

# INTRODUCTION

LCCC SAFE 225

PP 1

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# COURSE DESCRIPTION

- OSHA Regulations involving Industrial Hygiene
- Recognition of Workplace Health Hazards
- Avoid, Minimize or Eliminate these Hazards
- Occupational Exposure Limits
- Workplace Sampling Procedures

# WHAT IS INDUSTRIAL HYGIENE

“Industrial Hygiene (IH) is a science and art devoted to the anticipation, recognition, evaluation, prevention, and control of those environmental factors or stresses arising in or from the workplace which may cause sickness, impaired health and well being, or significant discomfort among workers or among citizens of the community.”

[American Industrial Hygiene Association](#)

# IH PRACTICE

- Workplace Analysis
- Environmental Monitoring
- Review of Occupational Exposure limits
- Determination of Control Methods
- Robert Kirkby, Michigan State Police

# EARLY HISTORY

4 BCE (BC) – Hippocrates (Greek)

- Lead Exposure in Mining

2 BCE – Galen (Greek)

- Lead Poisoning, Copper workers acid exposure

1 CE (AD) – Pliny the Elder (Rome)

- Zinc, Sulfur, Lead, Dust

# COMMON ERA (AD) HISTORY

1556 – Agricola (German)

- Book on Miners Diseases and Recommendations

1700 – Bernado Ramazzini (Italian)

- Book on Diseases of Workmen

1743 (1473) – Ulrich Ellenborg

- Miners Exposure to Mercury, Lead, Nitric acid

# RECENT HISTORY

1788 – Percival Pott

- “Soot – Wart” (testicular cancer)

1869-1970 – Dr. Alice Hamilton

- Showed Relationship illness/workplace Exposure

1911 – Workers Compensation

1913 – NY Dept. of Labor, Ohio Health Dept.

- IH programs

# CONGRESSIONAL ACTION

- Mine Safety and Health Act of 1966
- Coal Mine Safety and Health Act of 1969
- Occupational Safety and Health Act of 1970



# OSH ACT

“To assure safe and healthful working conditions for working men and women; by authorizing enforcement of the standards developed under the Act; by assisting and encouraging the States in their efforts to assure safe and healthful working conditions; by providing for research, information, education, and training in the field of occupational safety and health; and for other purposes.”

# HAZARDS ADDRESSED BY IH

- Air Contaminants
- Chemical Hazards
- Physical Hazards
- Biological Hazards
- Ergonomic Hazards

Can you give examples of each type of hazard?

# ROUTES OF ENTRY

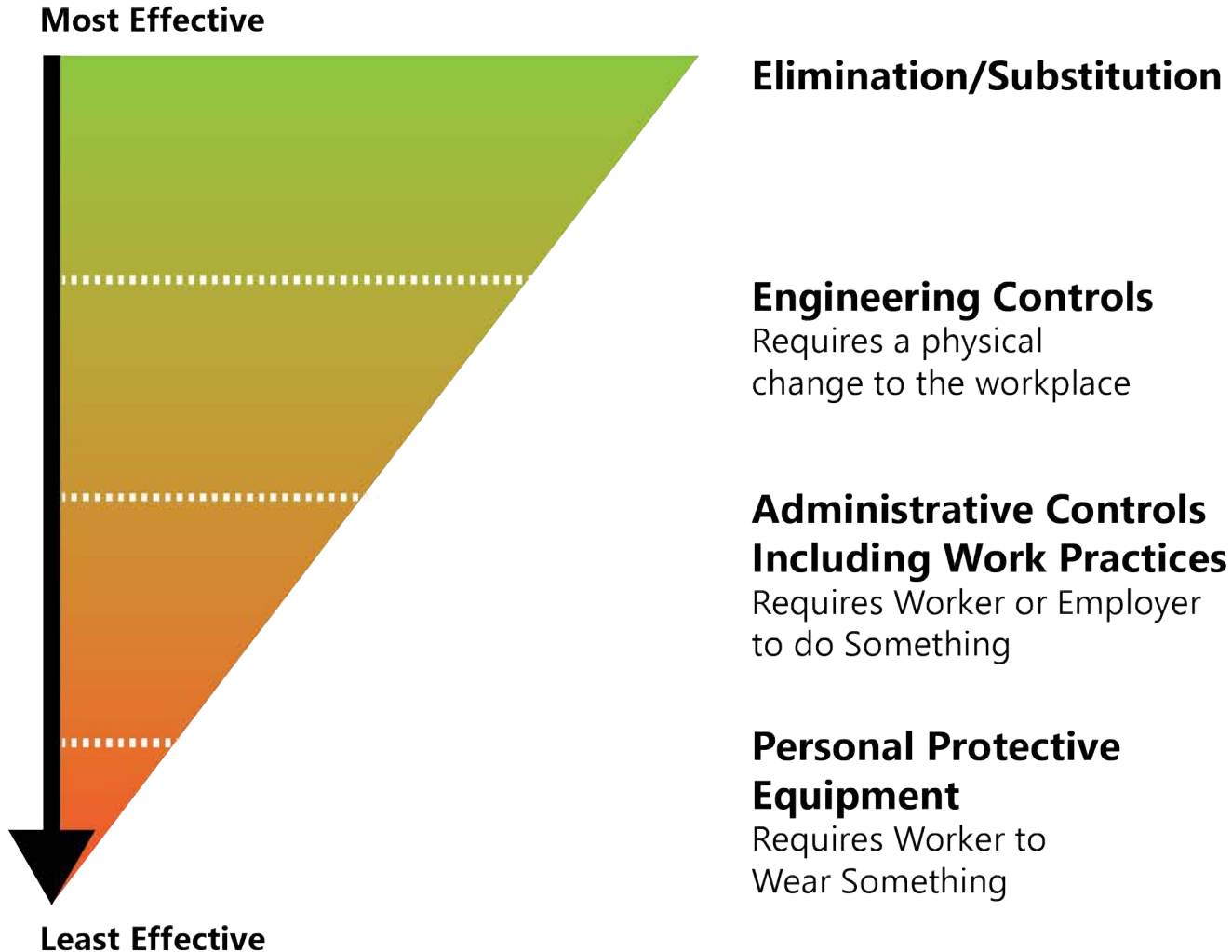
- Inhalation – Lungs
- Absorption – Skin
- Ingestion – Eating, Drinking, Smoking
- Injection – Punctures



