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 or 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

Most Effective

Elimination/Substitution

Engineering Controls
Requires a physical change to the workplace

Administrative Controls
Including Work Practices
Requires Worker or Employer to do Something

Personal Protective Equipment
Requires Worker to Wear Something

Least Effective
### EXPOSURES

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

<table>
<thead>
<tr>
<th>Substance</th>
<th>Acute Effects</th>
<th>Chronic Effects</th>
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</thead>
<tbody>
<tr>
<td>Benzene</td>
<td>Narcois, irritation</td>
<td>Cancer</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>Headache</td>
<td>Heart damage</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>Irritation</td>
<td>Cancer</td>
</tr>
<tr>
<td>Tolune</td>
<td>Narcosis</td>
<td>Brain damage</td>
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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
- Mg/m$^3$ – Milligrams per cubic meter of air
- µg/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
<table>
<thead>
<tr>
<th>Substance</th>
<th>PPM</th>
<th>Mg/m³</th>
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<tr>
<td>Acetone</td>
<td>1000</td>
<td>2400</td>
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<tr>
<td>Respirable fraction [dust]</td>
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<td>5</td>
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<tr>
<td>Ammonia</td>
<td>50</td>
<td>35</td>
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<tr>
<td>Carbon Monoxide</td>
<td>50</td>
<td>55</td>
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<tr>
<td>Copper Fume</td>
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<td>0.1</td>
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<tr>
<td>2-Butanone (MEK)</td>
<td>200</td>
<td>590</td>
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<tr>
<td>Stoddard Solvent</td>
<td>500</td>
<td>2900</td>
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<tr>
<td>Sulfuric Acid</td>
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<td>1</td>
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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 $\mu g/m^3$ (micrograms per cubic meter of air)

- Lead includes metallic lead, inorganic lead compounds
.1025(b) PEL

- 50 µg/m³ 8-Hour TWA

- Calculation for longer exposure
CALCULATION FOR SHIFTS > 8 HOURS

8 hour PEL is 50 µg/m³

Calculate PEL formula:

PEL = 400 / hours

Examples

10 hour shift: 40 µg/m³

12 hour shift: 33 µg/m³
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 µg/m³ 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
.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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