Introduction

Health Hazards in Construction

This module gives a general overview of the various health hazards to which construction workers may be exposed.

- Given current OSHA and industry information regarding construction worksite illnesses, injuries and fatalities, the student will be able to identify and protect themselves from common health hazards in construction.

- Specifically, upon completion of this training, the student will be able to:
  - 1: Identify major health hazards common to the construction industry
  - 2: Describe both acute & chronic health hazards
  - 3: Protect themselves from safety & health hazards
  - 4: Recognize employer requirements and to protect workers from exposure to safety & health hazards.
Introduction

Construction Diversity

• Construction work is dynamic, diverse, and constantly changing.
  – This poses a great challenge in protecting the safety and health of construction workers.
  – Construction workers are at risk of exposure to various health hazards that can result in injury, illness, disability, or even death.
Introduction

Risk Factors in Construction
• Factors increasing the health risk of construction workers include:
  – constantly changing job site environments and conditions
  – multiple contractors and subcontractors
  – high turnover; unskilled laborers
  – constantly changing relationships with other work groups
  – diversity of work activities occurring simultaneously
  – exposures to health hazards resulting from own work as well as from nearby activities ("bystander exposure")
Health Hazard Categories

Four major categories of health hazards to which construction workers may be exposed:

• Chemical Hazards (i.e. dusts, mist, fumes, gases and vapors)
• Physical Hazards (i.e. heat, noise, vibration)
• Biological Hazards (i.e. plants, insects, animals and microorganisms)
• Ergonomic Hazards (i.e. awkward postures and lifting, pushing and pulling).

TIP: Ergonomic hazards are the most frequently occurring health hazards in construction and the cause of most injuries.
Introduction

Some Examples of Construction Health Hazards

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<tr>
<th>Occupations</th>
<th>Potential Health Hazards</th>
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<tr>
<td>Brickmasons</td>
<td>Cement dermatitis, awkward postures, heavy loads</td>
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<td>Drywall installers</td>
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<td>Heavy metals in solder fumes, awkward posture, heavy loads, asbestos</td>
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<td>Painters</td>
<td>Solvent vapors, toxic metals in pigments, paint additives</td>
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<td>Pipefitters</td>
<td>Lead fumes and particles, welding fumes, asbestos dust</td>
</tr>
<tr>
<td>Carpet layers</td>
<td>Knee trauma, awkward postures, glue and glue vapor</td>
</tr>
</tbody>
</table>
### Some Examples of Construction Health Hazards

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<thead>
<tr>
<th>Occupations</th>
<th>Potential Health Hazards</th>
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</thead>
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<tr>
<td>Insulation workers</td>
<td>Asbestos, synthetic fibers, awkward postures</td>
</tr>
<tr>
<td>Roofers</td>
<td>Roofing tar, heat</td>
</tr>
<tr>
<td>Carpenters</td>
<td>Noise, awkward postures, repetitive motion</td>
</tr>
<tr>
<td>Drillers, earth, rock</td>
<td>Silica dust, whole-body vibration, noise</td>
</tr>
<tr>
<td>Excavating and loading machine operators</td>
<td>Silica dust, histoplasmosis, whole-body vibration, heat stress, noise</td>
</tr>
</tbody>
</table>

**TIP:** What is histoplasmosis? Histoplasmosis is a fungal infection. It occurs throughout the world. In the United States, it is most common in the southeastern, mid-Atlantic, and central states. The infection enters the body through the lungs. *Histoplasma* fungus grows as a mold in the soil, and infection results from breathing in airborne particles. Soil contaminated with bird or bat droppings may have a higher concentration of histoplasma.
Chemical Hazards

• Chemicals can exist in the form of:
  – dusts, fumes, fibers (solids)
  – liquids,
  – mists
  – gases,
  – vapors

• Chemicals are found in variety of products used at construction sites. Workers may also be exposed to chemicals generated during construction activities.

Safety Tip
Examples of chemical hazards found in construction work:
asbestos
lead
silica
cadmium
carbon monoxide
welding fumes
spray paints
cutting oil mists
solvents
hexavalent chromium
Chemical Hazards

Routes of Exposure

• Chemicals can enter the body through:
  – Inhalation: breathed in (Inhalation is typically the most common way chemicals can enter the body in a work situation.)
  – Ingestion: accidental swallowing through eating, drinking, or smoking
  – Absorption: absorbed through contact with skin or eyes
Chemical Hazards

Acute vs. Chronic

• There are generally two types of health effects from chemical exposure, acute and chronic.

