family



Occupational health hazards can unexpectedly be brought home; wear personal protective equipment (PPE) on the job and do not bring home health hazards that can harm your family!

Industrial Hygiene

Learning Goals...

- Define industrial hygiene.
- Recognize industrial hygiene's relationship to OSHA.
- Identify and define job hazard analysis
- Be able to apply the classic industrial hygiene approach (*anticipate, recognize, evaluate & control*) to hazard abatement.

Important Terms

- Industrial Hygiene
 - *Anticipate (hazards)*
 - *Recognize (hazards)*
 - *Evaluate (hazards)*
 - *Control (hazards)*
- Toxicology
- Job Hazard Analysis
- Hazard Abatement

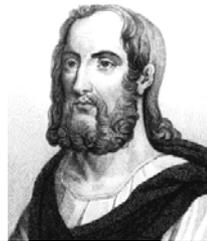
Industrial Hygiene

- Industrial hygiene is the art and the science of: ***Anticipating, Recognizing, Evaluating & Controlling*** hazards.



4th Century B.C.

Hippocrates -
Noted lead toxicity
in the mining
industry.



1st Century A.D.

Pliny the Elder -
Devised a face
mask made from
an animal bladder.



1556 A.D.

Georgius Agricola -
Publishes *De Re Metallica*
- diseases associated with
mining occupations.



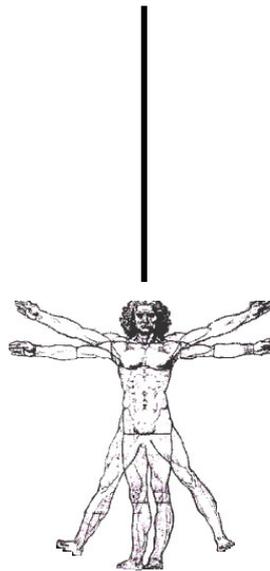
1700 A.D.

Bernardo Ramazzini -
“Father of Industrial
Medicine” publishes *De
Morbis Artificum Diatriba (The
Diseases of Workmen)*.



Chemical

Gases
Vapors
Fumes
Dusts
Fibers
Mists



Physical

Temperature
Noise
Repetitive Motion &
Awkward Postures
Ionizing & Non-
Ionizing Radiation



Biological

Fungi (Mold)
Bloodborne Pathogens
Bacteria
Poisonous Plants
Poisonous & Infectious
Animals

Toxicology

- Toxicology is the science that studies the poisonous or toxic properties of a substance.

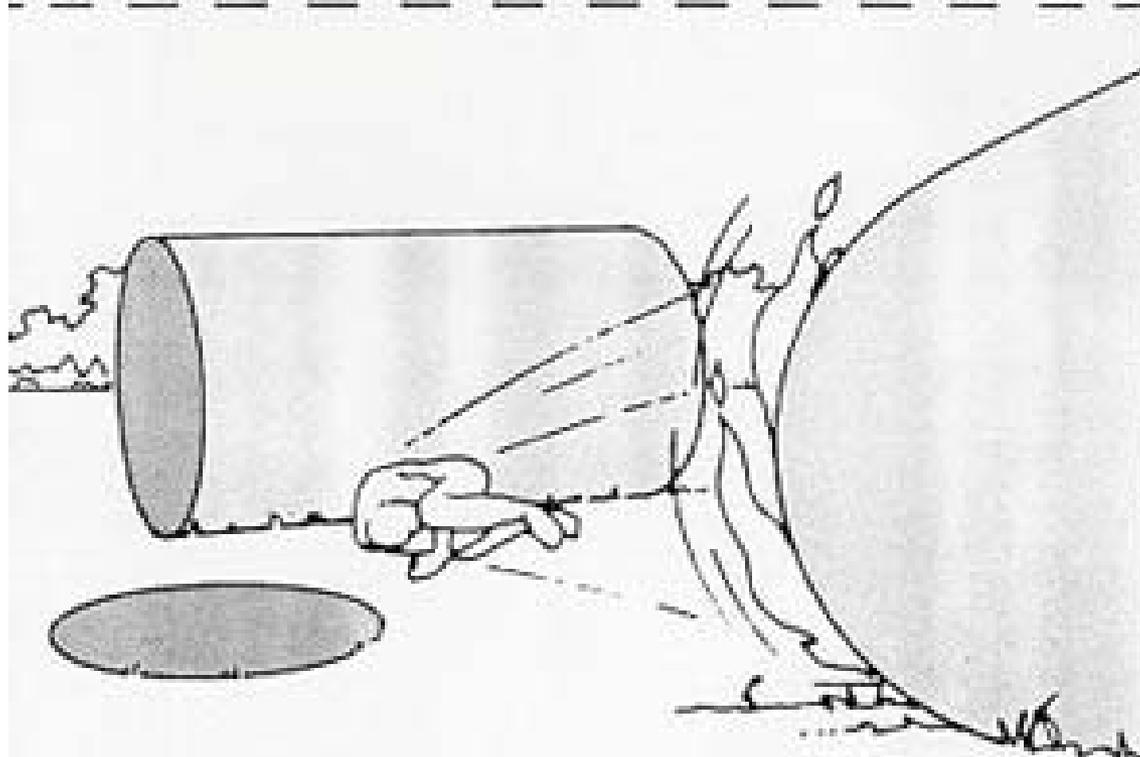
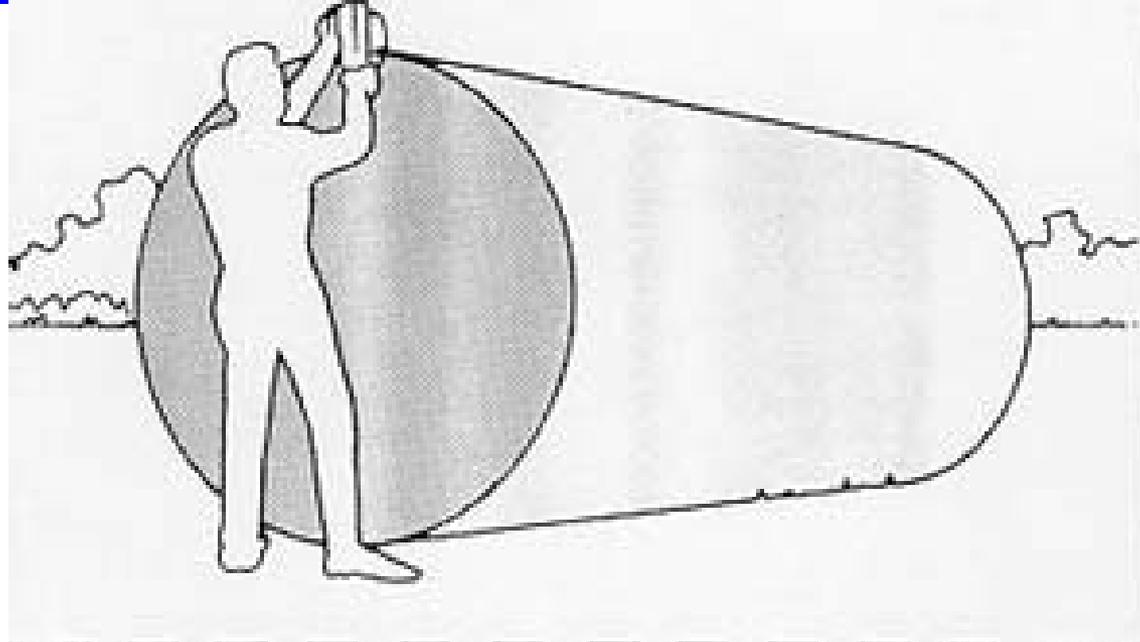
Anticipation of Health Hazards

- knowing the history of the work involved.
- Worker experience and education.

To anticipate hazards:

- Survey job-site conditions
- Be aware of the actions and behaviors of workers.

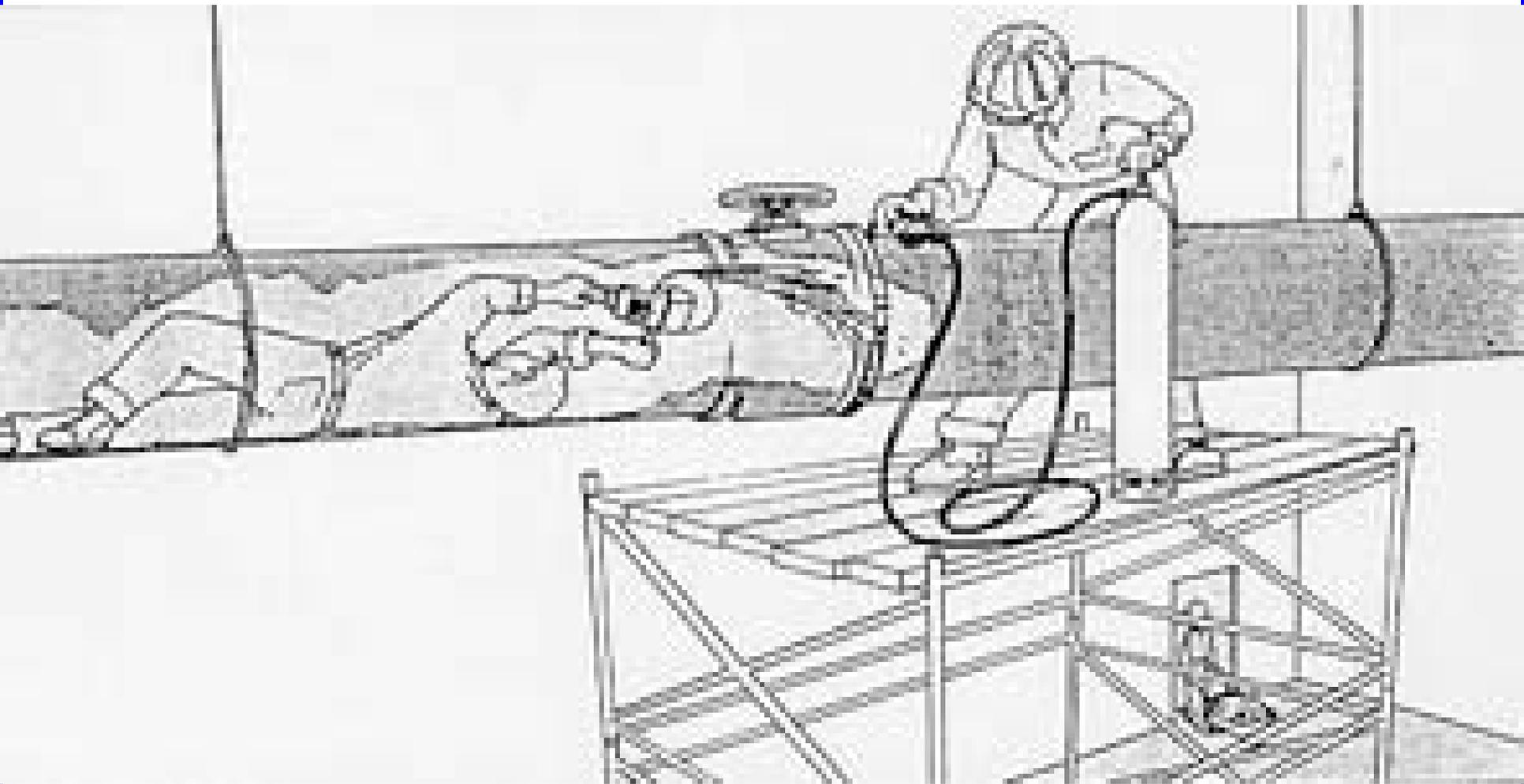






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theYNC.com

WALKER
MARCH 15
8PM





Hazardous Conditions

- Confined or enclosed spaces (hazardous atmospheres).
- Contaminated soil conditions (hazardous atmospheres).
- Unsanitary conditions (poor housekeeping, poorly kept toilet facilities, etc.).
- Presence of hazardous materials (dangerous coatings on structures & metal containing alloys, concrete & silica).
- The use of hazardous chemicals (gases, solvents & glues).
- The presence of residues left by degreasing agents, usually chlorinated hydrocarbons (chloroform and carbon tetrachloride).

Hazardous Conditions

- Older buildings and structures; unoccupied dwellings (fungi/mold, asbestos & lead).
- Extreme temperatures (hot & cold environments; working outside or in attics, boiler rooms, etc.).
- Radiological exposures (nuclear power plants, antennas, hospitals, laboratories and the sun).
- Loud noise (use of tools and equipment).
- Hot work (welding and cutting).
- The presence of plant and/or animal wildlife (poisonous venom, feces, rabies...).

Recognition of Health Hazards

- **What do you see?**
 - Visible material in the air
 - Settled dust
 - Warning signs, labels & decals



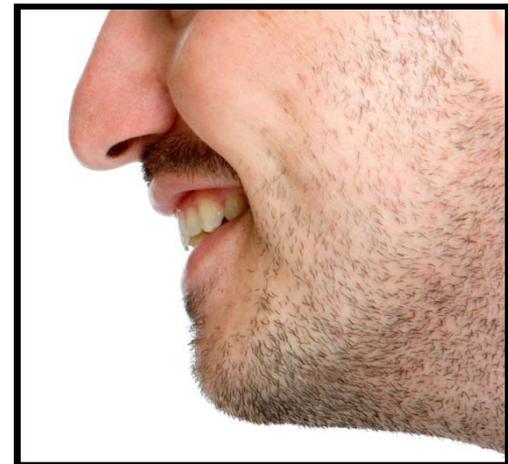
Recognition of Health Hazards

What do you smell or taste?

– Odor

- *Odor threshold* is the lowest level of a chemical that can be smelled by most people.
- *Olfactory fatigue* - loss of sense of smell.

– Taste

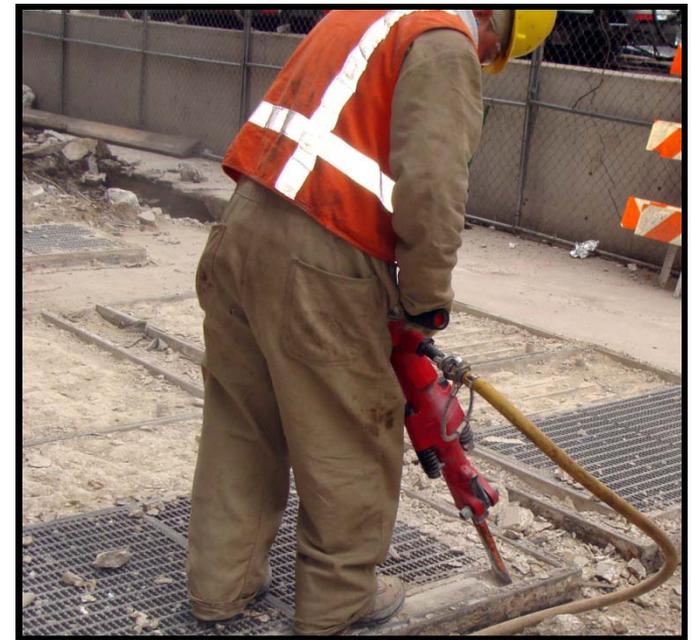


Recognition of Health Hazards

Do you hear anything?

Sources of loud noise in construction:

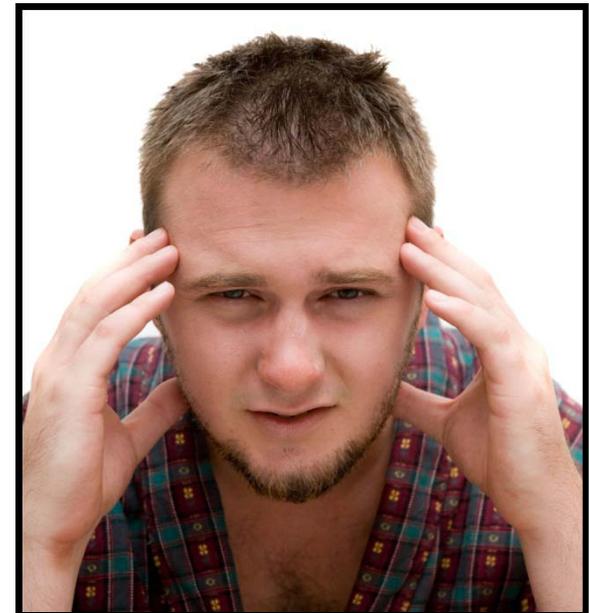
- Hand tools (e.g., metal hammers)
- Power tools (e.g., jackhammers, grinders, saws, powder actuated tools)
- Equipment (e.g., generators, excavators, cranes, trucks)
- Blasting



Recognition of Health Hazards

Do you feel immediate symptoms?

- Particles in you respiratory system.
- Narcotic effect



Recognition of Health Hazards

- Not implementing engineering and/or administrative controls (e.g., wet methods, ventilation, and dust collection systems).
- Not wearing appropriate Personal Protective Equipment (e.g., gloves, respirators, chemical suits, hearing protectors, etc.)
- Not practicing good housekeeping.
- Not following good hygiene practices.
- Not performing a hazard analysis (e.g., air monitoring, dust sampling, noise metering, and biological monitoring & medical surveillance).



Know the safety procedures on your job and learn to recognize safety violations – report them and get them corrected!

