



NORTH CAROLINA

Department of Transportation



Construction Health Hazards

Michael Heminuk, CSP

Objectives

- Identify common health hazards
- Describe types of common health hazards
- Apply health hazard protection methods
- Recognize employer requirements to protect workers from health hazards including Hazard Communication Program.

Health Hazards

Potential exposures to health hazards:

- Worker on the job
- Worker's family.



NCDOT Health Hazards

- Lead
- Asbestos
- Silica
- Hexavalent Chromium
- Isocyanates.

Common Health Hazards

Chemical



Physical



Biological



Ergonomic



Common Ways Workers Encounter Chemical Hazards

- Solids
- Liquids
- Gases
- **Aerosols:**
 - Dust, Mist, Fumes.

Welding Fumes



Asbestos



Spraying Chemicals



Silica



Lead



Effects of Chemical Exposure

Health Problems

Heart Ailments	Lung Damage	Sterility
CNS Damage	Kidney Damage	Burns
Cancer	Liver Damage	Rashes

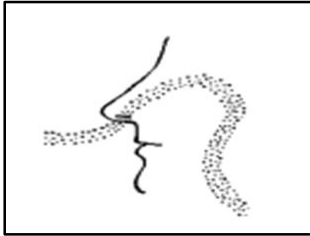
Fire



Explosion

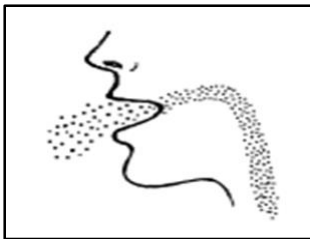


Routes of Entry



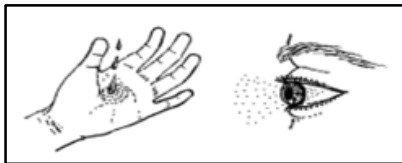
Source: OSHA

Inhalation: Breathed in (Most common route)



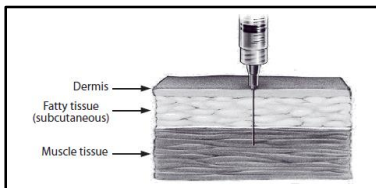
Source: OSHA

Ingestion: Swallowing via eating or drinking



Source: OSHA

Absorption: Drawn through skin or eye surface



Source: CDC

Injection: Punctures through skin

Health Effects

Exposure Condition		Exposure	Example
ACUTE	Immediate	Short-term, high concentration	H ₂ S exposure within a confined space
CHRONIC	Delayed; generally for years	Continuous; for long periods of time	Asbestosis

Acute



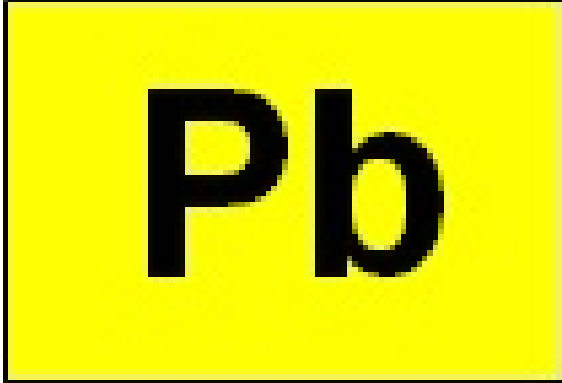
Chronic



Lead Exposure Health Effects

Symptoms can include tiredness, weakness, weight loss, insomnia, headache, nervous irritability, fine tremors, numbness, dizziness, anxiety and hyperactivity which could potentially lead to:

- *Damage of the nervous system and brain*
- *Anemia*
- *Kidney disease*



Pb

Lead Exposure Limits

- Permissible Exposure Limit (**PEL**) = 50 $\mu\text{g}/\text{m}^3$ as an 8 hour time-weighted average (TWA)
 - Employers shall implement engineering controls and safe work practices to prevent exposure
 - Employers shall provide protective clothing and where necessary, and respiratory protection in accordance with 29 CFR 1910.134
- Action Level (**AL**) = 30 $\mu\text{g}/\text{m}^3$ as an 8 hour TWA.

Medical Surveillance

In Construction, the employer shall provide *initial* medical surveillance for any employee exposed at or above the action level for any one day

Abatement Methods

- Elimination
- Substitution
- Engineering Controls
 - *Mechanical ventilation*
 - *Isolation*
- Administrative Controls
 - *Housekeeping*
 - *Personal hygiene practices*
 - *Designated break areas*
- Personal Protective Equipment (PPE)
 - *Respiratory protection*
 - *Protective work clothing*

Most Preferred



NC DOT Photo Library

Least Preferred

Asbestos

- Asbestos is the name given to a group of naturally occurring **fibrous silicate minerals** mined for their useful properties such as thermal insulation, chemical and thermal stability, and high tensile strength
- Used in building materials for resistance against heat and corrosion

Asbestos

- Airborne fibers range from 5 μm or greater, with a length-to-diameter ratio of at least 3 to 1
- **ACM:** “Asbestos-containing material,” any material containing >1% asbestos
- **PACM:** “Presumed asbestos-containing material” – thermal system insulation and surfacing material found in buildings constructed no later than 1980.

