

# OSHA 10-Hour Construction

## Study Guide



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# **OSHA 10 Hr. Construction Training Program**

## **Study Guide**

### **The Purpose and Design of the Study Guide**

U.S. OSHA created the Outreach Training Program for the purpose of expanding the knowledge base of employers and employees across the country relative to their standards and guidelines, thereby enhancing safety and health in the American workplace. OSHA requires specific topics to be included in every program.

The purpose of this study guide is to provide a thorough review of the 360 training OSHA 10 Hr. Construction Training Program. Each lesson corresponds to those in the series and contains bulleted highlights, followed by a note taking section.

# MODULE ONE

## INTRODUCTION TO OSHA (Occupational Safety and Health Administration)

This review covers the basic overview of OSHA, OSH Act, and OSHA's role in the prevention and elimination of work-related illnesses and injuries as well as information about employer and employee rights, responsibilities, and the inspection process.

### Lesson 1: Key Terms

- **Administer:** Manage; give out especially in doses.
- **Billboard:** Surface for displaying advertising bills.
- **Competent Person:** One able to identify existing and predictable workplace hazards that are unsanitary, hazardous, or risky, and who has the authority to promptly correct or eliminate them.
- **Federal:** Of or constituting a government with power distributed between a central authority and constituent units.
- **Hazards:** Sources of danger.
- **Terrain:** Features of the land.
- **Trench:** Long narrow cut in land.
- **Virtually:** Being in effect but not in fact or name.

### About OSHA

The Occupational Safety and Health Act (OSH Act) of 1970 was passed by Congress "to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources." Under the OSH Act, OSHA (Occupational Safety and Health Administration) was established within the Department of Labor and was authorized to regulate health and safety conditions for all employers with few exceptions.

OSHA can be contacted by calling 1-800-321-6742 (OSHA), going to its Web site at <http://www.osha.gov>, or writing to:

The U.S. Department of Labor  
Occupational Safety and Health Administration  
200 Constitution Avenue  
Washington, DC 20210

## **Who Is Covered by the OSHA Act?**

OSHA covers all employees and their employers under Federal government authority. Coverage is provided either directly by Federal OSHA or through an OSHA-approved state program.

## **OSHA Standards**

### **General Duty Clause**

Each employer "shall furnish . . . a place of employment which is free from recognized hazards that are causing, or are likely to cause, death or serious physical harm to employees." OSHA standards cover general industry, construction, maritime and some agricultural activities.

### **Recordkeeping and Maintenance of Recordkeeping Forms**

Employers of 11 or more employees must maintain records of occupational injuries and illnesses. Recordkeeping forms must be maintained on a calendar year basis, and a summary of the records for the previous year must be posted from February through April. Records must be maintained for five years at the establishment and must be available for inspection by OSHA, the National Institute for Occupational Safety and Health (NIOSH), and BLS.

### **Inspections**

OSHA is authorized to conduct workplace inspections to enforce its standards. Nearly all inspections are conducted without any advance notice. Listed in their order of importance, as determined by OSHA:

1. **Imminent Danger** - Imminent danger situations are given top priority. An imminent danger is any condition where there is reasonable certainty that a danger exists that can be expected to cause death or serious physical harm immediately or before the danger can be eliminated through normal enforcement procedures.
2. **Catastrophic and Fatal Accidents** - Second priority is given to the investigation of fatalities and catastrophes resulting in the hospitalization of three or more employees.

3. Employee Complaints - Each employee has the right to request an OSHA inspection when the employee feels that he or she is in imminent danger from a hazard, or when he or she feels that there is a violation of an OSHA standard that threatens physical harm.
4. Programmed High Hazard Inspections - OSHA establishes programs of inspection aimed at specific high hazard industries, occupations, or health hazards.
5. Re-Inspections - Establishments cited for alleged serious violations may be re-inspected to determine whether the hazards have been corrected.

### **Employers' and Workers' Rights and Responsibilities**

Citations must be posted for three working days, or until the violation is corrected, and must be posted at or near the place where each violation occurred.

- If employers agree with the citations, they must correct the violations and pay any penalties.
- If they do not agree, they have 15 working days to contest in writing the citation, penalty, and/or the abatement dates.