Evaluation of Health Hazards

Environmental & Personal Air Monitoring:

- Does not measure you or what you are doing, but rather what you are exposed to on the job.
- Must be done by a trained health professional (industrial hygienist or technician).
 - *Area monitoring*
 - *Personal monitoring*

NIOSH/John Rekus/elcoshimages.org



Area Monitoring

Personal Monitoring

- Determines individual worker exposure.
- Done during a specific time period...
 - 8-hour (TWA)
 - 15 minute (STEL)

Pump pulls air through a filter or tube, which traps the dust or toxin.



Evaluation of Health Hazards

Biological Monitoring & Medical Surveillance

Medical surveillance records include:

- Employee exposure records (results from personal air monitoring).
- Employee medical records (results from biological monitoring).

Employee Exposure & Medical Records

Retention of Medical Records...

- Employee medical records – duration of the employee's employment plus 30 years.
- Employee exposure records for at least 30 years (personal air monitoring results).
- Background data – 1 year



Air Monitoring Devices

- **Detector Tubes**
- **Sampling Tubes**
- **Multi or single gas/vapor detector**
- **Passive badge gas/vapor sampler**



Air Monitoring Devices

- Instant Swab Wipes



- Filter Cassette



- Sound Level Meter



- Personal Dosimeter



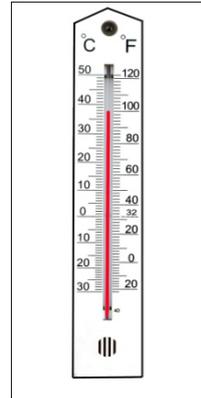
Air Monitoring Devices

- Noise badge
- Film Badge Dosimeters
- Survey Instruments
- Personal Alarm Monitors (RF)



Air Monitoring Devices

- Thermometer



- Wet Bulb Globe Temperature (WBGT)



- Thermo-Anemometer

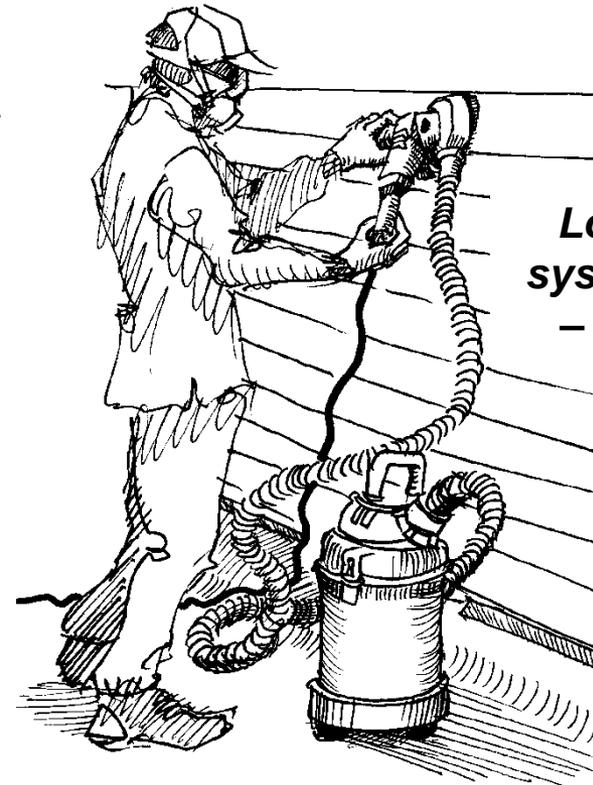


Control of Health Hazards

Hazard Abatement

To abate a hazard means to eliminate its effects.

Respirator – Personal Protective Equipment (PPE)



*Local exhaust system (vacuum)
– Engineering Control*

Hierarchy of Controls

1. ***Elimination of hazard;*** Substitution with safe alternative.
2. ***Engineering;*** Ventilation & wet methods.
3. ***Administrative;*** Work practices, scheduling workers to minimize exposure, extended breaks, etc.
4. ***Personal Protective Equipment (PPE);*** Respiratory and hearing protection, protection of face, hand, feet, eyes & whole body.

Job Hazard Analysis

What is it?

- Materials & Equipment



Job Hazard Analysis

How does it?

– Process



Job Hazard Analysis

Who are exposed?

– People



Job Hazard Analysis Example



Use of Professionals & Consultants

- The work involves many different or complex processes.
- All employees must remain involved in the process of identifying and correcting hazards.
 - Occupational Health Teams
 - You



Occupational Safety & Health Administration (OSHA)

Learning Goals:

- Identify the Occupational Safety and Health Administration (OSHA) as being the authority for protecting worker's health and safety on the job.
- Recognize both employer and employee rights and responsibilities under OSHA law.

Important Terms

- OSHA
- OSHA's General Duty Clause
- Worker rights under OSHA Law

You Have A Right!

- Occupational Safety & Health Act of 1970
 - To assure safe and healthful working conditions for working men and women;
 - By authorizing enforcement of the standards developed under the OSHAct;
 - By assisting and encouraging the States in their efforts to assure safe and healthful working conditions; and
 - By providing research, information, education, and conducting training in the field of occupational safety and health.

General Duty Clause

5. Duties

a) Each employer

- Shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employee;
- Shall comply with occupational safety and health standards promulgated under this Act.

b) Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct.

General Duty Clause Citation

1. An employer failed to keep the workplace free of a hazard to which employees of that employer were exposed.
2. The hazard was recognized. (Examples might include: through job-site safety personnel, employees, trade unions and other associations/organizations.)
3. The hazard was causing or was likely to cause death or serious physical harm.
4. There was a feasible and useful method to correct the hazard.

Health Hazards are Recognized by OSHA

- See OSHA Enforcement Policy

Stop health hazards before they stop you!

Lung Disease
Skin Irritation & Rashes
Hearing Loss
Cumulative Trauma Disorders
Cancer
Death!



Job Safety and Health It's the law!

OSHA
Occupational Safety
and Health Administration
U.S. Department of Labor

EMPLOYEES:

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in that inspection.
- You can file a complaint with OSHA within 30 days of retaliation or discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have the right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violations.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records and records of your exposures to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.
- You must comply with all occupational safety and health standards issued under the *OSH Act* that apply to your own actions and conduct on the job.

EMPLOYERS:

- You must furnish your employees a place of employment free from recognized hazards.
- You must comply with the occupational safety and health standards issued under the *OSH Act*.

This free poster available from OSHA –
The Best Resource for Safety and Health



Free assistance in identifying and correcting hazards or complying with standards is available to employers, without citation or penalty, through OSHA-supported consultation programs in each state.

1-800-321-OSHA
www.osha.gov

OSHA 3199-12-001

Refusing to Work because Conditions are Dangerous

Refusing work is protected if...

- You have asked the employer to eliminate the danger, and the employer failed to do so.
- You refused to work in “good faith”.
- A reasonable person would agree that there is a real danger of death or serious injury (illness).

Refusing to Work because Conditions are Dangerous

When all of these conditions are met, you take the following steps:

- Ask your employer to correct the hazard;
- Ask your employer for other work;
- Tell your employer that you won't perform the work unless and until the hazard is corrected; and
- Remain at the worksite until ordered to leave by your employer.

Health Standards in Construction

Learning Goals:

- Overview OSHA's health standards in construction.
- Be introduced to the American Conference of Governmental Industrial Hygienists (ACGIH)®
- Be introduced to the National Institute for Occupational Safety and Health (NIOSH)
- Become familiar with the terms and definitions used to describe occupational limits relating to health hazards.
- Identify OSHA's special emphasis programs and compliance directives for enforcing health standards in construction.

Important Terms

- Hierarchy of Controls
- Permissible Exposure Limit (PEL)
- Action Level (AL)
- Ceiling (C)
- American Conference of Governmental Industrial Hygienists (ACGIH)
- Threshold Limit Value (TLV)®

Important Terms

- National Institute for Occupational Safety & Health (NIOSH)
- Recommended Exposure Limit (REL)
- Short Term Exposure Limit (STEL)
- OSHA Special Emphasis Programs for Health

Health Standards in Construction Overview

- Availability of medical services and first aid
- Sanitation of the job-site (toilet facilities)
- Availability of water (potable and non-potable)
- Eating and drinking areas
- Vermin control

Health Standards in Construction Overview

- Chemicals
 - Gases
 - Vapors
 - Fumes
 - Dusts & Fibers
 - Mists
- Physical Health Hazards
 - Noise
 - Radiation

***OSHA currently
regulates
exposure to
approximately
400 substances!***

Medical Services & First Aid

- Make available medical personnel for advice and consultation on matters of occupational health.
- Provisions for prompt medical attention in case of serious injury.
- In the absence of an infirmary, clinic, hospital, or physician... a person who has a valid certificate in first-aid training must be available at the worksite to render first aid.
- First aid supplies must be easily accessible when required.

First Aid Kits

- Available on all job-sites where a hospital, clinic or physician is not available in terms of time and distance.
- Persons must be trained to use these supplies and be willing to give care.
- An automated electronic defibrillator (AED) is highly recommended.



Sanitation of Job-Sites

- Potable water (drinking water) must be provided.
- Capable of being tightly closed, and equipped with a tap. Water must not be dipped from containers.
- Clearly marked as to the nature of its contents and not used for any other purpose.
- The common drinking cup is prohibited.



Washing Facilities

- Provide adequate washing facilities for employees.
- Facilities must be in near proximity to the worksite.
- Maintained in a sanitary condition.



Good health starts with good hygiene!

Eating and Drinking Areas

- No employee shall be allowed to consume food or beverages neither in a toilet room nor in any area exposed to a toxic material.



Vermin Control

- Prevent the entrance or harborage of rodents, insects, and other vermin.

Permissible Exposure Limit (PEL)

- Standards that limit the amount or concentration of a material.
- Enforceable by OSHA.

Complying with OSHA Health Standards

- ***Administrative or engineering controls*** must first be implemented whenever feasible.
- Protective equipment or other protective measures must be used to keep the exposure of employees to air contaminants within the limits prescribed.
- Competent industrial hygienist or other technically qualified person.
- Follow OSHA's respiratory protection standard.

ACGIH–Threshold Limit Value (TLV) ®

- American Conference of Governmental Industrial Hygienists
- 29 CFR 1926.55 Appendix A (1970 TLVs)
 - Exposure of employees to inhalation, ingestion, skin absorption, or contact with any material or substance at a concentration above those specified shall be avoided!
- Current TLVs are not enforceable.

NIOSH – Recommended Exposure Limit (REL)

- National Institute for Occupational Safety & Health
- Levels that NIOSH believes would be protective of worker safety and health.
- Highly protective.
- Not enforceable by OSHA.

NIOSH Pocket Guide to Chemical Hazards

The NIOSH logo is displayed in a bold, italicized, black font. The letter 'N' is significantly larger and more prominent than the other letters, which are smaller and follow in a similar italicized style.

POCKET GUIDE TO

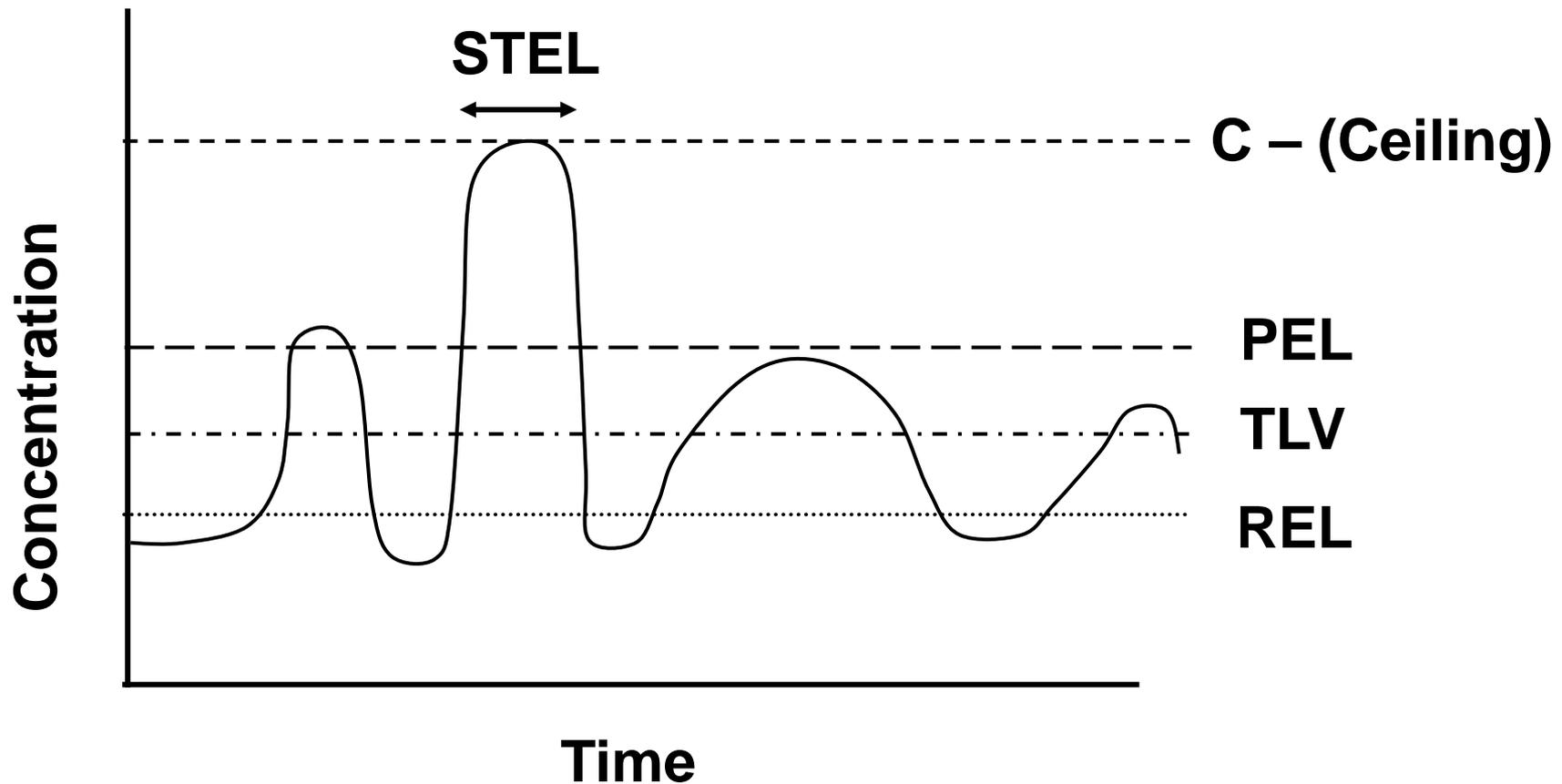
**CHEMICAL
HAZARDS**

*For more information on NIOSH and to access the
Pocket Guide to Chemical Hazards, go to
www.cdc.gov/niosh*

Additional Exposure Limits

- **Time Weighted Average (TWA)**
 - The average employee exposure over an 8-hour period.
- **Action Level (AL)**
 - Exposure level at which some OSHA regulations set to protect employees takes effect.
- **Ceiling Limit (C)**
 - The maximum allowable level.
- **Short Term Exposure Limit (STEL)**
 - Level that must not be exceeded when averaged over a specified short period of time (usually 15 minutes).

Exposure Limit Comparison Chart



Hierarchy of Controls

Hierarchy of controls in order of preference:

- 1. Elimination of hazard;** Substitution with safe alternative.
- 2. Engineering;** Ventilation & wet methods.
- 3. Administrative;** Work practices, scheduling workers to minimize exposure, extended breaks, etc.
- 4. Personal Protective Equipment (PPE);** Respiratory and hearing protection, protection of face, hand, feet, eyes & whole body.

Elimination & Substitution

- Automate the process; remove or isolate the worker.
- Select and use a less toxic chemical.
- Sub-contract out jobs to more qualified people.