Asbestos Health Effects

- **Asbestosis:** A serious, progressive, long-term non-cancer disease of the lungs
- **Lung Cancer:** Causes the largest number of deaths related to asbestos exposure
 - Most common symptoms of lung cancer are coughing and a change in breathing
- **Mesothelioma:** A rare form of cancer found in the thin lining (membrane) of the lung, chest, abdomen, and heart
 - Most cases are linked to asbestos exposures

Exposure Limits

- Permissible exposure limit
 - 0.1 fiber per cubic centimeter (f/cc) of air as an 8 hour TWA
- Excursion limit
 - Not more than 1 f/cc averaged over 30 minutes
- Monitoring
 - Initially for workers who are or may be exposed at or above the PEL and/or above the excursion limit
 - Periodic if above PEL or excursion limit

Chemical Hazard Protection

- **Engineering**

- Ventilation (local/general)
- Process and equipment modification
- Isolation/automation

- **Administrative**

- Monitor/measure exposure levels
- Inspections and maintenance
- Develop SOPs

- **PPE**

- Respirators
- Gloves
- Safety glasses
- Protective clothing.

Local Exhaust Ventilation



Source: OSHA

Physical Hazards in Construction

- Noise
- Temperature extremes
- Vibration.



Effects of Exposure to Physical Hazards

Temperature	Radiation	Vibration	Noise
Rash; Cramps	Burns	Fatigue	Interferences
Exhaustion	Sickness	Strains	Stress
Stroke	Aging	Carpal tunnel	Tinnitus
Hypothermia	Cancer	HAVS	Headaches
Frostbite	DNA mutations	Raynaud's	Hearing loss

Noise

Common Construction Noise Sources	
Equipment	Noise (dB)
Backhoe	85
Bulldozer	87
Router	90
Front end loader	90
Chop saw	92
Welding equipment	92
Nail gun	97
Jackhammer	102
Grader/scrapper	107

Prolonged exposures to 85 dB can lead to hearing loss

Protection Against Physical Hazards

Hazard	Engineering Controls	Administrative Controls	PPE
Temperature	Heaters; AC; windshields; ventilation	<u>Water</u> ; <u>Rest</u> ; <u>Shade</u>	Hoods; cooling vests; hard hat liners
Vibration	Vibration reduction equipment	Train not to grip too tightly; Job rotation	Anti-vibration gloves
Noise	Silencers; mufflers; enclosures; sound barriers	Increase distance between source and worker	Ear plugs; muffs

Biological Hazards in Construction

Insects



Animals



Mold



Plants



Water/Sewage



Blood



Effects of Exposure to Biological Hazards

- **Mild**

- Allergic reaction

- **Serious**

- Tetanus
- Swine Flu
- SARS
- Avian Flu
- West Nile
- Lyme Disease

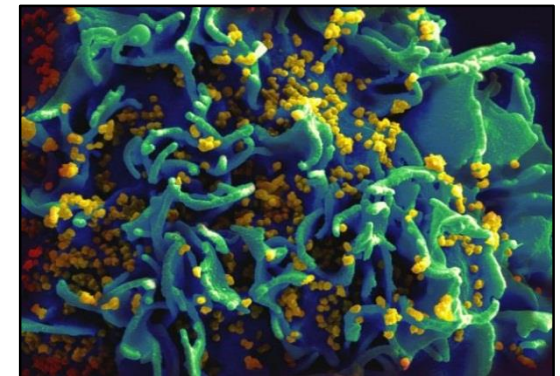
- **Chronic/Terminal**

- HIV
- Hepatitis B & C

Hepatitis C



HIV-infected H9 T cell



Ergonomic Hazards in Construction

- Lifting and pushing
 - Heavy
 - Awkward
 - Repetitive
- Awkward grips and postures
- Reaching
- Using wrong tool or using tool improperly
- Using excessive force
 - Overexertion.



