Hazard Identification and Control

INSTRUCTOR WORKBOOK

OSHA | Oregon OSHA
Department of Consumer and Business Services

Hazard Identification and Control

Presented by Oregon OSHA

Public education — our mission:

We provide knowledge and tools to advance self-sufficiency in workplace safety and health.

OSHA | Oregon OSHA

Department of Consumer and Business Services

Table of Contents

Oregon OSHA

Department of Consumer and Business Services

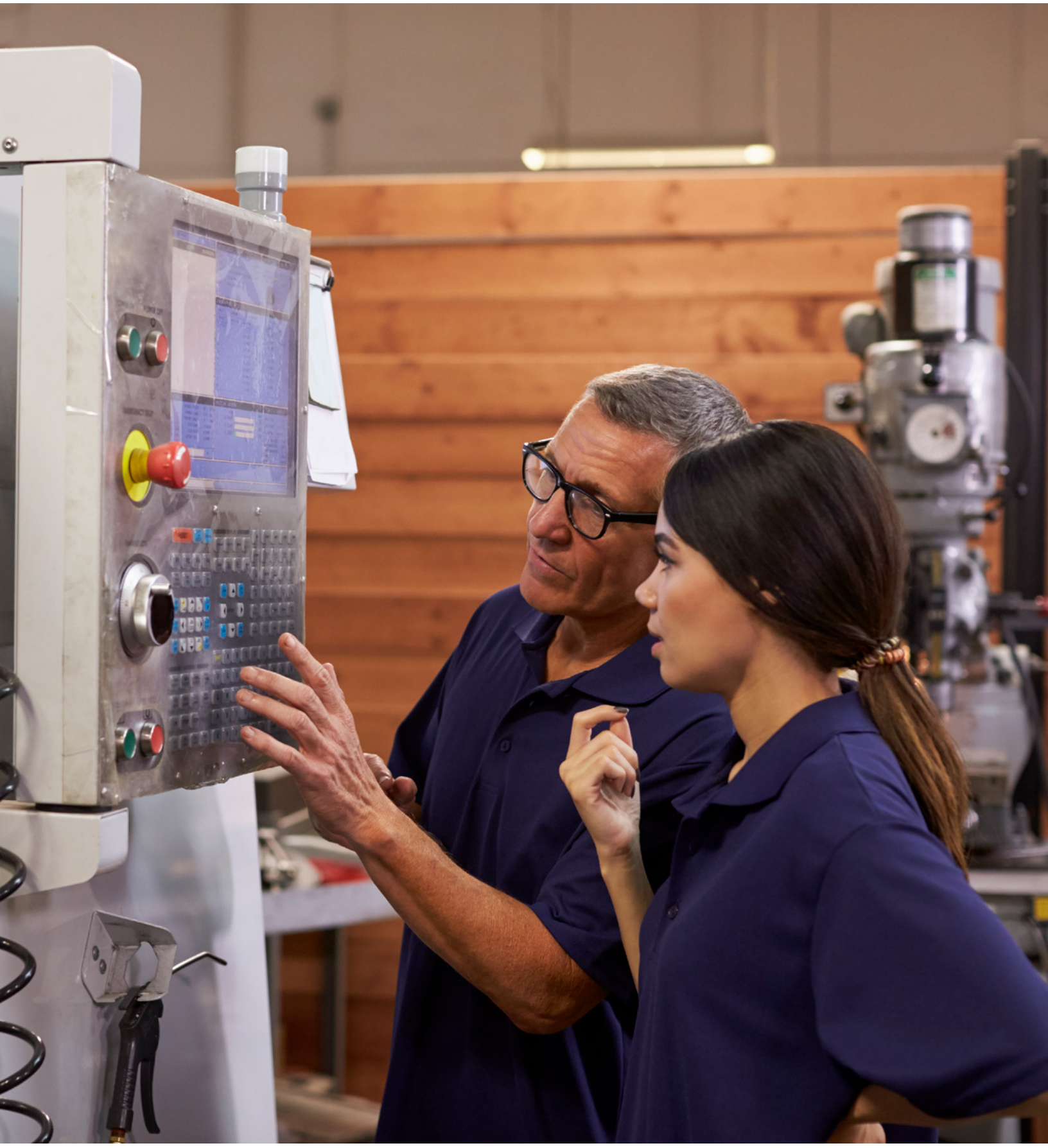
Welcome!