NIOSH/John Rekus/elcoshimages.org



*Elimination & Substitution Example...
Skid steer loader with pneumatic hammer.*

Elimination & Substitution





FIRE HOSE
FIRE

DAEMO

The Right
Powerful Hydraulic Attachments
CREATE! **DM SERIES**

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www.electroswitch.com
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Disaster Relief Equipments

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DM550

360

DAEMO

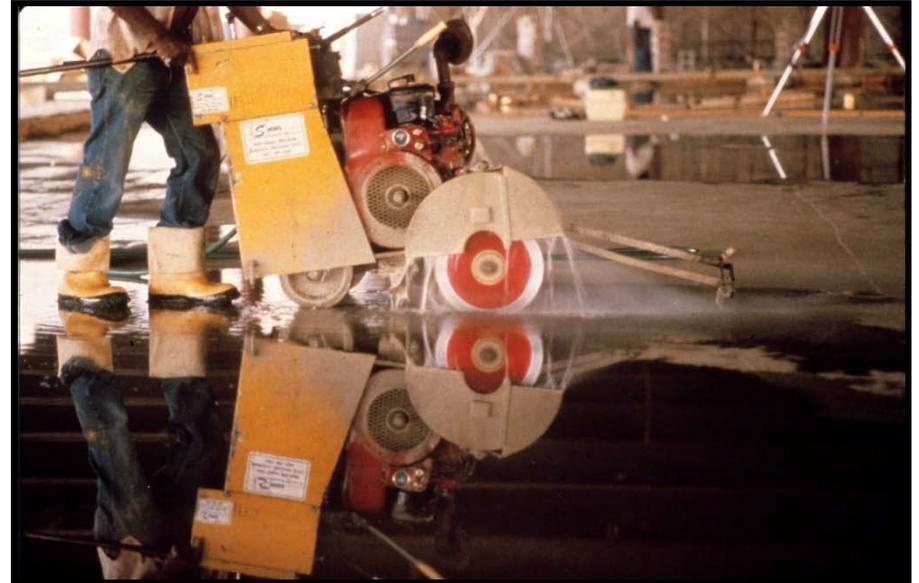
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Engineering Controls

- Using dust suppression (*wet methods*) and/or dust collection systems.
- Installing and using mechanical ventilation;
 - **General (dilution)**
 - **Local (exhaust) ventilation systems**

Wet Methods

NIOSH/John Rekus/elcoshimages.org

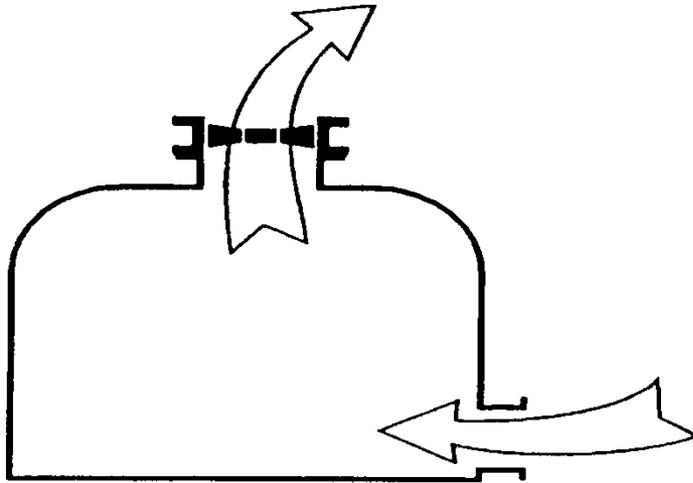


***Engineering Control Example...
Water suppression system on concrete saw.***

Dust Collection Systems

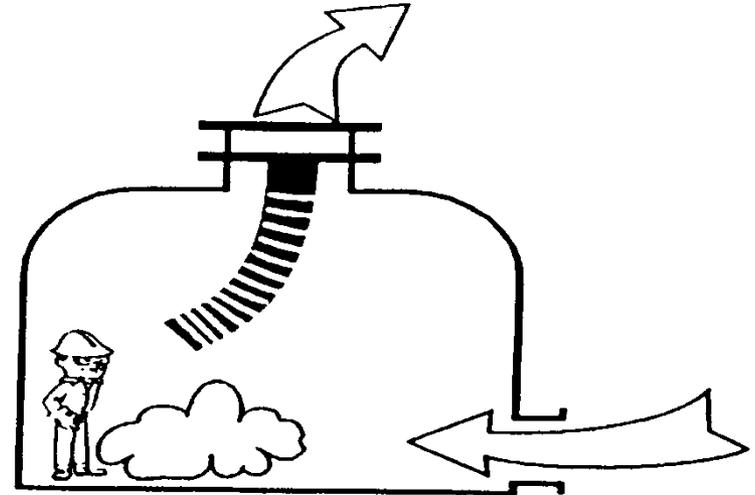


Mechanical Ventilation



General (Dilution) Ventilation...

Forces fresh air into an area and dilutes contaminants.



Local (Exhaust) Ventilation...

Removes contaminated air at its source.

General (Dilution) Ventilation

General (dilution) ventilation works best when:

- Air contaminants are widely disbursed throughout the area.
- Toxicity levels and concentrations are low.



***Ventilation Systems Examples...
Air moving equipment can be set up to either blow (dilute) or
suck (exhaust).***



Never Ventilate with Pure Oxygen!



Local (Exhaust) Ventilation

Local (exhaust) ventilation works best when:

- Air contaminants are generated at a single source.
- There's a need to remove high levels and concentrations of a toxic material.



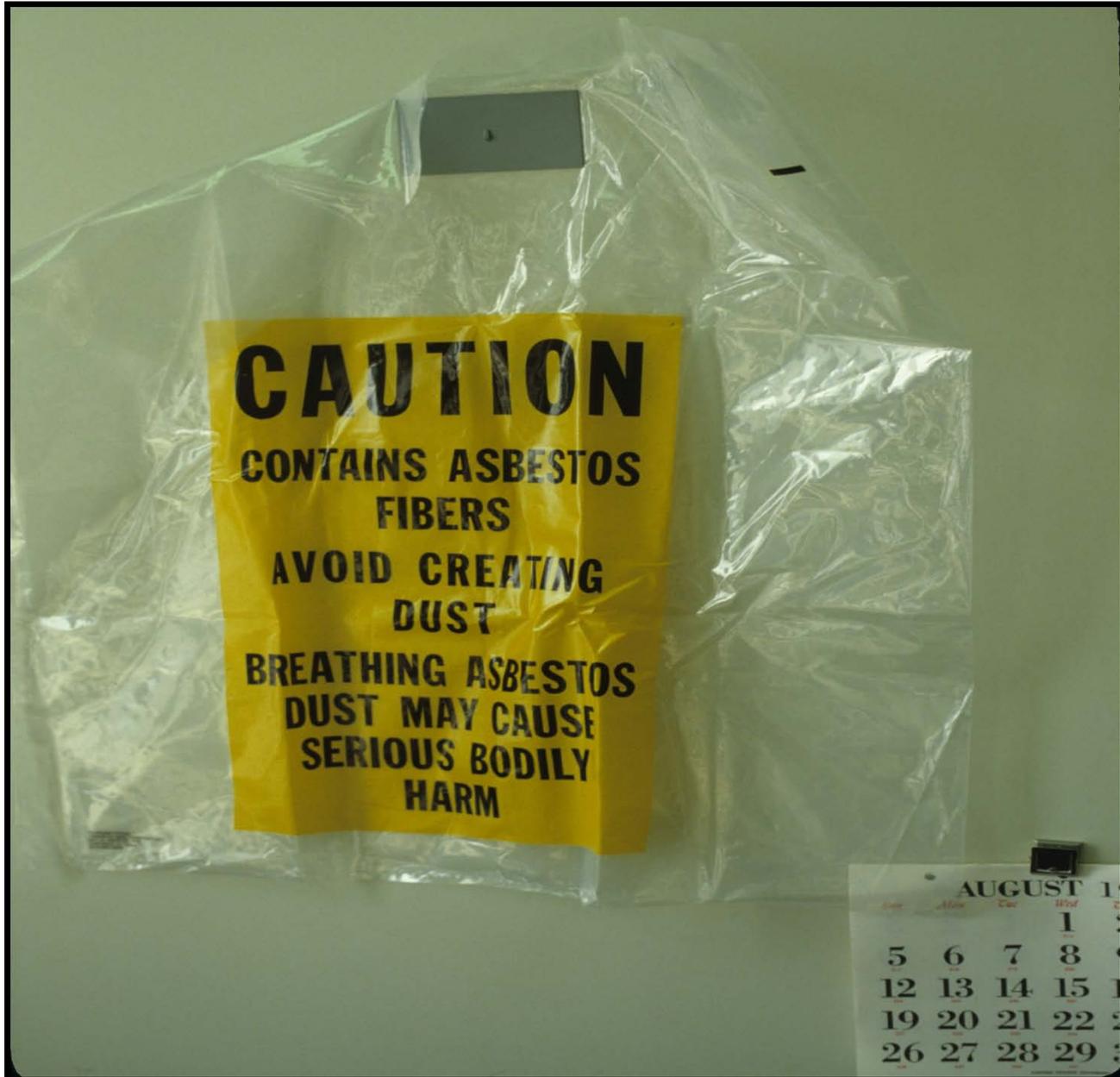
*Courtesy of Sentry Air Systems, Inc. Houston, TX USA
Model 300 Welding Fume Extractor
www.sentryair.com*

Administrative Controls

- Gathering all specialty equipment, including, ventilators, warning signs, personal protective equipment, etc. before starting work.
- Performing operations that involve toxic substances at times when other workers are not present.
- Isolate the work to a few employees.
- Rotating workers through various job assignments.

Administrative Controls

- Prohibiting workers from working with ionizing radiation once they have reached a predetermined level of exposure.
- Requiring workers in hot environments to take breaks in cool rest areas and providing fluids for rehydration.
- Prohibiting worker access to areas involving hazards such as lasers, toxic materials, or excessive noise.



Isolate the Work





Work Practice Controls

- Proper housekeeping & good personal hygiene.
- The proper procedures that minimize exposures.
- How to inspect and maintain process and equipment on a regular basis.
- No eating, drinking, smoking, chewing tobacco or gum, and applying cosmetics in hazardous areas.



Dust Control

- Use a sweeping compound to reduce airborne dust.
- Wear personal protective equipment (respirator).
- Schedule clean-up operations appropriately.
- Warn others and clear the area of those who are affected by the dust and are not protected.



Sweeping hazard!

HEPA Vacuum



Using vacuum technology will greatly reduce exposure to the inhalation of dust and potential toxins.

Personal Protective Equipment (PPE)

Consideration and use of PPE is only allowed when:

- Engineering controls and/or work practices are not ***feasible***.
- Engineering controls or work practices are being implemented.
- Engineering controls or work practices do not effectively reduce exposure to acceptable limits.
- In cases of emergency.



***Personal Protective Equipment Example...
Chemical resistant suit, gloves, safety glasses
and face shield.***

Feasible (Definition)

- ***Technologically feasible***
 - Engineering and administrative controls are being implemented and yet levels still remain above permissible exposure limits (PELs)
- ***Economically feasible***
 - Cost will not threaten the employer's ability to remain in business.

Personal Protective Equipment (PPE)

Important considerations for PPE:

- No one piece of protective equipment and clothing is capable of protecting against all hazards.
- The use of protective clothing can itself create significant wearer hazards:
 - Heat stress
 - Physical and psychological stress
 - Impaired vision, mobility & communication.



Worker protected with a powered air purifying Respirator (PAPR) while using a grinder.

Personal Protective Equipment (PPE)

- Is the device approved?
- Is the device appropriate?
- Is the worker properly trained?
- Does the material have sufficient strength?
- Will the material withstand repeated use?
- Is the material flexible or pliable enough?
- Will the material maintain its protective integrity?

Hazardous Materials Identification System

- Developed by the National Paint and Coatings Association (NPCA).
- A numerical hazard rating that incorporates the use of labels with color-coded bars.
- A special code identifying appropriate personal protective equipment (PPE) is also listed.

Chemical Name	
HEALTH	0
FLAMMABILITY	0
PHYSICAL HAZARD	0
PERSONAL PROTECTION	0

Personal Protective Equipment (PPE)

Employer Obligations:

- Perform a “hazard assessment” of the workplace.
- Identify and provide appropriate PPE.
- Train employees in the use and care of the PPE.
- Maintain PPE, including replacing worn or damaged PPE.
- Periodically review, update and evaluate the effectiveness of the PPE program.

Personal Protective Equipment (PPE)

Worker Responsibility:

- Properly wear PPE.
- Attend training sessions on PPE.
- Care for, clean and maintain PPE.
- Inform a supervisor of the need to repair or replace PPE.

Limitations & Use of Respirators

- All respirators leak!
- Must be properly fitted and worn.
- Respirators protect only the employees who are wearing them.
- Respirators are uncomfortable to wear.



Use Only NIOSH Approved Respirators!

Approved Filtering Facepieces (Disposable)

- Used for dust, mists, welding fumes, mold, etc.
- Does not provide protection from gases or vapors.
- Disposable & easy to breathe through.
- Least protection (rated the same as elastomeric half-face).
- Not allowed for use in atmospheres with less than 19.5% oxygen.
- **DO NOT USE FOR ASBESTOS.**



Half-Face Respirators (Elastomeric)

- Used for protection against most vapors, acid gases, dust or welding fumes, mold.
- Can be used with a variety of cartridges/filters.
- Requires regular cleaning & maintenance.
- Not allowed for use in atmospheres with less than 19.5% oxygen.



Full-Face Respirators (Elastomeric)

- Used for protection against most vapors, acid gases, dust or welding fumes, mold.
- Can be used with a variety of cartridges/filters.
- Requires regular cleaning & maintenance.
- Built in safety eye protection (ANSI Z87).
- Not allowed for use in atmospheres with less than 19.5% oxygen.



Powered-Air-Purifying Respirators (PAPR)

- Battery powered fan pulls air through filters and blows air into the facepiece or hood.
- Can be used with a variety of cartridges/filters.
- Requires regular cleaning & maintenance.
- Built in safety eye protection (ANSI Z87).
- Easier to fit, easier on heart and lungs.
- Not allowed for use in atmospheres with less than 19.5% oxygen.



Self-Contained Breathing Apparatus (SCBA)

- Used in immediately dangerous to life and health (IDLH) environments.
- Requires regular cleaning & maintenance.
- Built in safety eye protection (ANSI Z87).
- Easier to fit.
- Requires Compressed Gas Association (CGA) Grade D breathing air.
- Can be used in Oxygen deficient atmospheres (less than 19.5% oxygen).



Assigned Protection Factors

Type of respirator ^{1, 2}	Quarter mask	Half mask	Full facepiece	Helmet hood	Loose Fitting facepiece
Air-Purifying Respirator	5	³ 10	50	.....	.....
Powered Air-Purifying Respirator (PAPR)	.....	50	1,000	⁴ 25/1,000	25
Supplied-Air Respirator (SAR) or Airline Respirator					
Demand mode	.....	10	50	.....	.....
Continuous flow mode	.....	50	1,000	⁴ 25/1,000	25
Pressure-demand or other positive-pressure mode	.....	50	1,000	.....	.....
Self-Contained Breathing Apparatus (SCBA)					
Demand mode	.....	10	50	50	.....
Pressure-demand or other positive-pressure mode (e.g., open/closed circuit)	.....	.....	10,000	10,000	.....

Facial Hair



Facial hair is not allowed while wearing a tight fitting facepiece respirator!

**NOT
NIOSH
Approved!**





Respirator Use

1. Employee must wear a respirator due to job-site conditions.
2. Voluntary use by employee.



OSHA's Special Emphasis Programs

- National Emphasis Program – Crystalline Silica (CPL 03-00-007)
- National Emphasis Program on Lead (CPL 03-00-009)
- National Emphasis Program – Hexavalent Chromium (CPL 02-02-076)
- Inspection Procedures for the Hazard Communication Standard – OSHA Instruction CPL 02-02-038.
- Inspection Procedures for the Respiratory Protection Standard – OSHA Instruction CPL 02-00-120.
- Inspection Procedures for Hexavalent Chromium Standard – OSHA Instruction CPL 02-02-074
- Inspection Procedures for Occupational Exposure to Asbestos – OSHA Instruction CPL 02-02-063.



Competent Person

Learning Goals:

- Be able to identify the definition of competent person and know how to apply its meaning to construction job-sites.
- Identify the specific competent person requirements in OSHA's health standards.
- Learn an employer's responsibilities towards injury and illness prevention and be able to explain OSHA's employee training requirements.

Important Terms

- Competent person
- Qualified person
- Industrial Hygienist
- Program administrator

Competent Person

- Capable of identifying existing and predictable hazards.
- Has authorization to take prompt corrective measures to eliminate them.



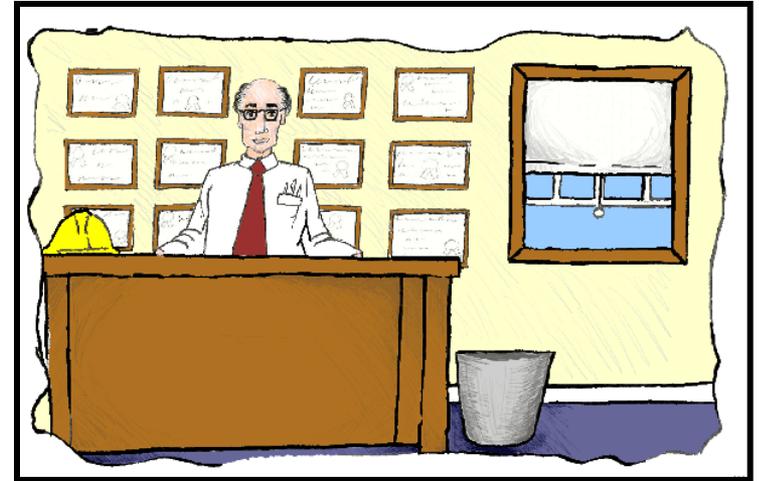
Qualified Person

- Possesses a recognized degree, certificate, or professional standing.
- Extensive knowledge, training, and experience.
- Successfully demonstrates ability to solve or resolve problems.



Industrial Hygienist

- A professional devoted to the anticipation, recognition, evaluation, prevention, and control of health hazards.



Program Administrator

- A respiratory protection program, when used, must be administered by a suitably trained **program administrator**.

Accident Prevention Responsibilities

- Employer must have a safety & health program that provides for:
 - Frequent and regular inspections of the job sites, materials, and equipment to be made by **competent persons.**



Employee Training Requirements

- Recognition and avoidance of unsafe conditions.
- Regulations applicable to work.
- Safe handling and use of hazardous substances.
- Personal hygiene.
- Confined & enclosed spaces.