### **Anti-Discrimination Provisions and Whistleblower Rights**

The OSH Act prohibits employment retaliation against an employee who complains to an employer, files a complaint related to workplace safety or health conditions, initiates a proceeding, contests an abatement date, requests information from OSHA, or testifies under the Act. The U.S. Department of Labor has established the Whistleblower Rights Program to assist workers who have experienced retribution from employers after reporting unsafe working conditions.

### **Keeping Employees Informed**

Employers are responsible for keeping employees informed about OSHA and the various safety and health matters with which they are involved. OSHA requires that each department within an organization post certain materials at a prominent location in the workplace. These include:

- Job Safety and Health Protection (workplace poster, OSHA 2203) informing employees of their rights and responsibilities under the OSH Act.
- Summaries of petitions for variances from standards or record-keeping procedures.
- Copies of OSHA citations for violations of standards.

## **Workers' Responsibilities and Rights**

- Read the OSHA poster.
- Follow the employer's safety and health rules and wear or use all required gear and equipment.
- Follow safe work practices for your job, as directed by your employer.
- Report hazardous conditions to a supervisor or safety committee.
- Report hazardous conditions to OSHA if employers do not fix them.
- Cooperate with OSHA inspectors.

Along with their responsibilities, workers have the following rights:

- Identify and correct problems in their workplaces, working with their employers whenever possible.
- Complain to OSHA about workplace conditions threatening their health or safety in person, by telephone, by fax, by mail or electronically through OSHA's Web site.

**NOTES:**

## MODULE TWO

### GENERAL SAFETY AND HEALTH

This course provides an overview of the OSHA 29 CFR 1926 Subpart C, General Safety and Health Provisions. Topics covered in this course include safety training and education, first aid, fire protection, and employee emergency action plans.

#### Lesson 2: Key Terms

- **ANSI:** American National Standards Institute.
- **Authorized Person:** A person assigned by the employer to perform a duty or to be at a particular job site.
- **Competent Person:** Has authorization to take corrective action and is able to recognize existing and predictable hazards.
- **Employer:** A contractor or subcontractor.
- **Qualified:** One who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, the work, or the project.

#### Contractor Requirements and Accident Prevention Responsibilities

##### Contractor Requirements

Under the general safety and health provisions covered in the OSHA standard, contractors have specific requirements pertaining to the health and safety of their employees. Laborers and mechanics performing contract work should never be required by contractors to work under conditions that are unsanitary, hazardous, or dangerous to their health and safety.

##### Accident Prevention Responsibilities

In order to decrease the risk of accidents and injuries in the workplace, employers should provide frequent and regular inspections of the job site, materials, and equipment used by employees. Inspections of the job site,

materials, and equipment should be conducted by “competent persons.” A **competent person** is defined as a person who is capable of identifying existing and predictable hazards in the surroundings or working conditions considered unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate the existing and predictable hazards.

### **Employer Responsibilities**

When working in an industrial environment, accidents are inevitable at the workplace. These unsafe conditions can be greatly reduced when employers educate and train employees on how to avoid accidents and exposures. Employers have responsibilities under OSHA standards to educate and train employees to recognize and avoid unsafe conditions in the workplace, and to control and eliminate any hazards or exposures to illness or injury.

### **Confined and Enclosed Spaces**

Confined or enclosed spaces are spaces having a limited means of egress, which is subject to the accumulation of toxic or flammable contaminants, or which has an oxygen deficient atmosphere. Confined or enclosed spaces include, but are not limited to, storage tanks, process vessels, bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels, pipelines, and open top spaces more than four feet in depth such as pits, tubs, vaults, and vessels.

### **Major Program Elements**

A safety program can be divided into four sections:

1. Management Commitment and Employee Involvement
2. Worksite Analysis
3. Hazard Prevention and Control
4. Training and Education

### **Assignment of Responsibility**

The following information applies to the assignment of responsibility:

- Safety designee on site; the safety designee should be knowledgeable and accountable.
- Supervisors (including foremen) should understand safety and health responsibilities.
- Employees should adhere to safety rules.

## **Fire Protection and Prevention**

The employer is responsible for the development and maintenance of an effective fire protection and prevention program at the job site throughout all phases of the construction, repair, alteration, or demolition work. One responsibility of the employer is to ensure the availability of the fire protection and suppression equipment.

