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APPRENTICESHIP PROGRAM

**Period 1**  
**Related Training Instruction (RTI)**  
**Module 8 – Safety**

**Reading material associated with this module:**  
**OSHA 29 CFR 1926 Safety and Health**  
**Regulations for Construction**

## OSHA 29 CFR 1926 – Health Hazards in Construction

- Health hazards in the construction industry effect not only the worker. The impact can also extend to the worker’s family, friends and co-workers.
- The objectives of this section of the presentation are as follows:
  - Identify common health hazards.
  - Describe types of common health hazards.
  - Apply health hazard protection methods.
  - Recognize employer requirements to protect workers from health hazards in construction, including hazard communication programs.

## OSHA 29 CFR 1926 – Health Hazards in Construction

- **Protection:**
  - Hierarchy of safety controls:
    - **Eliminate** the hazard.
    - **Substitute** less hazardous materials or methods.
    - **Engineering controls** to control the hazard at its source requiring a physical change to mitigate the hazard.
    - **Administrative controls** involving policies, procedures, and training to reduce exposure to hazards, focusing on changing work practices.
    - **PPE.**

## OSHA 29 CFR 1926 – Health Hazards in Construction

- Common health hazards can be classified as follows:
  - Chemical
  - Physical
  - Biological
  - Ergonomic

## OSHA 29 CFR 1926 – Health Hazards in Construction

- **Chemical Hazards:**

- Chemical hazards may be solids, liquids, gases and vapors, or aerosols such as dust, mist, and fumes.
- Workers may encounter chemical hazards through activities such as:
  - Welding (fumes).
  - Demolition or drilling (asbestos fibers).
  - Chemical spraying (flammable, combustible, or toxic mists and vapors).
  - Concrete cutting or drilling (silica dust).
  - Paint removal or working with old plumbing and connections (lead).

## OSHA 29 CFR 1926 – Health Hazards in Construction

- **Chemical Hazards:**
  - Chemical exposure may put workers at risk of developing health problems:
    - Heart ailments
    - Lung damage
    - Sterility
    - CNS damage
    - Kidney damage
    - Burns
    - Cancer
    - Liver damage
    - Rashes
  - Chemicals may also pose a risk of fire and explosion hazards.

## OSHA 29 CFR 1926 – Health Hazards in Construction

- **Chemical Hazards:**
  - Common routes of entry for chemical exposure can be:
    - Inhalation (Most common route).
    - Ingestion (Swallowed via eating or drinking).
    - Absorption (Drawn through skin or eye surface).
    - Injection (Punctures through skin).

## OSHA 29 CFR 1926 – Health Hazards in Construction

- **Chemical Hazards:**
  - Health effects are as follows:
    - Acute:
      - Immediate.
      - Short-term, high concentration exposure, ex. H<sub>2</sub>S exposure within a confined space.
    - Chronic:
      - Delayed; over a period of months or years.
      - Continuous exposure for long periods, ex. asbestosis.

## OSHA 29 CFR 1926 – Health Hazards in Construction

- **Chemical Hazards (Protection Solutions):**
  - Eliminate the hazard.
  - Substitute less hazardous or non-hazardous materials.
  - Engineering controls to mitigate the hazard.
    - Ventilation (local / general).
    - Process and equipment modification.
    - Isolation / automation.
  - Administrative controls to minimize the hazard.
    - Monitor / measure exposure levels.
    - Inspections and maintenance.
    - Develop SOPs.
  - PPE: respirators, gloves, safety glasses, and protective clothing.

## OSHA 29 CFR 1926 – Health Hazards in Construction

- **Physical Hazards:**
  - Physical hazards consist of:
    - Noise
    - Temperature extremes
    - Vibration
    - Radiation
  - Workers may encounter physical hazards through activities such as:
    - Equipment operation vibration and noise exposure (drilling, cutting, hammering).
    - Working either indoors or outdoors (extremes of hot or cold temperatures).
    - Radiation exposure (working in medical or power generation facilities).

## OSHA 29 CFR 1926 – Health Hazards in Construction

- **Physical Hazards:**
  - Exposure to physical hazards may cause numerous health issues:
    - Temperature:
      - Rash, cramps, exhaustion, stroke, hypothermia, frostbite.
    - Radiation:
      - Burns, sickness, aging, cancer, DNA mutations.
    - Vibration:
      - Fatigue, strains, carpal tunnel syndrome, HAVS (hard-arm vibration syndrome), Raynaud's Syndrome
    - Noise:
      - Interferences, stress, tinnitus, headaches, hearing loss

## OSHA 29 CFR 1926 – Health Hazards in Construction

- **Physical Hazards:**
  - Common construction noise sources may subject workers to prolonged exposure to decibel levels above 85db which can lead to significant hearing loss.

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

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

## OSHA 29 CFR 1926 – Health Hazards in Construction

- **Physical Hazards (Protection Solutions):**
  - Eliminate the hazard.
  - Substitute less hazardous or non-hazardous methods.
  - Engineering controls to mitigate the hazard.
    - Temperature: Heaters, AC, windshields, ventilation.
    - Vibration: Vibration reduction equipment.
    - Noise: Silencers, mufflers, enclosures, sound barriers.
  - Administrative controls to minimize the hazard.
    - Temperature: Water, rest, shade.
    - Vibration: Training not to grip too tightly, job rotation.
    - Noise: Increase distance between source and worker.
  - PPE: respirators, gloves, safety glasses, and protective clothing.

## OSHA 29 CFR 1926 – Health Hazards in Construction

- **Physical Hazards (Protection Solutions):**
  - PPE:
    - Temperature: Hoods, cooling vests, hard hat liners.
    - Vibration: Anti-vibration gloves.
    - Noise: Ear plugs, muffs.

