

Introduction to Occupational Safety and Health



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OSHAcademy Course 600 Study Guide

Introduction to Occupational Safety and Health

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Contact OSHAcademy to arrange for use as a training document.

This study guide is designed to be reviewed off-line as a tool for preparation to successfully complete OSHAcademy Course 600.

Read each module, answer the quiz questions, and submit the quiz questions online through the course webpage. You can print the post-quiz response screen which will contain the correct answers to the questions.

The final exam will consist of questions developed from the course content and module quizzes.

We hope you enjoy the course and if you have any questions, feel free to email or call:

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Course Introduction

Occupational Safety and Health Administration (OSHA)

All employees have the right to a safe workplace. The Occupational Safety and Health Act of 1970 (OSH Act) was passed to prevent workers from being killed or seriously injured at work. The law requires employers to provide their employees with safe working conditions that are free of known dangers. The Act created the Occupational Safety and Health Administration (OSHA), which sets and enforces workplace safety and health standards. OSHA also provides information, training and assistance to workers and employers. Workers may file a complaint to have OSHA inspect their workplace if they believe that their employer is not following OSHA standards or that there are serious hazards.

Hazards

Many workplaces have hazards which pose a threat to worker safety and health. Workplace hazards vary significantly depending on the type of work being performed and environment the work is performed under. For example, construction workers will may be exposed to fall hazards from working off the ground, while healthcare professionals may be exposed to bloodborne pathogens from sick patients. Hazards come in many forms, and it is important for you to know what a hazard is and how to protect yourself.

Hazard Controls

Once hazards have been identified in a workplace, it is important to establish systems to eliminate or reduce exposure to these hazards. Hazard controls do just that. To help approach hazard controls, a hierarchy of control strategies has been developed. In this module of the course, each of the hazard control strategies is described.

Personal Protective Equipment

Sometimes the only method to control hazards, short term or long term, is through the use of personal protective equipment (PPE). Personal protective equipment come in various forms and are designed to prevent an employee from coming into direct contact with a hazard. Employers are responsible for providing PPE for their employees, and employers are responsible for ensuring their employees use PPE as required and that it be used correctly.

Emergency Action Plans

If there was a fire, earthquake, or chemical spill at your workplace, would you know what to do? Your employer is responsible for developing an emergency action plan to help ensure employees know what to do in the event of a workplace emergency. Your emergency action

plan may assign responsibilities to you, and you need to know what these responsibilities are. If someone gets hurt, are you responsible for providing first aid care? If so, this should be detailed in the emergency action plan and your employer must provide any necessary training.

Course Objectives

This course will focus on each of these topics from the employee's perspective. The course will also explain the employer's responsibilities. By the end of this course you should be able to:

1. Explain the purpose of OSHA.
2. Explain your rights as an employee under the OSH Act.
3. Describe what a hazard is.
4. Evaluate fall hazards.
5. Define ergonomics.
6. Explain what Musculoskeletal Disorders (MSDs) are.
7. Describe basic electrical safety.
8. Describe the hierarchy of hazard controls.
9. Explain the purpose of personal protective equipment (PPE).
10. Describe an emergency action plan (EAP).

Module 1: About OSHA

OSHA's Mission

With the Occupational Safety and Health Act of 1970, Congress created the Occupational Safety and Health Administration (OSHA) to assure safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education and assistance.

Organization

OSHA is part of the United States Department of Labor. The administrator for OSHA is the Assistant Secretary of Labor for Occupational Safety and Health. OSHA's administrator answers to the Secretary of Labor, who is a member of the cabinet of the President of the United States. See the current OSHA Organizational Chart.

OSHA Coverage

The OSH Act covers most private sector employers and their workers, in addition to some public-sector employers and workers in the 50 states and certain territories and jurisdictions under federal authority. Those jurisdictions include the District of Columbia, Puerto Rico, the Virgin Islands, American Samoa, Guam, Northern Mariana Islands, Wake Island, Johnston Island, and the Outer Continental Shelf Lands as defined in the Outer Continental Shelf Lands Act.

What is OSHA's focus?

OSHA is not just concerned with work related deaths; instead OSHA oversees all aspects of worker health and safety. This includes work related accidents and illnesses. For example, OSHA has established rules to help prevent workers from being exposed to extreme environments that could cause physical injury or illness.

Take a look at the following list to get a sense of the most common workplace violations.

2017 Most Frequently Cited OSHA Violations – General Industry and Construction:

1. [1926.501 - Fall Protection - Construction](#)
2. [1910.1200 - Hazard Communication - General Industry](#)
3. [1926.451 - Scaffolding - Construction](#)

4. [1910.134 - Respiratory Protection - General Industry](#)
5. [1910.147 - Lockout/Tagout - General Industry](#)
6. [1926.1053 - Ladders - Construction](#)
7. [1910.178 - Powered Industrial Trucks - General Industry](#)
8. [1910.212 - Machine Guarding - General Industry](#)
9. [1926.503 - Fall Protection - Training Requirements - Construction](#)
10. [1910.305 - Electrical- Wiring Methods - General Industry](#)

Construction's "Fatal Four"

Out of 4,693 worker fatalities in private industry in calendar year 2016, 991 or 21.1% were in construction — that is, one in five worker deaths last year were in construction. Consequently, OSHA is focusing on the following causes of private sector worker deaths (excluding highway collisions) in the construction industry: falls, followed by struck by object, electrocution, and caught-in/between.

These "Fatal Four" were responsible for more than half (63.7%) the construction worker deaths in 2016, BLS reports. Eliminating the Fatal Four would save 631 workers' lives in America every year.

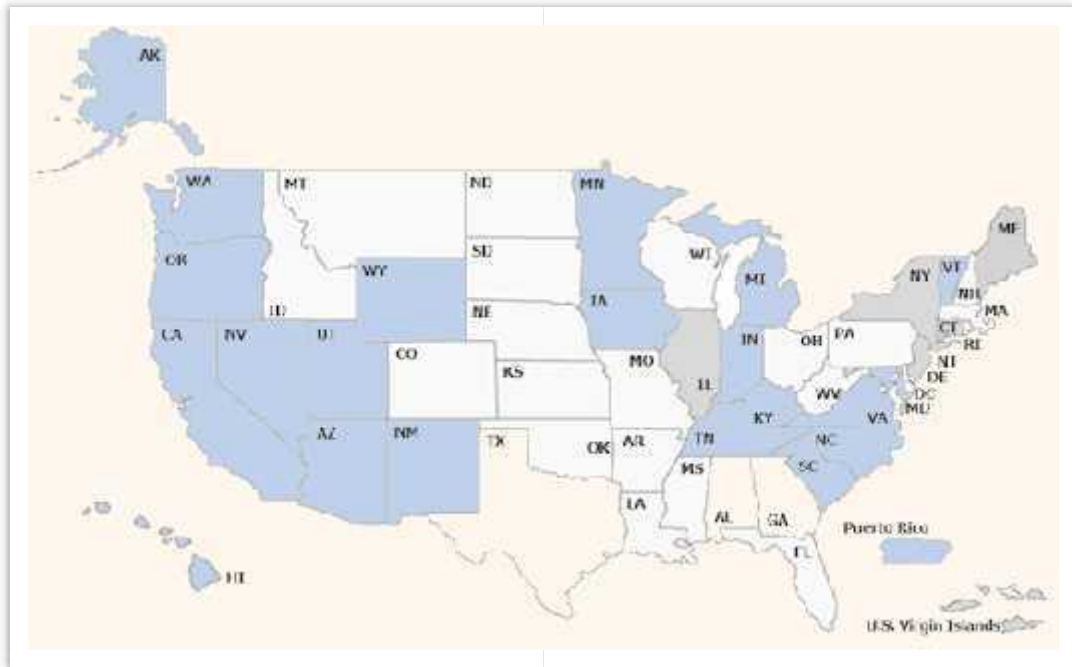
OSHA Jurisdiction

OSHA covers most private sector employers and workers in all 50 states, the District of Columbia, and other U.S. jurisdictions, either directly through Federal OSHA or through an OSHA-approved state plan.

State Plans

State Plans are OSHA-approved job safety and health programs operated by individual states rather than federal OSHA. OSHA encourages states to develop and operate their own job safety and health programs and precludes state enforcement of OSHA standards unless the state has an OSHA-approved State Plan.

OSHA approves and monitors all state plans and provides as much as fifty percent of the funding for each program. State-run safety and health programs must be at least as effective as the Federal OSHA program.



Twenty-six states, Puerto Rico, and the Virgin Islands have OSHA-approved State Plans. Twenty-two State Plans (21 states and one U.S. territory) cover both private and state and local government workplaces. The remaining six State Plans (five states and one U.S. territory) cover state and local government workers only.

To see more information on state plans, see [OSHA's State Plans Page](#)

Employee Rights

The OSH Act gives employees the right to safe and healthful working conditions. It is the duty of employers to provide workplaces that are free of known dangers that could harm their employees. This law also gives employees important rights to participate in activities to ensure their protection from job hazards. Employees have basic rights under the OSH Act.