The purpose of this workshop is to provide the knowledge and skills necessary to identify, assess, control, and prevent workplace hazards, as they relate to your industry and work environment.

Once hazards have been identified in a specific workplace, hazard control refers to the implementation of measures to reduce or eliminate risks associated with those hazards.

You'll learn to use the hierarchy of controls, which provides a systematic approach for determining the best methods for controlling hazards found in a work environment.

This material is intended for classroom use only and should not be considered a substitute for any provisions of the Oregon Safe Employment Act or for any rules issued by Oregon OSHA.



Hazard identification

What is a hazard?

A hazard is an unsafe **condition** or **practice** – or a combination of the two – that could cause an **injury**, **illness**, or **death**. A person can be exposed to a hazard in two ways:

1. Physical exposure. A person is generally within an arm's length of a physical hazard.
2. Environmental exposure. A person is exposed to an environmental condition, such as loud noise, a hazardous atmosphere, or extreme temperature.

It takes a hazard and exposure for an accident to happen. How does one's perception of a hazard change with daily exposure to that hazard?

> *The more we're exposed to a hazard without getting hurt, the more we trivialize the hazard.*

The importance of identifying hazards

Use the following incident reports to emphasize the importance of identifying hazards.

Let's look at four incident reports from The National Institute for Occupational Safety and Health (NIOSH).

1. **Forklift tips over.** The employee was working on a truss section while standing in a basket platform attached to the front of a forklift. While the forklift was stationary, the basket was raised about 14 feet above the pavement to allow the employee to work on upper sections of the truss. An additional part was needed to complete the assembly process, so the forklift operator moved the vehicle to where the additional part was located with the employee still on the platform. The forklift traveled several feet when the operator attempted to make a sharp left turn that caused the forklift to lose stability and roll onto its side. The employee fell to the pavement in the basket platform and received severe head injuries. The employee died in a hospital, several days later.
2. **Split-rim wheel explosion.** At the time of the incident, the employee, a laborer for a sand and gravel company, was repairing a split-rim tubeless tire to be mounted on a dump truck. He had just completed patching the 22.5-inch tire and then placed a tube in the tire. He had mounted it on a 20-inch split-rim wheel. The employee was working on the ground outside of a protective cage. The air chuck configuration provided by the employer put the victim in the blast zone. As the employee attempted to inflate the tire, the innertube exploded, causing the tire assembly to strike the victim in the head. The sound of the explosion brought other employees rushing to the scene. The victim was airlifted to a hospital where he died several days later of injuries related to the incident.
3. **Aerial lift boom fails.** The son of the owner of a commercial drywall construction company, an employee of the company, was readying an aerial lift for a job. He had replaced two battery terminals. He raised the boom and was reaching toward the battery compartment across the metal enclosure that houses the lift's toggle controls when the boom dropped

and pinned him to the control panel. He was discovered by his father. Emergency medical services were summoned, but he died from the injury.

4. **Elevator car falls on construction foreman.** A 53-year-old elevator construction foreman was killed, and his helper, an elevator constructor employed by another subcontractor, was injured when the hydraulic elevator car they were working under fell on them. The two were adjusting the hydraulic cylinder when the car fell, trapping them in the elevator pit. Two wooden poles (about 12 feet long) used to keep the elevator from falling were placed leaning against the guide rails. The car was about 15 inches above the poles, which were not secured in place. The poles were knocked out of position when the car fell due to the sudden loss of hydraulic pressure, trapping the two workers. The elevator apparently did not fall evenly to the bottom of the pit; this permitted the rescue team to enter the pit and extract the elevator constructor. However, rescuers had to use air bags to raise the car to remove the construction foreman.

What does the Oregon Safe Employment Act say about hazards?

Briefly discuss ORS 654.010, Employers to furnish safe place of employment.

ORS 654.010 states, "Every employer shall ...

- "Furnish employment and a place of employment which are safe and healthful for employees therein, and ...
- "Do every other thing reasonably necessary to protect the life, safety and health of such employees." ('Reasonably necessary' means an action that a prudent employer would take to mitigate a hazard.)

What does OAR 437-001-0760, Rules for all workplaces, say about hazards?