## OSHA 29 CFR 1926 – Health Hazards in Construction

- **Biological Hazards:**
  - Biological hazards consist of:
    - Insects
    - Animals
    - Mold
    - Plants
    - Water/Sewage
    - Blood

## OSHA 29 CFR 1926 – Health Hazards in Construction

- **Biological Hazards:**
  - Exposure to biological hazards may cause numerous health issues:
    - Mild:
      - Allergic reactions
    - Serious:
      - Tetanus, Swine Flu, SARS, Avian Flu, West Nile, Lyme Disease
    - Chronic/Terminal:
      - HIV, Hepatitis B & C

## OSHA 29 CFR 1926 – Health Hazards in Construction

- **Biological Hazards:**
  - Protection against biological hazards:
    - Practice precautions when dealing with blood, bodily fluids, animals, insects.
    - Maintain proper personal hygiene.
    - Obtain proper first aid for cuts and scratches.
    - Always use proper PPE.
    - Maintain necessary vaccinations.

## OSHA 29 CFR 1926 – Health Hazards in Construction

- **Ergonomic Hazards:**
  - Ergonomic hazards consist of:
    - Lifting and pushing heavy and awkward objects repetitively.
    - Awkward grips and postures.
    - Reaching.
    - Using the wrong tool or using tools improperly.
    - Using excessive force (overexertion).

## OSHA 29 CFR 1926 – Health Hazards in Construction

- **Ergonomic Hazards:**
  - Exposure to ergonomic hazards may cause numerous health issues:
    - 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 (ex. rotator cuff)

## OSHA 29 CFR 1926 – Health Hazards in Construction

- **Ergonomic Hazards:**
  - Protection against ergonomic hazards:
    - Use ergonomically designed tools.
    - Use correct work practices such as proper lifting techniques.
    - Ask for assistance when handling heavy loads and bulky/awkward materials.
    - Always use proper PPE.

## OSHA 29 CFR 1926 – Health Hazards in Construction

- **Employer Requirements:**
  - Employers are required to abide by OSHA regulations:
    - Permissible Exposure Limits (PELs) for all chemicals.
    - Monitoring and protection programs.
    - Hazard Communication Program (HAZCOM) including:
      - Worker Right to Know.
      - Hazardous chemical training.
      - Written plans (who, what, where, when, how).
      - Proper chemical labeling.
      - SDS (Safety Data Sheets).

## OSHA 29 CFR 1926 – Material Handling, Storage, Use, and Disposal

- The objectives of this section of the presentation are as follows:
  - Identify types of material handling equipment.
  - List hazards associated with material handling activities.
  - Determine means of prevention of hazards associated with material handling equipment.
  - Recognize employer requirements to protect workers from material handling hazards in construction.

## OSHA 29 CFR 1926 – Material Handling, Storage, Use, and Disposal

- **Types of equipment:**
  - Portable conveyors.
  - Powered industrial trucks.
  - Cranes.
  - Slings.

## OSHA 29 CFR 1926 – Material Handling, Storage, Use, and Disposal

- Common factors contributing to injuries:
  - Weight and bulkiness of objects.
  - Bending, twisting, and turning movements.
  - Improper operation of, or unfamiliarity with, equipment.
  - Struck by, or caught between, hazards.
  - Accumulated materials or clutter.
  - Improperly stacked materials.
  - Unsafe conditions of materials or containers.
  - Flammability or toxicity of materials.
  - Binding ties or other devices that secure bundles or bound materials.
  - Falling objects.
  - Lifting, pulling, pushing, large heavy items.

## OSHA 29 CFR 1926 – Material Handling, Storage, Use, and Disposal

- Types of injuries commonly reported:
  - Sprains, strains, tears.
  - Soreness and pain.
  - Bruises and contusions.
  - Cuts, lacerations, and punctures.

## OSHA 29 CFR 1926 – Material Handling, Storage, Use, and Disposal

- Examples of events or exposures leading to injuries:
  - Contact with objects and equipment.
  - Transportation incidents.
  - Exposure to harmful substances or environments.
  - Falls, slips, trips, or loss of balance.
  - Repetitive motion.
  - Overexertion.

## OSHA 29 CFR 1926 – Material Handling, Storage, Use, and Disposal

- Means of preventing hazards:
  - When moving materials manually:
    - Use devices to assist with holding loads.
    - Wear PPE.
    - Use proper lifting techniques.
    - Seek help for oversized loads.
    - Use blocking materials.

## OSHA 29 CFR 1926 – Material Handling, Storage, Use, and Disposal

- Means of preventing hazards:
  - When moving materials mechanically:
    - Use only thoroughly trained, competent, and certified operators.
    - Inspect equipment at least annually, or prior to use when not used on a regular basis, by a qualified person.
    - Perform a visual inspection by a qualified, trained person prior to each shift.
    - Slings:
      - Always select a properly rated sling.
      - Perform an inspection on all slings before use.
      - Do not shorten with knots, bolts or other devices, or kink legs.
    - Avoid sudden movements.
    - Keep clear of loads.

## OSHA 29 CFR 1926 – Material Handling, Storage, Use, and Disposal

- Forklift Operation:
  - When operating a forklift:
    - Make sure your vision is not obstructed.
    - The travel path is clear.
    - Watch for approaching people.
    - Do not drive with platform elevated.
    - Always utilize seat belts and ROPS (rollover protection structure).
    - Ensure you have a clear view when raising or lowering forks.
    - Maintain safe distances to people and objects.
  - Operating a forklift on grades / ramps:
    - Use extreme caution.
    - Avoid turns.
    - Point load up the incline

## OSHA 29 CFR 1926 – Material Handling, Storage, Use, and Disposal

- Forklift Operation (continued):
  - Operating a forklift on grades / ramps:
    - Use extreme caution.
    - Avoid turns.
    - Point load up the incline.
  - Elevating workers with a forklift:
    - Use of an approved safety platform firmly secured to the lifting carriage and/or forks is required.
    - Means shall be provided whereby personnel on the platform can shut off power to the truck.
    - Restraining means shall be provided for the workers.
    - Standing on forks is not allowed.