• ACUTE
  – Appears immediately or within short time following exposure, (minutes or hours); death possible from some hazardous substances
  – Typically sudden, short-term, high concentration
  – Examples:
    • Headache, collapse or death from high levels of carbon monoxide
    • Eye and throat irritation from exposure to ammonia
    • Death and/or serious injury resulting from exposure to Hydrogen Sulfide.
Chemical Hazards

Acute vs. Chronic

• CHRONIC
  – Usually develops slowly, as long as 15-20 years or more
  – Continued or repeated for a prolonged period, usually years
  – Examples:
    • Lung cancer, asbestosis, mesotheloma from exposure to asbestos
    • Silicosis from exposure to crystalline silica
    • Leukemia from exposure to benzene
Asbestos

- Construction workers may be exposed to asbestos ...
  - during demolition or remodeling of older buildings built before 1980 which can contain asbestos insulation, or other asbestos containing products.
  - Asbestos removal can only be done by specially trained asbestos workers.
  - Asbestos exposure can cause breathing problems, lung cancer and cancer of the lung lining many years after exposure.
Chemical Hazards

Welding Fumes

• Welding fumes contain ...
  – a variety of chemicals depending on what is being welded on, chemical makeup of welding rods, fluxes and shielding gases.
  – Generally, welding in confined spaces or welding on stainless steel which generates hexavalent chromium, are the most hazardous welding activities.
Chemical Hazards

Chromium Hexavalent (CrVI)

- Hexavalent chromium compounds, exist in several forms.
  - Industrial uses of hexavalent chromium compounds include chromate pigments in dyes, paints, inks, and plastics; chromates added as anticorrosive agents to paints, primers, and other surface coatings; and chromic acid electroplated onto metal parts to provide a decorative or protective coating.
  - Hexavalent chromium can also be formed when performing "hot work" such as welding on stainless steel or melting chromium metal.
  - Health Effects of hexavalent chromium exposure include: Lung cancer; Asthma; Nasal perforation, ulceration and; dermatitis

Link: http://www.osha.gov/SLTC/hexavalentchromium/index.html
Solvents

- Millions of workers are exposed to solvents on a daily basis.
  - Health hazards associated with solvent exposure include toxicity to the nervous system, reproductive damage, liver and kidney damage, respiratory impairment, cancer, and dermatitis.
  - Solvents share many chemical, physical, and biological properties that warrant national attention be directed to them as a group.
  - Many solvent groups or individual substances have special properties requiring more specialized control measures.
  - The photo shows a solvent which presents significant health hazards. What do you think might be an excellent source of information to help avoid exposure? Use your mouse on the photo to find out.
Chemical Hazards

Solvents
• A variety of solvents with varying degrees of toxicity are used in construction.
  – They are in paints, glues, epoxies and other products.
  – Generally, the possibility of exposure to excessive amounts of solvent vapors is greater when solvents are handled in enclosed or confined spaces.

  – Solvents can:
    • Irritate your eyes, nose or throat,
    • Make you dizzy, high, sleepy, give you a headache or cause you to pass out,
    • Affect your judgment or coordination,
    • Cause internal damage to your body,
    • Dry out or irritate your skin.

Link: http://www.osha.gov/SLTC/solvents/
Chemical Hazards

Crystalline Silica

• What is crystalline silica?
  – Crystalline silica is a basic component of soil, sand, granite, and many other minerals.
  – Quartz is the most common form of crystalline silica.
  – Cristobalite and tridymite are two other forms.
  – All three forms may become respirable size particles when workers chip, cut, drill, or grind objects that contain crystalline silica.

TIP: More than 100,000 workers are exposed to crystalline silica in high risk jobs such as abrasive blasting, foundry work, stonecutting, rock drilling, quarry work and tunneling.
Chemical Hazards

Crystalline Silica

• Hazards of crystalline silica?
  – Silica exposure remains a serious threat to nearly 2 million U.S. workers.
  – Seriousness of the health hazards associated with silica exposure is demonstrated by the fatalities and disabling illnesses that continue to occur in sandblasters and rock-drillers.
  – Has been classified as a human lung carcinogen.
  – Breathing crystalline silica dust can cause silicosis, which in severe cases can be disabling, or even fatal.

Chemical Hazards

Crystalline Silica
Symptoms of silicosis

- Chronic/classic silicosis: 15–20 years of moderate to low exposures; symptoms may or may not be obvious; chest x-ray to determine if there is lung damage; worker may experience shortness of breath upon exercising and have clinical signs of poor oxygen/carbon dioxide exchange.