***HAZWOPER Training
Construction Safety Council***



Health Hazards in Construction

Learning Goals:

- Be able to explain what a hazard is and how workers might be exposed to occupational health hazards in construction.
- List the three categories of health hazards found in construction.
- Overview the health effects of these hazards on the human body.
- Define important terms used to describe dangerous & hazardous environments.

Important Terms

- Health Hazard
- Acute Effects
- Chronic Effects
- Local Effects
- Systemic Effects
- Immediately Dangerous to Life & Health (IDLH)
- Hazardous Atmosphere
- Flammable & Explosive Environments
- Oxygen Deficiency Hazard

What is a Health Hazard?



1. **Chemical Hazards;** such as gases, vapors, fumes, dusts/fibers, mists and substances found in **OSHA PELs**, **NIOSH RELs**, and **ACGIH TLVs®**
2. **Physical Hazards;** such as temperature, noise, repetitive motion & awkward postures, ionizing and non-ionizing radiation.
3. **Biological Hazards;** such as mold, bloodborne pathogens, bacteria, poisonous plants and animals, animal, bird and rodent feces.



Some health hazards are obvious, like working with chemicals...

Some health hazards are not so obvious, like awkward postures and noise exposure...



Acute Health Effects

- Irritation; rashes & dry skin
- Dermatitis (acute)
- Corrosivity; burns or dissolves skin tissue
- Sensitization; allergic reactions (anaphylactic shock)
- Metal fume fever
- Lethal Concentration (LC)



Skull & cross-bone symbol is used to warn of an acute toxicity hazard.

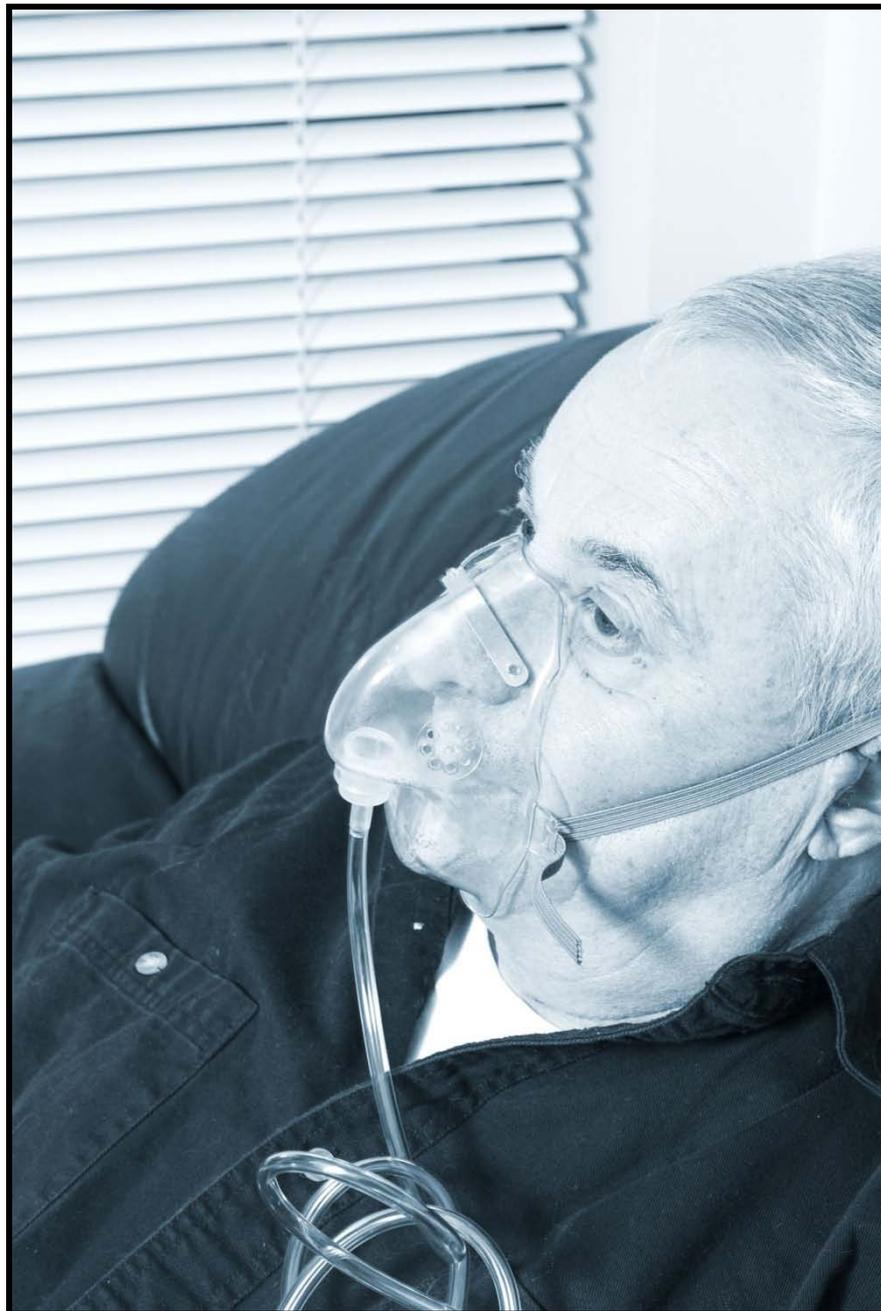
Chronic Health Effects

- Cancer
- Asbestosis
- Mesothelioma
- Silicosis
- Occupational Hearing Loss
- Cumulative Trauma Disorder



Chronic health hazard symbol

***Worker with
chronic health
problems; he
needs oxygen.***



Local Health Effects

- Concrete burns
- Skin & eye irritation
- Dermatitis
- Poison Ivy
- Tissue damage
- Acid burn
- Sunburn



Pictogram for Irritant & Sensitizer



Pictogram for Corrosive

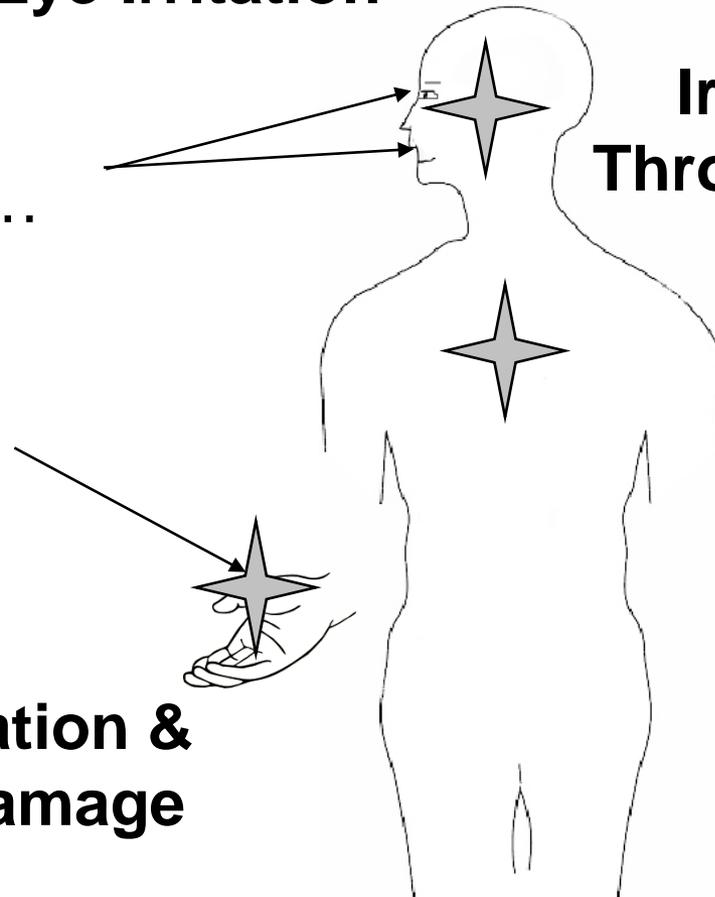
Local Health Effects

Eye Irritation

Substance makes contact with body...

Damage to body occurs at point of contact.

Skin irritation & Tissue Damage



Irritation to the Throat, Nose, Mouth & Lungs

Systemic Health Effects

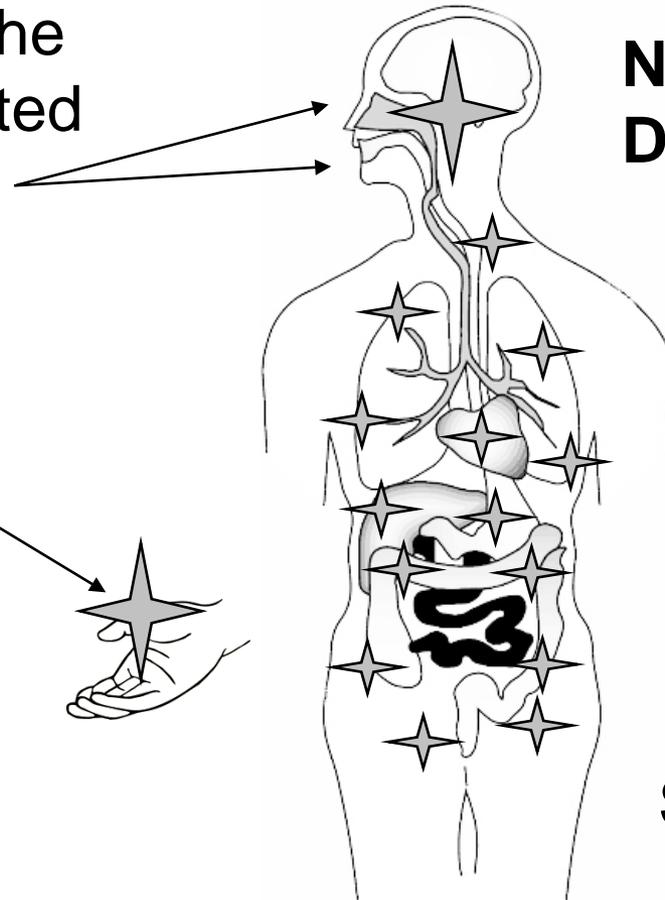
- Asbestosis & Mesothelioma
- Silicosis
- Metal fume fever
- Kidney damage
- Allergic reactions
- Infections
- Radiation sickness
- Nervous system failure
- Reproductive system damage



Systemic Health Effects

Substance enters the body and is deposited throughout the system.

Damage to body occurs at locations remote from initial point of contact.



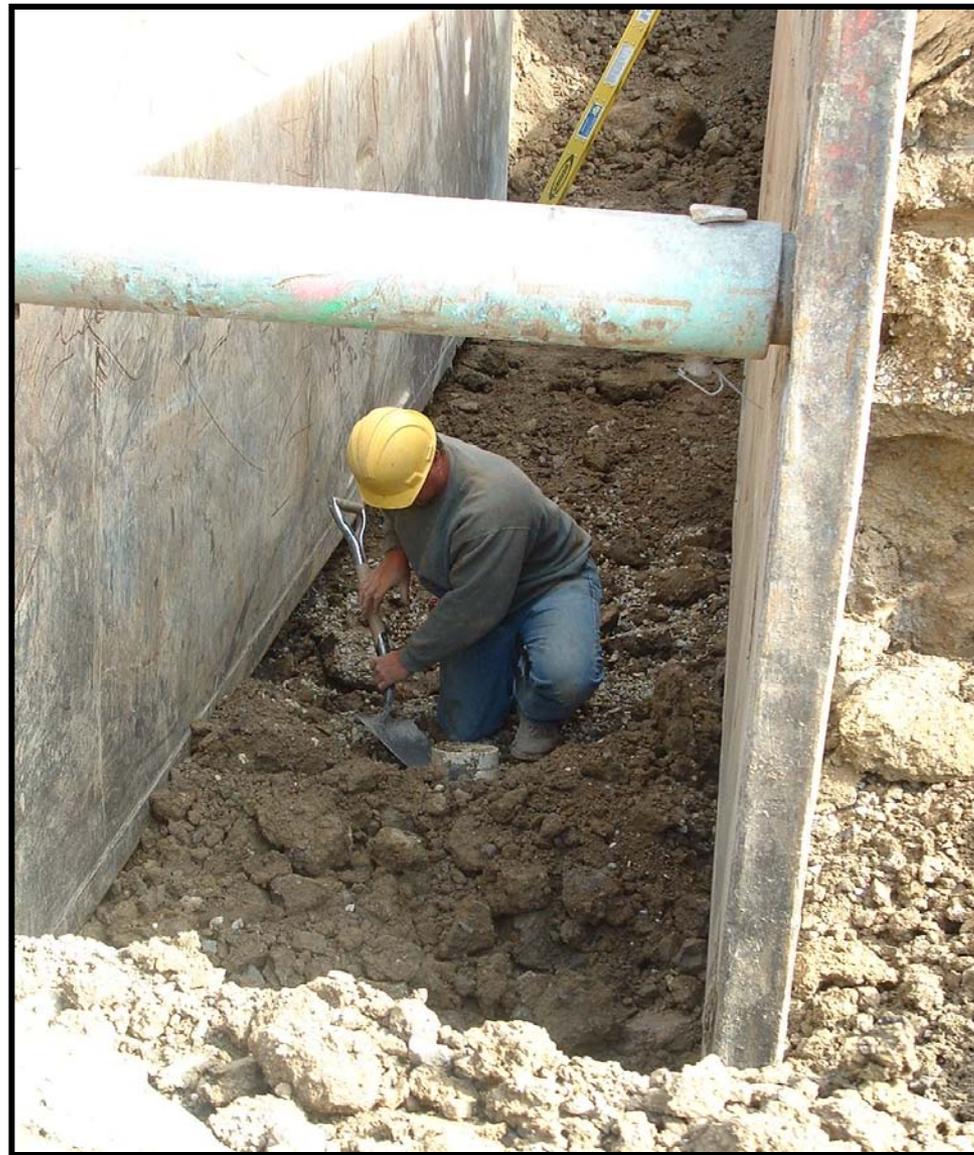
**Nervous System
Damage**

**Lung Cancer
&
Kidney Failure**

**Reproductive
System Damage**

Immediately Dangerous to Life & Health (IDLH)

- Poses an immediate or delayed threat to life.
 - Would cause irreversible adverse health effects.
 - Would interfere with an individual's ability to escape unaided from a space.
- Storage Tanks
 - Process Vessels
 - Bins
 - Boilers
 - Ventilation or Exhaust Ducts
 - Sewers & Manholes
 - Underground Utility Vaults
 - Tunnels
 - Pipelines
 - Open top spaces more than 4 feet in depth
 - Temporary Enclosures (heating enclosures for break)
 - Dumpsters
 - Stair-wells
 - Elevator Shafts
 - Basements
 - Attics
 - Trenches & Excavations



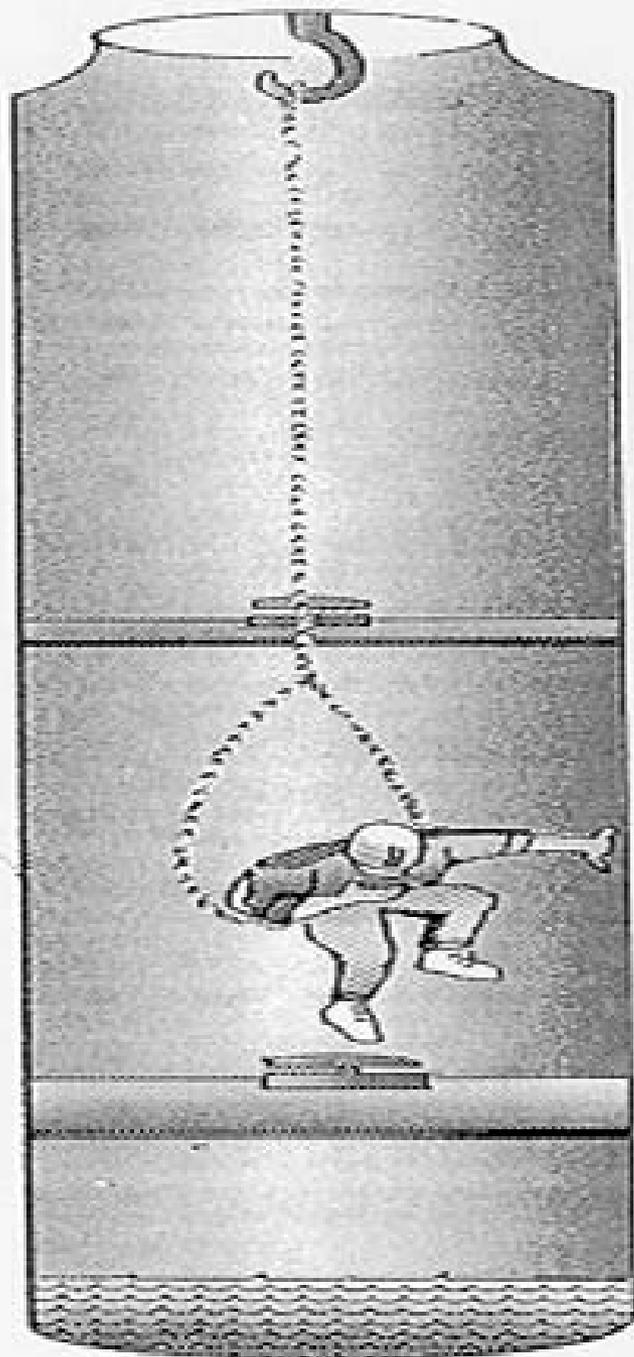
Hazardous atmospheres may exist in trenches.