## OSHA 29 CFR 1926 – Material Handling, Storage, Use, and Disposal

- Forklift Operation (continued):
  - Appropriate operating speed of the forklift is critical:
    - Preventing tip-overs.
    - Avoiding collisions.
    - Sliding on wet or slippery floors.
    - While ascending or descending ramps.
    - When vision may be obstructed. Use extreme caution.
    - Avoid turns.
    - Point load up the incline.
  - Avoid excess weight:
    - Do not exceed the weight capacity of the forklift.
    - Center loads and secure to keep from shifting to maintain balance.

## OSHA 29 CFR 1926 – Material Handling, Storage, Use, and Disposal

- Forklift Operation (continued):
  - Exiting the forklift:
    - Set brake.
    - Lower forks / lifting carriage.
    - Neutralize controls.
  - No passengers are allowed unless the forklift is equipped with a passenger seat.
  - Never jump from an overturning, sit-down type forklift.
  - Stay with the truck, hold on firmly, and lean in the opposite direction of the overturn.
  - Do not operate a forklift with proper training and certification.

## OSHA 29 CFR 1926 – Material Handling, Storage, Use, and Disposal

- Forklift Operation (continued):
  - Employer Requirements:
    - Comply with OSHA standards including:
      - Training requirements.
      - Inspection requirements.
      - Comply with manufacturers' requirements and recommendations for material handling equipment.

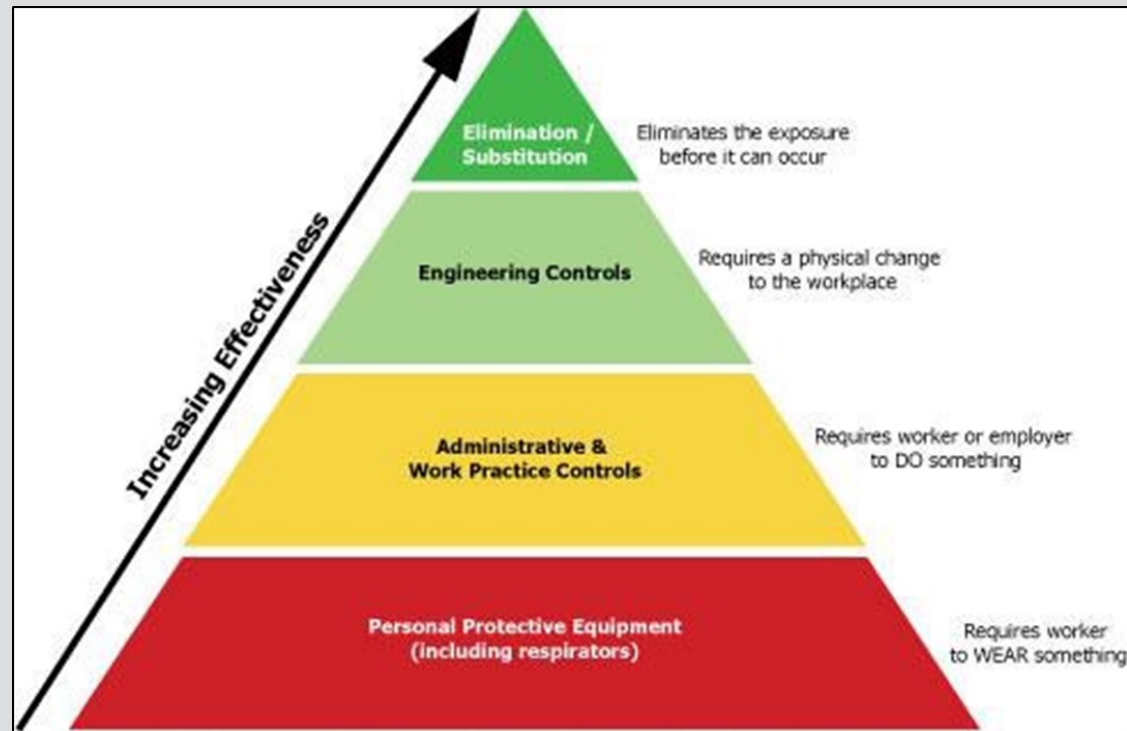
## **OSHA 29 CFR 1926 – Personal Protective Equipment**

- The objectives of this section of the presentation are as follows:
  - Identify hierarchy of controls.
  - Review types of PPE.
  - Provide PPE training requirements.
  - Identify employee and employer responsibilities.
  - Perform hazard recognition activity.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- Employers must protect employees as follows:
  - **Access** the workplace for hazards.
  - **Eliminate** and **reduce** hazards using engineering and administrative e controls.
  - Require **use** of appropriate personal protective equipment (PPE).
  - PPE is the last level of control after all other control measures have been taken.