- Accelerated silicosis: 5–10 years of high exposures to respirable crystalline silica. Symptoms include severe shortness of breath, weakness, and weight loss.

- Acute silicosis: a few months or as long as 2 years following exposures to extremely high concentrations of respirable crystalline silica. Symptoms of acute silicosis include severe disabling shortness of breath, weakness, and weight loss, which often leads to death.

TIP: Silicosis is classified into three types: chronic/classic, accelerated, and acute.
Chemical Hazards

Crystalline Silica

• Where are construction workers exposed?
  – Many different construction activities.
  – Most severe exposures generally occur during abrasive blasting with sand to remove paint and rust from bridges, tanks, concrete structures, and other surfaces.
  – Other construction activities that may result in severe exposure include: jack hammering, rock/well drilling, concrete mixing, concrete drilling, brick and concrete block cutting and sawing, tuck pointing, tunneling operations.
Chemical Hazards

Crystalline Silica

• Protect against exposures to crystalline silica.
  – Replace crystalline silica materials with safer substitutes, whenever possible.
  – Use engineering or administrative controls, where feasible, such as local exhaust ventilation, and blasting cabinets.
  – Use protective equipment or other protective measures (e.g. respiratory protection).
  – Use all available work practices to control dust exposures (e.g. water sprays).
  – Wear disposable or washable work clothes and shower if facilities are available. Vacuum the dust from your clothes (with a HEPA vacuum) or change into clean clothing before leaving the work site.
  – Participate in training, exposure monitoring, and health screening and surveillance programs to monitor any adverse health effects.
  – Do not eat, drink, smoke, or apply cosmetics in areas where crystalline silica dust is present and wash your hands and face outside of dusty areas before performing any of these activities.
**Chemical Hazards**

**TIP#1:** What is a HEPA Vacuum? A HEPA vacuum is different than a regular household vacuum in that it contains a special filter that is able to trap very fine dust particles that are too small to see. This type of filter is called a High Efficiency Particulate Air (HEPA) filter.

**TIP#2:** Smoking adds to the lung damage caused by silica exposures. Remember: If it’s silica, it’s not just dust.
Chemical Hazards

Lead

• Construction workers are and can be exposed to lead during many construction related activities to include:
  – Demolition of structures;
  – Flame-torch cutting;
  – Welding;
  – Use of heat guns, sanders, scrapers, or grinders to remove lead paint;
  – Abrasive blasting of steel structures
  – Excavation work in areas with lead contamination (e.g. burn pits and landfills)
  – Other construction and hazardous waste related activities.

TIP: Lead is highly toxic and can cause severe, long term health problems. Lead may cause a range of health effects, from behavioral problems and learning disabilities, to seizures and death. Children six years old and under are most at risk.
Chemical Hazards

Lead

• How You Can Become Exposed to Lead
  – Lead is an ingredient in thousands of products widely used throughout industry, including lead-based paints, lead solder, electrical fittings and conduits, tank linings, plumbing fixtures, and many metal alloys.
  – Although many uses of lead have been banned, lead-based paints continue to be used on bridges, railways, ships, and other steel structures because of its rust- and corrosion-inhibiting properties.
  – Also, many homes were painted with lead-containing paints.
  – Significant lead exposures can also occur when paint is removed from surfaces previously covered with lead-based paint.
Chemical Hazards

Lead

• OSHA has very strict regulations for worker exposure to lead.
  – Major Elements of OSHA’s Lead Standard:
    – A permissible exposure limit (PEL) of 50 micrograms of lead per cubic meter of air, as averaged over an 8-hour period.
    – Requirements for engineering controls and work practices, where feasible, to reduce worker exposure.
    – Requirements for good personal hygiene practices, such as washing hands before eating and taking a shower before leaving the worksite.
    – Requirements for protective clothing and, where necessary, with respiratory protection.
    – A requirement that employees exposed to high levels of lead be enrolled in a medical surveillance program.

Link:  http://www.osha.gov/SLTC/lead/
Confined Spaces
• Exposure to chemicals or lack of oxygen in confined spaces can be deadly.
  – Airborne chemicals can quickly reach dangerous levels in confined spaces that are not ventilated.
  – Carbon monoxide, hydrogen sulfide, welding fumes and solvent vapors are typical confined space chemical hazards.
  – In some confined spaces, oxygen deficiency will cause the person entering to instantly collapse.
  – As many co-workers who attempt rescue die in confined spaces as the original worker who collapsed.