## **Means of Egress**

Exits for buildings or structures shall be arranged and maintained to provide free and unobstructed egress from all parts of the building or structure at all times when the building is occupied. No lock or fastening preventing free escape from the inside of any building shall be installed except in mental, penal, or corrective institutions where supervisory personnel are continually on duty and effective provisions are made to remove occupants in case of fire or other emergency.

**NOTES:**

## MODULE THREE

# HEALTH HAZARDS IN CONSTRUCTION— COMMUNICATION

The Hazard Communication Standard (HCS) provides information to workers and employers about various chemical hazards that exist in the workplace and what protective measures they can take in order to prevent the adverse effects of such hazards.

### Lesson 3: Key Terms

- **Chemical:** An element or a compound produced by chemical reactions on a large scale for direct industrial and consumer use or for reaction with other chemicals.
- **Combustible:** A material having a flashpoint of 100 degrees F or above.
- **Flammable:** A material having a flashpoint below 100 degrees F.
- **HazCom:** Hazard Communication Standard.
- **Inhalation:** Breathing in an airborne substance that may be in the form of gases, fumes, mists, vapors, dusts, or aerosols.
- **MSDS:** Material Safety Data Sheet—It is a document containing the chemical hazard and safe handling information pertaining to a specific chemical or compound and is prepared in accordance with the OSHA Hazard Communication Standard.
- **OSHA:** Occupational Safety and Health Administration.
- **Training:** A course of study in which employees are trained to identify and work safely with hazardous materials.

### The Need of a Hazard Communication Standard (HCS)

According to OSHA, over 650,000 hazardous chemical products exist and hundreds of new ones are being introduced annually. More than 32 million workers are potentially exposed to one or more chemical hazards in more than 3 million American workplaces.

## **The Concept of Hazard Communication Standard (HCS)**

The simple idea behind the Hazard Communication Standard (HCS) is that workers have both a need and a *right to know* about the hazards and identities of the chemicals they are exposed to when performing their tasks and duties.

### **The Hazard Communication Standard Coverage**

Implementation of HCS for all those companies who import, produce, distribute, or use hazardous chemicals in the United States is mandatory. They must provide proper information and training to all of their affected employees.

The Hazard Communication Standard covers both physical (such as explosive, flammable) and health (acute and chronic) hazards. Being a worker or an employer, it is a need and a *right to know* how you can perform your job responsibilities safely.

### **Hazardous Materials**

Hazardous and toxic materials are those chemicals which may be present in a workplace that have a capacity to cause harm. Mixtures, fuels, solvents, paints, and dusts are all considered hazardous substances or materials.

### **Material Safety Data Sheet (MSDS)**

A Material Safety Data Sheet (MSDS) provides detailed information about a specific hazardous material. Although labels are a good way to provide information about hazardous chemicals, sometimes you need more information about the chemical but it may not be possible to provide all the information on a label.

An MSDS must be maintained in the facility for use of personnel while the material is in the facility, and will be retained for a period of 30 years upon discontinuation of use of the material the MSDS represents.

**NOTES:**

# MODULE FOUR

## HAZARDOUS MATERIALS

This course is designed for people working in the Construction Industry who are exposed to health hazards and chemicals during the course of their work. Topics include definitions, the Hazard Communication Standard, asbestos standards, MDA, lead, worker protection programs, process safety management of highly hazardous chemicals, and cadmium. This course focuses on the topics covered in OSHA 29 CFR 1926 Subpart D.

### Lesson 4: Key Terms

- **Article:** A manufactured item other than a fluid or particle:
  - Which is formed to a specific shape or design during manufacture;
  - Which has end use function(s) dependent in whole or in part upon its shape or design during end use, and
  - Which under normal conditions of use does not release more than very small quantities, e.g., minute or trace amounts of a hazardous chemical and does not pose a physical hazard or health risk to employees.
  
- **Chemical:** Any element, compound, or mixture of elements and/or compounds.
  
- **Container:** Any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical.
  
- **Explosive:** A chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.
  
- **Hazardous Chemical:** Any chemical that poses a physical or health hazard.
  
- **Physical Hazard:** A chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive), or water-reactive.
  
- **Trade Secret:** Any confidential formula, pattern, process, device, information, or compilation of information that is used in an employer's

business, and gives the employer an opportunity to obtain an advantage over competitors who do not know or use it.