## OSHA 29 CFR 1926 – Personal Protective Equipment



## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Engineering Controls:**
  - Engineering controls require physical changes to the workplace, such as:
    - Isolation of the hazard.
    - Ventilation systems to remove the hazard.
    - Equipment modifications.
    - Other types of workplace changes.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Administrative Controls:**
  - Administrative controls require the worker to perform an action:
    - Following proper, specific procedures.
    - Perform inspections and maintenance.
    - Provide proper housekeeping.
    - Supervise.
    - Follow rules for specific regulated areas.
    - Limit exposure by time or distance.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Administrative Controls:**
  - Example: Noise Exposure
    - Operate noisy machines during shifts when fewer people are exposed.
    - Limit the amount of time a person spends near a noise source.
    - Provide quiet areas where workers can gain relief from hazardous noise sources.
    - Control noise exposure through distance.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Types of PPE:**
  - Head Protection:
    - Causes of head injuries:
      - Object striking head.
      - Head striking object.
      - Contact with exposed, energized electrical conductors.
    - Employees working in an area where there is a possible danger of head injury from impact, or from falling or flying objects, or from electrical shock and burns, shall be protected by protective helmets.
    - Helmets for protection against impact and penetration of falling and flying objects shall meet ANSI Z89.1-1969 Safety Requirements for Industrial Head Protection.
    - Helmets for protection of employees exposed to high voltage electrical shock and burns shall meet ANSI Z89.2-1971

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Types of PPE:**
  - Head Protection:
    - Types of hard hats:
      - Type 1 are designed to shield workers from objects and blows that come from above and hit the top of the hard hat.
      - Type 2 are designed to protect against lateral blows and impacts as well as impacts that land on top of the head.
      - There are also three classes of hard hats:
        - Class E (electrical) which are designed to reduce exposure to high-voltage conductors and offer protection up to 20,000 volts.
        - Class G (general) are made to lessen exposure to low-voltage conductors and offer protection up to 2,200 volts.
        - Class C (conductive) are not designed to provide protection against electrical conductors.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Types of PPE:**
  - Eye and Face Protection:
    - Causes of eye injuries:
      - Dust.
      - Flying particles.
      - Harmful chemicals.
      - Intense light, i.e., welding, lasers.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Types of PPE:**
  - Eye and Face Protection:
    - Must meet the requirements of ANSI Z87.1-1968.
      - Elements to consider when selecting eye protection:
        - Ability to provide necessary protection level.
        - Fit and comfort.
        - Vision and movement not restricted.
        - Durable and cleanable.
        - Other PPE being worn concurrently is not restricted.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Types of PPE:**
  - Eye and Face Protection:
    - Safety glasses provide protection against:
      - Flying particles from wood, metal, cement, plastics, or other materials.
      - Airborne particulates such as ashes, dust, embers, sand blast, grit, paint, or other materials.
    - Goggles provide protection for the eyes, eye sockets, and facial area around the eyes from impact, dust, and splashes.
      - Goggles may also fit over corrective lenses and may not interfere with the function of the glasses.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Types of PPE:**
  - Eye and Face Protection:
    - Welding shields protect eyes from burns caused by infrared light and intense radiant light and protect face and eyes from flying sparks and metal spatter slag.
    - Face shields protect the face from nuisance dusts and potential splashes or sprays of hazardous liquids.
      - Face shields do **not** protect from impact hazards **unless so rated**.
      - Face shields are for face protection, not eye protection. To protect the eyes, wear safety glasses with side shields under the face shield.
    - Employees who normally wear corrective lenses must wear either ANSI Z87.1-1968 rated prescription safety glasses with side shields **or** rated safety glasses with side shields over unrated prescription glasses. If goggles are required, they must also meet this requirement.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Types of PPE:**
  - **Respiratory Protection:**
    - Respiratory protection must be worn whenever you are working in a hazardous atmosphere.
    - The appropriate respirator will depend on the contaminant(s) to which you are exposed and the protection factor (PF) required.
    - Required respirators must be NIOSH-approved and medical evaluation and training must be provided before use.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Types of PPE:**
  - Respiratory Protection:
    - Single-strap dust masks:
      - These types of respirators are not normally NIOSH-approved. They must **not** be used to protect against hazardous atmospheres. However, they may be used to provide comfort from pollen or other allergens.
    - Approved filtering facepieces (dust masks):
      - These masks can be used for dusts, mists, welding fumes, etc. They do **not** provide protection from gases or vapors. **DO NOT USE FOR ASBESTOS OR LEAD.**

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Types of PPE:**
  - Respiratory Protection:
    - Half-face respirators:
      - These types of respirators can be used for protection against most vapors, dusts and welding fumes. Cartridges/filters must match contaminants and be changed periodically.
    - Full-face respirators:
      - These respirators provide a higher level of protection than the half-face respirators. They can be used for the same irritants and contaminants as the half-face type while also providing protection for the face and eyes.
      - Cartridges/filters must also match the contaminants and be replaced periodically.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Types of PPE:**
  - **Respiratory Protection:**
    - **Loose-fitting powered-air-purifying respirators (PAPR):**
      - These respirators offer breathing comfort from a battery powered fan which pulls air through filters and circulates it throughout the helmet/hood. These can be worn by most workers who have beards. Cartridges/filters must match contaminants and be changed periodically.
    - **Self-contained breathing apparatus (SCBA):**
      - These types of devices are used for entry and escape from atmospheres that are considered immediately dangerous to life and health (IDLH) or oxygen deficient. They are provided with their own air supply.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Types of PPE:**
  - Hearing Protection:
    - Exposure to sound levels over 85db can cause hearing loss.
    - Protection against noise exposure is required when sound levels exceed 90db.
    - A continuing, effective hearing conservation program shall be administered.
    - Examples of hearing protection that may be utilized include:
      - Disposable foam plugs.
      - Molded ear plugs.
      - Noise cancelling ear plugs.
      - Earmuffs.
    - The Noise Reduction Rating (NRR) of the hearing protection used must be considered.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Types of PPE:**
  - Hand and arm protection:
    - Employers must provide hand protection when employees are exposed to hazards such as :
      - Skin absorption of harmful substances.
      - Severe cuts or lacerations.
      - Severe abrasions.
      - Punctures.
      - Chemical and thermal burns.
      - Harmful temperature extremes.
      - Hearing Protection:
    - Types of gloves available include anti-vibration, leather palm, permeation resistant, heat resistant, and cut-resistant.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Types of PPE:**
  - Foot and leg protection:
    - Causes of foot injuries:
      - Heavy objects.
      - Sharp objects.
      - Molten metal.
      - Hot surfaces.
      - Slippery or wet surfaces.
      - Electrical hazards.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Types of PPE:**
  - Foot and leg protection:
    - Examples of PPE for foot and leg protection:
      - Impact resistant toe and/or instep. May be steel or composite.
      - Heat-resistant soles.
      - Metal shanks.
      - Specialty footwear:
        - Metatarsal guards.
        - Liquid or chemical resistant.
        - Conductive or nonconductive.
    - Leggings / chaps for heat-resistance (foundry work) or cut-resistance (logging).
    - Knee pads for protection from hard surfaces during kneeling tasks.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Types of PPE:**
  - Body protection:
    - Causes of body injuries:
      - Intense heat.
      - Splashes of hot metals or liquids.
      - Impacts from tools, machinery, or materials.
      - Sharp objects.
      - Hazardous chemicals.
      - Contact with potentially infectious materials.
      - Radiation.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **Types of PPE:**
  - Body protection:
    - Examples of PPE for body protection:
      - Reflective clothing (vests).
      - Overalls (numerous varieties including flame-resistant, chemical-resistant, cut-resistant).