**TIP:** Confined spaces include manholes, sewers, vaults, tanks, and boilers in new construction or in repair and maintenance work.
Hazard Communication

Right to Know

• Hazard Communication.
  – There are an estimated 575,000 chemical products used, imported, or produced in the United States.
  – Millions of American workers are exposed to chemicals on a daily basis.
  – Hazardous chemical exposure can cause or contribute to many serious health effects and safety hazards that have the potential to cause fire, explosions, and other serious accidents.
HazCom Background

- Hazard Communication (HazCom) = Right To Know
  - Ensures that hazards of all chemicals produced or imported are evaluated, and that information concerning their hazards is transmitted to employers and employees.
  - Transmittal of information includes container labeling and other forms of warning, materials safety data sheets, and employee training.
  - The HazCom standard establishes uniform requirements to make sure the hazards of all chemicals in the workplace are evaluated and the information is passed on to affected workers.

LINK: http://www.osha.gov/dsg/hazcom/index.html
Hazard Communication

How HazCom Works

• Chemical Manufacturers Must:
  – determine the hazards of each product; and
  – communicate information to customers through labels and Material Safety Data Sheets (MSDS).

• Employers Must:
  – identify and list chemicals in the workplace;
  – obtain MSDSs and labels for each chemical; and
  – develop and implement written programs that include chemical lists, labels, MSDSs, personal protective equipment (PPE), and employee training.

• Employees Must:
  – comply with all elements of the HazCom program by following the warnings and cautions on MSDSs and on chemical labels; and
  – wear and maintain required PPE.

TIP: The HazCom program ensures that employees are aware of chemicals in the workplace. Each employee, whether they directly or indirectly work near chemicals, must become familiar with the HazCom program. It is your “Right to Know.”
Training

• Employee training plans must include general and site-specific information:
  – how the HazCom program is implemented;
  – hazards of the chemicals in the area;
  – measures employees can take to protect themselves;
  – location and use of PPE, if required; and
  – methods and observations workers can use to detect the presence of a chemical.
Hazard Communication

Labels and Warnings

• Each container must ...
• be labeled, tagged, or marked with the identity of the chemical contained, and must show appropriate hazard warnings.
• Labels must be legible, in English, and prominently displayed.
Material Safety Data Sheets (MSDSs)

- Chemical manufacturers must ...
  - develop an MSDS for each chemical they produce or import.
  - MSDS must be provided automatically at the time of the initial shipment of the product.
  - MSDS must be in English and include information regarding the chemical identity.
  - Information must be provided:
    - on the characteristics, both physical and chemical;
    - known acute and chronic health effects and related health information;
    - exposure limits;
    - whether the chemical is considered to be a carcinogen;
    - precautionary measures;
    - emergency and first-aid procedures; and
    - the identification of the organization that prepared the MSDS.
Hazard Communication

MSDS

• Some items that must be included on an MSDS:
  – The characteristics of the chemical, both physical and chemical Known acute and chronic health effects and related health information;
  – Exposure limits.
  – Whether the chemical is considered to be a carcinogen.
  – Precautionary measures.
  – Emergency and first-aid procedures. The identification of the organization that prepared the MSDS.
Physical Health Hazards

Physical health hazards are different types of energy which may be hazardous to workers.

- They include:
  - Noise
  - Vibration
  - Temperature extremes
  - Radiation
Physical Health Hazards

Noise

• Sound is vibrating energy or waves of motion.
  – When these waves strike the ear, they are heard as sound.
  – In general, what we know of as “Noise” is really “Unwanted Sound”.

## Physical Health Hazards

### Sample Noise Levels

<table>
<thead>
<tr>
<th>Equipment or Tool</th>
<th>Noise level will probably exceed:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whisper</td>
<td>10 decibels</td>
</tr>
<tr>
<td>Typical conversation</td>
<td>65 decibels</td>
</tr>
<tr>
<td>Jet Take Off</td>
<td>120 decibels</td>
</tr>
<tr>
<td>Back hoe</td>
<td>85 decibels</td>
</tr>
<tr>
<td>Bulldozer</td>
<td>87 decibels</td>
</tr>
<tr>
<td>Chopsaw</td>
<td>92 decibels</td>
</tr>
<tr>
<td>Grader/scaper</td>
<td>107 decibels</td>
</tr>
<tr>
<td>Front end loader</td>
<td>90 decibels</td>
</tr>
<tr>
<td>Jackhammer</td>
<td>102 decibels</td>
</tr>
<tr>
<td>Nail-gun</td>
<td>97 decibels</td>
</tr>
<tr>
<td>Router</td>
<td>90 decibels</td>
</tr>
<tr>
<td>Welding equipment</td>
<td>92 decibels</td>
</tr>
</tbody>
</table>