- **Workplace:** An establishment, job site, or project at one geographical location containing one or more work areas.

## Asbestos

Asbestos is the generic term for a group of naturally occurring, fibrous minerals with high tensile strength, flexibility, and resistance to heat, chemicals, and electricity.

In the construction industry, asbestos is found in installed products such as sprayed-on fireproofing, pipe insulation, floor tiles, cement pipe and sheet, roofing felts and shingles, ceiling tiles, fire-resistant drywall, drywall joint compounds, and acoustical products. Because very few asbestos-containing products are being installed today, most worker exposures occur during the removal of asbestos and during the renovation and maintenance of buildings and structures containing asbestos.

### Classification of Asbestos

**Class I** is the most potentially hazardous class of asbestos job and involves the removal of thermal system insulation and sprayed-on or troweled-on surfacing asbestos-containing materials.

**Class II** includes the removal of other types of asbestos-containing materials that are not thermal system insulation, such as resilient flooring and roofing materials containing asbestos.

**Class III** focuses on repair and maintenance operations where asbestos-containing or presumed asbestos-containing materials are disturbed.

**Class IV** pertains to custodial activities where employees clean up asbestos-containing waste and debris.

### General Compliance Requirements

For any employee exposed to airborne concentrations of asbestos, the employer must provide and ensure the use of protective clothing, such as coveralls or similar full-body clothing, head coverings, gloves, foot coverings, face shields, vented goggles, or other appropriate protective equipment wherever the possibility of eye irritation exists. The employer must also provide and ensure the use of respirators where necessary. The employer must provide medical

examinations for workers who, for 30 or more days per year, engage in Class I, II, or III work or experience related to asbestos.

## **What Kinds of Building Materials May Contain Asbestos?**

Exposure to asbestos dust can occur at major construction job sites, in shipyards, in industry, and during construction or renovation of commercial buildings. Even workers' families and friends can be at risk, as asbestos can often be carried on clothing. It is important to note that workers are not always told they are working around asbestos, and even single exposures to very low doses of fibers can result in harm.

There are many products containing asbestos. The following list gives an idea of the widespread use of asbestos, even though more products than those listed here may contain asbestos.

### **MDA—Methylenedianiline**

MDA is a light-brown crystalline solid with a faint amino-like odor. It is slightly soluble in water and very soluble in alcohol and benzene. It is used mainly for making polyurethane foams, which have a variety of uses, such as insulating materials. It is also used for making coating materials, epoxy glues, Spandex® fiber, dyes, and rubber.

Routes of exposure to MDA include skin absorption, inhalation, and ingestion. Short-term (acute) overexposure to MDA produces symptoms such as fever, chills, loss of appetite, vomiting, and/or jaundice. Short-term contact with MDA may irritate the skin, eyes, and mucous membranes, and sensitization to MDA may also occur. Long-term (chronic) overexposure may cause cancer as well as damage to the liver, kidneys, blood, and spleen.

### **Respiratory Protection**

Employers must provide (at no cost to the employee) and ensure the use of respirators when engineering and work practice controls are being installed; when engineering and work practice controls are not sufficient to reduce exposure to or below the PEL; when engineering controls are not feasible in repair or maintenance and spray application processes; and during emergencies. Keep in mind that engineering controls **MUST BE USED** to the fullest extent feasible.

### **Lead**

Pure lead (Pb) is a heavy metal at room temperature and pressure. As a basic chemical element, lead can combine with various other substances to form

numerous lead compounds. Lead has been poisoning workers for thousands of years. Lead can damage the central nervous system, cardiovascular system, reproductive system, hematological system, and kidneys. When absorbed into the body in high enough doses, lead can be toxic. In addition, a worker's lead exposure can harm the development of the worker's children.

**NOTES:**

# MODULE FIVE

## CRANES AND RIGGING

This course is intended for workers who want to learn more about cranes, derricks, hoists, elevators, and/or conveyors. Topics include cranes and derricks, helicopters, base-mounted drum hoists, overhead hoists, conveyors, and aerial lifts. This course covers the topics included in OSHA 29 CFR 1926.55 Subpart N.