- Work in a safe workplace.
- Raise a safety or health concern with your employer or OSHA, or report a work-related injury or illness, without being retaliated against.
- Receive information and training on job hazards, including all hazardous substances in your workplace
- Request an OSHA inspection of your workplace if you believe there are unsafe or unhealthy conditions. OSHA will keep your name confidential. You have the right to have a representative contact OSHA on your behalf.

- Participate (or have your representative participate) in an OSHA inspection and speak in private to the inspector.
- File a complaint with OSHA within 30 days (by phone, online or by mail) if you have been retaliated against for using your rights.
- See any OSHA citations issued to your employer.
- Request copies of your medical records, tests that measure hazards in the workplace, and the workplace injury and illness log.

A job must be safe or it cannot be called a good job. OSHA strives to make sure that every employee in the nation goes home unharmed at the end of the workday, the most important right of all.

For more information on employee rights, see [Workers' Rights](#)

Employer Responsibilities

Employers have the responsibility to provide a safe workplace. Employers **MUST** provide their employees with a workplace that does not have serious hazards and must follow all OSHA safety and health standards. Employers must find and correct safety and health problems.

OSHA further requires that employers must try to eliminate or reduce hazards first by making feasible changes in working conditions - switching to safer chemicals, enclosing processes to trap harmful fumes, or using ventilation systems to clean the air are examples of effective ways to get rid of or minimize risks - rather than just relying on personal protective equipment such as masks, gloves, or earplugs.

Employers **MUST** also:

- Prominently display the official [OSHA poster](#) that describes rights and responsibilities under the OSH Act.
- Inform workers about hazards through training, labels, alarms, color-coded systems, chemical information sheets and other methods.
- Train workers in a language and vocabulary they can understand.
- Keep accurate records of work-related injuries and illnesses.
- Perform tests in the workplace, such as air sampling, required by some OSHA standards.

- Provide hearing exams or other medical tests required by OSHA standards.
- Post OSHA citations and injury and illness data where workers can see them.
- Notify OSHA within 8 hours of a workplace fatality or within 24 hours of any workrelated inpatient hospitalization, amputation or loss of an eye.
- Not retaliate against workers for using their rights under the law, including their right to report a work- related injury or illness.

Making a Difference

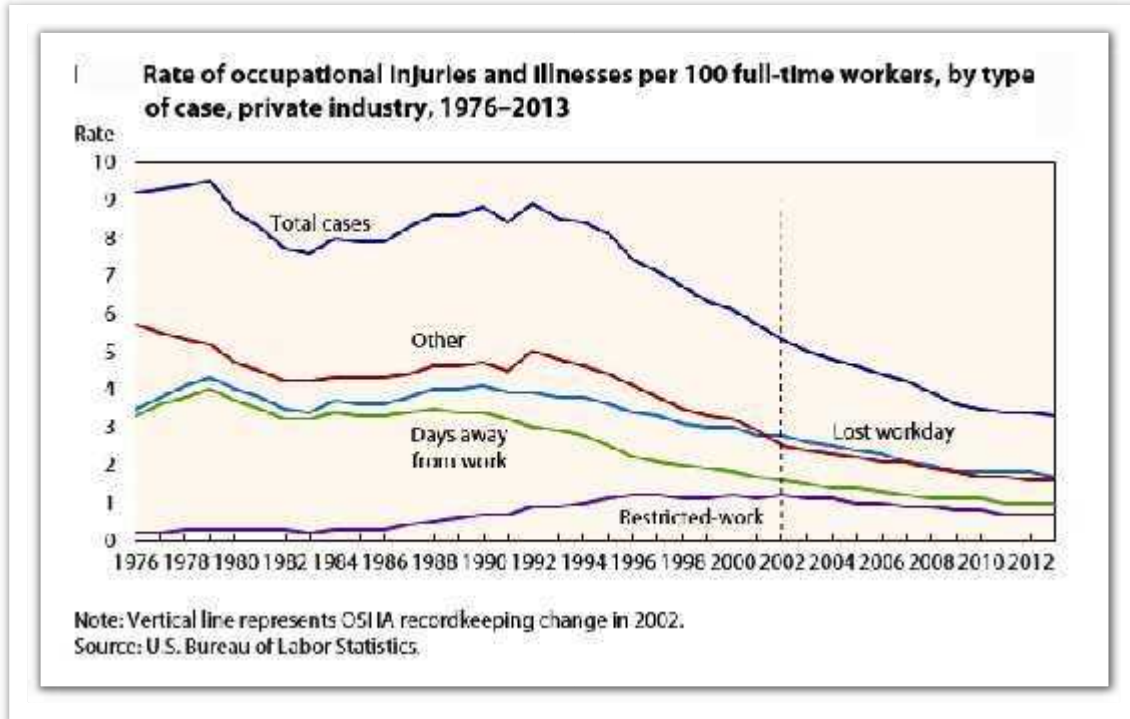
Worker Injuries, Illnesses and Fatalities

In more than four decades, OSHA and our state partners, coupled with the efforts of employers, safety and health professionals, unions and advocates, have had a dramatic effect on workplace safety.

- Worker deaths in America are down-on average, from about 38 worker deaths a day in 1970 to 14 a day in 2016.
- Worker injuries and illnesses are down-from 10.9 incidents per 100 workers in 1972 to 2.9 per 100 in 2016.

According to the [Bureau of Labor Statistics](#) (BLS), 5,190 workers were killed on the job in 2016 (3.6 per 100,000 full-time equivalent workers) - on average, 99 a week or about 14 deaths every day.

For more information on injuries, illnesses, and fatalities by state, see the [BLS Statistics Page](#).



Module 1 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. The OSHA Act does NOT cover workers in which of the following locations?**
 - a. Virgin Islands
 - b. Bermuda
 - c. Oregon
 - d. Guam

- 2. The top two OSHA cited workplace violations in 2017 were _____.**
 - a. fall protection and hazard communication
 - b. respiratory protection and ladders
 - c. machine guarding and hazard communication
 - d. scaffolding and machine guarding

- 3. State-run safety and health programs must be _____.**
 - a. identical to Federal OSHA program
 - b. approved by congressional act
 - c. at least as effective as the Federal OSHA program
 - d. monitored closely to ensure compliance

- 4. Employees have which the following rights under the OSH Act.**
 - a. Employees can do whatever they want, if it's safe
 - b. Employees can file a complaint with OSHA within 30 days of retaliation by the employer for making safety and health complaints.
 - c. Employees MUST notify their employers about workplace hazards
 - d. Employees cannot see OSHA citations issued to their employee

5. As an employee, you _____ comply with all occupational safety and health standards issued under the OSH Act that apply to your own actions and conduct on the job.

- a. must
- b. may
- c. should
- d. can

Module 2: Hazard Awareness

What are the Hazards?

The answer to this question may seem obvious, but supposed obvious hazards can be easily overlooked. Many workplaces contain hazardous materials including raw materials (wood, metal, plastic) to be manufactured into finished goods, and toxic chemicals (solvents, acids, bases, detergents) used at various stages of the process. As an employee, being aware of these hazards is important to ensuring your safety. There can be many hazards in the workplace, and being able to identify these hazards can help prevent accidental injury or illness.

Other hazards you should be aware of:

- Stationary machinery and equipment may not be properly guarded, or in poor working order because of poor preventive/corrective maintenance.
- Tools may not be properly maintained.
- Saws may not be sharpened or safety harnesses may be old and in need of replacement.
- The work environment might include extreme noise, flammable or combustible atmospheres, or poor workstation design.
- Floors may be slippery and isles cluttered.
- Guardrails, ladders, or floor-hole covers may be missing or damaged.
- Employees might be fatigued, distracted in some way, or otherwise lack the mental or physical capacity to accomplish work safely.

Some or all of these potential safety hazards may exist in a workplace. The list could go on and on. It's vitally important that workers and supervisors are knowledgeable to ensure that workplace hazards are identified and eliminated as soon as possible.

A proactive supervisor should encourage employees to report any potential hazards immediately. Safety should always be one the company's core values.

Although an employer is responsible for identifying workplace hazards, you should be proactive about your safety and be aware of your environment and potential hazards.

What is a Hazard?

In the previous section, we listed several different types of hazards. So why are we asking what a hazard is? One of the goals of this training is to give you the tools to help identify hazards in the workplace. To do this, it is important to understand what a hazard is!

OSHA usually defines a hazard as, "a danger which threatens physical harm to employees." Expanding on that basic definition we can think of a hazard as an "unsafe workplace condition or practice (danger) that could cause an injury or illnesses (harm) to the employee."

A hazard may be an object (tools, equipment, machinery, materials) or a person (when distracted, mentally/physically incapable). It's important to know a hazard is only one part in the "accident formula" described. It takes a hazard and exposure before an accident can occur.

The first step in controlling workplace hazards is to first identify them. We want to determine what hazards are present. You want to know what a hazard looks like, what kind of accidents might it cause, and how severe the resulting injuries might be.