Source: U.W. Dept. of Environmental & Occupational Health Services – Rick Neitzel July, 2005
Physical Health Hazards

When Noise is Dangerous

• Excessive short-term and long-term exposure to noise can cause hearing loss
  – Prolonged noise over days, weeks, months and years above OSHA’s action level of 85 dBA (averaged over an 8-hour workday) may cause hearing loss
  – Single exposure above 115 dBA may cause hearing loss

Tip: Studies have shown that the highest percentages of overexposed workers occur in highway and street construction, carpentry, and concrete work.
Physical Health Hazards

Factors Affecting Noise Levels
• Several factors influence the noise levels to which workers are exposed:
  – Type of equipment being operated
  – Condition/maintenance of the equipment
  – Other equipment running at the same time
  – Enclosed or partially enclosed spaces

  – High noise levels can be sporadic in construction. Damage to hearing is cumulative and exposure limits are based on 8-hour averages. Workers not using or operating equipment are often exposed to excessive noise as much as the operators.

**TIP:** Damage to your hearing is nearly always irreversible.
Physical Health Hazards

Hearing Protection

• Designed to block out damaging noise from reaching your ear drum.
  – There are two basic types of hearing protection: Ear muffs and ear plugs.
  – Ear Plugs
    • Some earplugs are designed to reduce or attenuate the most harmful frequencies of noise.
    • Many different types of earplugs. Some are pre-molded and some are foam designed to be disposable.
    • Earplugs must be inserted correctly.
  – Always use approved ear protection.

TIP: The human ear has no natural defense to block out excessive noise. Exposure to excessive noise without protection will damage, and in some cases, destroy your ability to hear.
Physical Health Hazards

Hearing Protection

• Ear Muffs:
  – Generally afford the most protection.
  – Have a headband, ear caps, and ear cushions.
  – Require a good seal.
  – Provide additional protection when worn with ear plugs in high noise environments (e.g. flight lines, boiler rooms, rattling of bolts).
  – In hot weather/tight working conditions, earmuffs can be uncomfortable. Since ear protection reduces noise, be careful around mobile equipment.
Physical Health Hazards

- Noise

- Noise is dangerous:
  - Excessive short term and long term exposure.
  - Prolonged noise over days, weeks, months and years above OSHA’s action level of 85 dBA (averaged over an 8 hour workday)
  - When you can carry on a normal conversation.
  - Single exposure to very high noise exceeding 115 dBA and higher.
Physical Health Hazards

Vibration

- Two basic types of work related vibration. Whole Body Vibration and Hand – Arm Vibration.
  - Whole-body vibration (WBV) can occur from operating large mobile equipment, such as drillers, air hammers, pile drivers, tractors, graders, excavators, earth-moving equipment, and other large machinery.
  - Whole-body vibration is transmitted through the seat or feet of employees who drive mobile machines, or other work vehicles, especially over rough and uneven surfaces.
  - Large shocks and jolts may cause health risks including back-pain.
Physical Health Hazards

WBV Control

• Tips to prevent / minimize exposure to WBV include:
  – introducing working methods which eliminate or reduce exposure;
  – choosing work equipment of appropriate ergonomic design,
  – considering the choice of seat (including suspension seats) and the choice of tires
  – regular maintenance of vehicles (including their seats and suspension) and maintenance of unmade roads and ground conditions throughout sites to suit the machines that use them will greatly reduce shocks and jolts.
  – limiting the duration and magnitude of exposure
  – ensuring the work schedules have adequate rest periods
Physical Health Hazards

Vibration

- Hand-arm vibration (HAV) can result from ...
  - Using hand-held power tools, such as pneumatic drills and hammers, and disc grinders.
  - HAV may cause carpal tunnel syndrome, a disease that affects the fingers and hands.
  - In the long run, permanent damages to the nerves will result in a loss of the sense of touch and dexterity.
  - Working in a cold and damp environment can aggravate the harmful effects of hand-arm vibration.

**TIP:** Hand-arm vibration comes from the use of hand-held power tools and is the cause of significant ill health (painful and disabling disorders of the blood vessels, nerves and joints).
Physical Health Hazards

HAV Risk Controls

• Alternative work methods.
• Mechanize or automate the work. Make sure that equipment selected can do the work efficiently.
• Select the lowest vibration tool that is suitable and can do the work efficiently.
• Limit the use of high-vibration tools wherever possible. Introduce appropriate maintenance programs for your equipment.
• Limit the time that your employees are exposed to vibration.
• Wear protective clothing when necessary to keep hands warm and dry.