OAR 437-001-0760(7) states:

- 437-001-0760(7)(a): All places of employment must be inspected by a qualified person or persons as often as the type of operation or the character of the equipment requires. Defective equipment or unsafe conditions found by these inspections shall be replaced or repaired or remedied promptly.
- 437-001-0760(7)(b): Wherever required in this safety code, a written and dated [inspection] report, signed by the person or persons making the inspection, must be kept.

How do you define "qualified person"?

A qualified person is one who can evaluate hazardous conditions and mechanical systems, inspect equipment, and train others.

What does "remedied promptly" mean?

As soon as an employer knows that a hazard exists, the employer must establish a strategy for controlling or eliminating the hazard.

What information should the inspection report include?

The report should be prepared by a qualified person (or persons), and should document identified hazards, their location, and how they will be corrected.

OAR 437-001-0765(7) states, "Your safety committee must establish procedures for conducting workplace safety and health inspections. Persons trained in hazard identification must conduct inspections as follows:"

Where	Who	When
Primary fixed locations	Employer and employee representatives	Quarterly
Office environments	Employer and employee representatives	Quarterly
Auxiliary and satellite locations	Employer and employee representatives or a designated person	Quarterly
Mobile work locations, infrequently visited sites, and sites that do not lend themselves to quarterly inspections	Employer and employee representatives or a designated person	As often as the safety committee determines is necessary

Source: OAR 437-001-0765(7), Table 2 – Safety committee procedures for inspections

OAR 437-001-0765(8) states your safety committee must:

- Work with management to establish, amend, or adopt accident investigation procedures that will identify and correct hazards.
- Have a system that allows employees an opportunity to report hazards and safety and health related suggestions.
- Establish procedures for reviewing inspection reports and for making recommendations to management.
- Evaluate all accident and incident investigations and make recommendations for ways to prevent similar events from occurring.
- Make safety committee meeting minutes available for all employees to review.
- Evaluate management's accountability system for safety and health, and recommend improvements. Examples include use of incentives, discipline, and evaluating success in controlling safety and health hazards.


ONCRETE
BE RESULTS
CRANE ROSTER
CONCRETE
WASTAGE
TOWER CRA
HEIGHT W

Common types of workplace hazards

Fall hazards

A fall hazard is anything at your worksite that could cause you to lose your balance or lose bodily support and result in a fall to the same level or a lower level. Any walking or working surface can be a potential fall hazard.

We need to protect workers from falling because even those who are experienced working at heights can lose their balance or grip, slip, trip, or misstep.

Examples:

Briefly cover the most common types of falls and ask for examples in participants' workplaces.

Impact hazards

Struck-by and struck-against impacts often cause serious accidents. The severity of injury from an impacting object depends on three factors:

1. Velocity of the impact
2. Characteristics of the object (size, hardness, and shape)
3. Body part impacted

Examples:

Briefly cover struck-by and struck-against impacts and ask for examples in participants' workplaces.

Mechanical hazards

There are as many hazards created by moving machine parts as there are types of machines. Mechanical hazards can be caused by **motion** and **action**:

Mechanical hazard motions include:

- Rotating
- Reciprocating
- Transverse

Mechanical hazard actions include:

- Cutting
- Shearing
- Bending
- Punching

Examples:

Briefly cover mechanical hazard motions and actions and ask for examples in participants' workplaces.

Toxic hazards

Toxic hazards are associated with a broad class of chemicals that can injure plants, animals, or humans. The toxicity of a substance depends on a number of factors in determining whether a hazard exists, including:

- How much of the chemical is required to cause harm.
- How the chemical enters the body.
- How much of the chemical enters the body.
- The length of time one is exposed to the chemical.
- Other chemicals that may be involved.
- How an individual reacts to the chemical (compared to other individuals).

Examples:

Briefly cover the routes of entry for toxic materials and ask for examples in participants' workplaces.

Extreme temperature hazards

Overexposure to extreme temperatures can result in injuries ranging from burns to frostbite. Temperature indicates the level of heat present, which will flow from an area of higher temperature to a lower temperature area. Heat is transferred by:

- Convection. The transfer of heat by molecules moving through a fluid, gas, or liquid.
- Radiation. The transfer of heat energy by electromagnetic waves.
- Conduction. The transfer of heat from one object to another one that has a different temperature, while the objects are touching each other.

Examples:

Briefly cover hazards caused by extreme temperatures and ask for examples in participants' workplaces.