### Lesson 5: Key Terms

- **Accident:** Harmful event that is unexpected or without apparent cause.
- **Act:** As a statute, decree, or enactment resulting from a decision by a legislative body.
- **ANSI:** American National Standards Institute.
- **Block:** Sheaves or grooved pulleys in a frame with a hook, eye, and strap.
- **Boom:** An inclined spar, strut, or other long member supporting the hoisting tackle.
- **Boom angle indicator:** An accessory device that measures the angle of the boom base section centerline to horizontal load and the weight of the object being lifted which includes load blocks and hooks, wire ropes, rigging, boom attachments, and ancillary attachments.
- **Boom stops:** A device used to limit the angle of the boom at its highest position.
- **Brake:** To slow or stop motion by friction or power.
- **Counterweight:** Weights used for balancing loads and the weight of the crane in providing stability.
- **Crane:** Consists of a rotating structure on rubber tires or crawler treads used for lifting and lowering horizontally.
- **Deck:** The revolving superstructure or turntable bed.
- **Drum:** The spool or cylindrical member around which cables are wound for raising and lowering loads.

- **Hoist:** Used to lift and lower load.
- **Jib:** Extension attached to the boom point to provide added boom length for lifting specified loads.
- **OSHA:** Occupational Safety and Health Administration.
- **Outriggers:** Support members attached to the crane's carrier frame that are used to level and stabilize the crane.
- **PCSA:** Power Crane and Shovel Association.
- **Pendants:** Stationary wire ropes used to support the boom.
- **Radius:** The horizontal distance from the axis of the rotation of the crane's superstructure to the center of the suspended load.
- **Standards:** Measure of comparison for quantitative or qualitative value; a criterion.
- **Superstructure:** The rotating frame, gantry, and boom, or other operating equipment.

### Definition of Competent Person

A competent person is defined as being one who is capable of identifying working conditions that are unsanitary, hazardous, or dangerous to employees and who has the authorization to take prompt corrective measures to eliminate such hazards.

### Crane Hazards

The following are examples of various crane hazards:

- Improper load rating
- Excessive speeds
- No hand signals
- Inadequate inspection and maintenance
- Unguarded parts
- Unguarded swing radius
- Working too close to power lines
- Improper exhaust system
- Shattered windows
- No steps/guardrails walkways

- No boom angle indicator
- Not using outriggers

**NOTES:**

# MODULE SIX

## ELECTRICAL SAFETY

OSHA's electrical standards address electrical workplace hazards. Employees working on, near, or around electricity may be exposed to dangers such as, electric shock, electrocution, burns, fires, and explosions. The objective of the standard is to minimize the potential hazard by specifying design characteristics of safety when installing and using electrical equipment and systems.

### Lesson 6 Key Terms

- **Amperes or Amps:** The volume of the current flow.
- **AWG:** American wire gauge (AWG), which is one measurement standard used to size wire.
- **Circuit:** Completion of the path of the current; including a voltage source, conductors, and the load (such as, a lamp, tool, or heater).
- **Conductors:** Materials that contain free electrons that allow current to flow through the material.
- **Current:** Electron flow (measured in amperes).
- **Electric Shock:** The physical effect nerve stimulation and/or muscle contraction caused by the flow of current through the body.
- **Electrocution:** Death caused by electrical shock.
- **GFCI:** Ground-Fault Circuit Interrupter. A device which detects current imbalance between the circuit conductors and reference to the grounding conductor. If an imbalance or "leak" occurs as small as 5 milliamps (.005 amps) for as little as 1/40th of a second this device will interrupt the circuit, preventing a shock which most people would not feel.
- **Grounding:** An intentional conductive connection to the earth that provides a path back to the source from any conductive portion of the load device or equipment for any fault current that may occur in a circuit.
- **Insulators:** Materials with few free electrons. Current does not easily flow through insulators, if at all.

- **Resistance:** Opposition to current flow.
- **Volts:** The electrical pressure (measure of electrical force).
- **Watts:** Measurement work produced by the electrical circuit.
- **Wire Gauge:** System used to measure the physical size of wire.

## **Electricity—The Dangers**

The following are some of the dangers associated with electricity:

- More than five workers are electrocuted every week.
- Electricity causes 12 percent of young worker deaths in the workplace.
- It takes very little current flow to cause harm to a person who comes in direct contact with an electrical circuit.
- There is a significant risk of fires due to electrical malfunctions.