Tip: Although some manufacturers sell vibration-dampening gloves which may minimize HAV, gloves should be used to keep hands warm, but should not be solely relied upon to provide protection from vibration.
Physical Health Hazards

Temperature Extremes

• A change in body temperature due to ...
  – extreme work environmental conditions can lead to stress or illness from heat or cold.
  – Heat and cold stress/illness can develop into life-threatening situations.
  – Heavy work in high temperatures can cause muscle cramps, dehydration, sudden collapse, and unconsciousness.
  – Cold temperatures can lead to fatigue, irregular breathing, confusion, and loss of consciousness (hypothermia).
Physical Health Hazards

Heat

- Hot conditions can occur from:
  - prolonged work under direct sunlight in summer (e.g., asphalt paving or roofing in summer).
  - wearing impermeable protective clothing when doing heavy work.
  - working in an enclosed area with a strong heat source, poor ventilation, and high humidity (e.g., heavy equipment operators in an enclosed cab with without sufficient ventilation).
Physical Health Hazards

Energy Dangers

• Four different types of energy that may be dangerous to workers are:
  – Noise
  – Vibration
  – Temperature extremes
  – Radiation
Heat Illnesses

• Heat rash
• Fainting
• Heat cramps
• Heat exhaustion
• Heat stroke

TIP: HEAT ILLNESS CAN BE DEADLY. Every year, thousands of workers become sick from exposure to heat, and some even die. These illnesses and deaths are preventable.
Physical Health Hazards 2

Symptoms of Heat Illness

• Early symptoms
  – Fatigue
  – Heavy sweating
  – Headache
  – Cramps
  – Dizziness
  – High pulse rate
  – Nausea/vomitting

• Life-threatening symptoms
  – High body temperature
  – Red, hot, dry skin
  – Confusion
  – Convulsions
  – Fainting

TIP: Watch for symptoms in yourself and your coworkers. If you feel any symptoms, tell your coworkers and supervisor immediately because you may need medical help. Know who to talk to and how to get help before you start each workday.
Prevent Heat Illness

• Tell your supervisor if you are new to working in the heat or have had heat illness before.
  – Stay alert to the weather. During a heat wave you are at greater risk of getting sick. You need to watch yourself and coworkers more closely, and may need to drink more water, take more breaks, and use other measures.
  – Drink enough cool, fresh water. Drink at least one 8-ounce cup (3 cones) every 15 minutes during your entire work shift. Do not wait until you are thirsty to drink water.
    • Do not drink alcohol.
    • Avoid coffee.
    • Choose water over soft drinks.
• Take rest breaks in the shade to cool down.
• Wear proper clothing
  – Loose fitting, light-weight and light-colored cotton clothes, a wide-brimmed hat or cap, and a bandana if appropriate.
• Talk to your doctor if you have illnesses like diabetes, are taking medicines or are on a low salt diet.

Heat Illness

- The following are forms of heat illness:
  - Heat rash
  - Fainting
  - Heat cramps
  - Heat exhaustion
  - Heat stroke
Cold Stress

- Cold conditions can result from:
  - cold air temperatures
  - rain, snow, sleet, or other wet weather conditions
  - windy conditions
  - underground construction work
  - working over water and falling in
Cold Stress Injury

- Cold illnesses and injuries include:
  - Immersion injury (trench foot)
  - Frost nip
  - Frost bite
  - Hypothermia
Prevent Cold Stress

- Avoid exposure to extremely cold temperatures when possible.
  - Wear appropriate clothing.
    - Wear several layers of loose clothing.
    - Tight clothing reduces blood circulation.
  - Make sure to protect the ears, face, hands and feet.
    - Boots should be waterproof and insulated.
    - Wear a hat; it will keep your whole body warmer.
  - Move into warm locations during work breaks.
  - Carry cold weather gear, such as extra socks, gloves, hats, jacket, blankets, a change of clothes and a thermos of hot liquid.
  - Include a thermometer and chemical hot packs in your first aid kit.
  - Avoid touching cold metal surfaces with bare skin.
  - Monitor your physical condition and that of your coworkers.
Radiation

• Radiation may be defined as ...
  – energy traveling through space.
  – Non-ionizing radiation is essential to life, but excessive exposures will cause tissue damage.
  – All forms of ionizing radiation have sufficient energy to ionize atoms that may destabilize molecules within cells and lead to tissue damage.
  – Radiation sources are found in a wide range of occupational settings.
  – If radiation is not properly controlled it can be potentially hazardous to the health of workers.
Ionizing Radiation
• Ionizing radiation sources may be found ...
  – in a wide range of occupational settings to include construction, health care facilities, research institutions, nuclear reactors and their support facilities, nuclear weapon production facilities, and other various settings, just to name a few.
  – These radiation sources can pose a considerable health risk to affected workers if not properly controlled.
  – X-rays and gamma rays from equipment used to gauge the density and thickness of pipes, to inspect welds, or for detecting weakness of metal structures and radioactive isotopes from flow meters.