Confined & Enclosed Spaces

- Any space having a limited means of egress.
- Subject to the accumulation of toxic or flammable contaminants.
- Potential oxygen deficient atmosphere.

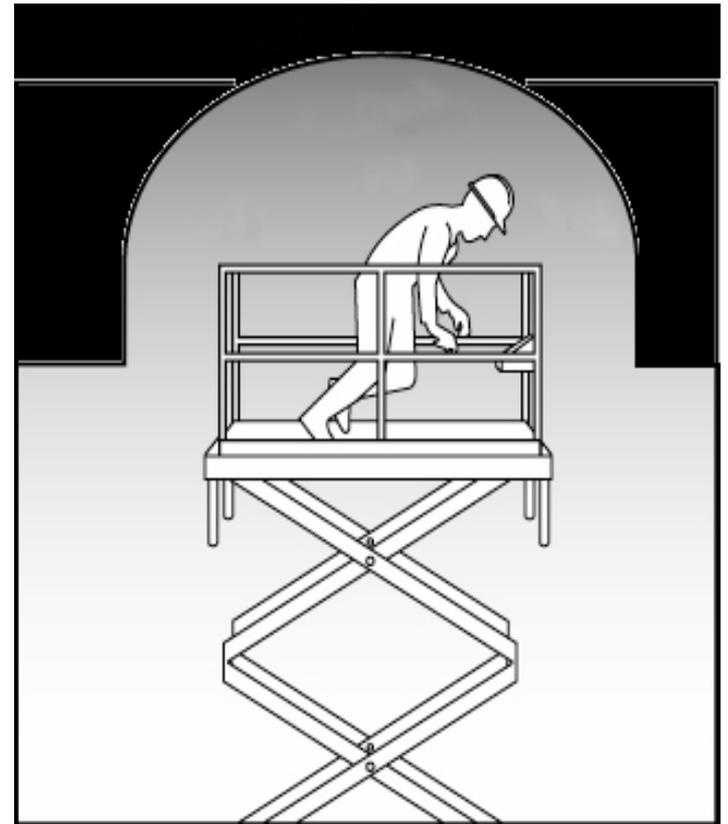
Confined & Enclosed Spaces

- **Identify the hazards;** oxygen deficiency, flammable and/or toxic.
- **Classify the space;** enclosed space, confined space (hazards isolated), or permit required confined space.
- **Eliminate and/or control the hazards;** engineering controls (ventilation) and/or personal protective equipment (PPE).
- **Coordinate entry operations;** entrant & attendant responsibilities, ensure proper communication.
- **Ensure prompt rescue;** team readily available, properly equipped & trained!



Confined & Enclosed Spaces

Working in elevated lifts (locations) could cause you to be exposed to unexpected hazardous atmospheres.



Confined & Enclosed Spaces



Confined Space Entry Procedures

- Understand the procedures for confined space entry.
- Know the hazards of the specific space.
- Review the specific procedures for each entry.
- Understand how to use entry and rescue equipment.
- Highly trained and skilled workers!



Confined Space Entry Procedures



Test all confined spaces before you enter!

- ⊗ Oxygen Content
- ⊗ Flammable Environments
- ⊗ Toxic Substances



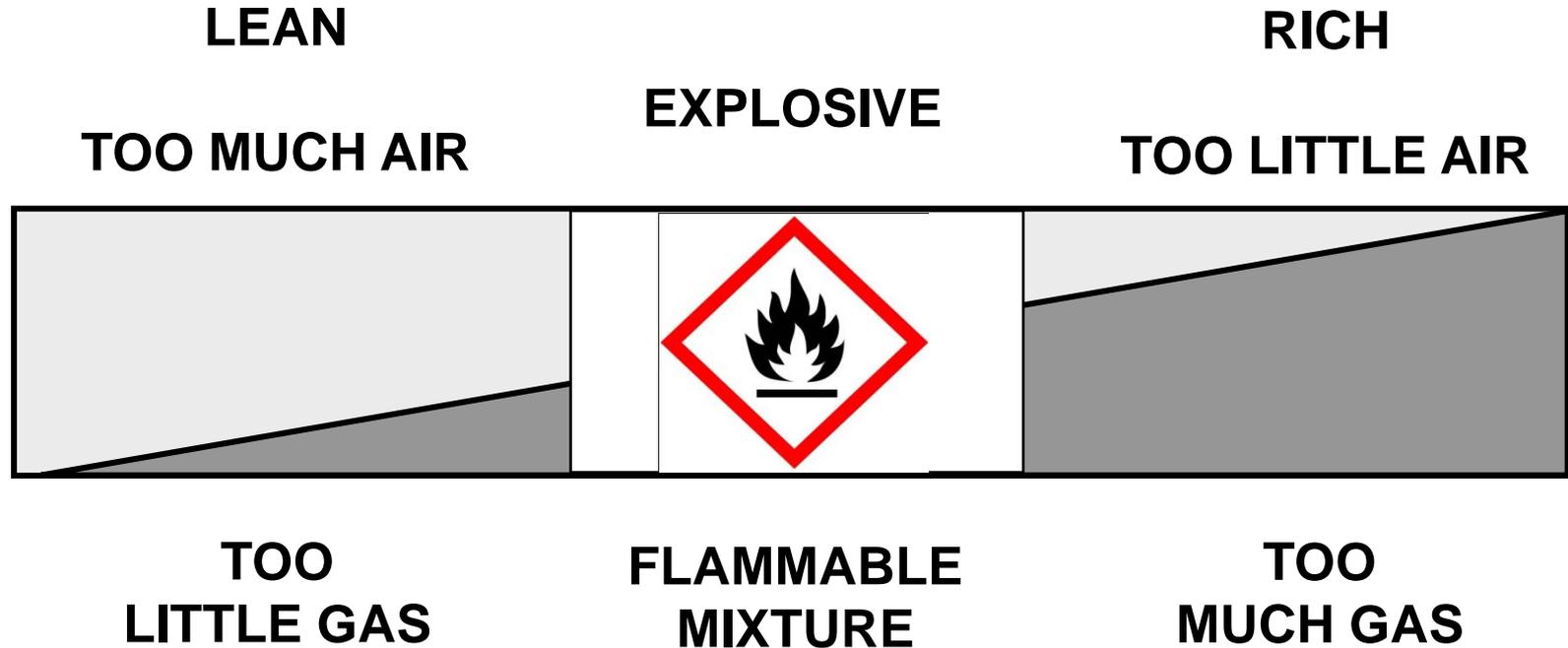
Hazardous Atmospheres

- Oxygen concentration below 19.5% or above 23.5%
- Flammable gas, vapor, mist in excess of 10% of its lower flammable limit (LFL).
- Airborne combustible dust at high concentrations.
- Exposure to any substance above OSHA's Permissible Exposure Limit (PEL).

What do you think?

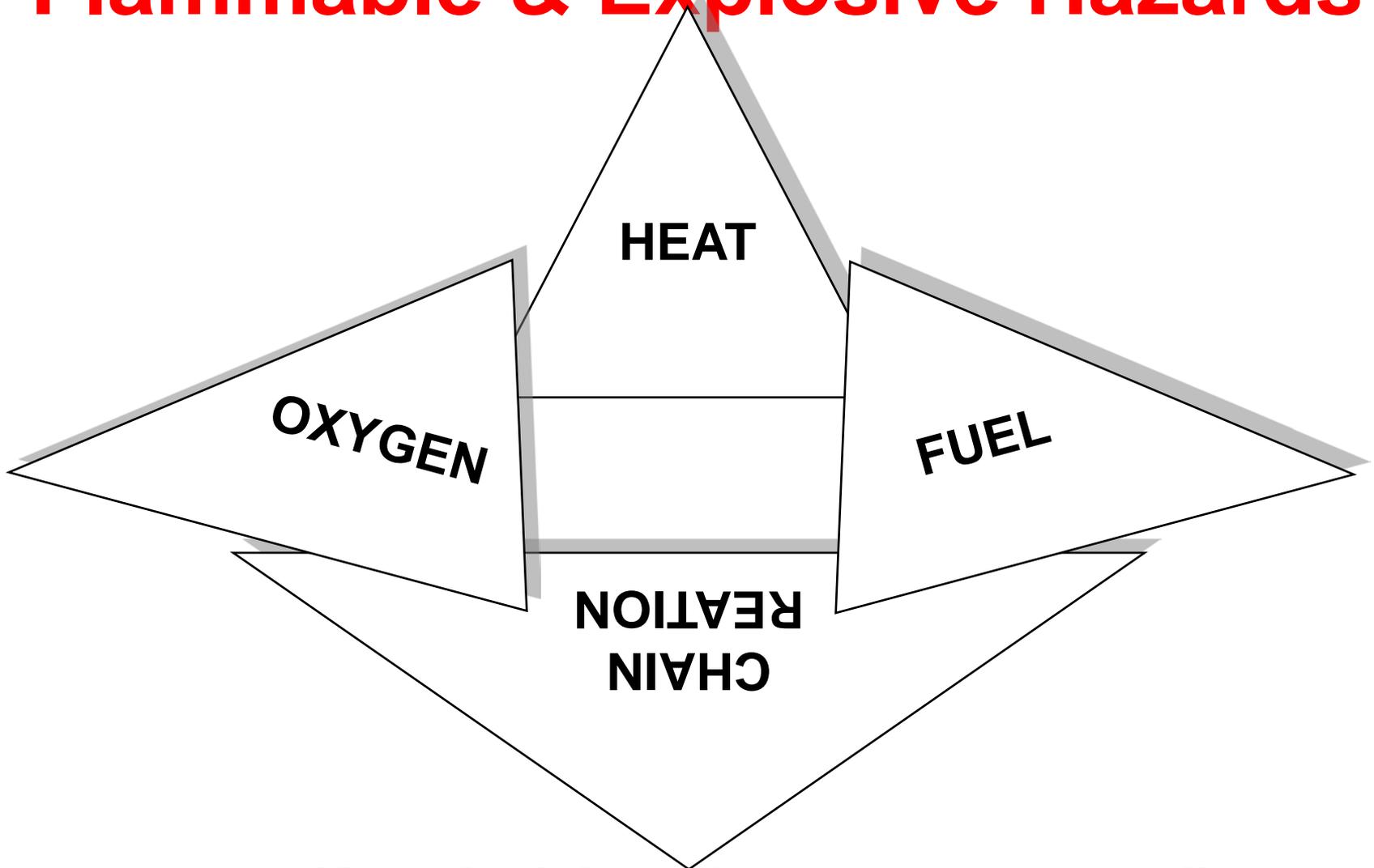


Flammable & Explosive Hazards



Pictogram for Flammable
Globally Harmonized System

Flammable & Explosive Hazards



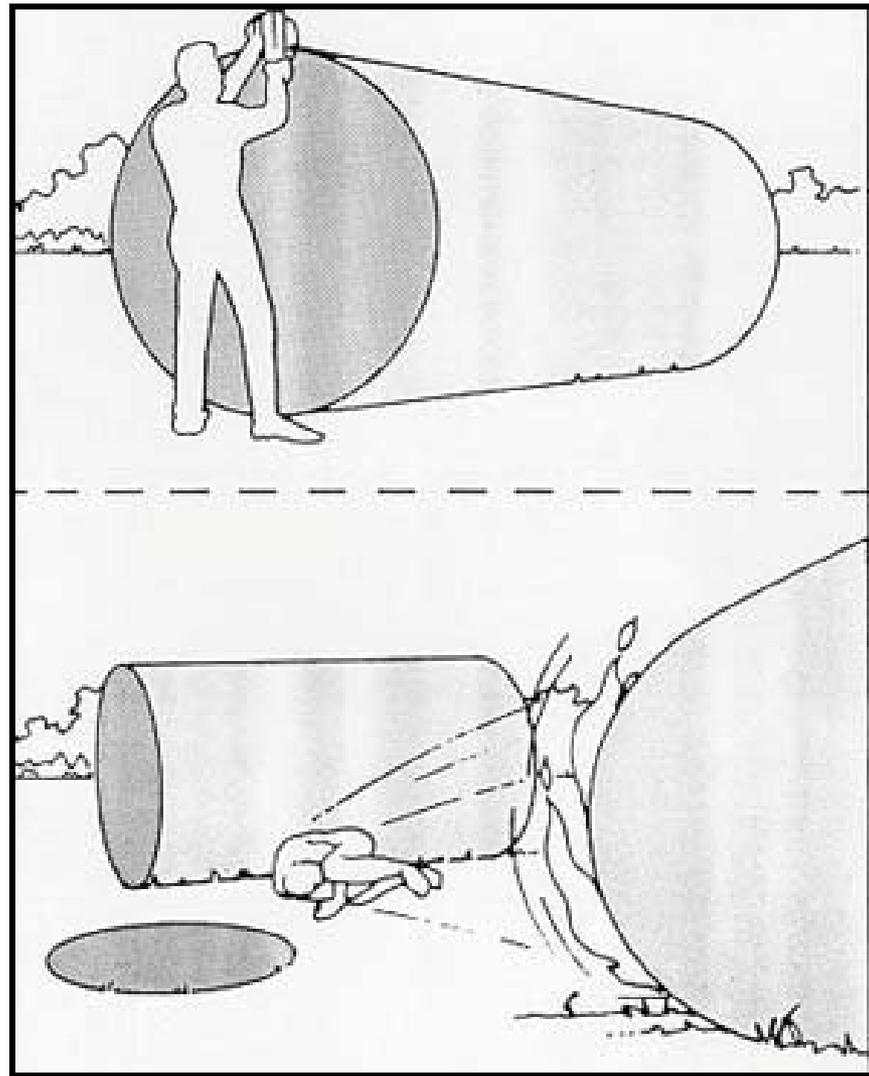
Keep fuel, heat & oxygen separated!



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theYNC.com

MARCH 15
9PM

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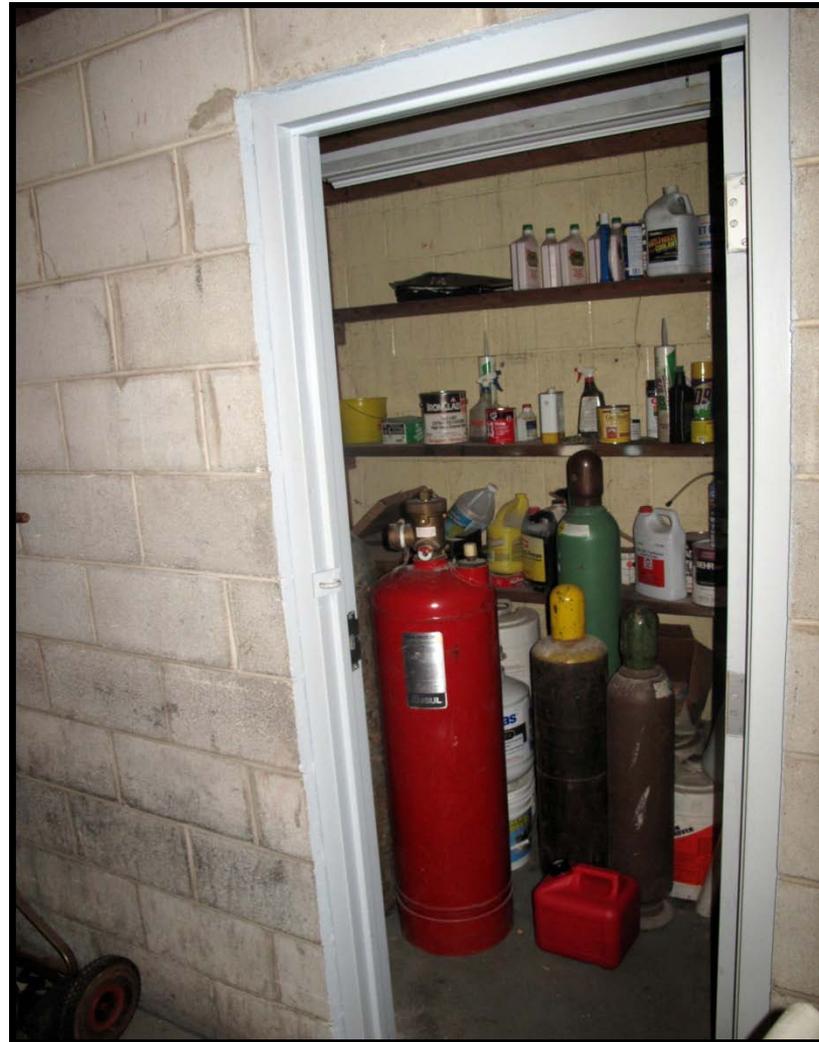
Flammable Materials (Storage & Use)

- No more than 25 gallons of flammable or combustible liquids may be stored in a room outside of an approved storage cabinet.
- Not more than 60 gallons of flammable or 120 gallons of combustible liquids may be stored in any one storage cabinet. Not more than three such cabinets may be located in a single storage area.
- Storage of liquid petroleum gas (LPG) within buildings is prohibited.
- Only approved containers and portable tanks shall be used for storage and handling of flammable and combustible liquids.

Hazard Recognition

Improper storage of flammable & combustible liquids and gases; creates a potential fire hazard as well as a toxic atmosphere.

Notice the enclosed space hazard.