## **Electrical Injuries**

The following are the main types of electrical injuries:

- Direct
- Indirect

### **Direct**

The following are considered to be direct electrical injuries:

- Electrocution (death due to electrical shock)
- Electrical shock and related symptoms resulting from it (e.g., bone fractures, neurological disorders, etc.)
- Burns
- Arc flash/blast (usually resulting in burns, concussion injuries, etc.)

### **Indirect**

The following are considered to be indirect electrical injuries:

- Falls
- Back injuries
- Cuts to the hands

## **Electrical Hazards—Other Preventive Measures**

### **Grounding**

Grounding creates a low-resistance path from a tool to the earth to disperse unwanted current.

When a short or lightning occurs, energy flows to the ground, protecting you from electrical shock, injury, and death.

### **Control—Ground Tools and Equipment**

The following should be taken into consideration when working with tools and equipment:

- Properly ground power supply systems, electrical circuits, and electrical equipment.
- Frequently inspect electrical systems to insure that the path to ground is continuous.
- Inspect electrical equipment before use.
- Don't remove ground prongs from tools or extension cords.
- Ground exposed metal parts of equipment.

### **Tool Safety Tips**

The following are some safety tips to consider when using tools:

- Use gloves and appropriate footwear when using tools.
- Store tools in a dry place when not in use.
- Don't use tools in wet/damp conditions.
- Keep working areas well lit.
- Ensure that tools are not a tripping hazard.
- Don't carry a tool by the cord.
- Don't yank the cord to disconnect the tool from the electrical source.
- Keep cords away from heat, oil, and sharp edges.
- Disconnect tools when not in use and when changing accessories such as, blades and bits.
- Remove damaged tools from use.

### **Preventing Electrical Hazards—Tools**

The following measures should be taken to prevent electrical hazards associated with the use of tools:

- Inspect tools before use.
- Use the right tool correctly.
- Protect your tools.
- Use double insulated tools.

### **Locking Out and Tagging Out of Circuits**

The following steps must be performed when locking out and tagging out circuits:

- Apply locks to the power source after de-energizing.
- Verify circuit is de-energized by testing with known functioning meters.
- Tag deactivated controls and power sources.
- Tag de-energized equipment and circuits at all points where they can be energized.
- Tags must identify equipment or circuits being worked on.

### **Safety-Related Work Practices**

To protect workers from electrical shock:

- Use barriers and guards to prevent passage through areas of exposed energized equipment.
- Pre-plan work, post hazard warnings, and use protective measures.
- Keep working spaces and walkways clear of cords.
- Use special insulated tools when working on fuses with energized terminals.
- Don't use worn or frayed cords and cables.
- Don't fasten extension cords with staples, hang the cords from nails, or suspend the cords using wire.

**NOTES:**

## MODULE SEVEN

# STRUCK BY AND CAUGHT IN BETWEEN HAZARDS

This course provides an overview of construction-related struck by and caught in between hazards. It identifies the types of operations that most often cause these hazards. Additionally, the course discusses the engineering controls that should be followed and lists the personal protective equipment that should be used to limit or eliminate struck by and caught in between injuries.

### Lesson 7: Key Terms

- **Audible backup alarms:** These devices must be installed on heavy construction vehicles and maintained in proper working order. They sound an alarm to nearby workers that a dangerous vehicle is backing up.
- **Chock:** A wedge or block used to keep a vehicle parked on an incline from rolling.
- **Excavation work:** Excavation-related work is a major cause of caught in between hazards. In 2005, the vast majority of caught in between hazard citations were related to excavation operations.
- **Limited access zone:** The area adjacent to masonry wall construction that clearly limits access by all but essential employees.
- **PSI:** Pressure per square inch—used to measure compressed air.
- **Shoring:** A structure like a metal hydraulic, mechanical, or timber shoring system that supports the sides of an excavation and is used to prevent cave-ins.
- **Toeboards:** A type of guard installed along the lower edge of scaffold platforms and overhead walkways, designed to keep tools and other objects from falling and injuring workers below. Installing toeboards is considered an engineering control.

