Health Hazards for Roadway Workers

Paul Albritton
Technical Training Coordinator
Iowa Local Technical Assistance Program (LTAP)
Objectives for Today

1. Identify common health hazards.
2. Describe types of common health hazards.
3. Apply health hazard protection methods.
Health Hazards

Potential exposures to health hazards:

- Worker on the job
- Worker’s family

Source: OSHA
Common Health Hazards

Chemical

Physical

Biological

Ergonomic

Source: OSHA
Common Ways Workers Encounter Chemical Hazards

- Solids
- Liquids
- Gases and vapors
- Aerosols
  - Dust, Mist, Fumes

Welding Fumes
  - Source: U.S. Navy

Asbestos
  - Source: OSHA

Spraying Chemicals
  - Source: NIOSH

Silica
  - Source: U.S. EPA

Lead
  - Source: OSHA
## Effects of Chemical Exposure

<table>
<thead>
<tr>
<th>Health Problems</th>
<th>Heart Ailments</th>
<th>Lung Damage</th>
<th>Sterility</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNS Damage</td>
<td></td>
<td>Kidney Damage</td>
<td>Burns</td>
</tr>
<tr>
<td>Cancer</td>
<td></td>
<td>Liver Damage</td>
<td>Rashes</td>
</tr>
</tbody>
</table>
Effects of Chemical Exposure

May pose risk of fire and explosion hazards:

Fire

Explosion
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

Source: OSHA
Routes of Entry

**Inhalation:** Breathed in (Most common route)

**Ingestion:** Swallowing via eating or drinking

**Absorption:** Drawn through skin or eye surface

**Injection:** Punctures through skin
# Health Effects of Chemical Exposure

<table>
<thead>
<tr>
<th>Exposure Condition</th>
<th>Exposure</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACUTE</strong></td>
<td>Immediate</td>
<td>Short-term, high concentration</td>
</tr>
<tr>
<td><strong>CHRONIC</strong></td>
<td>Delayed; generally for years</td>
<td>Continuous; for long periods of time</td>
</tr>
</tbody>
</table>

**Source:**
- U.S. Army Corps of Engineers
- OSHA

---

**Acute**

![Image of firefighters](image1)

Source: U.S. Army Corps of Engineers

**Chronic**

![Image of X-ray](image2)
Chemical Hazard Protection

Silica Exposure
What is Respirable Crystalline Silica?

- Crystalline silica is a common mineral found in many naturally occurring and man-made materials used at construction sites.
- Materials like sand, concrete, brick, block, stone and mortar contain crystalline silica.
What is Respirable Crystalline Silica?

- **Respirable crystalline silica** is a very small particle typically at least 100 times smaller than ordinary sand found on beaches or playgrounds.

- It is generated by operations like:
  - cutting sawing
  - grinding
  - drilling and crushing stone, rock, concrete, brick, block and mortar, or when abrasive blasting with sand.
How Small?

Particles are split into three groups according to their health risks:

1. Inhalable dust (100 μm)
2. Thoracic dust (10 μm)
3. Respirable dust (4 μm)

= Total dust
So What Changed?

In 2016, OSHA reduced the PEL of respirable crystalline silica averaged over an 8-hour shift by 5X.

- **Pre-2016:** 250 micrograms/cubic meter of air
- **2016:** 50 micrograms/cubic meter of air
Chemical Hazard Protection

- Silica Exposure
- Hawks Nest Tunnel
- 1930’s
Chemical Hazard Protection

The Hawk’s Nest Tunnel Tragedy: The Forgotten Victims of America’s Worst Industrial Disaster

• 2900 worked inside the tunnel
• At least 764 died
• Many more died long after the completion of the tunnel

• 60% worked less than 2 months
• 80% worked less than 6 months
• 90% worked less than 1 year
Silica Discussion

Respirable Crystalline Silica Exposure 1926.1153

• Employers can either use a control method laid out in Table 1 of the construction standard or measure worker exposure.

What is Table 1?

• Table 1 matches 18 common construction tasks with effective dust control methods.
### Table 1: Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica

<table>
<thead>
<tr>
<th>Equipment/ Tasks</th>
<th>Engineering and Work Practice Control Methods</th>
<th>Required Respiratory Protection and Minimum Assigned Protection Factor (APF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handheld power saws (any blade diameter)</td>
<td>Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer’s instructions to minimize dust emissions. When used outdoors. When used indoors or in an enclosed area.</td>
<td>&lt;4 hrs/ Shift  &gt;4 hrs/ Shift  None  APF 10 APF 10</td>
</tr>
</tbody>
</table>
Table 1: Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica

- Chop Saws
- Hammer Drills
- Dowel Bar Drills
- Jack Hammers
- Others?
Chemical Hazard Protection

- Eliminate
- Substitution
- Engineering
- Administrative
- PPE
Chemical Hazard Protection

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

• Administrative
  • Monitor/measure exposure levels
  • Inspections and maintenance
  • Develop SOPs
Chemical Hazard Protection

• PPE
  • Respirators
  • Gloves
  • Safety glasses
  • Protective clothing
Physical Hazards

- Noise
- Temperature extremes
- Vibration
- Others?