Flammability and fire hazards

For combustion to take place, fuel and an oxidizer (oxygen) must be present in gaseous form. Flammable materials include:

- Chemicals
- Cleaning agents
- Coatings
- Fabrics
- Fuel
- Hydraulic fluid
- Insecticides
- Lubricants
- Metals
- Plastics
- Refrigerants
- Rubber products
- Solvents
- Vegetation
- Wood and paper

Examples:

Briefly cover flammability and fire hazards and ask for examples in participants' workplaces.

Explosion hazards

An explosion is caused by a rapid expansion of gas from chemical reactions or incendiary devices. Common types of industrial explosions include:

- Chemical explosions, such as mixing ammonium nitrate fertilizer (an oxidizer) and fuel oil (a combustible liquid)
- Combustion explosions, such as blowing up dynamite
- Electrical explosions, such as an arc flash

Examples:

Briefly cover each type of explosion and ask for examples in participants' workplaces.

Pressure hazards

High and low pressure conditions in the workplace can cause injuries. Standard atmospheric pressure is 14.7 pounds per square inch (psi). High pressure gas distribution lines are considered high-pressure when operating at 2 psi or higher. The American Society of Mechanical Engineers (ASME) rate steam boilers that operate at more than 15 psi as high pressure. The pressure in full cylinders of compressed air, oxygen, or carbon dioxide is more than 2,000 psi. Examples of pressure hazards include:

- Ruptured cylinders. The thrust generated by gas flowing through a puncture or rupture of a cylinder can be 20 times greater than the weight of the cylinder and reach velocity of 50 feet per second in one-tenth of a second! The result: a missile.
- Whipping hoses and lines. Compressed air and water hoses can kill when end fittings become loose. Such hoses and lines should be restrained with sand bags, chains, or clamps. Never try to grab a whipping hose or line: turn off the controlling valve.
- Water hammer. Water hammer is the result of pressure surge or wave caused when a fluid in motion through a piping system is forced to stop or change direction suddenly.

Using compressed air used for cleaning. Compressed air must not be used for cleaning purposes except where reduced to less than 30 psi. and then only with effective chip guarding and personal protective equipment (Refer to 29 CFR 1910.242(b), Compressed air used for cleaning).

Employers should not allow employees to use compressed air for cleaning themselves or their clothing. Why?

Air may be injected under the skin causing a possible embolism. Fabric may also become super-saturated with oxygen creating a serious fire hazard. Clothing can be totally engulfed in flame in an instant.

Examples:

Briefly cover pressure hazards and ask for examples in participants' workplaces.

Electrical hazards

Exposure to electrical current can cause injury or death. Common electrical hazards include:

- Shock. Electrical shock is a sudden and stimulation of the body's nervous system by an electrical current.
- Ignition of combustible or explosive material. Ignition is usually caused by a spark, arc, or corona effect (ionized gas allows a current between conductors).
- Overheating. High current creates high heat that can result in fires, equipment burnout and burns to employees.
- Electrical explosions. Rapid overheating of circuit breakers, transformers, and other equipment may result in an explosion.
- Inadvertent activation of equipment. Unexpected startup of equipment and machinery can injure and kill.

Examples:

Briefly cover the five categories of electrical hazards and ask for examples in participants' workplaces.

Ergonomic hazards

Ergonomic hazards cause wear and tear on the body; these include repetition, awkward posture, forceful motion, stationary position, direct pressure, vibration, extreme temperature, noise, and stress.

Examples:

Briefly cover ergonomic hazards and ask for examples in participants' workplaces.

Biohazardous material hazards

Biohazardous materials include infectious agents or biologic materials that present a risk to the health of humans, animals, or the environment. The risk can be direct through infection or indirect through damage to the environment. Biohazardous materials include certain types of recombinant DNA, organisms, and viruses infectious to humans, animals, or plants (such as parasites, viruses, bacteria, fungi, prions, and rickettsia), and biologically active agents (such as toxins, allergens, and venoms) that can cause disease in other living organisms or cause significant effects to the environment or community.

Examples:

Briefly cover the types of biohazards and ask for examples in participants' workplaces.