Flammable & Combustible Storage Cabinet

Photo courtesy of Justrite Mfg. Co.

Hazard Control

An approved “*Safety Can*”...

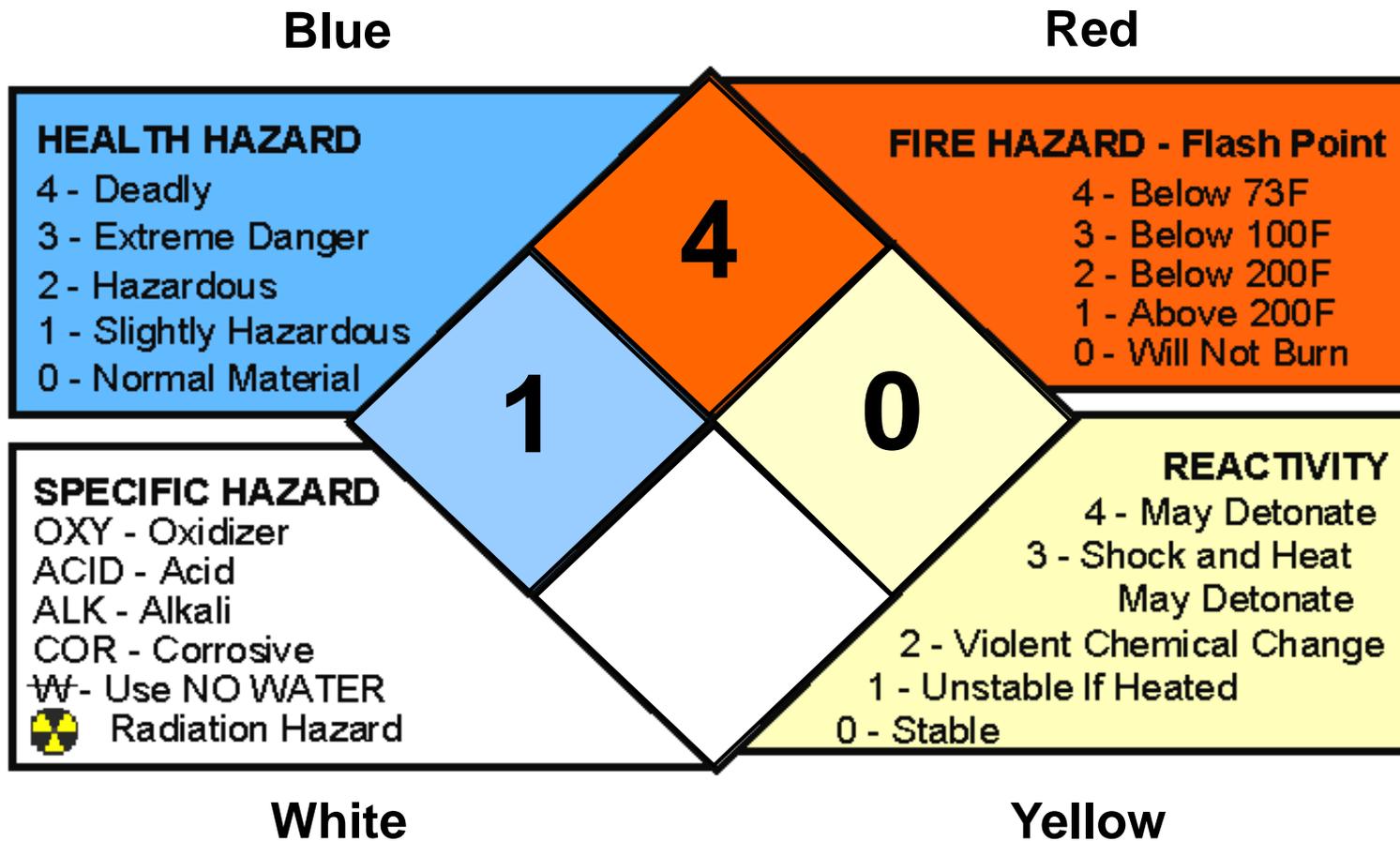
- A closed container of not more than 5 gallons capacity.
- Has a flash-arresting screen.
- Spring-closing lid and spout cover.



“*Safety Can*”

Photo courtesy of Justrite Mfg. Co.

National Fire Protection Association (NFPA 704M)



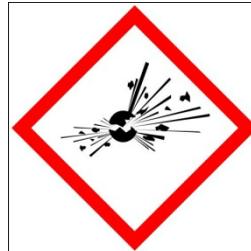
The Globally Harmonized System of Classification & Labeling of Chemicals



Gas



Aquatic Hazard



Explosive



Flammable



Corrosive



Oxidizer



Irritant & Sensitizer

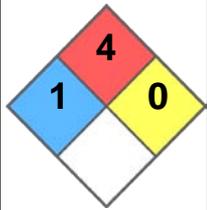


Acute Toxicity

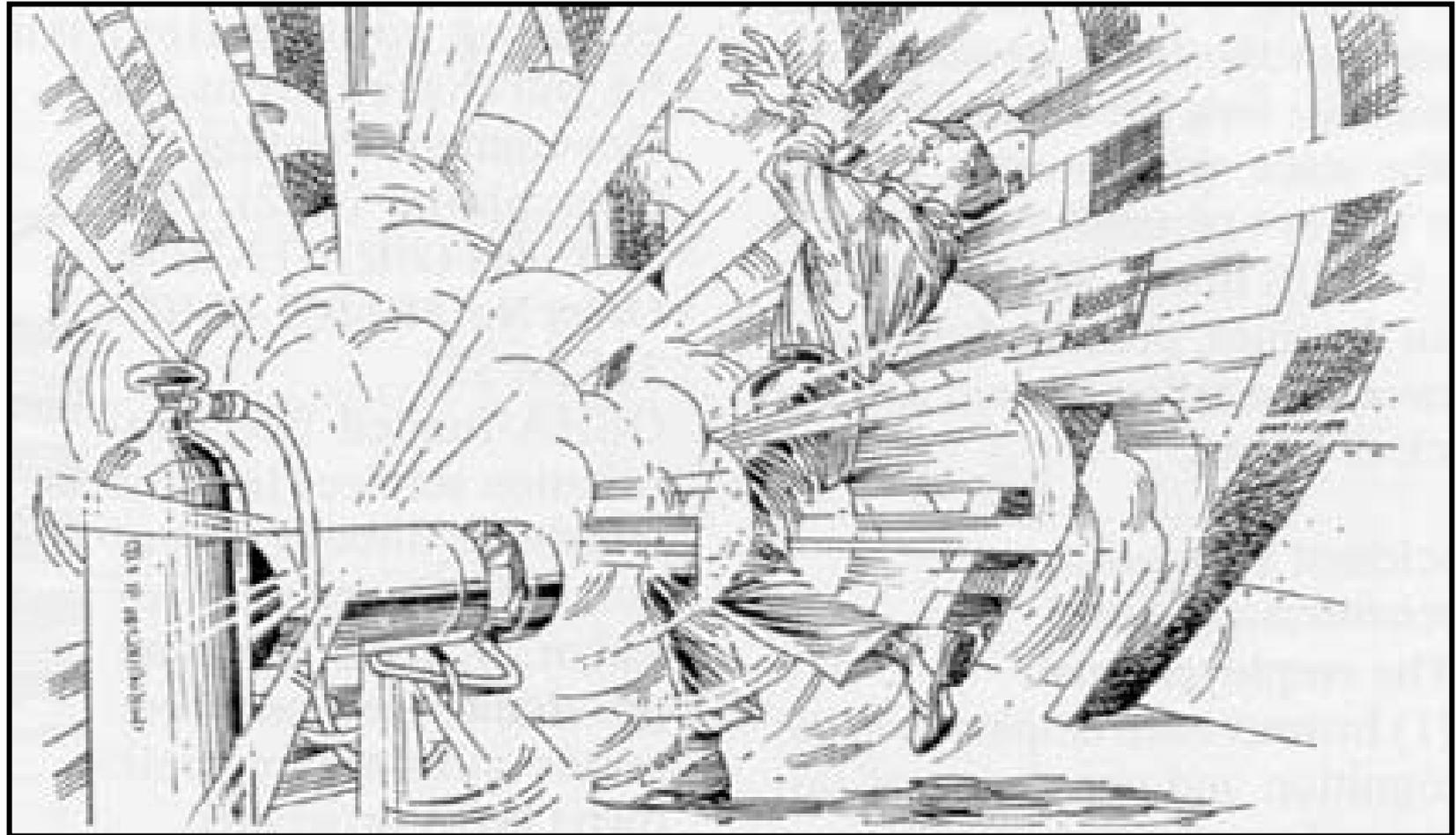


Chronic Health Hazard

Propane (LPG)

<i>Propane – Physical Properties</i>			
Gas Density: 1.55 (air = 1)	LFL: 2.1%	NFPA Fire Rating: 4 NFPA Health Rating: 1 NFPA Reactivity Rating: 0 NFPA Special Instruction: N/A	
Flash Point: -156°F	UFL: 9.5%		
Globally Harmonized System Label:			

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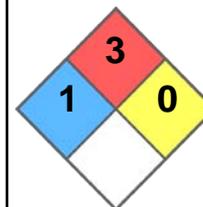


Propane – Physical Properties

**Gas Density: 3 - 4
(air = 1)**

LFL: 1.4%

**NFPA Fire Rating: 3
NFPA Health Rating: 1
NFPA Reactivity Rating: 0
NFPA Special Instruction: N/A**



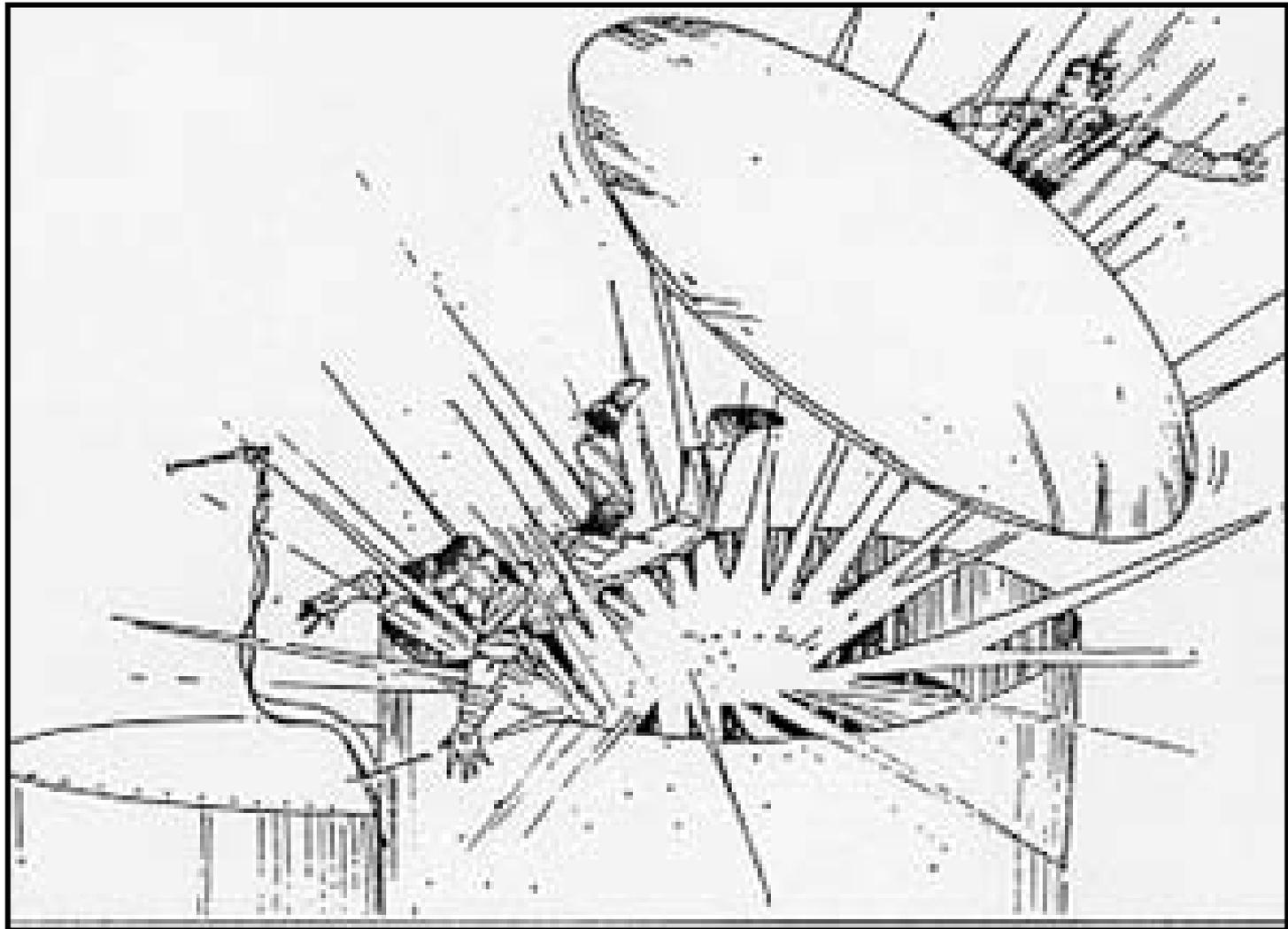
Flash Point: -45°F

UFL: 7.6%

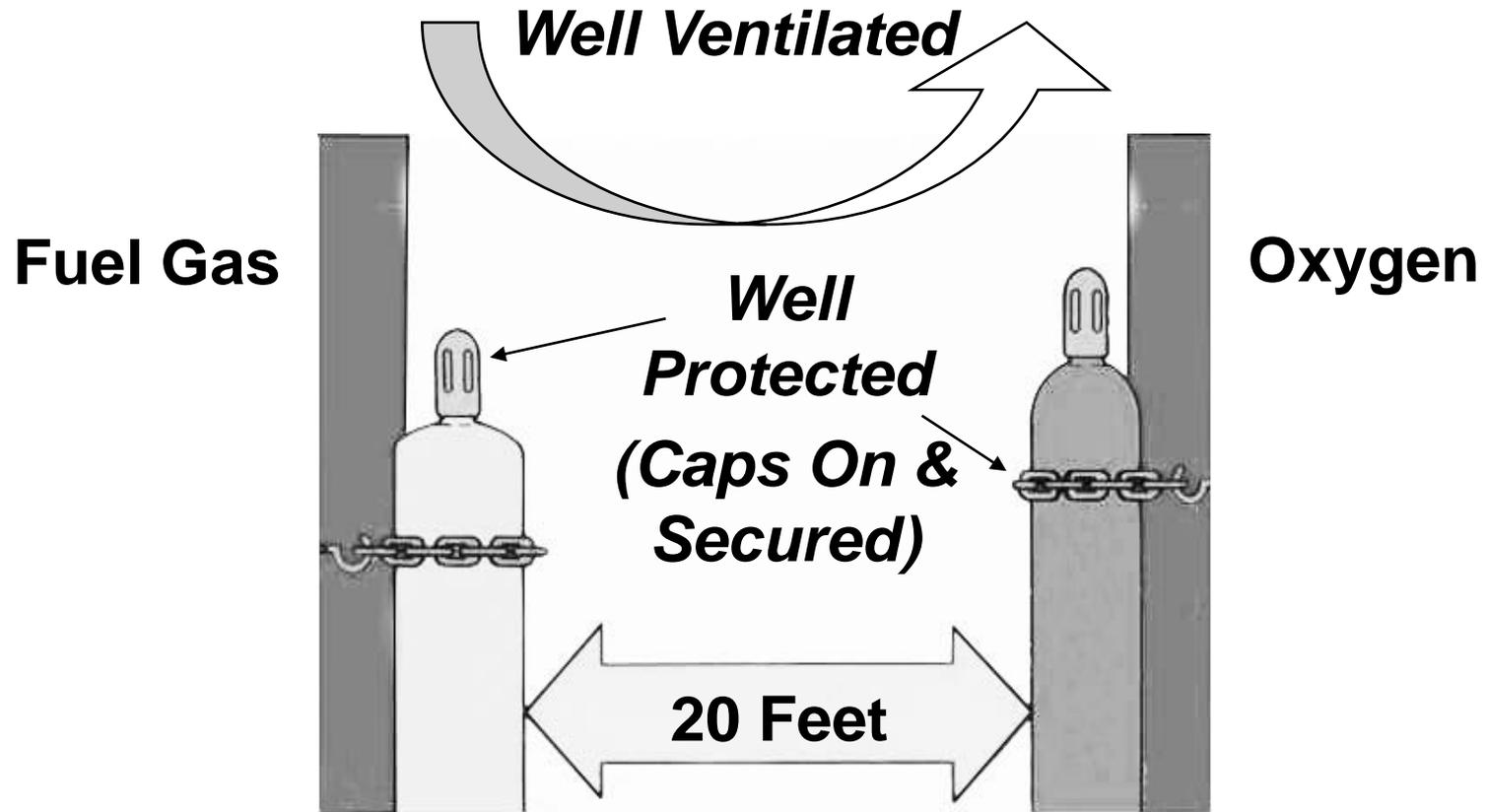
Globally Harmonized System Label:



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Compressed Gas Cylinders

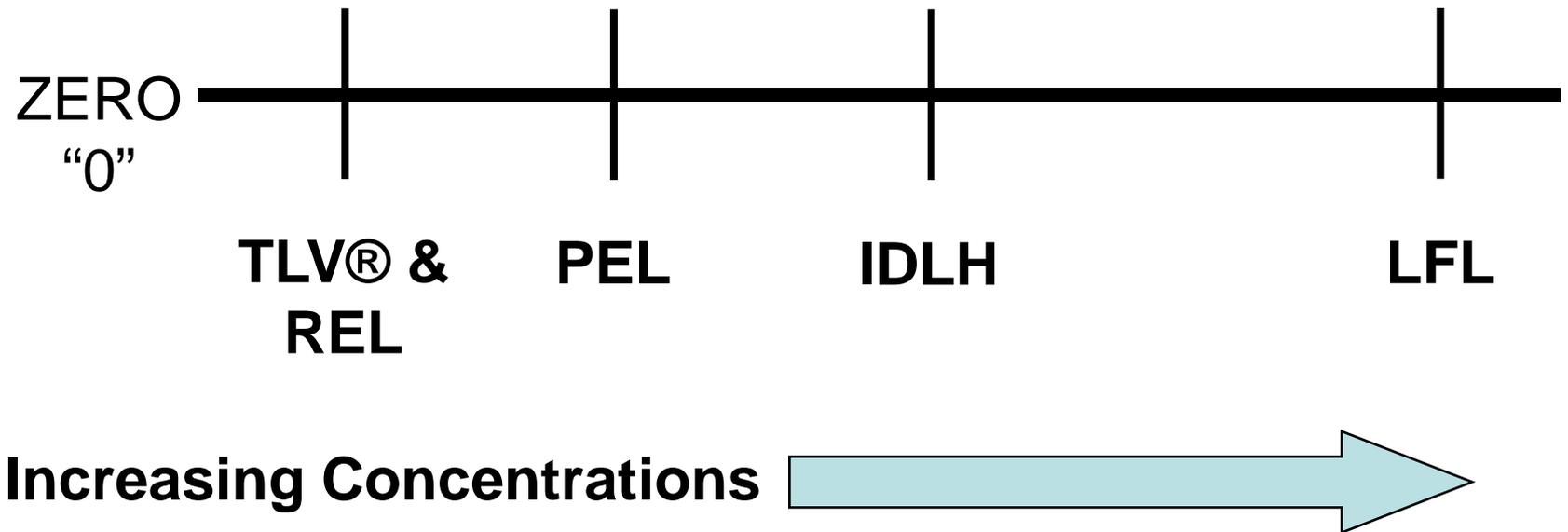


Compressed Gas Cylinders & Confined Spaces

- Use with caution around confined and enclosed spaces.
- Never bring a compressed gas cylinder into a confined or enclosed space – including trenches.
- Remove all hoses and leads from confined space when not in use.



Toxic vs. Flammable Environments



Oxygen Deficiency Hazards

- Normal breathing air contains around 20.9% oxygen...
- Oxygen deficient atmosphere – below 19.5%
 - Displacement
 - Consumption

Oxygen Deficiency Hazards

<i>O2 Content</i>	<i>Effects and Symptoms</i>
15 – 19%	<ul style="list-style-type: none">• Decreased ability to work strenuously. May impair coordination and induce early symptoms in persons with coronary, pulmonary, or circulatory problems.
12 – 14%	<ul style="list-style-type: none">• Respiration increases in exertion, pulse up, impaired coordination, perception, and judgment.
10 – 12%	<ul style="list-style-type: none">• Respiration further increases in rate and depth, poor judgment, lips blue.
8 – 10%	<ul style="list-style-type: none">• Mental failure, fainting, unconsciousness, ashen face, blueness of lips, nausea, and vomiting.
6 – 8%	<ul style="list-style-type: none">• 8 min., 100% fatal; 6 min., 50% fatal; 4-5 min., recovery with treatment.
4 – 6%	<ul style="list-style-type: none">• Coma in 40 sec., convulsions, respiration ceases, death.



Chemical Health Hazards

Learning Goals:

- Be able to explain what a chemical health hazard is and how construction workers might be exposed to these hazards.
- Define important terms used to describe chemical hazards in the workplace.
- Overview the health effects of these hazards on the human body.

Important Terms

- Gases, vapors, fumes, dusts/fibers & mists
- Routes of entry
- Units of concentration
- Respirable
- Breathable Air
- Simple asphyxiant
- Chemical asphyxiant
- Gas & vapor density
- Carcinogens
- Toxic & highly toxic

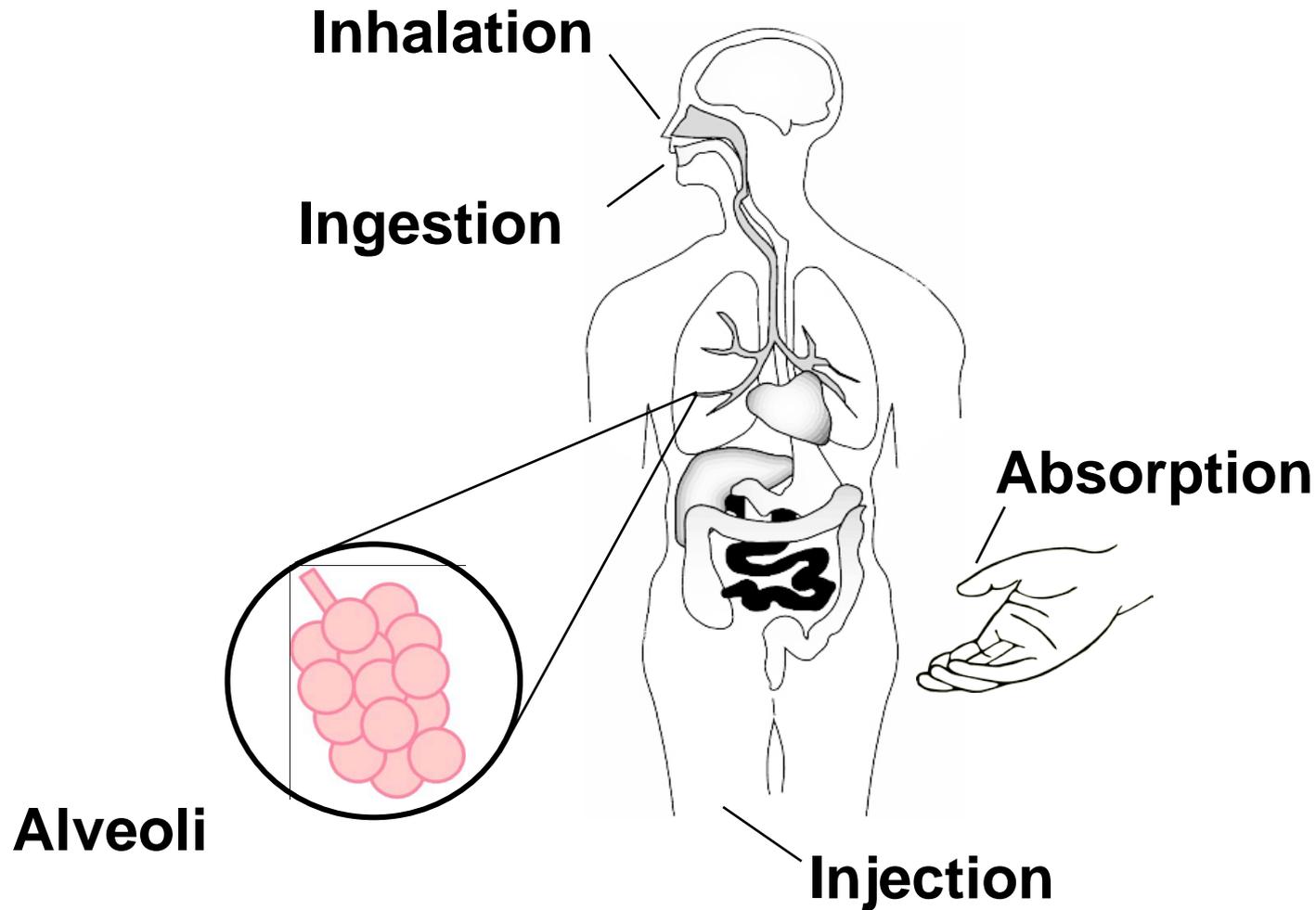
Important Terms

- Reproductive toxins
- Irritants
- Corrosives
- Sensitizers
- Hepatotoxins (liver toxins)
- Nephrotoxins (kidney toxins)
- Neurotoxins (nerve toxins)
- Hematopoietic system (blood forming system)
- Synergistic Effect
- Your Right to Know
- Material Safety Data Sheet (MSDS)

Chemical Health Hazards

- Gas
- Vapor
- Fume
- Dust/Fiber
- Mist

Routes of Entry

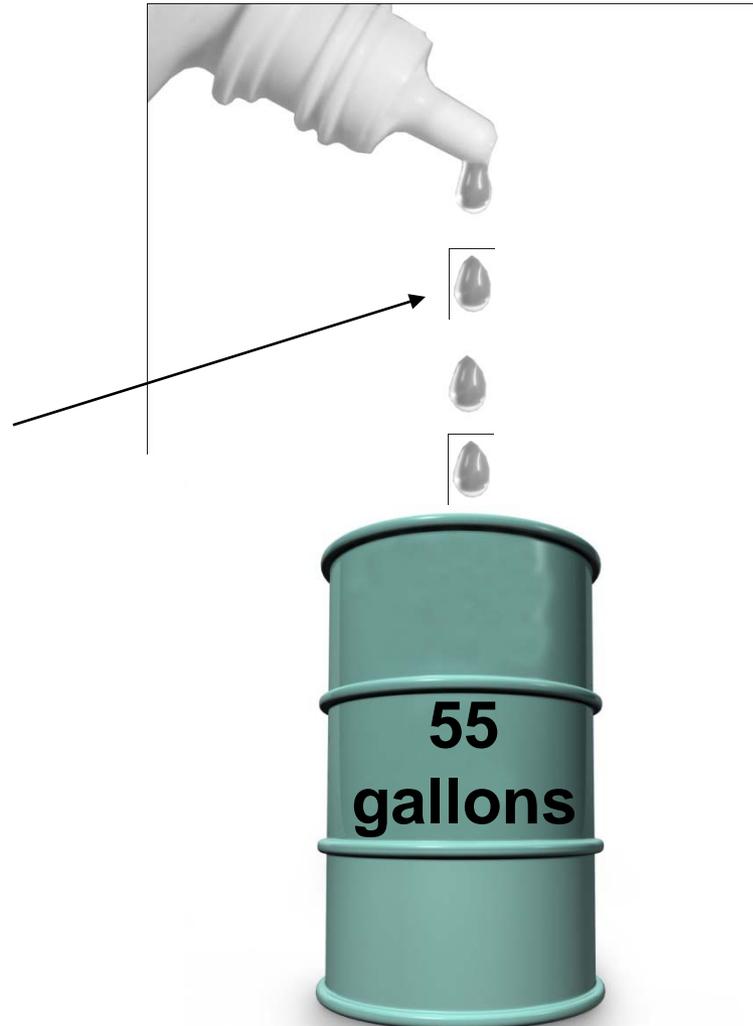


Units of Concentration

- **(ppm)** Parts per Million
- **(mg/m³)** Milligrams per Cubic Meter of Air
- **(μg/m³)** Micrograms per Cubic Meter of Air
- **(f/cc)** Fibers per Cubic Centimeter of Air

Part Per Million (ppm)

Four (4) eye drops in a 55 gallon drum is equivalent to 1 part per million (1 ppm).



Milligrams per Cubic Meter of Air (mg/m³)



X 1000 = 1 mg/m³



Approximate Volume = 1,000,000 m³

Micrograms per Cubic Meter of Air ($\mu\text{g}/\text{m}^3$)



$$\text{X } 1 = (1 \mu\text{g}/\text{m}^3)$$

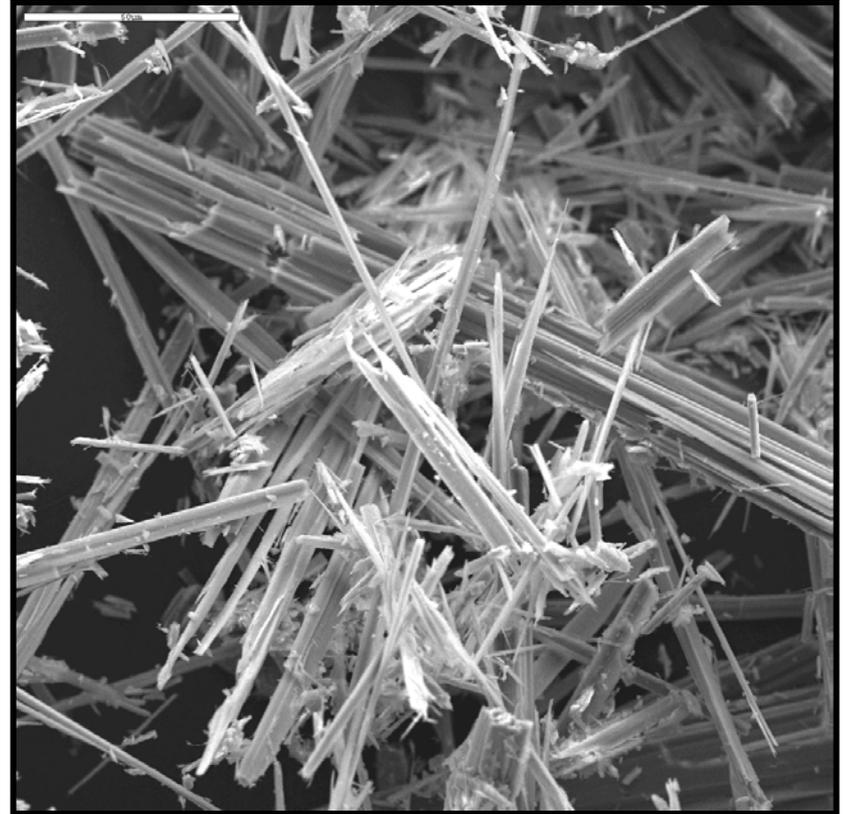
*X 50 (artificial sweetener packets)
= 50 $\mu\text{g}/\text{m}^3$
(OSHA PEL for Lead).*

Approximate Volume = 1,000,000 m^3



Fibers per Cubic Centimeter (f/cc)

Fiber – Means a particulate form of asbestos, 5 micrometer (μm) or longer, with a length-to-width ratio of at least 3 to 1.



OSHA PEL for Asbestos



0.1 f/cc is equivalent to the number of fibers on the tip of a pencil mixed in with the volume of ten refrigerators.



Average amount of air a worker breathes during an 8-hour shift (ten refrigerators)