Effects of Exposure to Ergonomic Hazards

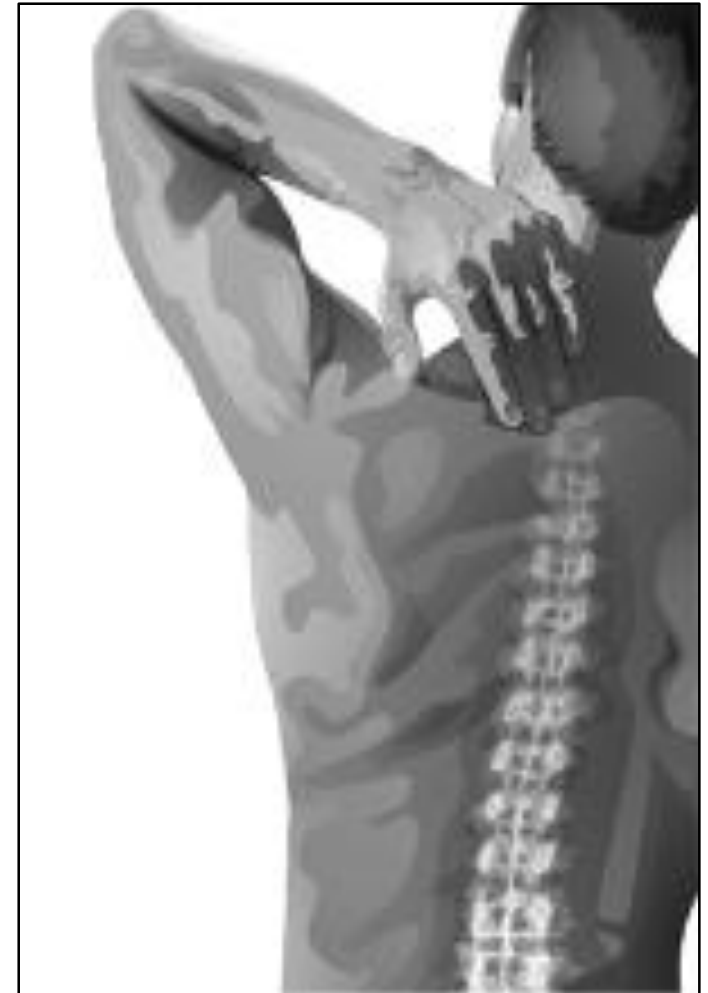
Musculoskeletal Disorders (MSDs)

- **Mild**

- Joint pain
- Swelling
- Sciatica
- Acute lower back pain

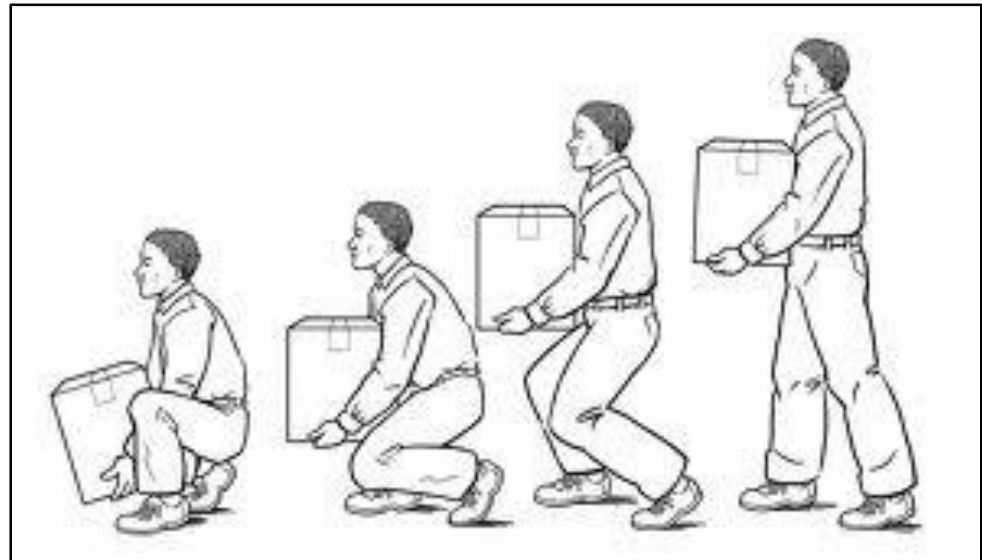
- **Serious**

- Epicondylitis (Tennis Elbow)
- Raynaud's Phenomenon (White finger)
- Thoracic Outlet Syndrome
- Carpal Tunnel Syndrome
- Chronic lower back pain
- Tears (Rotator Cuff is common).



Protection Against Ergonomic Hazards

- Use ergonomically designed tools
- Use correct work practices
 - Proper lifting techniques
 - Work station setup
- Ask for help when handling:
 - Heavy loads
 - Bulky/Awkward materials
- Proper PPE.



Employer Requirements

Abide by OSHA regulations!

- Permissible Exposure Limits (PELs) for all chemicals
- Monitoring and protection programs
- Hazard Communication Program (HAZCOM)
 - Worker right to know
 - Hazardous chemical training
 - Written plan (Who, What, Where)
 - Proper chemical labeling
 - SDS



Multiple Health Hazards

In some cases, workers can be exposed to several health hazards at the same time or on the same worksite over time.



This worker is simultaneously exposed to noise, silica dust, vibration, and ergonomic hazards.

Health Hazards in Construction

Questions?