Workplace violence

Workplace violence includes activities that occur in the workplace and adversely affect employees' physical or psychological well-being. Risk factors associated with workplace violence include:

- Contact with the public
- Exchanging money
- Selling or dispensing alcohol or drugs
- Delivering passengers, goods or services
- Mobile workplaces such as a taxicab or police cruiser
- Exposure to unstable or volatile persons, such as in health care and social services
- Working alone, especially late at night or early morning

- Working in high-crime areas
- Guarding valuable property or possessions
- Working in community settings
- Deciding on benefits, or in some other way controlling a person's future, well-being, or freedom such as a government agency

Examples:

Briefly cover the risk factors associated with workplace violence and ask for examples in participants' workplaces.

Three strategies to identify and assess hazards

1. Perform regular safety and health inspections.

Regular workplace inspections help you determine whether or not you have controlled older safety, health, or ergonomic hazards and can help you identify new hazards. Quarterly inspections by workers trained in hazard recognition are a good way to get the job done. Be sure to document inspections so you can later verify that hazardous conditions are corrected.

If your workplace has a safety committee, the committee must establish a procedure for conducting safety and health inspections; the procedure must:

- Establish how often the inspections are conducted. Most workplaces must be inspected quarterly. The exceptions are mobile workplaces and remote sites that have only a few employees; they can be inspected as often as your safety committee deems necessary.
- Establish who conducts the inspections. Those who conduct inspections do not have to be safety committee members but they must be trained in hazard identification and they must include employer and employee representatives.
- Establish where the inspections are conducted. Your safety committee will have to determine where the potential safety or health hazards are at your workplace.

2. Investigate incidents and near misses to determine root causes.

Incidents. Most incidents are preventable. Each one has a root cause – poor supervision, inadequate training, and lax safety policies are some examples. When you eliminate or control the root causes, you can prevent the incident from reoccurring. Develop a procedure that determines who will do the investigation and ensures the investigation will be thorough and accurate.

Near misses. Investigate near misses to determine root causes too. One way to investigate near misses is to have a no-fault incident reporting system: Workers can fill out a simple incident-report form that describes the near miss and how it happened. Investigate the near miss as if it were an incident and tell your workers what you will do to prevent it from happening again.

Why is it so important to uncover root causes for incidents and near misses?

You can prevent future accidents from happening.

3. Do a job hazard analysis (JHA).

A job hazard analysis – also called a job safety analysis – is a method of identifying, assessing, and controlling hazards associated with specific jobs. A job hazard analysis breaks down a job into tasks. You evaluate each task to identify any hazards, and then determine how each hazard will be controlled. A job hazard analysis works well for jobs with hazards that are difficult to eliminate and is especially useful for jobs with a history of incidents or near misses.

Performing a job hazard analysis for complex jobs can take a considerable amount of time and expertise to develop. Involving the employees performing those jobs throughout the analysis process can provide you a better understanding of the different ways each task is accomplished. You may also want to have a safety professional help you.

Most Oregon OSHA rules do not specifically require you to conduct a job hazard analysis; however, a job hazard analysis is a useful tool that can help you eliminate hazards before they cause injuries.

JHA example: Loading an empty trailer with pallets of product.

Basic job step	Hazard present	Safe job procedure
1. Ensure the truck is correctly spotted or equipped with warning devices.	1. Worker could be caught between backing trailer and dock. Worker could fall from the dock.	1. Stay clear of the doorway while the trailer is being backed onto the dock. Keep others away from the area. Remove awareness chain or bar from the front of the dock door once the trailer is properly spotted.
2. Block wheels; place jacks under trailer nose.	2. Worker could fall on stairs going to dock well. Worker's head could be struck against trailer. Worker could slip on ice or snow.	2. If the truck driver has not chocked or blocked the wheels, go down tile ramp/ stairs to the dock well and chock the wheels. Use caution when walking on snow or ice. Hold onto hand rails; use ice-melt chemical if needed. When placing the chock, avoid bumping the head on the underside of the trailer. Place jacks under the nose of the trailer. If the dock is equipped with an automatic trailer restraint, push the button to activate the device.

Why is it important to involve employees in the JHA process?

The more involved employees are, the more ownership they feel. Employees use their "own" procedures when they are not supervised.

Identifying and assessing hazards: Exercise

Look at the three photos below and discuss the hazards you see.

Discuss the hazards and the types of accidents that might occur.

Photo 1

What is the hazard?

What kind of accident might occur?

Photo 2

What is the hazard?

What kind of accident might occur?