One way to identify hazards is to perform a safety inspection. Safety inspections should do more than simply identify hazardous conditions. They should provide useful data for the purpose of effective analysis and evaluation of the safety management system. Sounds complicated, but it's really not.

There are five basic methods you can use to identify workplace hazards before an accident occurs:

1. informal observations, and formal observation programs,
2. comprehensive company-wide surveys,
3. individual interviews,
4. walk-around inspections, and
5. documentation review.

You may not be the person conducting the safety inspection in your workplace, but if you understand what it is, you might be able to provide valuable information as a part of the process.

"Recognized" Hazards

Occasionally, students ask what is considered a "recognized" hazard in the workplace. As described in OSHA's Field Compliance Manual, recognition of a hazard is established on the basis of industry recognition, employer recognition, or "common sense" recognition criteria. Let's take a closer look at these three categories to better understand what OSHA means.

- **Industry Recognition:** A hazard is recognized if the employer's industry recognizes it. Recognition by an industry, other than the industry to which the employer belongs, is generally insufficient to prove industry recognition. Although evidence of recognition by the employer's specific branch within an industry is preferred, evidence that the employer's industry recognizes the hazard may be sufficient.
- **Employer Recognition:** A recognized hazard can be established by evidence of actual employer knowledge. Evidence of such recognition may consist of written or oral statements made by the employer or other management or supervisory personnel during or before the OSHA inspection, or instances where employees have clearly called the hazard to the employer's attention.
- **Common Sense Recognition:** If industry or employer recognition of the hazard cannot be established, recognition can still be established if it is concluded that any reasonable person would have recognized the hazard. This argument is used by OSHA only in flagrant cases. *Note: Throughout our courses we argue that "common sense" is a dangerous concept in safety. Employers should not assume that accidents in the workplace are the result of a lack of common sense.*

"Foreseeable" Hazards

Another important question to ask about the nature of a hazard relates to whether it was "foreseeable." A hazard for which OSHA issues a citation must be reasonably foreseeable. All the factors which could cause a hazard need not be present in the same place at the same time in order to prove foreseeability of the hazard; e.g., an explosion need not be imminent.

Remember, a foreseeable hazard is one that may be reasonably anticipated. Employees and employers should always evaluate hazards based on what could be anticipated, not just what the current environment is at that moment.

EXAMPLE

If combustible gas and oxygen are present in sufficient quantities in a confined area to cause an explosion if ignited but no ignition source is present or could be present, no OSHA violation would exist. If an ignition source is available at the workplace and the employer has not taken sufficient safety precautions to preclude its use in the confined area, then a foreseeable hazard may exist.

It is necessary to establish the reasonable foreseeability of the general workplace hazard, rather than the particular hazard which led to the accident.

EXAMPLE

A titanium dust fire may have spread from one room to another only because an open can of gasoline was in a second room. An employee who usually worked in both rooms was burned in the second room from the gasoline. The presence of gasoline in the second room may be a rare occurrence. It is not necessary to prove that a fire in both rooms was reasonably foreseeable. It is necessary only to prove that the fire hazard, in this case due to the presence of titanium dust, was reasonably foreseeable.

Fall Protection

A fall hazard is anything in the workplace that could cause an unintended loss of balance or bodily support and result in a fall. Fall hazards are foreseeable. Employees may fall to:

- a lower level, for instance, from a roof to the ground, or
- to the same surface upon which the employee is working, for instance from a slip or trip.

You can identify fall hazards and control them before they cause injuries. Fall hazards cause accidents such as the following:

- A worker walking near an unprotected leading edge trips over a protruding board.
- A worker slips while climbing an icy stairway.
- A makeshift scaffold collapses under the weight of four workers and their equipment.

- A worker carrying a sheet of plywood on a flat roof steps into a skylight opening.

Here is a real-life example involving a company cited for violations related to fall hazards. As you will read, a contractor fell from a sixth-floor balcony.

Company Cited for Fall Hazards

OSHA cited a company for one willful and 4 serious violations related to fall hazards after a worker was injured by falling from a sixth-floor balcony while attempting to access a suspension scaffold. **A willful violation** is one committed with intentional knowledge or voluntary disregard for the law's requirements, or with plain indifference to worker safety and health. Proposed penalties total \$136,290. **A serious violation** occurs when there is substantial probability that death or serious physical harm could result from a hazard about which the employer knew or should have known.

- The willful violation was for the use of makeshift devices on top of scaffolds to increase the level height for working and a failure to protect workers on scaffolds from fall hazards.
- The four serious violations were for (1) failure to install cross bracing on the entire scaffold, (2) failure to ensure personal fall arrest systems were attached to a secure anchorage point and not scaffold guard rails, (3) failure to train workers to recognize and avoid hazards including falls, and (4) failure to ensure proper step ladder use.

In this example, the company had several violations that contributed to the worker's injuries. These hazards were foreseeable and could have been prevented.

How to Evaluate Fall Hazards

The purpose of evaluating fall hazards is to determine how to eliminate or control them before they cause injuries. Below are important factors to consider in conducting an evaluation.

Involve Others

You may need others to help you evaluate fall hazards. Involve others who may have experience identifying fall hazards, such as fellow employees or supervisors; they'll help you identify the hazards and determine how to eliminate or control them. Involving others also strengthens your company's safety and health program.

Identify tasks that could expose workers to falls

As part of the hazard identification process, evaluate each task you will be performing and look for anything that might expose you to a fall hazard. For example, if you will be climbing a ladder to change a light bulb, make sure the ladder is not damaged and that the ladder is stable.

Ensure all walking/working surfaces have the strength to support workers and their equipment and then identify all tasks that could expose workers to falls. A walking/working surface is any surface, horizontal or vertical, on which a person walks or works.

Identify fall hazards that you can eliminate

Eliminating a fall hazard is the most effective fall-protection strategy. Here are some ways to eliminate fall hazards:

- Perform construction work on the ground before lifting or tilting it to an elevated position.
- Install permanent stairs early in the project so that workers don't need to use ladders between floors.
- Use tool extensions to perform work from the ground.

Prevent fall hazards

If you can't eliminate the hazard, take steps to prevent or control a fall. Here are some ways to do this:

-) To prevent falls, use covers, guardrails, handrails, perimeter safety cables, and personal fall-restraint systems.
-) To control falls, use personal fall-arrest systems, positioning-device systems, and safety net systems. Use these fall-protection systems only when you can't eliminate fall hazards or prevent falls from occurring.

Supported Access

Portable ladders, supported scaffolds, and aerial lifts let you get to a work area and support you while you work. They make getting to a work area easy, but they can cause falls when they're not used properly.

Portable Ladders

Portable ladders are versatile, economical, and easy to use. However, workers sometimes use them without thinking about using them safely. Each year, most workers are injured when they fall from ladders. Most of the falls in the workplace are less than 10 feet.

We use ladders to do all sorts of tasks, so it's not surprising that many types of ladders are available. Let's look at the most common types.

Common Types of Portable Ladders



Straight Ladder (left)

The most common type of portable ladder. Length cannot exceed 30 feet. Available in wood, metal, and reinforced fiberglass. Supports only one worker.



Standard Folding Ladder (right)

Folding ladders have flat steps, a hinged back, and is not adjustable. For use only on firm, level surfaces. Available in metal, wood, or reinforced fiberglass. Must have a metal spreader or locking arm and cannot exceed 20 feet. Supports only one worker.



Extension Ladder (left)

Extension ladders offer the most length in a general-purpose ladder. They have two or more adjustable sections. The sliding upper section must be on top of the lower section. Made of wood, metal, or fiberglass. Maximum length depends on material. Supports only one worker.

Platform Ladder (right)

Platform ladders have a large, stable platform near the top that supports one worker. Length cannot exceed 20 feet.



Trestle Ladder (left)



Trestle ladders have two sections that are hinged at the top and form equal angles with the base. Used in pairs to support planks or staging. Rungs are not used as steps. Length cannot exceed 20 feet.

Tripod (Orchard) Ladder (right)



Tripod ladders have a flared base and a single back leg that provides support on soft, uneven ground. Length cannot exceed 16 feet. Metal and reinforced fiberglass versions are available. Supports only one worker.

It's important to choose the right ladder for the right job. Using a ladder for a task that it was not designed for may increase the risk of falling.

Basic Ergonomics

Webster's New World Dictionary (College Edition) defines ergonomics as "The study of the problems of people in adjusting to their environment; especially the science that seeks to adapt work or working conditions to suit the individual worker." To better understand what ergonomics is and how it affects you and other employees, we need to go explore the topic further.

Ergonomics may be thought of as the science of fitting the job to the individual worker. Ergonomics studies the various risk factors brought to a job. Listed below are three areas within which ergonomic risk factors exist.

The worker, task, and environment can increase the risk of injury and illness.

- **Risk factors inherent in the worker.** Workers come in all shapes and sizes, and have varying degrees of physical fitness.