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **PPE Training:**
  - Employers shall provide training for each employee that is required to use PPE.
  - Each employee shall be trained to know at least the following:
    - When PPE is necessary.
    - What PPE is necessary.
    - How to properly don, doff, adjust and wear PPE.
    - The limitations of PPE.
    - The proper care, maintenance, useful life, and disposal of the PPE.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **PPE Employer Responsibilities:**
  - Employers shall perform the following:
    - Hazard assessment.
    - Appropriate selection of PPE and determination of when to use.
    - Provide specific items of PPE at no cost to employee (see next slides for details).
    - Ensure that employee-owned PPE is adequate, properly maintained, and sanitary.
    - Train employees and enforce the use of PPE.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **PPE Employer Payment:**
  - Per OSHA 1910.132(h) employers shall provide required PPE at no cost to the employee with the following exceptions:
    - The employer is not required to pay for non-specialty safety-toe protective footwear (including steel-toe shoes or steel-toe boots) and non-specialty prescription safety eyewear, provided that the employer permits such items to be worn off the job-site.
    - When the employer provides metatarsal guards and allows the employee, at his or her request, to use shoes or boots with built-in metatarsal protection, the employer is not required to reimburse the employee for the shoes or boots.
    - The employer must pay for replacement PPE, except when the employee has lost or intentionally damaged the PPE.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **PPE Employer Payment:**
  - The employer is not required to pay for:
    - The logging boots required by 29 CFR 1910.266(d)(1)(v);
    - Everyday clothing, such as long-sleeve shirts, long pants, street shoes, and normal work boots; or
    - Ordinary clothing, skin creams, or other items, used solely for protection from weather, such as winter coats, jackets, gloves, parkas, rubber boots, hats, raincoats, ordinary sunglasses, and sunscreen.
  - Where an employee provides adequate protective equipment he or she owns, the employer may allow the employee to use it and is not required to reimburse the employee for that equipment.
  - When the provisions of another OSHA standard specify whether or not the employer must pay for specific equipment, the payment provisions of that standard shall prevail.

## OSHA 29 CFR 1926 – Personal Protective Equipment

- **PPE Employee Responsibilities:**
  - Employees shall perform the following:
    - Actively participate in training.
    - Consistently use PPE as prescribed.
    - Properly maintain, inspect, clean, and store PPE.
    - Immediately replace damaged PPE.

## OSHA 29 CFR 1926 – Stairways and Ladders

- **Introduction:**
  - This section shall cover the following items:
    - Basic types of ladders and stairways.
    - Stair and ladder hazards.
    - Methods to prevent stairway and ladder hazards.
    - Employer requirements.

## OSHA 29 CFR 1926 – Stairways and Ladders

- **Introduction:**

- Falls are the leading cause of fatalities in the construction industry.
- Falls from ladders make up approximately 1/3 of these fatalities.
- Approximately 25,000 injuries per year occur due to falls from stairways and ladders.
- Falls are preventable.
- Based on a report from the CDC using data from 2011, nearly 90% of all ladder fall injuries were from heights less than 16 feet with falls from 6-10 feet being the most common (50%). For fatal ladder falls, heights of 6-10 feet were the most common accounting for 28% of all fatalities.

## OSHA 29 CFR 1926 – Stairways and Ladders

- **Basic Ladder Types:**

- Fixed ladders such as vertical (cage or no cage), roof access ladders, and dock ladders.
- Extension ladders, adjustable for height and requiring a stable surface to lean against.
- Step ladders, self-supporting A-frame design with flat steps for medium-height tasks.
- Platform ladders, similar to step ladders, but with a large, stable platform and often guardrails.
- Multi-purpose / combination ladders which can transform into step, extension, or scaffold configurations.

## OSHA 29 CFR 1926 – Stairways and Ladders

- **Ladder Ratings:**
  - The following ratings are set by the American National Standards Institute (ANSI) and cover the total weight (user + tools + materials) a ladder can safely hold:
    - Type III (Light Duty), 200lbs., household use.
    - Type II (Medium Duty), 225lbs., commercial use.
    - Type I (Heavy Duty), 250lbs., construction / industrial use.
    - Type IA (Extra Heavy Duty), 300lbs., construction / industrial use.
    - Type IAA (Special Duty), 375lbs., construction / industrial use.