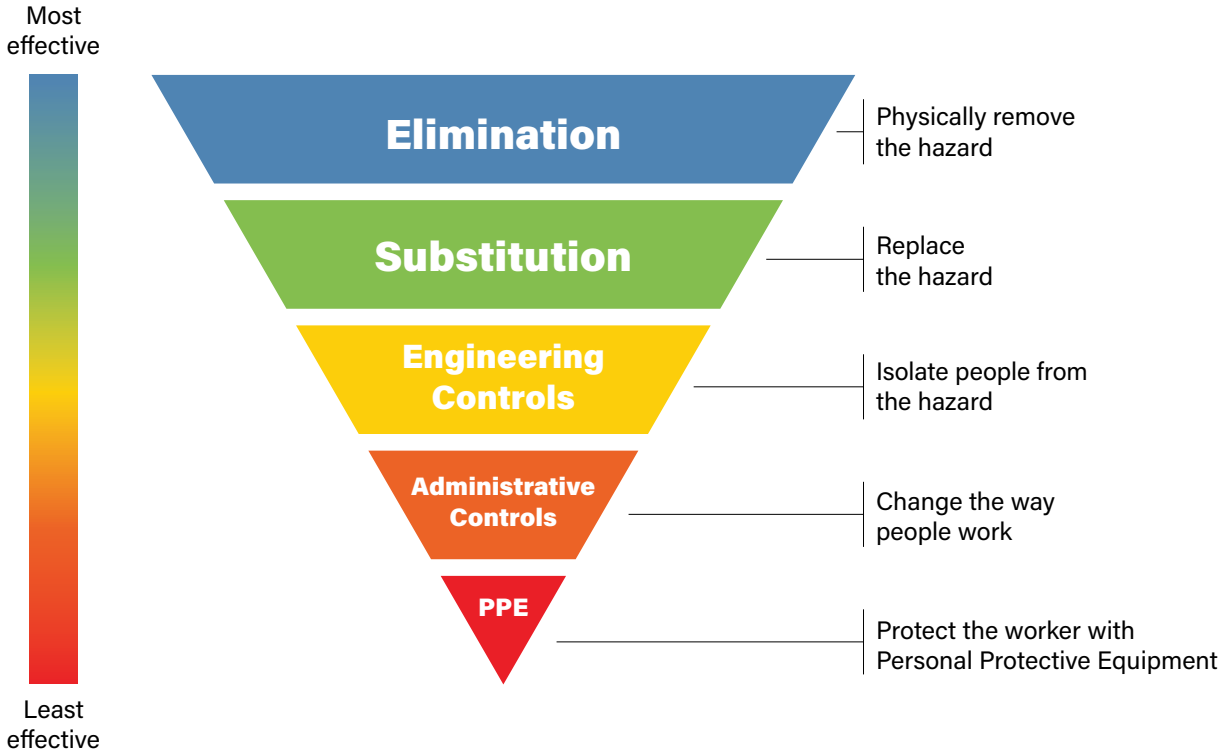
Photo 3

What is the hazard?

What kind of accident might occur?

Controlling and preventing hazards

The hierarchy of controls



The hierarchy of controls is a method of identifying and ranking safeguards to protect workers from hazards. Often, you'll need to combine control methods to best protect workers. For example, a local exhaust system (an engineering control) requires training, periodic inspections, and preventive maintenance (administrative controls).

Elimination – Physically remove the hazard

Elimination makes sure the hazard no longer exists. Examples:

- Ending the use of a hazardous material
- Doing work at ground level rather than at heights
- Stopping the use of noisy processes

Substitution – Replace the hazard

Substitution means changing out a material or process to reduce the hazard. Examples:

- Switching to a less hazardous material
- Switching to a process that uses less force, speed, temperature, or electrical current

Engineering controls – Isolate people from the hazard

Engineering controls reduce exposure by preventing hazards from coming into contact with workers. They still allow workers to do their jobs, though. Examples:

- Noise enclosures
- Local exhaust ventilation
- Guardrail systems
- Machine guards
- Interlocks
- Lift equipment

Administrative controls – Change the way people work

Administrative controls change the way work is done or give workers more information by providing workers with relevant procedures, training, or warnings. They're often used together with higher-level controls. They include:

- Procedures, such as equipment inspections, planned preventive maintenance, checklists, lockout/tagout/tryout, infection prevention and control practices, changing work schedules, pre- and post-task reviews, and rotation of workers
- Training on topics such as hazard communication, permit-required confined space entry, lockout/tagout/tryout, and safe work procedures
- Warnings, such as signs, backup alarms, smoke detectors, computer messages, mirrors, horns, labels, and instructions