- **Risk factors inherent in the task.** Job tasks, especially repetitive tasks, can present risk factors that increase the likelihood of an injury.
- **Risk factors inherent in the environment.** The workplace environment, within which the worker and job exist, may also contain exposures to risk factors.

Each of these ergonomic categories can present risk factors that can result in musculoskeletal disorders (MSDs). To better understand ergonomics, we need to understand musculoskeletal disorders. Let's take a closer look at these MSDs.

Musculoskeletal Disorders?

Musculoskeletal disorders (MSDs) include a group of conditions that involve the nerves, tendons, muscles, and supporting structures such as intervertebral discs. They represent a wide range of disorders, which can differ in severity from mild, periodic symptoms to severe, chronic and debilitating conditions.

Below is a list of examples.

- carpal tunnel syndrome,
- tenosynovitis,
- tension neck syndrome, and
- low back pain

Contributing Factors

Contributing factors are aspects of work tasks that can lead to fatigue, MSD symptoms and injuries, or other types of problems. These factors may be present in one or more of the tasks employees must perform to accomplish their jobs.

The contributing factors you should be aware of include:

- awkward postures,
- repetitive motions,
- forceful exertions,
- pressure points (e.g., local contact stress), and

- vibration.
- the environment (e.g., light, noise, temperature extremes)

For more information on ergonomics, take OSHAcademy course [711 Introduction to Ergonomics](#) and course [722 Ergonomics Program Management](#).

Electrical Safety

The first step toward protecting yourself when dealing with electricity is recognizing the many hazards you face on the job. To do this, you must know which situations can place you in danger. Knowing where to look helps you to recognize hazards. Each of the following is an example of an electrical hazard that could cause shock, injury, or fatality:

- inadequate electrical wiring,
- exposed electrical parts,
- overhead power lines,
- wires with bad insulation,
- improper grounding of electrical circuits,
- overloaded circuits,
- damaged power tools and equipment,
- using the wrong electrical protective equipment,
- using the wrong power tool,
- metal ladders, and wet conditions.

Real World Accident

A meter technician was called to repair a residential power outage. By the time he arrived at the site of the outage, he had already worked two hours of overtime and worked 14 straight hours the day before. At the site, a tree limb had fallen across an overhead power line. The

neutral wire in the line was severed and the two energized 120-volt wires were disconnected. The worker removed the tree limb and climbed up a power pole to reconnect the three wires. He was wearing insulated gloves, a hard hat, and safety glasses.

He prepared the wires to be connected. While handling the wires, one of the energized wires caught the cuff of his left glove and pulled the cuff down. The conductor contacted the victim's forearm near the wrist. He was electrocuted and fell backwards. He was wearing a climbing belt, which left him hanging upside down from the pole. Paramedics arrived five minutes after the contact. The power company lowered his dead body 30 minutes later.

Several factors may have contributed to this incident. Below are some ways to eliminate these risk factors:

- Ask for assistance when you are assigned tasks that cannot be safely completed alone. The task assigned to the victim could not have been done safely by only one person. Do not work overtime performing hazardous tasks that are not part of your normal assignments.
- Employees should only be given tasks they are qualified to perform.
- All employees below the journeyman level should be supervised.

Overhead Power Line Hazards

Most people do not realize overhead power lines are typically not insulated. More than half of all electrocutions are caused by direct worker contact with energized power lines.

Power line workers must be especially aware of the dangers of overhead lines. In the past, 80% of all lineman deaths were caused by contacting a live wire with a bare hand. Due to such incidents, all linemen now wear special rubber gloves that protect them up to 34,500 volts. Today, most electrocutions involving overhead power lines are caused by failure to maintain proper work distances.

Shocks and electrocutions occur where physical barriers are not in place to prevent contact with the wires. When dump trucks, cranes, work platforms, or other conductive materials (such as pipes and ladders) contact overhead wires, the equipment operator or other workers can be killed.

Clearance Distances

If you do not maintain required clearance distances from power lines, you can be shocked and killed.

- The minimum distance for voltages up to 50kV is 10 feet.
- For voltages over 50kV, the minimum distance is 10 feet plus 4 inches for every 10 kV over 50kV.

Never store materials and equipment under or near over-head power lines. You need to recognize that overhead power lines are a hazard.

Improper Grounding Hazards

If an electrical system is not grounded properly, a hazard exists. The most common OSHA electrical violation is improper grounding of equipment and circuitry.

The metal parts of an electrical wiring system we touch (switch plates, ceiling light fixtures, conduit, etc.) should be grounded and at 0 volts. If the system is not grounded properly, these parts may become energized. Metal parts of motors, appliances, or electronics that are plugged into improperly grounded circuits may be energized.

When a circuit is not grounded properly, a hazard exists because unwanted voltage cannot be safely eliminated. If there is no safe path to ground for fault currents, exposed metal parts in damaged appliances can become energized.

Extension cords may not provide a continuous path to ground because of a broken ground wire or plug. If you contact a defective electrical device that is not grounded (or grounded improperly); you will be shocked. You need to recognize that an improperly grounded electrical system is a hazard.

Wet Conditions Hazards

Working in wet conditions is hazardous because you may become an easy path for electrical current. For instance, if you touch a live wire while standing in even a puddle of water, you will probably receive a shock.

Damaged insulation, equipment, or tools can expose you to live electrical parts. A damaged tool may not be grounded properly, so the housing of the tool may be energized, causing you to receive a shock. Improperly grounded metal switch plates and ceiling lights are especially hazardous in wet conditions. If you touch a live electrical component with a non-insulated hand tool, you are more likely to receive a shock when standing in water.

Remember, you don't have to be standing in water to be electrocuted. Wet clothing, high humidity, and perspiration also increase your chances of being electrocuted. You need to recognize that all wet conditions are hazards.

Module 2 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

1. How does OSHA define a “hazard?”

- a. “A danger which threatens physical harm to employees”
- b. “To take a chance or a risk”
- c. “The absence of lack of predictability”
- d. “Something causing unavoidable harm”

2. According to the text, it takes both _____ and _____ before an accident can occur.

- a. lack of knowledge, experience
- b. hazard, exposure
- c. carelessness, distraction
- d. fatigue, carelessness

3. Ways to control falls include all the following, except_____.

- a. safety-net systems
- b. positioning-systems devices
- c. fall-arrest systems
- d. ladder systems

4. Carpal Tunnel Syndrome is an example of a Musculoskeletal Disorder (MSD).

- a. true
- b. false

5. What causes more than half of all electrocutions?

- a. Direct contact with energized powerlines
- b. Failure to keep safe distances
- c. Storing materials or equipment under or near overhead powerlines
- d. Employees who don’t wear gloves

Module 3: Hazard Controls

As you learned earlier, there are many different types of hazards in the workplace. Hazardous conditions include unsafe materials, equipment, the environment, and employees. Unsafe work practices include: allowing untrained workers to perform hazardous tasks, taking unsafe shortcuts, horseplay, or long work schedules. To combat these hazardous conditions and unsafe work practices, control strategies, called the "**Hierarchy of Controls**" have been developed.

Traditionally, a hierarchy of controls, listed from most to least effective, has been used as a means of determining how to implement feasible and effective controls. [ANSI Z10, Occupational Health and Safety Management Systems](#), encourages employers to employ the six hazard control strategies.

1. **Elimination:** Totally eliminates the hazard. No hazard: no exposure.
2. **Substitution:** Mitigates a hazard. Replaces toxics with non-toxics.
3. **Engineering controls:** Isolates hazards through design.
4. **Warnings:** Alert employees to the hazard.
5. **Administrative controls:** Safe procedures and practices.
6. **Personal protective equipment (PPE):** Places a barrier between hazard and worker.



The idea behind this hierarchy is that the control methods at the top of the list are usually more effective and protective than those at the bottom. Following the hierarchy leads to the

implementation of inherently safer systems, ones where the risk of illness or injury has been substantially reduced.

For more information on evaluating safety management systems, see course [716 Safety Management System Evaluation](#), and [OSHAcademy's Ultimate Safety Management System Audit](#).

Let's take a closer look at the hierarchy of control strategies.

"Feasible" Controls

Hazard abatement (reduction) measures required to prevent a hazard should be technologically and economically feasible (reasonable) for the employer. This means that the measures required to prevent a possible hazard should be 1) possible given currently available technology, and 2) financially reasonable.

OSHA uses the following criteria to determine the feasibility of hazard controls:

- **Technical Feasibility:** Technical feasibility is the existence of technical know-how as to materials and methods available or adaptable to specific circumstances which can be applied with a reasonable possibility that employee exposure to hazards will be reduced.
- **Economic Feasibility:** Economic feasibility means that the employer is financially able to undertake the measures necessary to abate identified hazards. Economic feasibility is a major issue to be considered when imposing hazard controls. OSHA may allow the use of PPE to abate a hazard, at least until engineering controls become a less significant economic burden for the company when the following conditions are met:
 1. If significant reconstruction of a single establishment involving a capital expenditure which would seriously jeopardize the financial condition of the company is the only method whereby the employer could achieve effective engineering controls;
 2. If there are no feasible administrative or work practice controls; and
 3. If adequate personal protective equipment or devices are available.