## OSHA 29 CFR 1926 – Stairways and Ladders

- **Hazards Associated with Stairs and Ladders:**
  - Slips, trips, and falls.
  - Electrical hazards.
  - Falling objects.
  - Protruding objects, sharp edges, or rough spots.

## OSHA 29 CFR 1926 – Stairways and Ladders

- **Reducing or Eliminating Hazards:**
  - Safe Practices:
    - Extend side rails at least 3' above the upper landing surface.
    - Do not exceed load or capacity rating.
    - Maintain ladders free of oil, grease, or other slipping hazards.
    - Use ladders only as designed.
    - Angle the ladder so that for every 4' of vertical height the ladder rises, its base is placed 1' away from the wall or supporting surface.
    - Ladders shall only be used on level and stable surfaces unless secured to prevent accidental displacement.
    - Keep areas clear around the top and bottom of the ladder.
    - Equally support the rails of a non-self-supporting ladder at the top.

## OSHA 29 CFR 1926 – Stairways and Ladders

- **Reducing or Eliminating Hazards:**
  - Safe Practices:
    - When ascending or descending a ladder:
      - Maintain 3 points of contact.
      - Face the ladder and stay inside the side rails.
      - Never carry tools/objects in hands.
      - Be extra careful getting on or off the ladder.
    - Don't move, shift, or extend the ladder while in use.
    - When exposed to energized electrical equipment, use non-conductive side rails.
    - Don't stand on the top or any step above the manufacturer's marked "highest standing level".
    - Don't climb the cross-bracing on the rear section of a step ladder.

## OSHA 29 CFR 1926 – Stairways and Ladders

- **Reducing or Eliminating Hazards:**
  - **Safe Practices:**
    - Ladders shall not be used on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental displacement.
    - Ladders placed in any location where they can be displaced by workplace activities or traffic, such as passageways, doorways, or driveways, shall be secured to prevent accidental displacement or a barricade shall be used to keep the activities or traffic away from the ladder.
    - Do not use single-rail ladders.
    - Inspect ladders by a competent person:
      - Periodically for visible defects.
      - After any incident that could affect their safe use.

## OSHA 29 CFR 1926 – Stairways and Ladders

- **Reducing or Eliminating Hazards:**
  - Ladder Requirements:
    - Provide double-cleated ladder or two or more ladders:
      - When 25 or more employees are using them as the only means of access to a work area.
      - Or when serving two-way traffic.
    - Rungs, cleats and steps are to be parallel, level, and uniformly spaced.
      - Spacing shall be as follows:
        - 10 to 14 inches apart along portable or fixed ladder side rails.
        - 8 to 12 inches apart on step stools.
        - 8 to 18 inches apart on the base section of extension trestle ladders and 6 to 12 inches on the extension section.

## OSHA 29 CFR 1926 – Stairways and Ladders

- **Reducing or Eliminating Hazards:**
  - Ladder Requirements:
    - Ladders shall not be tied or fastened together to create longer sections, unless they are specifically designed for such use.
    - The side rail of spliced side rails must have strength equivalent to a one-piece side rail made from the same material.
    - Stepladders must have a metal spreader or locking device to hold the front and back sections open when the ladder is being used.
    - Ladder surfaces shall be free of projections, sharp edges, or abrasive materials that could puncture or cut the user or snag clothing.
    - Wooden ladders are not to be coated with opaque coverings, except for identification or warning labels only on one face of a side rail.
    - Rungs and steps shall be corrugated, knurled, dimpled, coated with skid-resistant material, or otherwise treated to minimize slipping.

## OSHA 29 CFR 1926 – Stairways and Ladders

- **Reducing or Eliminating Hazards:**
  - Structural Defects:
    - Portable ladders with structural defects, such as, but not limited to, the following, shall be immediately removed from service, and either marked in such a manner that readily identifies them as defective, or be tagged with “Do Not Use” or similar language until repaired.
      - Broken or missing rungs, cleats, or steps.
      - Broken or split rails.
      - Corroded components.
    - Ladder repairs shall restore the ladder to a condition meeting its original design criteria, before the ladder is returned to use.

## OSHA 29 CFR 1926 – Stairways and Ladders

- **Employer Requirements:**

- The employer shall provide a training program for each employee using ladders and stairways. The program shall enable each employee to recognize hazards related to ladders and stairways and shall train each employee in the procedures to be followed to minimize these hazards.
- The employer shall ensure that each employee has been trained by a competent person in the following areas, as applicable:
  - The nature of fall hazards in the work area.
  - The correct procedures for erecting, maintaining, and disassembling the fall protection systems to be used.
  - The proper construction, use, placement, and care in handling all stairways and ladders.
  - The maximum intended load-carrying capacities of ladders used.
- Retraining shall be provided as necessary.

## OSHA 29 CFR 1926 – Tools (Hand and Power)

- **Introduction:**
  - This section shall cover the following items:
    - Identify various types of tools.
    - Describe types of hazards.
    - Describe guarding requirements.
    - Describe safe operation methods.
    - Recognize employer requirements.

## OSHA 29 CFR 1926 – Tools (Hand and Power)

- **Basic Tool Types:**
  - Hand tools include various types of hammers, screw/nut drivers, wrenches, cutting tools, pliers, clamps, benders, etc.
  - Power tools can be operated by electric, pneumatic, liquid fuel, hydraulic, and powder actuated means, and are comprised of numerous types such as saws, drill/drivers, benders, routers, hammers, grinders, cutting tools, etc.

## OSHA 29 CFR 1926 – Tools (Hand and Power)

- **Types of Hazards:**
  - Struck by tool.
  - Electrical injury.
  - Caught in tool.
  - Flying debris.
  - Trips and slips.
  - Sharp edges / protruding objects.