### What Is the Struck By Hazard?

According to the U.S. Department of Labor Occupational Safety and Health Administration, at:

[http://www.osha.gov/SLTC/etools/construction/struckby/falling\\_flying.html](http://www.osha.gov/SLTC/etools/construction/struckby/falling_flying.html)

being struck by objects is a leading cause of construction-related deaths. OSHA estimates that 75 percent of struck-by fatalities involve heavy equipment like trucks or cranes. The number of workers that die as a result of being struck by a vehicle was at a seven-year high in 1998.

Safety and health programs must include ways to limit or eliminate the many ways struck-by accidents can occur, since one of the major causes of construction-related death is from being struck by objects.

Typically, struck by accidents are associated with:

- Vehicles
- Falling or flying objects
- Masonry walls

### **The Danger from Heavy Vehicles**

If vehicular safety practices are not followed at a work site, workers are at risk of being pinned (caught) in between construction vehicles and walls or stationary surfaces, struck by swinging backhoes, crushed beneath overturned vehicles, or many other similar accidents. When working near a public roadway, workers are additionally exposed to being struck by trucks, cars, or other vehicles.

### **Danger from Being Struck By Falling or Flying Objects**

Workers are at risk from *falling* objects when they are required to work beneath cranes, scaffolds, overhead electrical line work, etc.

There is a danger from *flying* objects when using power tools, or during activities like pushing, pulling, or prying, that can cause objects to become airborne.

### **Ways to Avoid Being Struck By Falling or Flying Objects**

Workers can be struck by falling or flying objects or by materials that slide, collapse, or otherwise fall on them. To protect workers from these types of injuries, OSHA requires that employers:

- Require the use of hardhats/helmets when appropriate.
- Train employees to stack materials to prevent sliding, falling, or collapse and enforce such practices.

- Install protective devices onsite such as toeboards on elevated platforms and on walkways
- Install debris nets beneath overhead work

### **Working around Cranes and Hoists**

It is extremely hazardous to work underneath heavy equipment, especially when it is being operated. Heavy debris can fall from a swinging bucket. A crane can accidentally break something loose and send it flying. If hoists break during use, their loads can tumble down and strike workers.

Always follow these safe practices while working around cranes and hoists:

- Never allow employees to work underneath loads being moved.
- Barricade areas and post warning signs to keep non-essential employees and outsiders away from overhead equipment.
- Inspect cranes and hoists before each use to ensure components are in good working condition.
- Never exceed the lifting capacity of cranes and hoists.

### **Avoiding Struck By Hazards Related to Masonry Construction**

Only essential workers should be allowed near this type of operation. To enforce this, set up a limited access zone around operations. Additionally, be sure to:

- Have concrete structures checked by qualified persons before placing loads.
- Adequately shore or brace structures until they are permanently supported.
- Secure unrolled wire mesh, so it cannot recoil.
- Never load a lifting device beyond its intended capacity.
- Use automatic holding devices for backup support when using lifts.

### **What is the Caught in Between Hazard?**

OSHA's website states that the top four causes of construction fatalities are a result of:

- Falls
- Struck by
- Caught in between
- Electrocution

This lesson discusses situations in which workers can be caught in between equipment, moving loads, or even safety guards. This hazard exists in many of the same situations where struck by hazards exist. For instance, a worker can be caught in between a falling slab and a concrete foundation. Or, a worker can be caught (or pinned) in between a vehicle and a structure. Finally, workers can be caught in between a collapsed trench that is not properly braced, or struck by warehoused construction materials that were not correctly stacked to prevent sliding.

### **Preventing Caught In Between Hazards**

Engineering controls like shoring, fall protection systems, and properly stacking building materials will help to prevent caught in between hazards. Some of these practices are:

- Never allow workers to enter an unprotected trench (or excavation) that is five feet or deeper unless an adequate protective system is in place; in some cases, trenches less than five feet deep may also require such a system.
- Ensure the trench (or excavation) is adequately protected either by sloping, shoring, benching, or trench shield systems.
- Follow fall protection guidelines per 1926.502 Subpart M Appendix E.
- Always properly stack building materials so they are clear of work areas and so they do not suddenly shift or slide onto a worker.

**NOTES:**

# MODULE EIGHT

## FALL PROTECTION

This course gives you a basic understanding about OSHA's role in prevention and elimination of work-related illnesses and injuries. The OSHA standard identifies areas or activities where fall protection is needed.