Examples?

More Common

# HIERARCHY OF CONTROLS



# EXPOSURES

- Acute Effects – short time interval after exposure
- Chronic Effects – Long period after exposure

Substance	Acute Effects	Chronic Effects
Benzene	Narchois, irritation	Cancer
Carbon monoxide	Headache	Heart damage
Formaldehyde	Irritation	Cancer
Toluene	Narcosis	Brain damage

# AIR CONTAMINANTS

# AIR CONTAMINANTS EXAMPLES

- Dust – Silica, Metals, PNOC
- Fume – Metals Melting or Welding
- Mist – Acids, Water Solutions
- Fibers – Asbestos, Glass Fibers, Cellulose
- Gases – Carbon Monoxide, Ammonia
- Vapors – Gasoline, Solvents

# MEASURES OF CONCENTRATION

- PPM – Parts per Million Parts of Air
- $\text{Mg}/\text{m}^3$  – Milligrams per cubic meter of air
- $\mu\text{g}/\text{m}^3$  – Micrograms per cubic meter of air
- f/cc – Fibers per cubic centimeter of air
- mppcf – millions of particles per cubic foot of air  
Former silica standard – obsolete



# OSHA EXPOSURE LIMITS

- Occupational Safety and Health Administration
- PEL – Permissible Exposure Limit
- AL – Action Level
- Legally Enforceable

# NIOSH

- National Institute for Occupational Safety and Health
- REL – Recommended Exposure Limit
- Possibly Legally Enforceable Under 5(a)(1)

# ACGIH

- American Conference of Governmental Hygienists
- TLV – Threshold Limit Value
- Possibly Legally Enforceable Under 5(a)(1)

# TIME OF EXPOSURE

- TWA – 8 Hour, Time Weighted Average
- STEL – Short Term Exposure Limit- 15 minutes
- Ceiling – Maximum Exposure –Never Exceeded

# OSHA PELS

## 29 CFR 1910.1000

- 29 CFR 1910 Table Z-1
- 29 CFR 1910.1000 Table Z-2
- 29 CFR 1910.1000 Z-3

# OSHA Z-1 TABLE -EXAMPLES

Substance	PPM	Mg/m <sup>3</sup>
Acetone	1000	2400
Respirable fraction [dust]		5
Ammonia	50	35
Carbon Monoxide	50	55
Copper Fume		0.1
2-Butanone (MEK)	200	590
Stoddard Solvent	500	2900
Sulfuric Acid		1

# EXPANDED HEALTH STANDARDS

Lead as an Example

# EXPANDED HEALTH STANDARDS

- .1001 Asbestos
- .1025 Lead
- .1026 Chromium VI
- .1027 Cadmium
- .1048 Formaldehyde
- .1052 Methylene chloride
- .1053 Respirable crystalline silica
- **See handout for complete list**