Elimination and Substitution

Elimination and substitution, while most effective at reducing hazards, also tend to be the most difficult to implement in an existing process. If the process is still at the design or development stage, elimination and substitution of hazards may be inexpensive and simple to implement. For an existing process, major changes in equipment and procedures may be required to eliminate or substitute for a hazard.

Safety professionals consider these strategies first because they can completely eliminate the hazard. Eliminating the hazard will also eliminate the possibility of exposure to the hazard.

Difference Between Elimination and Substitution

When using elimination, the hazard is completely removed, making it impossible for an accident to occur. The hazard is not simply reduced, but it is completely eliminated.

When using substitution, the hazard is reduced or eliminated by using a less hazardous component. Although it is possible to eliminate the hazard, the substitution method does not necessarily eliminate the hazard. This is why the elimination is preferred over substitution.

Some examples of these two strategies include:

- eliminating the source of excessive temperatures, noise, or pressure, and
- substituting a toxic chemical with a less toxic or non-toxic chemical.

Engineering Controls

The basic concept behind engineering control strategies is that, to the extent possible, tools, equipment, machinery, and work environment should be designed to eliminate or reduce exposure to hazards. While this approach is called engineering controls, it does not necessarily mean that an engineer is required to design the control.

Some examples of this strategy include:

-) designing equipment to run more quietly,
-) designing a work station to relieve physical stress and remove ergonomic hazards, □
designing general ventilation with sufficient fresh outdoor air to improve indoor air quality and generally to provide a safe, healthful atmosphere, and
-) ensure adequate lighting is installed for the environment and tasks performed.

Enclosure of Hazards

When you cannot remove a hazard, or replace it with a less hazardous alternative, the next best control is enclosure. Enclosing a hazard usually means that there is no hazard exposure to workers during normal production operations.

There may be potential exposure to workers during maintenance operations or if the enclosure system breaks down. For those situations, additional controls such as safe work practices or personal protective equipment (PPE) may be necessary to control exposure.

Some examples of enclosure designs are:

- complete enclosure of moving parts of machinery,
- complete containment of toxic liquids or gases from the beginning to end of a process,
- glove box operations to enclose work with dangerous microorganisms, radioisotopes, or toxic substances
- complete containment of noise, heat, or pressure producing processes with materials especially designed for those purposes.

Barriers or Local Ventilation

When the potential hazard cannot be removed, replaced, or enclosed, the next best approach is a barrier to exposure or, in the case of air contaminants, local exhaust ventilation to remove the contaminant from the workplace.

This engineering control involves potential exposure to the worker even in normal operations. Consequently, it should be used only in conjunction with other types of controls, such as safe work practices designed specifically for the site condition and/or PPE. Examples include:

- ventilation hoods in laboratory work,
- machine guarding, including electronic barriers,
- isolation of a process in an area away from workers,
- baffles used as noise-absorbing barriers, and
- nuclear radiation or heat shields.

Warnings

With the release of ANSI Z10-2012, "warnings" have been promoted to their own hierarchy level. Previously they were considered part of administrative controls. Warnings do not prevent exposure to a hazard, but they do provide a visual or audible indicator to warn people of potential danger.

Warnings can be either visual, audible, or both. They may also be tactile. Some examples of warnings are:

- **Visual:** Signs, labels, tags, and flashing/strobe lights.
- **Audible:** Alarms, bells, beepers, sirens, announcement system and horns.
- **Tactile:** Vibration devices or air fans.

For instance, a door could have both a sign warning of a hazard as well as an alarm if opened. Warnings can be effective deterrents, but are not as effective as elimination, substitution, or engineering controls. *OSHA Signs*

OSHA's [1910.145, Specifications for accident prevention signs and tags](#) details the following types of signs:

- **Danger Signs** - Signs that alert people to specific and immediate dangers (including radiation hazards).
- **Warning Signs** - Signs that warn people of potential hazards that can lead to death.
- **Caution Signs** - Signs used to alert people to potential hazards. This class can also be used to caution people against certain unsafe practices. This class is for hazards that can result in minor (non-life threatening) accident or injury.
- **Safety Instruction Signs** - These signs offer instructions for how someone should act or perform to avoid possible hazards.

One potential problem when using warnings is the misinterpretation of the warning itself. Does the symbol or text clearly explain what the hazard is to the public? For example, if a sign only contains a written warning, someone might read the sign but not know what the warning actually means. Or, if an alarm sounds, what does the alarm mean? These are challenges when using warnings and why they are not as effective as higher-level controls.

Administrative Controls

Administrative controls are developed by management for the purpose of preventing or reducing exposure by controlling behaviors that may result in exposure to hazards. These controls are needed when hazards can't be adequately eliminated or mitigated through elimination, substitution, and engineering controls.

Administrative controls are policies, programs, processes, procedures, and practices that include the following examples:

- providing training for all hazardous tasks,
- developing safety procedures for all hazardous tasks,
- developing safety rules and guidelines for all work,
- developing suitable work schedules to reduce stress and fatigue, and
- creating safe work procedures and practices using job hazard analyses.

Be careful to distinguish rules from guidelines when developing administrative controls. It's important to understand that mandatory safety "rules" are required and must be followed. On the other hand, discretionary "guidelines" are voluntary. Safety managers may be justified when disciplining employees for non-compliance with rules, but they are not justified in disciplining if employees choose not to follow guidelines.

Ultimately, effective administrative controls are only as effective as the safety management system that supports them. It's always better to eliminate the hazard so that you don't have to rely on administrative controls that tend to work only if employees behave.

Safe Work Practices

Safe work practices may be quite specific or general.

In terms of scope, safe work practices may be a very important part of a single task or applicable to many jobs in the workplace. Here are some examples of safe work practices:

- removing tripping, blocking, and slipping hazards,
- wetting down surfaces to keep toxic dust out of the air,
- using safe lifting techniques, and
- maintaining equipment and tools in good repair.

Interim Measures

When a hazard is recognized, the preferred correction or control cannot always be accomplished immediately. OSHA believes there is always some kind of interim measure that can be used to temporarily abate a hazard. These can range from taping down wires that pose a tripping hazard to actually shutting down an operation temporarily.

The importance of taking these interim protective actions cannot be overemphasized. There is no way to predict when a hazard will cause serious harm, and no justification to continue exposing workers unnecessarily to risk.

Personal Protective Equipment (PPE)

When engineering, work practice and administrative controls are not feasible or do not provide sufficient protection, employers must provide PPE to their employees and ensure its use. PPE is actually used primarily in conjunction with other controls.

- **Eye and Face Protection:** Safety glasses or face shields are worn any time work operations can cause foreign objects to get in the eye. For example, during welding, cutting, grinding, nailing (or when working with concrete and/or harmful chemicals or when exposed to flying particles). Wear when exposed to any electrical hazards, including working on energized electrical systems.
- **Eye and face protectors:** Select based on anticipated hazards.
- **Foot Protection:** Construction workers should wear work shoes or boots with slip-resistant and puncture-resistant soles. Safety-toed footwear is worn to prevent crushed toes when working around heavy equipment or falling objects.
- **Hand Protection:** Gloves should fit snugly. Workers should wear the right gloves for the job (examples: heavy-duty rubber gloves for concrete work; welding gloves for welding; insulated gloves and sleeves when exposed to electrical hazards).
- **Head Protection:** Wear hard hats where there is a potential for objects falling from above, bumps to the head from fixed objects, or of accidental head contact with electrical hazards. Hard hats - routinely inspect them for dents, cracks or deterioration; replace after a heavy blow or electrical shock; maintain in good condition.
- **Hearing Protection:** Use earplugs/earmuffs in high noise work areas where chainsaws or heavy equipment are used; clean or replace earplugs regularly.

It's important to remember that, like administrative controls, the use of PPE does not control the hazard itself, but rather it merely controls exposure to the hazard by setting up a barrier between the employee and the hazard. Use of PPE may also be appropriate for controlling hazards while engineering controls are being installed or work practices developed.

We'll cover PPE in more detail in the next module.

For more information on PPE, take course [700 Personal Protective Equipment](#), and see [OSHA's Publication 3151, Personal Protective Equipment](#).

Module 3 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. Removing the source of excessive temperatures, noise or pressure is an example of _____.**
 - a. substitution
 - b. elimination
 - c. engineering Control
 - d. barrier or local ventilation practice

- 2. Redesigning a piece of equipment so that it is not so noisy when operating is an example of _____.**
 - a. engineering controls
 - b. enclosure of hazards
 - c. administrative controls
 - d. feasible controls

- 3. Changing the work schedule so workers have reduced exposure to noisy equipment is an example of _____.**
 - a. engineering controls
 - b. enclosure of hazards
 - c. administrative controls
 - d. feasible controls

- 4. Using ear plugs when working around noisy equipment is an example of which control strategy?**
 - a. Engineering controls
 - b. Enclosure of hazards
 - c. Personal protective equipment
 - d. Administrative controls

5. If a hazard exists, what action should be taken immediately?

- a. Shut down the organization
- b. Notify OSHA of the problem
- c. Take interim measures to fix the hazard
- d. Talk with management

Module 4: Personal Protective Equipment (PPE)

Requirements

OSHA requires the use of personal protective equipment (PPE) to reduce employee exposure to hazards when engineering and administrative controls are not feasible or effective in reducing these exposures to acceptable levels.