## OSHA 29 CFR 1926 – Tools (Hand and Power)

- **Hazards Created By:**
  - Using the wrong tool for the job.
  - Using the tool the wrong way / unfamiliarity with the tool operation.
  - Using damaged or broken tools.
  - Using dull tools.
  - Using spark-producing tools near flammable sources.
  - Using tools that are not properly grounded.
  - Using tools that are not properly guarded.
  - Using inadequate or improper PPE.

## OSHA 29 CFR 1926 – Tools (Hand and Power)

- **Guarding:**
  - Use guarding techniques against hazards created by:
    - Motions, such as rotating, in-going nip points, reciprocating, and transversing.
    - Actions, such as cutting, punching, shearing, and bending.
  - Provide guards for:
    - Exposed moving parts.
    - Points of operation, in-going nip points, and rotating parts.
    - Flying chips and sparks.
    - Abrasive wheels and cutting blades.
  - All tools shall be used with the with the correct shield, guard, or attachment recommended by the manufacturer.

## OSHA 29 CFR 1926 – Tools (Hand and Power)

- **Safe Operation Methods:**
  - General hand and power tool practices:
    - Keep tools clean and well-maintained.
    - Use the correct tool and use it correctly.
    - Follow the manufacturer's use and maintenance instructions.
    - Wear the appropriate PPE.
    - Practice good housekeeping.
    - Keep work areas well lit.
    - Inspect tools before and during use; remove tools from service if damaged or defective.
    - Keep all cutting tools sharp.
    - Replace all disposable cutters (bits, blades, abrasives) when they are no longer working efficiently. Do not force dull cutters.

## OSHA 29 CFR 1926 – Tools (Hand and Power)

- **Safe Operation Methods:**
  - Precautions for power tools:
    - Disconnect from power source when not in use.
    - Keep people at a safe distance
    - Secure the workpiece.
    - Fit with required guards and safety switches.
    - Maintain good footing and balance.
    - Wear proper clothing for the task. Avoid rings, watches, necklaces, loose clothing.
    - Safeguard exposed moving parts.
    - Remove damaged tools from service and tag “Do Not Use” or similar language.
    - Never remove the grounding prong from power or extension cords.
    - Protect power and extension cords from damage.

## OSHA 29 CFR 1926 – Tools (Hand and Power)

- **Safe Operation Methods:**
  - Precautions for fuel-powered tools:
    - Handle, transport, and store fuel in approved containers.
    - Shut down and allow engine to cool before refilling fuel tank.
    - Use hearing and respiratory protection as needed.
    - When used in enclosed spaces, the applicable requirements for concentrations of toxic gases and personal protective equipment shall be followed.

## OSHA 29 CFR 1926 – Tools (Hand and Power)

- **Safe Operation Methods:**

- Precautions for powder-actuated tools:
  - Only employees trained in the operation of a particular tool shall be allowed to operate a powder-actuated tool.
  - Tool shall be tested each day before loading to ensure that safety devices are in proper working condition. The method of testing shall be in accordance with the manufacturer's recommended procedure.
  - Must wear suitable PPE.
  - Any tool found not in proper working order or that develops a defect in use, shall be immediately removed from service until repaired.
  - Tools shall not be loaded until just prior to the intended firing time.
  - Neither loaded or empty tools are to be pointed at any person.
  - Hands shall be kept clear of the barrel end.

## OSHA 29 CFR 1926 – Tools (Hand and Power)

- **Safe Operation Methods:**
  - Precautions for powder-actuated tools:
    - Loaded tools shall not be left unattended.
    - Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tile, surface-hardened steel, glass block, live rock, face brick or hollow tile.
    - Driving into materials easily penetrated shall be avoided unless backed by a suitable substance that will prevent the pin or fastener from passing completely through.
    - No fastener shall be driven into a spalled area caused by an unsatisfactory fastening.
    - Tools shall not be used in an explosive or flammable atmosphere.
    - All tools shall be used with the correct shield, guard, or attachment recommended by the manufacturer.
    - Select appropriate powder charge for tool and task.

## OSHA 29 CFR 1926 – Tools (Hand and Power)

- **Employer Requirements:**
  - Employer shall not issue or permit the use of unsafe hand tools.
  - All hand and power tools and similar equipment, whether furnished by the employer or employee, shall be maintained in a safe condition.
  - Employer shall comply with OSHA standards for training and inspection.
  - Employer and employee must comply with the manufacturer's requirements and recommendations.

## OSHA 29 CFR 1926 – Electrical

- **Introduction:**
  - This section shall cover the following items:
    - Identify and describe major types of electrical hazards.
    - Describe electrical protection methods.
    - Recognize employer requirements to protect workers from electrical hazards.

## OSHA 29 CFR 1926 – Electrical

- **Definitions:**

- Electricity is the movement of free electrons between atoms.
- Related terms:
  - Current is the movement of electrical charge.
  - Resistance is the opposition of current flow.
  - Voltage is the measurement of electrical force.
  - Conductors are substances, such as metals, that provide little resistance to electricity.
  - Insulators are substances such as dry wood, rubber, glass, or Bakelite, that have high resistance to electricity.
  - Grounding is a conductive connection to the earth which acts as a protective measure.

## OSHA 29 CFR 1926 – Electrical

- **Electrical Hazards:**
  - Burns:
    - Most common electrical related injury.
    - Three types of electrical burns:
      - Electrical contact
      - Arc flash
      - Thermal contact
  - Electrical Shock:
    - Caused when electrical current passes through the body.
    - Depending on the voltage, current, and duration the effects can range from minor discomfort (tingling) to life-threatening injury or death (electrocution).