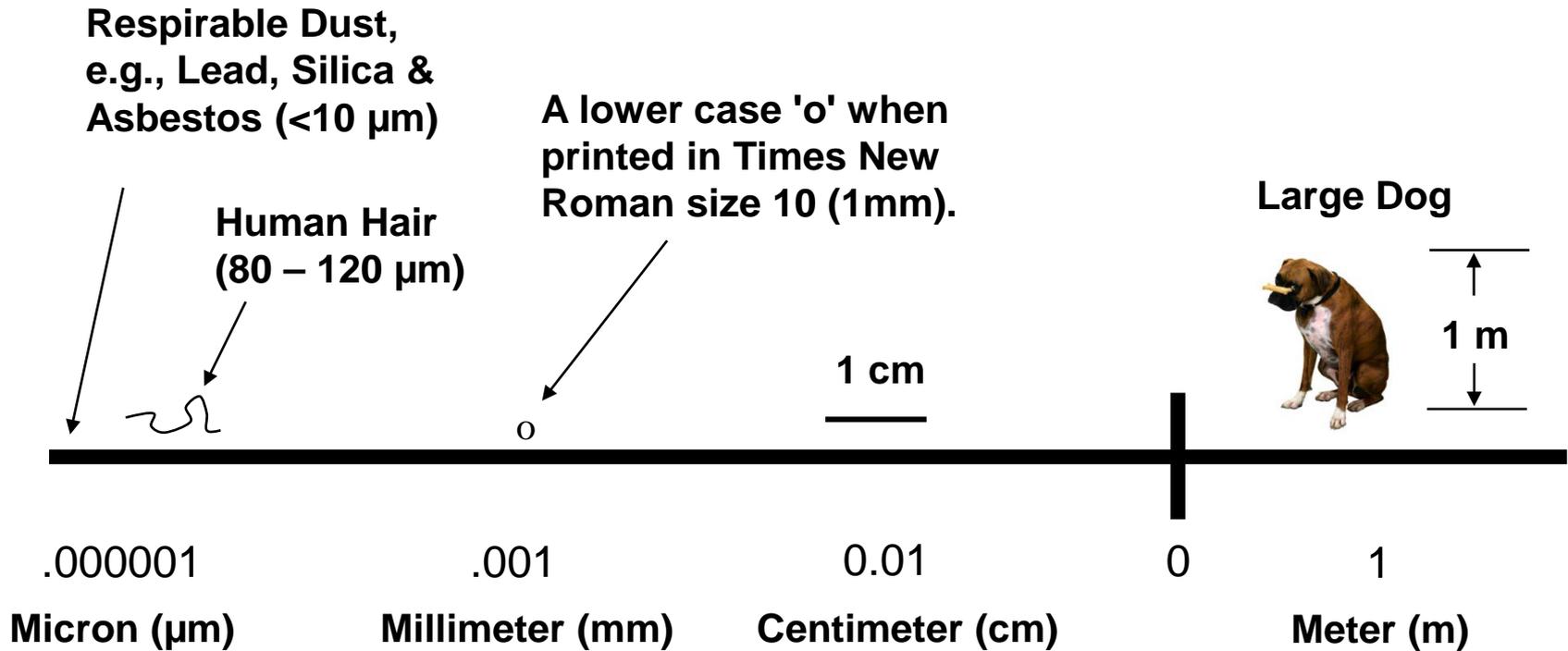
Respirable Particles

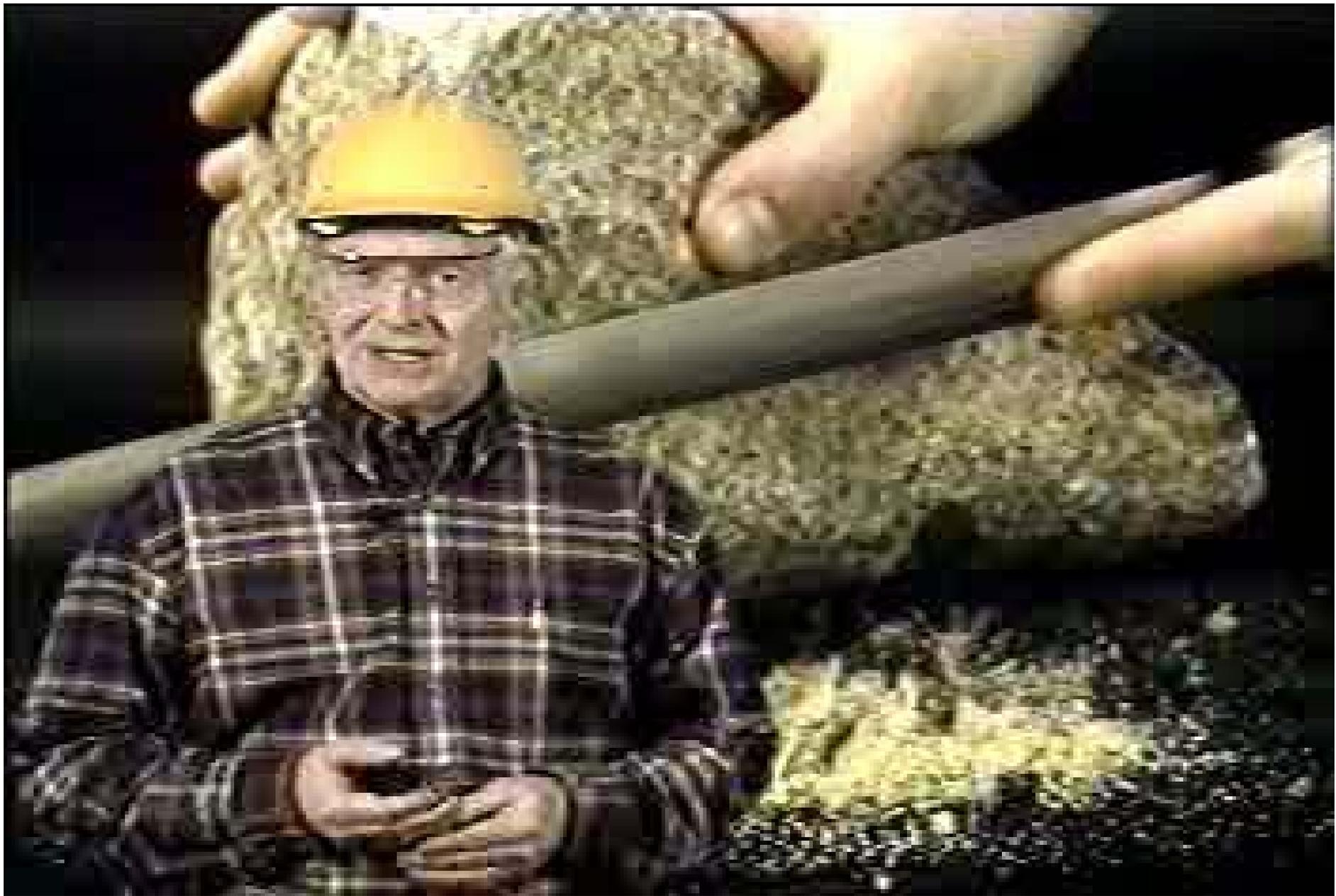
Respirable dust is less than 10 microns (μm) in diameter!



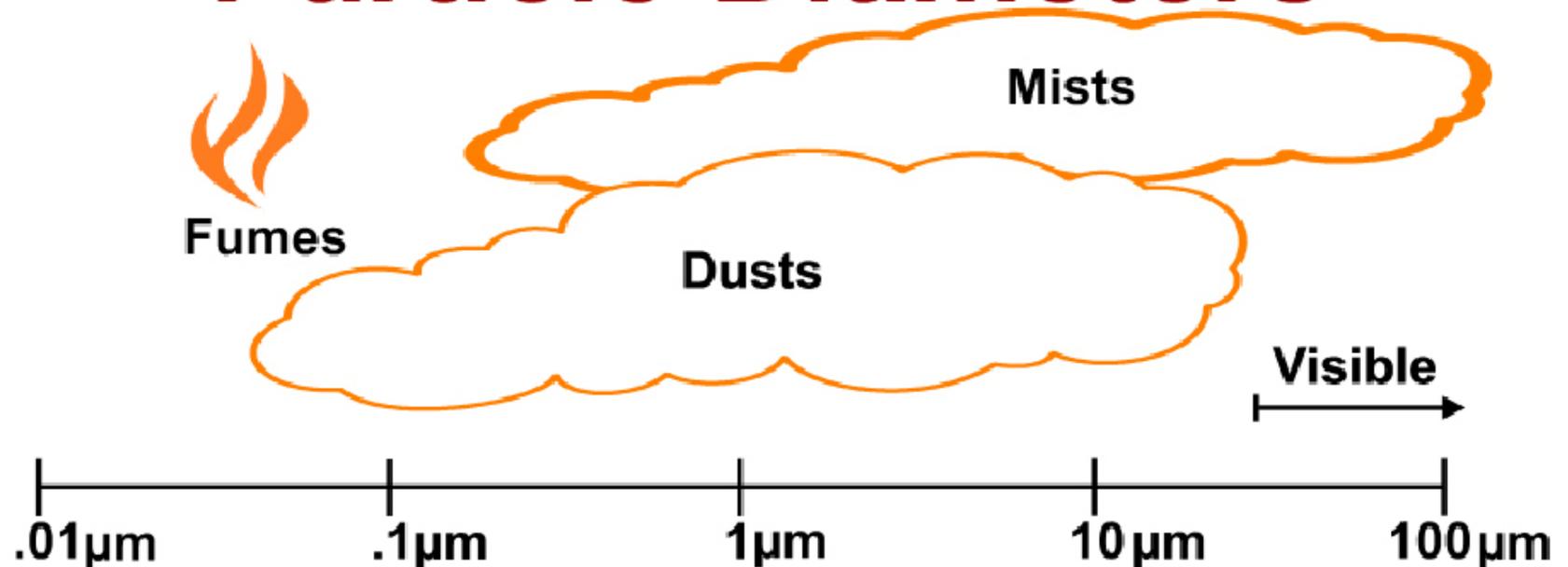
Human hair is between 80 – 120 microns (μm) in diameter.

Respirable Particles





Particle Diameters



1 Micron = $1\mu\text{m} = \frac{1}{1,000,000}$ Meter

1 Red Blood Cell = $7\mu\text{m}$

High Efficiency Particulate Air (HEPA)



100

- Capable of filtering 0.3 micrometer particles with 99.97% efficiency.

Gases



Examples of gases found in construction:

- **Oxygen** – used for welding and cutting.
- **Acetylene** – used for welding and cutting.
- **Propane** – used for heating & fuel.
- **Carbon Dioxide** – used as an inert gas and can be found naturally in sewers.
- **Methane** – the principle component of natural gas and found in earth deposits.

Gases



Examples of gases found in construction:

- **Hydrogen Sulfide** –break down of organic matter and can be found naturally in sewers.
- **Carbon Monoxide** – highly toxic and produced by the incomplete combustion of fuels.
- **Welding Gases** – The welding arc can produce ozone, phosgene and carbon monoxide gases.
- **Diesel Exhaust** – Nitrogen Dioxide.

Group Discussion...

How do Gases Affect the Body?

Who's at Risk?

***What hazardous gases
are present on your job?***

Gases

Important questions concerning gases:

- What is the gas density?
- What is the flammable range (LFL) of the gas?
- How toxic is the gas (PEL, TLV, REL & IDLH)?
- Is the gas a simple asphyxiant or a chemical asphyxiant?

Gas Density

Gas Density
(Air = 1)

Propane
1.55



Helium .062

Carbon
Dioxide 1.53

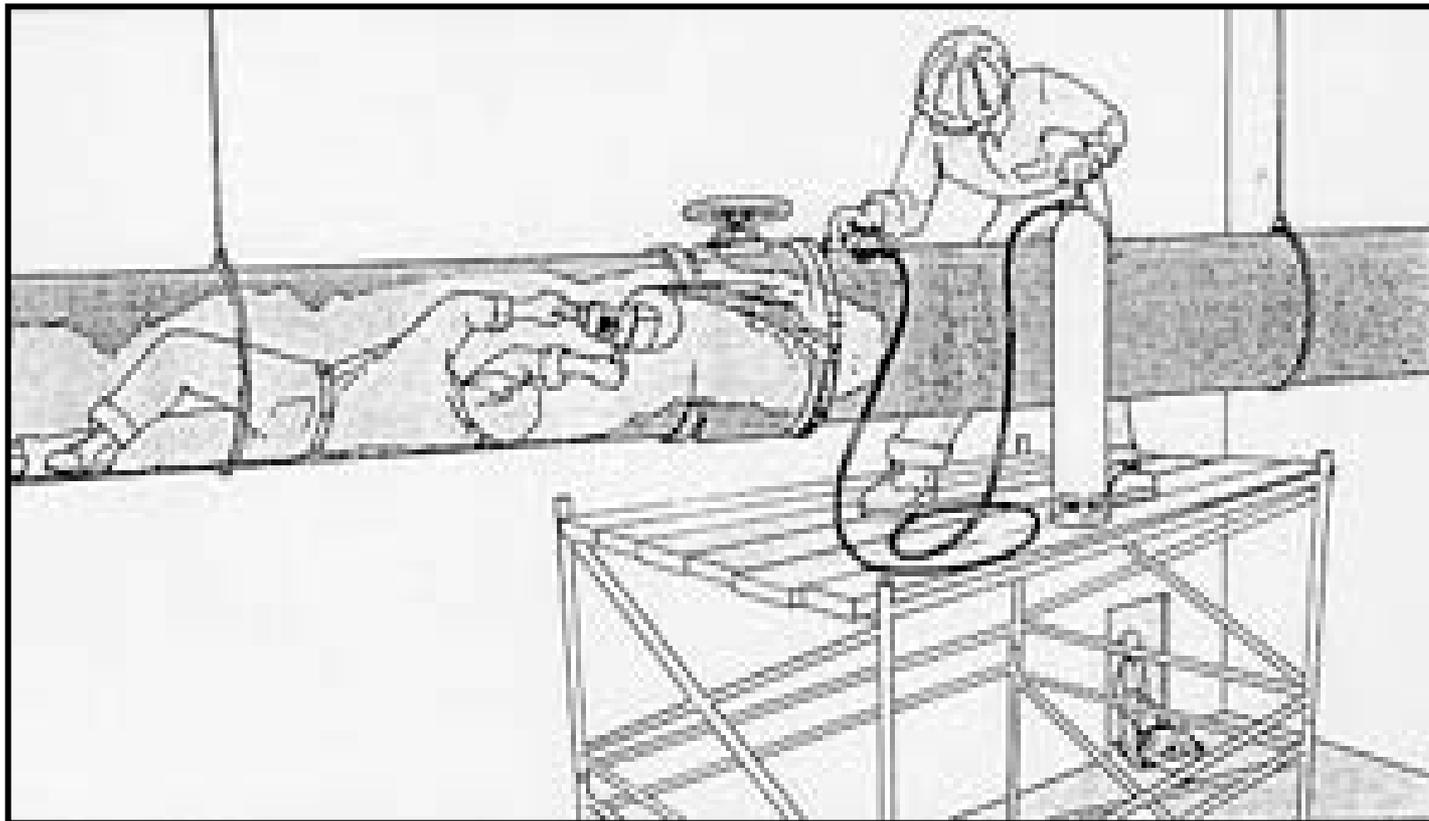
Breathable Air

Composition of Air

<i>Substance (Gas)</i>	<i>% by Volume (ppm)</i>
Nitrogen	78% (780,000)
Oxygen	20.9% (209,000)
Argon	0.9% (9,000)
Carbon Dioxide	0.1% (1,000)

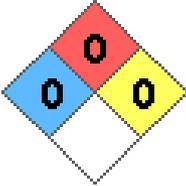
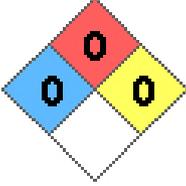
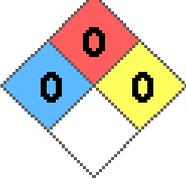
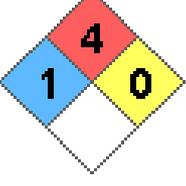


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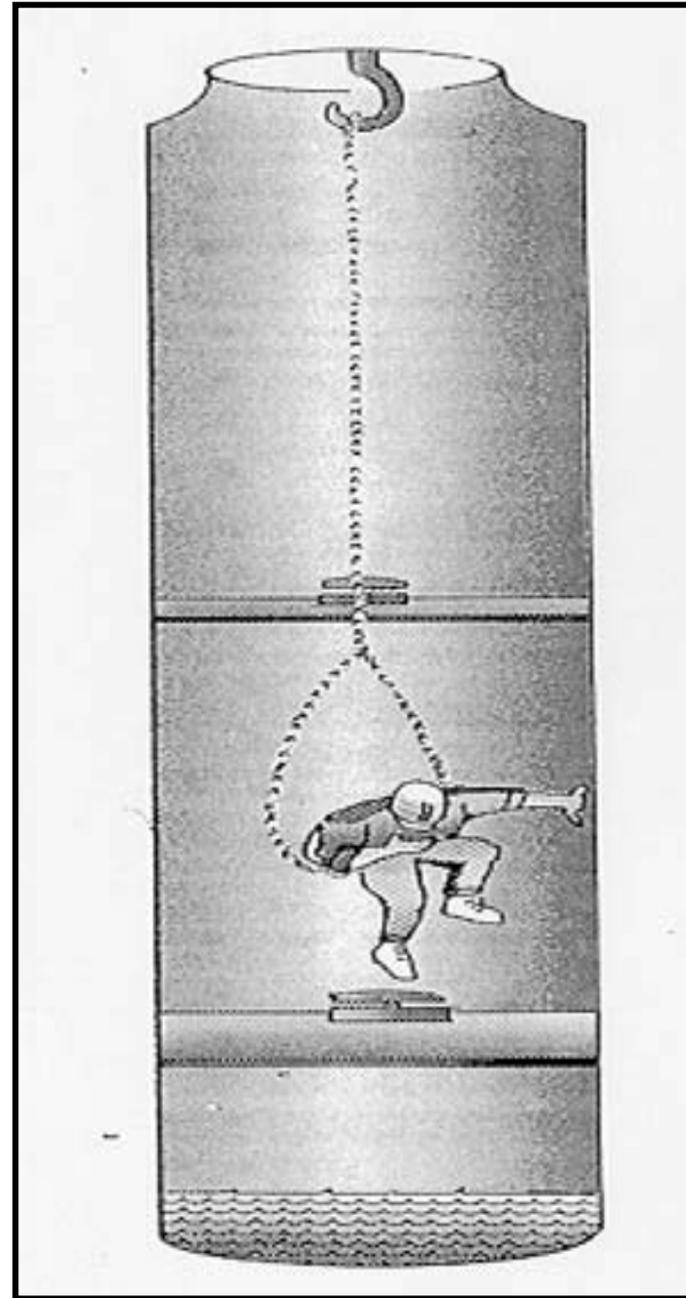
***Never use pure oxygen for ventilation,
cooling or cleaning!***

Simple Asphyxiants

<i>Asphyxiant (Gas)</i>	Gas Density	LFL	PEL	IDLH	NFPA 704M	
Carbon Dioxide	1.53	NA	5000	40,000	Fire: 0 Health: 0 Reactivity: 0 Specific Hz: NA	
Nitrogen	.97	NA	E ³	NA	Fire: 0 Health: 0 Reactivity: 0 Specific Hz: NA	
Argon	1.38	NA	E ³	NA	Fire: 0 Health: 0 Reactivity: 0 Specific Hz: NA	
Methane	.55	5.3%	E ³	5300	Fire: 4 Health: 1 Reactivity: 0 Specific Hz: NA	

Sewer Entry

- Engulfment
- Toxic gases
- Explosive -
Flammable gases
- Oxygen Deficiency



Confined Space Hazards



***Confined Space Hazards...
Always check for hazardous atmospheres!***