Employers are required to determine if PPE should be used to protect their workers and have an obligation to provide PPE, including personal protective equipment for eyes, face, head, and extremities, and protective clothing and barriers. Employers must also make sure employees use and maintain PPE in a sanitary and reliable condition.

Proper Use

Personal Protective Equipment must be worn and used in a manner that will make full use of its protective qualities. Personal protective equipment used incorrectly potentially exposes an employee to hazards, defeating the idea behind using PPE.

Low rates of compliance in wearing PPE usually indicate the safety management system is failing in some way. When employees don't wear or use PPE correctly, it is usually because the employer:

- does not provide quality PPE,
- does not properly supervise the use of PPE,
- fails to enforce the use of PPE, or
- does not properly train employees on the use of PPE.

Trained Subjects

According to the standard, to meet the minimum training requirements, each employee receiving PPE training must be trained to know at least the following topics:

1. when PPE is necessary,
2. what PPE is necessary,
3. how to properly don, doff, adjust, and wear PPE,
4. the limitations of the PPE, and
5. the proper care, maintenance, useful life, and disposal of the PPE.

So far, we meet minimum OSHA requirements, but one very important topic is missing as an OSHA requirement:

6. why PPE is necessary.

Why is this topic so important? Because study after study tells us the most common reason employees don't follow rules in the workplace is because they don't know why the rules are important.

Educate the "Why"

As we mentioned previously, the first five topic elements in the list required by OSHA describe the "what, when, and how" of PPE use. The goal is to increase both knowledge and skill so the employee is better able to properly use PPE.

The methods used to train the employee are primarily discussion and hands-on demonstration. To measure knowledge and skill, the instructor usually tests the employee by asking them to demonstrate using the PPE (harness, respirators, etc.).

Educate about the Consequences

The final "why" training topic addresses the importance of using PPE and what the consequences of behavior (compliance and failure to comply) will be. There are two primary types of consequences:

- **Natural consequences** include some form of resulting injury or illness to the employee that inevitably occurs. For instance, a natural consequence might be an eye injury as a result of not using eye protection.
- **System consequences** describe the discipline or recognition given by others in the company in response to the employee's performance. For example, an employee might be recognized for properly using PPE during a hazardous task.

The goal of this last element is to increase employee motivation to use PPE. When employees understand the consequences, they are more likely to use PPE properly and consistently.

Demonstration is the key

Before an employee is allowed to do work requiring PPE, the employer must require each affected employee to demonstrate:

- an understanding of the training elements listed above, and

- the skills and ability to use PPE properly.

Demonstration is the most common and probably the most efficient method to determine employee knowledge and skills. How do employees demonstrate an understanding of the six PPE training topics listed previously? Simple, their level of knowledge is measured by asking employees questions similar to those listed below.

- What PPE is required for your particular job?
- When is the PPE required to be used in your job?
- What are the possible defects your PPE might have?
- How do you properly care for and maintain/store your PPE?
- What is the useful life of your PPE?
- From what hazards does the PPE protect you?

Employees may be required to individually complete written tests or answer questions orally. The standard is that tests must measure individual knowledge. Asking groups of employees' questions is not appropriate. OSHA does prefer written exams.

Who Should Conduct the Training?

This is a very important question. Whoever the person training PPE is, he or she needs to be an expert who not only understands how to use PPE correctly, but has a thorough understanding of the importance of doing so. It's critical that the employee understands the importance of wearing PPE, not only for their safety, but their "continuing employment."

Training Documentation

PPE training must be completed using a written certification document containing:

1. the name of each employee trained,
2. the date(s) of training, and
3. the subject of the certification.

When documenting safety training, and specifically PPE training, it's also important to formally certify employees have demonstrated (proved) to the trainer, adequate knowledge and skills with respect to safety training.

PPE training documentation will be strengthened when it contains the elements below:

- **A statement by the employee** that they have received training by the employer on the six subjects listed previously, and that the trainer has demonstrated proper use of the PPE and answered all employee questions about PPE use satisfactorily.
- **A statement by the trainer** that, through an oral or written test, the employee has satisfactorily demonstrated an understanding of the subjects covered during training, and has, through practice, demonstrated the skills needed to properly don, doff, use, care for, and maintain the PPE.

Lack of PPE Leads to Electrocution

A 31-year-old assembly technician was working with a battery charger manufacturer for about a month when tragedy struck when he was testing transformers and electrocuted.

OSHA investigators found that the man's death might have been prevented if his employer had supplied adequate personal protective equipment, followed safety procedures and provided training.

"In seconds, a family was altered forever, and a young girl is now fatherless," said OSHA's area director. "Companies that operate with high-voltage electricity must train workers to recognize hazards and use proper procedures to prevent electrical shock. No one should die on-the-job. The employer must act now to train its workers, so that another family does not suffer."

The company was been cited for one willful and 14 serious safety violations. In its inspection, OSHA found multiple electrical safety hazards; machines with moving parts without safety guards; and inadequate protections to stop machine starts during service and maintenance. Inspectors also found hand, eye and face protection was not supplied. Additionally, hazardous chemicals were stored improperly and employees were allowed to use damaged powered industrial trucks.

The company faced penalties of \$106,400.

Something to think about: How much training and good quality PPE could have been purchased for \$106,000? PPE is always a good investment, not only potentially saving lives, but a lot of money too.

Module 4 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. Employers must make sure employees use and maintain PPE _____.**
 - a. as needed by the task
 - b. in a sanitary and reliable condition
 - c. at work and home
 - d. using their own funds

- 2. Which of the following PPE training topics is not required by OSHA, but should be taught?**
 - a. When PPE is necessary
 - b. What PPE is necessary
 - c. The limitations of PPE
 - d. Why PPE is important

- 3. Before an employee is allowed to do work requiring PPE, the employer must require each affected employee to _____.**
 - a. attend a basic training session
 - b. demonstrate the ability to use PPE properly
 - c. take a written exam
 - d. memorize the PPE OSHA rules

- 4. When the employer believes a trained employee, who violates PPE safety rules, lacks understanding and skill required by the PPE standard, the employer must discipline the employee for failure to comply with safety rules.**
 - a. True
 - b. False

- 5. To meet minimum rule OSHA requirements, the employer must verify each affected employee has received and understood the required PPE training. What form must this certification take?**
- a. Certification by any form is acceptable
 - b. Informal documentation is all that is required
 - c. Certification must be in writing
 - d. Certification by two or more witnesses is adequate

Module 5: Emergency Action Plans (EAPs)

Introduction

How would you escape from your workplace in an emergency? Do you know where all the exits are in case your first choice is too crowded? Are you sure the doors will be unlocked and the exit route, such as a hallway, will not be blocked during a fire, explosion, or other crisis? Knowing the answers to these questions could keep you safe during an emergency.

Emergency Action Plan Requirements

An emergency action plan (EAP) is a written document required by OSHA standards. The purpose of an EAP is to facilitate and organize employer and employee actions during workplace emergencies.

Well-developed emergency plans and proper employee training (such that employees understand their roles and responsibilities within the plan) will result in fewer and less severe employee injuries and less structural damage to the facility during emergencies. A poorly prepared plan, likely will lead to a disorganized evacuation or emergency response, resulting in confusion, injury, and property damage.

Emergency actions plans must be written. However, for smaller companies, the plan does not need to be written and may be communicated orally if there are 10 or fewer employees.

Elements of the EAP

Develop an EAP to cover natural and man-made emergencies.

At a minimum, the plan must include but is not limited to the following elements:

- means of reporting fires and other emergencies,
- evacuation procedures and emergency escape route assignments,
- procedures for employees who remain to operate critical plant operations before they evacuate,
- accounting for all employees after an emergency evacuation has been completed,
- rescue and medical duties for employees performing them, and
- names or job titles of persons who can be contacted.

Although they are not specifically required by OSHA, employers may find it helpful to include the following in the EAP:

- A description of the alarm system to be used to notify employees (including disabled employees) to evacuate and/or take other actions. The alarms used for different actions should be distinctive and might include horn blasts, sirens, or even public-address systems.
- The site of an alternative communications center to be used in the event of a fire or explosion.
- A secure on- or offsite location to store originals or duplicate copies of accounting records, legal documents, your employees' emergency contact lists, and other essential records.

Reporting Emergencies

Employees must know how to report emergencies. Some use internal telephone numbers, intercom, or public-address systems to notify other employees. It is important for employees to also notify the proper authorities such as fire, medical, or rescue services, if your company relies on this type of assistance during an emergency.