Personal protective equipment (PPE)

PPE includes clothing and devices to protect workers. PPE needs constant effort and attention (including proper use and training) from workers. Higher-level controls aren't always feasible, and PPE might be needed in conjunction with other control measures. Examples:

- Safety glasses
- Personal fall protection systems and related equipment
- Hard hats
- Respirators
- Hearing protection
- Protective clothing

How to use the hierarchy of controls

Identify the hazards you are trying to control. Think about how you can block the path between the worker and the hazard. Brainstorm ways the hazard can be eliminated, substituted, engineered out, administratively controlled, or what PPE can be used with other controls.

You will also need to decide if a control is feasible:

- Is it right for the hazard?
- Is it appropriate?
- Is it consistent with employer policies?
- Will workers accept it?
- Is it recognized as an appropriate practice in the industry?
- Is it effective, reliable, and durable?
- Is it readily available?
- Is it cost-effective in the short- and long-term?

Choose feasible controls that are highest on the hierarchy. If they will take time to implement, use one or more of the lower options you identified as interim controls until the permanent solution is in place. Remember that you may need a combination of controls (such as engineering controls and administrative controls) to provide the best level of protection.

Identifying, controlling, and preventing hazards: Exercise

Look at the four photos below and discuss the hazards you see.

Have students use the hazard identification and control worksheet to identify hazards, unsafe behaviors, and ways to control or prevent them in the four photos below.

Photo 1

Photo 2

Photo 3

Photo 4

Hazard identification and control worksheet

Photo number 1

Hazard:

Unsafe behavior:

Ways to eliminate or control the hazard:

Photo number 2

Hazard:

Unsafe behavior:

Ways to eliminate or control the hazard:

Photo number 3

Hazard:

Unsafe behavior:

Ways to eliminate or control the hazard:

Photo number 4

Hazard:

Unsafe behavior:

Ways to eliminate or control the hazard:

Let's review!

1. **A hazard is an unsafe condition or practice that could cause (choose all that apply):**
   - **a) an injury**
   - **b) an illness**
   - **c) death**
2. **These must be present to have an accident (choose one):**
   - a) person and condition
   - b) condition and behavior
   - **c) hazard and exposure**
   - d) exposure and behavior
3. **Investigate incidents and near misses to determine (choose one):**
   - **a) root causes**
   - b) who is at fault
   - c) if any equipment is missing
   - d) if someone left work early
4. **Which of the following is considered a root cause? (Choose all that apply.)**
   - **a) poor supervision**
   - **b) inadequate training**
   - **c) lax safety policies**
   - d) a missing screw driver
5. **The primary objective of an incident or accident analysis is to fix the (choose one):**
   - a) blame
   - b) hazard
   - c) system
   - **d) cause**
6. **Working within arms-length of an unguarded saw would be considered (choose one):**
   - **a) physical exposure**
   - b) environmental exposure
   - c) a good idea
   - d) machine exposure
7. **Which of the following is considered an engineering control? (Choose one.)**
   - a) telling the employee to use common sense
   - **b) installing a machine guard**
   - c) conducting retraining
   - d) wearing earplugs
8. **Which of the following is considered an administrative control? (Choose one.)**
   - a) replacing a defective ladder
   - **b) requiring employees to follow safe procedures**
   - c) turning down the radio
   - d) logging in to a computer monitor with a strong password
9. **Which of the following are strategies to identify and analyze hazards? (Choose all that apply.)**
   - **a) perform regular safety and health inspections**
   - b) use a dog with a good sense of smell
   - **c) investigate incidents and near misses to determine root causes**
   - **d) do a job hazard analysis**
10. **Why are engineering controls important? (Choose one.)**
    - a) they are always designed by engineers with advanced degrees
    - **b) they reduce exposure by preventing hazards from coming into contact with workers**
    - c) they are much cheaper than other controls
    - d) they are made from recyclable materials

Notes

Salem Central Office

350 Winter St. NE
Salem, OR 97301-3882

Phone: 503-378-3272
Toll-free: 800-922-2689

Fax: 503-947-7461
en Español: 800-843-8086

OSHA | Oregon OSHA
Department of Consumer and Business Services

osha.oregon.gov
440-5987 (11/24/COM)

STATE OF OREGON 1859