Source: OSHA
## Effects of Exposure to Physical Hazards

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Vibration</th>
<th>Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rash; Cramps</td>
<td>Fatigue</td>
<td>Interferences</td>
</tr>
<tr>
<td>Exhaustion</td>
<td>Strains</td>
<td>Stress</td>
</tr>
<tr>
<td>Stroke</td>
<td>Carpal tunnel</td>
<td>Tinnitus</td>
</tr>
<tr>
<td>Hypothermia</td>
<td>HAVS</td>
<td>Headaches</td>
</tr>
<tr>
<td>Frostbite</td>
<td>Raynaud’s</td>
<td>Hearing loss</td>
</tr>
</tbody>
</table>
Consider Anti Vibration Gloves

Prolonged use of a chainsaw (or other machines) exposing the operator to vibrations may produce Raynaud’s phenomenon or carpal tunnel syndrome. These conditions reduce the hands ability to feel and regulate temperature, produce numbness and burning sensations and may cause nerve and tissue necrosis.
Prolonged exposures to 85 dB can lead to hearing loss.
Hearing Protection

• Examples
  • Disposable foam plugs
  • Molded ear plugs
  • Noise cancelling ear plugs
  • Ear muffs

• Consider Noise Reduction Rating (NRR) of devices
### OSHA PEL’s for Noise Exposure

<table>
<thead>
<tr>
<th>Duration</th>
<th>PEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 hours per day</td>
<td>90 dB</td>
</tr>
<tr>
<td>4 hours per day</td>
<td>95 dB</td>
</tr>
<tr>
<td>2 hours per day</td>
<td>100 dB</td>
</tr>
<tr>
<td>1 hour per day</td>
<td>105 dB</td>
</tr>
<tr>
<td>½ hour per day</td>
<td>110 dB</td>
</tr>
<tr>
<td>15 minutes per day</td>
<td>115 dB</td>
</tr>
</tbody>
</table>
## Protection Against Physical Hazards

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

Eliminate or substitute hazard, whenever feasible
Protection Against Physical Hazards

• Foot Protection
  • Steel Toe
  • Composite Toe
• Specialty Footwear
• Eye Protection
  • ANSI Z-87
Biological Hazards

- **Insects**
  - Source: James Jordan (Flickr.com)

- **Animals**
  - Source: Jean-Jacques Boujot (Flickr.com)

- **Mold**
  - Source: OSHA

- **Plants**
  - Source: OSHA

- **Water/Sewage**
  - Source: Matt Brown (Flickr.com)

- **Blood**
  - Source: Monsieur Gordon (Flickr.com)
Poisonous Plants

- Poison Ivy
Poisonous Plants

• Poison Ivy Treatments
Poisonous Plants

• Wild Parsnip
Poisonous Plants

- Wild Parsnip Symptoms
Insects

Ticks

• Avoided wooded areas with high grass and leaf litter
• Use repellent

Remove by

• Grasp with tweezers by mouthparts
• Pull steadily directly away from skin
• Clean wound and disinfect the site
Insects

Stinging Insects

• Wasps
• Murder Hornets
• Bees

If Stung

• Take Tylenol or Motrin for pain
• Wash with soap and water
• Hydrocortisone cream to relieve redness, itching and swelling
Insects

If Stung (cont.)

• If allergic, have Epinephrine to reduce your body’s response.
• Give oxygen if needed
• Get to hospital
Effects of Exposure to Biological Hazards

- **Mild**
  - Allergic reaction

- **Serious**
  - Tetanus
  - Swine Flu
  - SARS-COVID-19
  - Avian Flu
  - West Nile
  - Lyme Disease

- **Chronic/Terminal**
  - HIV
  - Hepatitis B & C

Source: NIAID

- Source: OSHA

- Source: NIAID
Protection Against Biological Hazards

• Practice precaution with:
  • Blood
  • Bodily fluids
  • Animals
  • Insects
• Personal hygiene
• Proper first aid
  • Cuts/Scratches
• Proper PPE
• Vaccinations – schedule

Source: U.S. Army Corps of Engineers
OSHA and COVID-19

OSHA requirements apply to preventing occupational exposure to SARS-CoV-2. (COVID-19)

Among the most relevant are:

- OSHA's Personal Protective Equipment (PPE) standards (in general industry, 29 CFR 1910 Subpart I), which require using gloves, eye and face protection, and respiratory protection when job hazards warrant it.
  - When respirators are necessary to protect workers, employers must implement a comprehensive respiratory protection program in accordance with the Respiratory Protection standard (29 CFR 1910.134).
OSHA and COVID-19

• The General Duty Clause, Section 5(a)(1) of the Occupational Safety and Health (OSH) Act of 1970, 29 USC 654(a)(1), which requires employers to furnish to each worker "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."
Recordkeeping - Under OSHA's recordkeeping requirements, COVID-19 is a recordable illness, and thus employers are responsible for recording cases of COVID-19, if:

1. The case is a confirmed case of COVID-19 and
2. The case is work-related as defined by 29 CFR § 1904.5;[3] and
3. The case involves one or more of the general recording criteria set forth in 29 CFR § 1904.7.[4]
OSHA and COVID-19

OSHA has divided job tasks into four risk exposure levels:
OSHA and COVID-19

• Lower Exposure Risk (Caution)

Jobs that do not require contact with people known to be, or suspected of being, infected with SARS-CoV-2. Workers in this category have minimal occupational contact with the public and other coworkers.

• Includes –
  • Remote Workers
  • Office Workers (no frequent close contact with coworkers)
  • Telemedicine Workers
  • Long Distance Truck Drivers
OSHA and COVID-19

- **Medium Exposure Risk**

Jobs that require frequent/close contact with people who may be infected, but who are not known to have or suspected of having COVID-19.

- Those who may have frequent contact with travelers who return from international locations with widespread COVID-19 transmission.
- Those who may have contact with the general public (e.g., in schools, high population density work environments, and some high-volume retail settings).
OSHA and COVID-19

• **High Exposure Risk**

Jobs with a high potential for exposure to known or suspected sources of SARS-CoV-2. Workers in this category include:

• Healthcare delivery and support staff (hospital staff who must enter patients’ rooms) exposed to known or suspected COVID-19 patients.

• Medical transport workers (ambulance vehicle operators) moving known or suspected COVID-19 patients in enclosed vehicles.

• Mortuary workers involved in preparing bodies for burial or cremation of people known to have, or suspected of having, COVID-19 at the time of death.
OSHA and COVID-19

• **Very High Exposure Risk**

Jobs with a very high potential for exposure to known or suspected sources of SARS-CoV-2 during specific medical, postmortem, or laboratory procedures. Workers in this category include:

• Healthcare workers (e.g., doctors, nurses, dentists, paramedics, emergency medical technicians) treating on known or suspected COVID-19 patients.

• Healthcare or laboratory personnel collecting or handling specimens from known or suspected COVID-19 patients.

• Morgue workers performing autopsies, which generally involve aerosol-generating procedures, on the bodies of people who are known to have, or are suspected of having, COVID-19 at the time of their death.
Ergonomic Hazards

- 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

Source: OSHA
Effects of Exposure to Ergonomic Hazards

Musculoskeletal Disorders (MSDs)

• Serious
  • Epicondylitis (Tennis Elbow)
  • Raynaud’s Phenomenon (White finger)
  • Carpal Tunnel Syndrome
  • Chronic lower back pain
  • Tears (Rotator cuff is common)

Source: OSHA
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

Source: Boston University (bu.edu/wellness/workplace/ergonomic)
Responsibilities

Employers must:

• Assess hazards
• Use Engineering & Administrative Controls if possible
• Select appropriate PPE and determine when to use
• Provide some PPE at no cost to employee
• Make sure that employee-owned PPE is adequate, properly maintained and sanitary
• Train employees and enforce use of PPE
Responsibilities

Employees must:

• Actively participate in training
• Consistently use PPE as prescribed
• Properly maintain, inspect, clean, and store PPE
• Immediately replace damaged PPE
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.

Source: OSHA
Training Objectives

1. Identify common health hazards.
2. Describe types of common health hazards.
3. Apply health hazard protection methods.
Workplace Safety

“Our most valuable asset is our people. Nothing is more important than their safety and well being. Our coworkers and families rely on this commitment. There can be no compromise.”

Code of Conduct Handbook, Ford Motor Company
Workplace Safety Programs

“When it comes to health and safety concerns, compliance with legal requirements represents a minimum. When necessary and appropriate, we establish and comply with standards of our own, which may go beyond legal requirements.”

Code of Conduct Handbook, Ford Motor Company
Iowa LTAP

To learn more about what LTAP has to offer, check out our website: iowaltap.iastate.edu

Details on;
Relevant Workshops
Free Equipment Rentals
Workplace Safety Resources
Technology News newsletter
Event Email List

Thank you for making LTAP a part of your organization!
Keith Knapp: kknapp@iastate.edu
David Veneziano: dvenez@iastate.edu
Paul Albritton palbritt@iastate.edu