There are preferred procedures for reporting emergencies such as dialing 911, or an internal emergency number, or pulling a manual fire alarm but there are many other possibilities.

- Dialing "911" is a common method for reporting emergencies if external emergency personnel are used at your workplace.
- Internal numbers may be used for reporting emergencies. If they are, they should be posted on, or near, each phone. Internal numbers sometimes are connected to intercom systems so that coded announcements may be made.
- Employees may be requested to activate manual pull stations or other alarm systems.

No matter what system is used, it is imperative that emergency situations be immediately reported. Fires and other emergency situations can reach dangerous levels in seconds and any delay in getting emergency responders to the scene can result in additional loss of life and property.

Evacuation Procedures

Evacuation policies, procedures, and escape route assignments are put into place so employees understand who is authorized to order an evacuation, under what conditions an evacuation would be necessary, how to evacuate, and what routes to take. Exit diagrams are typically used to identify the escape routes to be followed by employees from each specific facility location.

Evacuation procedures also often describe actions employees should take before and while evacuating such as shutting windows, turning off equipment, and closing doors behind them.

Under the typical EAP, the employer will expect all employees to evacuate in an emergency. However, sometimes a critical decision may need to be made when planning - whether employees should be trained and responsible for extinguishing small (controllable) fires.

A disorganized evacuation can result in confusion, injury, and property damage. When developing the emergency action plan, it is important to determine the following:

- conditions under which an evacuation would be necessary,
- conditions under which it may be better to shelter-in-place,
- a clear chain of command and designation of the person in your business authorized to order an evacuation or shutdown,
- specific evacuation procedures, including routes and exits,
- specific evacuation procedures for high-rise buildings for employers and employees,
- procedures for assisting visitors and employees to evacuate, particularly those with disabilities or who do not speak English,
- designation of what, if any, employees will remain after the evacuation alarm to shut down critical operations or perform other duties before evacuating,
- a means of accounting for employees after an evacuation,
- special equipment for employees, and
- appropriate respirators.

During development and implementation of your draft plan, think about all possible emergency situations and evaluate your workplace to see if it complies with OSHA's emergency standards.

Exit Routes

Normally, a workplace must have at least two exit routes to permit prompt evacuation of employees and other building occupants during an emergency. More than two exits are required, however, if the number of employees, size of the building, or arrangement of the workplace will not allow employees to evacuate safely.

Exit routes must be located as far away as practical from each other in case one is blocked by fire or smoke. But, there is one exception to this rule. If the number of employees, the size of the building, its occupancy, or the arrangement of the workplace allows all employees to evacuate safely during an emergency, one exit route is permitted.

Most employers create maps from floor diagrams with arrows that designate the exit route assignments. These maps should include locations of exits, assembly points, and equipment (such as fire extinguishers, first aid kits, spill kits) that may be needed in an emergency. Exit routes should be:

- clearly marked and well lit,
- wide enough to accommodate the number of evacuating personnel,
- unobstructed and clear of debris at all times, and
- unlikely to expose evacuating personnel to additional hazards.

When preparing drawings that show evacuation routes and exits, post them prominently for all employees to see. See [OSHA's Interactive Floorplan Demonstration](#).

Assisting Others to Evacuate

Many employers designate individuals as evacuation wardens to help move employees from danger to safe areas during an emergency. Generally, one evacuation warden for every 20 employees should be adequate, and the appropriate number of wardens should be available at all times during working hours.

Evacuation Wardens may be responsible for checking offices, bathrooms, and other spaces before being the last person to exit an area. They might also be tasked with ensuring that fire doors are closed when exiting.

Employees designated to assist in emergency evacuation procedures should:

- be trained in the complete workplace layout and various alternative escape routes if the primary evacuation route becomes blocked, and

- be made aware of employees with special needs (who may require extra assistance during an evacuation), how to use the buddy system, and any hazardous areas to avoid during an emergency evacuation.

Visitors also should be accounted for following an evacuation and may need additional assistance when exiting. Some employers have all visitors and contractors sign in when entering the workplace and use this list when accounting for all persons in the assembly area. The hosts and/or area wardens, if established, are often tasked with helping these individuals safely evacuate.

Employees Who May Remain to Shut Down

Large companies may have certain equipment and processes must be shut down in stages or over time. In other instances, it is not possible or practical for employees stay behind to shut down equipment or processes under emergency situations and everyone must evacuate.

However, smaller enterprises may require designated employees remain behind briefly to operate fire extinguishers or shut down gas and/or electrical systems and other special equipment that could be damaged if left operating or create additional hazards to emergency responders (such as releasing hazardous materials).

Each employer must review their operation and determine whether total and immediate evacuation is possible for various types of emergencies. The preferred approach, and the one most often taken by small enterprises, is immediate evacuation of all their employees when the evacuation alarm is sounded.

If any employees will stay behind, the plan must describe in detail the procedures to be followed by these employees.

- All employees remaining behind must be capable of recognizing when to abandon the operation or task and evacuate themselves before their egress path is blocked.
- In small establishments it is common to include in the plan locations where utilities (such as electrical and gas) can be shut down for all or part of the facility either by company employees or by emergency response personnel.

Accounting for Employees

Procedures to account for employees after the evacuation to ensure that everyone got out may include designating employees to sweep areas, checking offices and rest rooms before being the last to leave a workplace or conducting a roll call in the assembly area. Evacuation wardens

can be helpful in accounting for employees. To ensure the fastest, most accurate accounting of employees, consider including these steps in the EAP:

- **Designate assembly areas** or areas Assembly areas, both inside and outside the workplace, are the locations where employees gather after evacuating.
 - **Internal assembly areas** within the building are often referred to as "areas of refuge." Make sure the assembly area has sufficient space to accommodate all of employees.
 - **Exterior assembly areas**, used when the building must be partially or completely evacuated, are typically located in parking lots or other open areas away from busy streets. Try and designate assembly areas so that employees will be upwind of the building.
- **Take a head count after the evacuation.** Accounting for all employees following an evacuation is critical. Identify the names and last known locations of anyone not accounted for and pass them to the official in charge.
- **Assembly area design.** When designating an assembly area, consider (and try to minimize) the possibility of employees interfering with rescue operations.
- **Account for others.** Establish a method for accounting for non-employees such as suppliers and customers.
- **Additional evacuation.** Establish procedures for further evacuation in case the incident expands. This may consist of sending employees home by normal means or providing them with transportation to an offsite location.

Fire, Rescue, and Medical Services

Although most of us quickly move away from the hazardous environments created during emergency situations, a group of dedicated and well-trained professional emergency responders and medical service personnel are tasked with containing and mitigating these incidents, rescuing individuals at-risk, and providing medical assistance to the injured.

Unless the company is a large employer handling hazardous materials and processes or has employees regularly working in hazardous situations, the company will probably choose to rely on local public resources to provide these specialized services.

If external departments or agencies, such as the local fire and police departments, medical clinics or hospitals, and ambulance services are used, make sure they are prepared to respond

as outlined in the EAP. Make sure they are familiar with the building and any dangerous locations within the building.

Names of Job Titles of Contact Persons

Names, titles, departments, and telephone numbers of employees who can be contacted for additional information and/or explanation of their duties under the plan.

Module 5 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. Regarding Emergency Action Plans (EAPs), employers with more than 10 employees _____.**
 - a. may use an abbreviated format for the plan
 - b. must maintain the EAP in writing
 - c. may communicate the EAP informally
 - d. should submit the EAP to OSHA for review

- 2. An Emergency Action Plan (EAP) must include all of the following elements, except _____.**
 - a. names of contact persons
 - b. evacuation procedures
 - c. rescue and medical duties
 - d. disciplinary procedures

- 3. If a company has more than _____ employees, an emergency action plan MUST be written, kept in the workplace, and available for employee review.**
 - a. 5
 - b. 10
 - c. 15
 - d. 20

- 4. Supervisors must designate and train their employees to assist in a safe and orderly evacuation of all employees.**
 - a. True
 - b. False

5. External assembly areas should be located _____.

- a. downwind from the building
- b. at least one mile from the building
- c. upwind from the building
- d. in the nearest parking lot

Module 6: Fire Prevention Plans (FPPs)

Introduction

The purpose of the Fire Prevention Plan (FPP) is to eliminate the causes of fire, prevent loss of life and property by fire, and to comply with the Occupational Safety and Health Administration's (OSHA) standard on fire prevention, [29 CFR 1910.39](#).

- It provides employees with information and guidelines that will assist them in recognizing, reporting, and controlling fire hazards.
- It identifies materials that are potential fire hazards and their proper handling and storage procedures.
- It distinguishes potential ignition sources and the proper control procedures of those materials.
- The plan describes fire protection equipment and/or systems used to control fire hazards.
- It identifies persons responsible for maintaining the equipment and systems installed to prevent or control ignition of fires.
- The FPP identifies persons responsible for the control and accumulation of flammable or combustible material.
- It describes good housekeeping procedures necessary to insure the control of accumulated flammable and combustible waste material and residues to avoid a fire emergency.
- The plan provides training to employees on fire hazards to which they may be exposed.