LINK: http://www.osha.gov/SLTC/radiationionizing/
Affects / Effects

- Radiation affects people by depositing energy ...
  - in body tissue, which can cause cell damage or cell death.
  - In some cases there may be no noticeable effect. In other cases, the cell may survive but become abnormal, either temporarily or permanently.
  - An abnormal cell may become malignant.
  - Both large and small doses of radiation can cause cellular damage.
  - The extent of the damage depends upon the total amount of energy absorbed, the time period and dose rate of the exposure, and the particular organs exposed.

TIP: Health effects: increased risk of developing cancer and genetic disease.
Radiation Protection

• Three basic concepts apply to protecting yourself from all types of ionizing radiation: time, distance, and shielding.
  
  – Time: The amount of radiation exposure increases as the time spent near the source of radiation increases.
  
  – Distance: The farther away people are from a radiation source, the less their exposure.
  
  – Shielding: The greater the thickness and density of shielding around a radiation source, the smaller the exposure.

TIP: The two types of ionizing radiation are particulate (alpha, beta, neutrons) and electromagnetic (x-rays, gamma rays) radiation.
Non-ionizing Radiation

- Non-ionizing radiation is described as:
  - A series of energy waves composed of oscillating electric and magnetic fields traveling at the speed of light.
  - Includes the spectrum of ultraviolet (UV), visible light, infrared (IR), microwave (MW), radio frequency (RF), and extremely low frequency (ELF).
  - Lasers commonly operate in the UV, visible, and IR frequencies.
  - Non-ionizing radiation is found in a wide range of occupational settings and can pose a considerable health risk to potentially exposed workers if not properly controlled.
Non-ionizing Radiation

• Health effects:
  – skin cancer
  – eye damage
  – premature skin aging
  – Burns

• The best protection to nonionizing radiation is to avoid exposure when able.

• Protective equipment should be worn when potentially exposed and dependent upon the type of non-ionizing sources.
Radiation Protection

• The three basic ways to protect yourself from all types of ionizing radiation are:
  – Reduce the time of exposure
  – Increase the distance from the exposure
  – Use shielding
Biological Hazards

Biological Agents
• Include:
  – Bacteria, viruses, fungi, other microorganisms and their associated toxins.
  – Have the ability to adversely affect human health in a variety of ways, ranging from relatively mild, allergic reactions to serious medical conditions, even death.
  – These organisms are widespread in the natural environment; they are found in water, soil, plants, and animals.
  – Because many microbes reproduce rapidly and require minimal resources for survival, they are a potential danger in a wide variety of occupational settings.
  – Diseases or illnesses can occur from biological sources which include:
    • West Nile virus
    • Lyme Disease
    • Histoplasmosis (fungus in bird droppings)
    • Hantavirus

Biological Hazards

Biological Agents

• Exposure to biological agents may occur ...
  – During demolition, renovation, sewer work, earth work, work on air handling systems, or other construction work from contact with contaminated or disease-carrying:
    • soil
    • water
    • insects (mosquitoes, ticks)
    • bird or bat droppings
    • animals
    • structures

**TIP:** Exposure to biological agents should be minimized to the full extent possible and/or otherwise controlled following established engineering, work practice controls and personal protective equipment controls when necessary. In occupations where there is potential exposure to biological hazards, workers should practice proper personal hygiene, particularly hand washing.
Biological Hazards

Bloodborne Pathogens (BBPs)

• Bloodborne pathogens are ...
  – Infectious microorganisms in human blood that can cause disease in humans.
  – These pathogens include, but are not limited to, hepatitis B (HBV), hepatitis C (HCV) and human immunodeficiency virus (HIV).
  – Needlesticks and other sharps-related injuries may expose workers to bloodborne pathogens.
  – Workers in many occupations, including first aid team members, housekeeping personnel in some industries, medical waste clean up workers, nurses and other healthcare personnel are at a higher risk of exposure to bloodborne pathogens.