# EXPANDED STANDARDS

## I.E. LEAD

- Scope
- Definitions
- Exposure Limits
- Monitoring
- Methods of Compliance
  - Work Practices
  - Engineering Controls
- Respirators
- Clothing & Equipment
- Housekeeping
- Hygiene Facility, Practices
- Medical Surveillance
- Medical Removal
- Training
- Communication of Hazard
- Recordkeeping
- Observation of Samples



# .1025(a) SCOPE AND APPLICATION

- Applies to all occupational exposure
- Does not apply to agriculture and construction

# .1025(b) DEFINITIONS

- Action level 30  $\mu\text{g}/\text{m}^3$  (micrograms per cubic meter of air)
- Lead includes metallic lead, inorganic lead compounds

# .1025(b) PEL

- $50 \mu\text{g}/\text{m}^3$  8-Hour TWA
- Calculation for longer exposure

# CALCULATION FOR SHIFTS > 8 HOURS

8 hour PEL is  $50 \mu\text{g}/\text{m}^3$

## Examples

Calculate PEL formula:

10 hour shift:  $40 \mu\text{g}/\text{m}^3$

$\text{PEL} = 400 / \text{hours}$

12 hour shift:  $33 \mu\text{g}/\text{m}^3$

# RESPIRATORS SUPPLEMENTING ENGINEERING CONTROLS

- Must meet all requirements for respirator use
- Allows accounting for compliance with PEL by use of respirator protection factors
  - Must meet all respirator requirements

# .1025(d) EXPOSURE MONITORING

- Minimum 7 hour sample
- Initial monitoring – representative number
- When monitoring shows >AL all monitored
- Changes made – repeat monitoring
- >AL – repeat 6 months
- >PEL – repeat 3 months
- Notify employees

# AIR MONITORING

- OSHA Technical Manual
- Introduction to air sampling
- Introduction to air sampling media





# .1025(e) METHODS OF COMPLIANCE

- Above the PEL for more than 30 days/year
  - Engineering controls required
- Above the PEL for less than 30 days per year
  - Controls to reduce to  $200 \mu\text{g}/\text{m}^3$  required
- Respiratory protection where controls not sufficient
- Requirements for compliance program, ventilation maintenance and administrative controls

# .1025(f) RESPIRATORY PROTECTION

- When respirators are required
- Comply with 29 CFR 1910.134 with exceptions
- Respirator selection



images: OSHA

# .1025(f) MUST COMPLY WITH 1910.134

1910.134(b) through (d) and (f) through (m)

- Except (d)(1)(iii)

# .1025(g) PROTECTIVE WORK CLOTHING AND EQUIPMENT

- Provided at no cost
- Intervals for cleaning or replacement
- Handling soiled clothing
- Prohibition on shaking or air pressure

# .1025(h) HOUSEKEEPING

- Surfaces as clean as possible
- Cleaning prohibitions: air pressure, shoveling
- Vacuums prevent reentry of dust into work area

# .1025(i) HYGIENE FACILITIES AND PRACTICES

- Eating and drinking
- Change rooms
- Showers
- Lunchrooms



# .1025(j) MEDICAL SURVEILLANCE

- Provide for employees above AL – 30 days/year
- Blood lead monitoring
- Medical examinations
- Examination content
- Multiple physician review
- Chelation prohibition



# .1025(k) MEDICAL REMOVAL PROTECTION

- Employees with High blood lead levels
  - Temporary or final determination
  - No loss of pay or benefits



# .1025(1) EMPLOYEE INFORMATION AND TRAINING

- Training program
- Training content
- Access to training materials

# .1025(m) COMMUNICATION OF HAZARDS

- Hazard communication
- Signs

**DANGER**

**LEAD  
MAY DAMAGE FERTILITY OR THE UNBORN  
CHILD  
CAUSES DAMAGE TO THE CENTRAL  
NERVOUS SYSTEM  
DO NOT EAT, DRINK OR SMOKE IN THIS AREA**

# .1025(n) RECORDKEEPING

- Exposure monitoring
- Medical Surveillance
- Medical removals
- Availability
- Transfer of records

# .1025(o) OBSERVATION OF MONITORING; APPENDICES

Employees able to see monitoring

Appendix A: Substance Data Sheet

Appendix B: Summary of Standard

Appendix C: Medical Surveillance Guidelines

# 1010.134 SECTIONS

- a) Permissible Practice
- b) Definitions
- c) Respiratory Program
- d) Selection of Respirators
- e) Medical Evaluation
- f) Fit Testing
- g) Use of respirators
- h) Maintenance and Care
- i) Breathing Air
- j) Identification of Cartridges
- k) Training and information
- l) Program evaluation
- m) Recordkeeping
- n) Effective Date

# RESPIRATORY PROTECTION

## OSHA Respirator Video

# ASBESTOS & SILICA

- See Asbestos PPT
- See Silica PPT





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