FPP Responsibilities

Fire safety is everyone's responsibility. All employees should know how to prevent and respond to fires, and are responsible for adhering to company policy regarding fire emergencies.

Management. Management determines fire prevention and protection policies. They should do the following:

-) Managers should provide adequate hazard controls to provide a safe workplace.

- Managers should also provide adequate resources and training to employees to encourage fire prevention and the safest possible response in the event of a fire emergency.

Plan Administrator. This person maintains all records pertaining to the plan. The Plan Administrator should also:

- Develop and administer the fire prevention training program.
- Ensure that fire control equipment and systems are appropriate and properly maintained.
- Control fuel source hazards in the workplace.
- Conduct fire risk surveys and make recommendations for improvement.

Supervisors. Supervisors ensure that employees receive appropriate fire safety training.

- Supervisors should notify the plan administrator when changes in operation increase the risk of fire.
- They are also responsible for enforcing fire prevention and protection policies.

Employees. All employees should complete all required training before working without supervision. It's important that employees also:

- Conduct operations safely to limit the risk of fire.
- Report potential fire hazards to their supervisors.
- Follow fire emergency procedures.

Written Plan Components

A fire prevention plan must be in writing, be kept in the workplace, and be made available to employees for review. However, according to OSHA, if you have 10 or fewer employees you may communicate the plan orally to employees.

At a minimum, your fire prevention plan must include:

- A list of all major fire hazards, proper handling and storage procedures for hazardous materials, potential ignition sources and their control, and the type of fire protection equipment necessary to control each major hazard;

- Procedures to control accumulations of flammable and combustible waste materials; Procedures for regular maintenance of safeguards installed on heat-producing equipment to prevent the accidental ignition of combustible materials;
- The name or job title of employees responsible for maintaining equipment to prevent or control sources of ignition or fires; and
- The name or job title of employees responsible for the control of fuel source hazards.

An employer must inform employees upon initial assignment to a job of the fire hazards to which they are exposed. An employer must also review with each employee those parts of the fire prevention plan necessary for self-protection.

FPP Best Practices

To limit the risk of fires, good housekeeping is critical. All employees should take the following precautions:

- Minimize the storage of combustible materials.
- Make sure that doors, hallways, stairs, and other exit routes are kept free of obstructions.
- Dispose of combustible waste in covered, airtight, metal containers.
- Use and store flammable materials in well-ventilated areas away from ignition sources.
- Use only nonflammable cleaning products.
- Keep incompatible (i.e., chemically reactive) substances away from each other.
- Perform "hot work" (i.e., welding or working with an open flame or other ignition sources) in controlled and well-ventilated areas.
- Keep equipment in good working order (i.e., inspect electrical wiring and appliances regularly and keep motors and machine tools free of dust and grease.
- Ensure that heating units are safeguarded.
- Report all gas leaks immediately. A responsible person shall ensure that all gas leaks are repaired immediately upon notification.
- Repair and clean up flammable liquid leaks immediately.

- Keep work areas free of dust, lint, sawdust, scraps, and similar material.

Do not rely on extension cords if wiring improvements are needed, and take care not to overload circuits with multiple pieces of equipment.

- Ensure that required hot work permits are obtained.
- Turn off electrical equipment when not in use.

Hazards that Cause Fires

Electrical Hazards: Electrical system failures and the misuse of electrical equipment are leading causes of workplace fires. Fires can result from loose ground connections, wiring with frayed insulation, or overloaded fuses, circuits, motors, or outlets.

Portable Heaters: All portable heaters should be approved by the plan administrator. Portable electric heaters should have tip-over protection that automatically shuts off the unit when it is tipped over.

Office fires hazards: Fire risks are not limited to industrial facilities. Fires in offices have become more likely because of the increased use of electrical equipment, such as computers and fax machines.

Welding, Cutting, and Open Flame Work: Welding and cutting and working with open flames are obvious fire hazards in the workplace, and in some cases fire watches need to be positioned close by, and barriers may need to be placed between welding and materials that might catch fire.

Flammable and Combustible Materials: If your workplace contains flammable and combustible materials, the plan administrator should regularly evaluate the presence of those materials.

- **Class A Combustibles:** These include common combustible materials (wood, paper, cloth, rubber, and plastics) that can act as fuel and are found in non-specialized areas such as offices.
- **Class B Combustibles:** These include flammable and combustible liquids (oils, greases, tars, oil-based paints, and lacquers), flammable gases, and flammable aerosols.

Smoking in the Workplace: In an effective FPP, smoking is prohibited in all company buildings. Certain outdoor areas may also be designated as no smoking areas. The areas in which smoking is prohibited outdoors should be identified by NO SMOKING signs.

Fire Extinguishing Equipment

A fire extinguishing system is an engineered set of components that work together to quickly detect a fire, alert occupants, and extinguish the fire before extensive damage can occur. All system components must be:

- Designed and approved for use on the specific fire hazards they are expected to control or extinguish.
- Protected against corrosion or either made or coated with a non-corrosive material if it may be exposed to a corrosive environment.
- Designed for the climate and temperature extremes to which they will be exposed.

Fixed Extinguishing Systems: Fixed fire extinguishing/suppression systems are commonly used to protect areas containing valuable or critical equipment such as data processing rooms, telecommunication switches, and process control rooms. Their main function is to quickly extinguish a developing fire and alert occupants before extensive damage occurs by filling the protected area with a gas or chemical extinguishing agent.

Portable Extinguishing Systems: Workplace fires and explosions kill hundreds and injure thousands of workers each year. One way to limit the amount of damage due to such fires is to make portable fire extinguishers an important part of your FPP. When used properly, fire extinguishers can save lives and property by putting out a small fire or controlling a fire until additional help arrives.

For more information on fire extinguishing systems and using portable fire extinguishers, see [OSHAcademy Course 718, Fire Prevention Plans](#).

FPP Training Requirements

Employers should train workers about fire hazards in the workplace and about what to do in a fire emergency.

Management Training Responsibilities: Unless a specific manager is designated, all managers should be responsible for coordinating with the Plan Administrator for training all employees covered under the FPP.

- All managers should be educated to understand their FPP responsibilities including inspection and drill procedures.

- Managers should also make sure all employees who might be expected to use portable fire extinguishers are properly trained.
- Supervisors should train employees about the fire hazards associated with the specific materials and processes to which they are exposed, and maintain written documentation of the training.

Many of the topics taught in the FPP training may be presented in the classroom. If employees are expected to use portable fire extinguishers, they must participate in "hands-on" exercises that help them understand the procedures. Hands-on training also gives employees an opportunity to demonstrate to trainers that they have the skills required to use fire extinguishers.

At a minimum, FPP Training should include all the following topics:

- review OSHA requirements contained in [29 CFR 1910.38, Emergency Action Plans](#),
- review OSHA requirements contained in [29 CFR 1910.39, Fire Prevention Plans](#),
- person(s) responsible for Control of Fuel Source Hazards,
- the location of the company FPP and how it can be accessed,
- good fire-prevention housekeeping practices and equipment maintenance,
- alarm systems and evacuation routes,
- proper response and notification in the event of a fire,
- the use of portable fire extinguishers, and
- recognition of potential fire hazards.

Module 6 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

1. The purpose of the Fire Prevention Program (FPP) includes all the following, except _____.

- a. eliminate the cause of the fire
- b. prevent loss of life and property by fire
- c. reduce property damage due to emergency response
- d. comply with OSHA standards

2. Which of the following criteria is NOT required for the Fire Prevention Plan?

- a. Names of contact persons
- b. Evacuation procedures
- c. Rescue and medical duties
- d. Disciplinary procedures

3. To limit the risk of fires, what precaution should be taken when conducting "hot work?"

- a. Ensure adequate ventilation
- b. Be sure to wear cooling PPE materials
- c. Never conduct hot work on piping systems
- d. Only fire watches may conduct hot work operations

4. Why have fires in offices become more likely?

- a. Because the materials used in offices are more flammable
- b. Because there are more people working in offices now
- c. Because of the increased use of electrical equipment
- d. Because offices are considered low-hazard fire areas

5. Fixed fire extinguishing/suppression systems are commonly used to protect _____.

- a. against the spread of fire in confined spaces
- b. areas containing flammable or combustible substances
- c. people in high-traffic areas
- d. areas containing valuable or critical equipment

Additional Resources

-) [OSHAct of 1970](#)
-) [Occupational Safety and Health Administration \(OSHA\) Website](#)
-) [OSHA Field Operations Manual \(FOM\)](#)
-) [OSHA Commonly Used Statistics](#)
-) [OSHA Worker Rights & How to Contact OSHA](#)
-) [OSHA Fall Protection](#)
-) [OSHA Ergonomics: Computer Workstations](#)
-) [OSHA Electrical Safety](#)
-) [OSHA Electrical Safety Quick Card](#)
-) [OSHA Personal Protective Equipment \(PPE\) Standards](#)
-) [OSHA Emergency Action Plan eTool](#)