TIP: Occupations that deal with plants or animals or their products or with food and food processing may expose workers to biological hazards.
Biological Hazards

Bloodborne Pathogens (BBPs)

• In order to reduce or eliminate the hazards ...
  – Of exposure to BBP’s, in those jobs where exposure to blood or other potentially infectious materials are anticipated, an employer must implement an exposure control plan for the worksite with details on employee protection measures.
  – Plan must also describe how an employer will use a combination of engineering and work practice controls such as “universal precautions”, ensure the use of personal protective clothing and equipment, provide training, medical surveillance, hepatitis B vaccinations, and signs and labels, among other provisions.

TIP: Universal precautions is an approach to infection control to treat all human blood and certain human body fluids as if they were known to be infectious for HIV, HBV and other bloodborne pathogens.
Biological Hazards

Poisonous Plants

• Poisonous plants found in the US include ...
  – Poison ivy, poison oak, and poison sumac.
  – Plants can cause allergic reactions if the leaves or stalks are damaged and come in contact with workers’ skin.
  – These plants can also be dangerous if they are burned and their toxins are inhaled by workers.

TIP: Nearly one-third of forestry workers and firefighters who battle forest fires in California, Oregon, and Washington develop rashes or lung irritations from contact with poison oak, which is the most common poisonous plant in those states.
Biological Hazards

Other Biological Hazards

• Many types of venomous wildlife and insects.
  – Venomous snakes, spiders, scorpions, and stinging insects can be found throughout various geographic regions of the US.
  – Especially dangerous to workers who have allergies.
  – Anaphylactic shock, the body’s severe allergic reaction to a bite or sting and requires immediate emergency care.
  – Thousands of people are stung each year, and as many as 40–50 people in the US die each year from severe allergic reactions.

TIP: Venomous U.S. snakes include rattlesnakes, copperheads, cottonmouths/water moccasins, and coral snakes. Stinging insects include bees, wasps, hornets, and fire ants. Venomous spiders include black widows, brown recluse spiders, and hobo spiders.
Interactive Exercise

- Bloodborne pathogens are infectious microorganisms in human blood that can cause disease in humans. Which of these are considered to be bloodborne pathogens?
  - Multiple myeloma - wrong
  - Hepatitis B (HBV) – correct
  - Hepatitis C (HCV) - correct
  - Recombinant DNA – wrong
  - Human immunodeficiency virus (HIV) - correct
Ergonomic Hazards

- Can cause painful and disabling injuries to joints and muscles.
  - Principal causes:
    - heavy, frequent, or awkward lifting
    - repetitive tasks
    - awkward grips, postures
    - using excessive force, overexertion
    - using wrong tools for the job
      or using tools improperly
    - using improperly maintained tools
    - hand-intensive work

TIP: Ergonomics is the science of fitting workplace conditions and job demands to the capabilities of the working population. Effective and successful "fits" assure high productivity, avoidance of illness and injury risks, and increased satisfaction among the workforce.
Ergonomic Hazards

– Can lead to musculoskeletal disorders (MSDs) and injuries:
  • strains and sprains –
  • one of the most common injuries among construction workers
  • tendonitis
  • carpal tunnel syndrome
  • low back pain
  • fatigue

**TIP**: Ergonomic hazards are the most frequently occurring health hazards in construction and the cause of most injuries
Did You Know . . . ?

• The number of back injuries in U.S. construction ...
  – 50% higher than the average for all other U.S. industries in 1999 (CPWR, 2002).
  – Backaches and pain in the shoulders, neck, arms, and hands were the most common symptoms reported by construction workers in one study (Cook et al, 1996).
  – Material handling incidents account for 32% of workers’ compensation claims in construction, and 25% of the cost of all claims. The average cost per claim is in the thousands of dollars).
  – Musculoskeletal injuries can cause temporary or even permanent disability, which can affect the workers earnings and contractors profits.
  – There are however contractors in the U.S. who are successfully implementing safety and health programs to address these issues, including work-related musculoskeletal disorders. Click on the link shown to learn more.

Multiple Health Hazards
• Many health hazards can be found on the construction site.
  – These include chemical hazards, physical hazards, biological hazards and ergonomic hazards.
  – It is important to consider that 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.
More Information

- OSHA: [OSHA Assistance for the Construction Industry](https://www.osha.gov)

- NIOSH: [Construction : NIOSH Construction Program | CDC/NIOSH](https://www.cdc.gov/niosh/corp.html)

- Construction Association of Ontario: [http://www.csa0.org](http://www.csa0.org)

- Center for Research on Occupational & Environmental Toxicology: [CROETweb: Construction Safety and Health — General Information](http://www.croet.org/construction)