## OSHA 29 CFR 1926 – Electrical

- **Electrical Hazards:**

- Arc Flash / Arc Blast:

- Arc flash is a sudden and intense release of electrical energy through the air, creating extreme heat and light, often resulting from an electrical fault and generating temperatures up to 35,000 degrees F.
- Arc blast is a product of arc flash which produces a powerful pressure wave.
- Injuries can include external burns, internal burns and toxicity from inhaling hot gases and vaporized metal, hearing damage, eye damage including blindness from the ultraviolet light of the flash, as well as other devastating injuries.

## OSHA 29 CFR 1926 – Electrical

- **Electrical Hazards:**
  - Fire / Explosion:
    - Most electrical fires result from issues with “fixed wiring”, but may also occur from issues with cords, plugs, receptacles, and switches.
    - Typical origination factors include faulty outlets and wiring, overloaded circuits, misused extension cords, defective appliances, tools, lighting, and improper/inadequate maintenance.
    - Explosions can occur when a combination of a flammable substance (gas, vapor, mist, or dust) and oxygen (air) within specific concentration ranges, called the Lower Explosive Limit (LEL) and Upper Explosive Limit (UEL), can ignite and rapidly combust, causing an explosion, when provided with sufficient energy from an ignition source, such as an electrical spark or overheat condition.

## OSHA 29 CFR 1926 – Electrical

- **Types of Electrical Hazards:**
  - Overhead / buried electrical lines causing electrocution, burns, and falls.
    - Use caution when utilizing ladders, lifts, or trenching / digging.
    - Michigan requires calling Miss Dig (811) before ANY digging. Call 2-3 days in advance of digging and confirm that all affected utility operators have responded prior to starting.
  - Contact with live electrical parts, such as exposed wiring, cut/frayed/damaged extension cords, broken lights, defective power tools, batterieschargers.
  - Improper repairs of equipment / wiring.
  - Overloaded extension cords or power strips.
  - Portable heaters and appliances utilized improperly where the manufacturer’s recommendations are not followed or where an extension cord or power strip is used.

## OSHA 29 CFR 1926 – Electrical

- **Electrical Protection Methods:**

- Maintain safe distance from overhead power lines.
- Use ground-fault circuit interrupters (GFCI). GFCI's are designed to protect from electrical shock by detecting an imbalance in current, indicating current is leaking to ground, often through water or a person's body. If the GFCI detects even a small imbalance (around 5 milliamperes), the circuit is interrupted almost instantly (within 1/30<sup>th</sup> of a second) to prevent serious injury or death.
- GFCIs are available in various types such as a receptacle, circuit breaker, or temporary/portable unit.
- Inspect extension cords prior to use for cuts, fraying, or abrasion.
- Inspect power tools for damage or misuse that could indicate damaged insulation inside.
- Use power tools as designed, following safety information and manufacturer's instructions.

## OSHA 29 CFR 1926 – Electrical

- **Electrical Protection Methods:**

- Never carry a tool by the cord.
- Never pull the cord to disconnect the tool from the outlet.
- Keep cords away from heat, oil, and sharp edges.
- Disconnect the tool when not in use and when changing accessories such as blades and bits.
- Keep batteries charged using only the charger recommended by the manufacturer. Charge in a cool, dry location away from combustibles, direct sunlight, and heat.
- Remove batteries from tools for transport or storage and keep away from metal to prevent short circuits.
- Inspect batteries for dents, leaks, or damage. Discontinue use if damaged.
- Recycle batteries through certified e-waste or hazardous waste programs; never in regular trash.

## OSHA 29 CFR 1926 – Electrical

- **Electrical Protection Methods:**

- Avoid accidental tool starting by not carrying with fingers on the switch while plugged in.
- Always use gloves and appropriate footwear.
- Do not use tools in wet/damp environment.
- Ensure that cords do not cause a tripping hazard.
- Remove damaged cords from use.

## OSHA 29 CFR 1926 – Electrical

- **Electrical Protection Methods:**

- Follow lockout/tagout (LOTO) procedures:
  - Lockout/tagout is a critical workplace safety procedure that prevents hazardous energy (electrical, mechanical, hydraulic/pneumatic, thermal, etc.) from harming workers during service, maintenance, or installation of equipment by physically locking and tagging equipment in the “off” or isolated state, ensuring it cannot unexpectedly start or release energy until work is complete.
  - LOTO prevents contact with operating components, such as blades, gears, or shafts, as well as electrical or thermal contact, and unexpected release of gases, fluids, or solid matter.

## OSHA 29 CFR 1926 – Electrical

- **Electrical Protection Methods:**
  - Power source identification:
    - Mark all breakers accordingly for the circuits they protect.
    - Mark all disconnect means accordingly for the equipment they serve.
    - Identify all voltages with proper labeling.

## OSHA 29 CFR 1926 – Electrical

- **Employer Requirements to Protect Workers:**
  - Ensure overhead power line safety.
  - Isolate electrical parts.
  - Supply ground-fault circuit interrupter (GFCI) protection.
  - Establish and implement an Assured Equipment Grounding Conductor Program (AEGCP) as mandated by OSHA for construction sites, to ensure the safety of temporary electrical cords, plugs, and cord-connected equipment by requiring documented inspections and testing. AEGCP serves as an alternative to GFCIs for ground-fault protection.
  - Ensure power tools are maintained.
  - Ensure proper training.
  - Enforce LOTO safety related work practices.
  - Ensure proper use of extension cords and power strips.
  - Ensure proper identification of power sources.

## Period 1 Conclusion

- This concludes Period 1 of the apprenticeship program.
- The test will consist of questions about the material covered in Period 1 and will include questions from ***both*** the Fire Alarm Signaling Systems 4<sup>th</sup> edition handbook and the PowerPoint presentations.
- Apprentices will need a passing score on the test as well as their supervisor's approval to graduate from Period 1 of the program.