It clarifies what an employer must do to provide fall protection for employees, such as identifying and evaluating fall hazards and providing training. Under the standard, employers are able to select fall protection measures compatible with the type of work being performed.

OSHA places its rules for fall protection in several different subparts in the construction standards, depending primarily on the nature of the work. The standard covers most construction workers, except those inspecting, investigating, or assessing workplace conditions prior to the actual start of work or after all work has been completed.

### Lesson 8: Key Terms

- **Anchorage:** A secure point of attachment for lifelines, lanyards, or deceleration devices.
- **Body belt:** A strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device.
- **Body harness:** Straps that may be secured about the person in a manner that distributes the fall-arrest forces over at least the thighs, pelvis, waist, chest, and shoulders with a means for attaching the harness to other components of a personal fall arrest system.
- **Connector:** A device that is used to couple (connect) parts of a personal fall arrest system or positioning device system together.
- **Controlled access zone:** A work area designated and clearly marked in which certain types of work (such as overhand bricklaying) may take place without the use of conventional fall protection systems—guardrail, personal arrest, or safety net—to protect the employees working in the zone.
- **Deceleration device:** Any mechanism, such as rope, grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards—which serve to dissipate a substantial

amount of energy during fall arrest, or otherwise limits the energy imposed on an employee during fall arrest.

- **Guardrail system:** A barrier erected to prevent employees from falling to lower levels.
- **Hole:** A void or gap 2 inches (5.1 cm) or more in the least dimension in a floor, roof, or other walking/working surface.
- **Lanyard:** A flexible line of rope, wire rope, or strap that generally has a connector at each end for connecting the body belt or body harness to a deceleration device, lifeline, or anchorage.
- **Leading edge:** The edge of a floor, roof, or formwork for a floor or other walking/working surface (such as the deck) which changes location as additional floor, roof, decking, or formwork sections are placed, formed, or constructed.
- **Lifeline:** A component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorage at both ends to stretch horizontally (horizontal lifeline), and that serves as a means for connecting other components of a personal fall arrest system to the anchorage.
- **Low-slope roof:** A roof having a slope less than or equal to 4 in 12 (vertical to horizontal).
- **Opening:** A gap or void 30 inches (76 cm) or more high and 18 inches (46 cm) or more wide, in a wall or partition, through which employees can fall to a lower level.
- **Personal fall arrest system:** A system including, but not limited to, an anchorage, connectors, and a body harness used to arrest an employee in a fall from a working level. As of January 1, 1998, the use of a body belt for fall arrest is prohibited.
- **Positioning device system:** A body belt or body harness system rigged to allow an employee to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning backwards.
- **Rope grab:** A deceleration device that travels on a lifeline and automatically, by friction, engages the lifeline and locks to arrest a fall.

- **Safety-monitoring system:** A safety system in which a competent person is responsible for recognizing and warning employees of fall hazards.
- **Self-retracting lifeline/lanyard:** A deceleration device containing a drum-wound line which can be slowly extracted from, or retracted onto, the drum under minimal tension during normal employee movement and which, after onset of a fall, automatically locks the drum and arrests the fall.
- **Snap-hook:** A connector consisting of a hook-shaped member with a normally closed keeper, or similar arrangement, which may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object.
- **Steep roof:** A roof having a slope greater than 4 in 12 (vertical to horizontal).
- **Toe-board:** A low protective barrier that prevents material and equipment from falling to lower levels, and protects personnel from falling.
- **Unprotected sides and edges:** Any side or edge (except at entrances to points of access) of a walking/working surface (e.g., floor, roof, ramp, or runway) where there is no wall or guardrail system at least 39 inches (1 meter) high.
- **Walking/working surface:** Any surface, whether horizontal or vertical, on which an employee walks or works, including, but not limited to, floors, roofs, ramps, bridges, runways, formwork, and concrete reinforcing steel. Does not include ladders, vehicles, or trailers on which employees must be located to perform their work duties.
- **Warning line system:** A barrier erected on a roof to warn employees that they are approaching an unprotected roof side or edge, and which designates an area in which roofing work may take place without the use of guardrail, body belt, or safety net systems to protect employees in the area.

### **Fall Prevention Measures**

- Select fall protection systems appropriate for given situations.
- Use proper construction and installation of safety systems.
- Supervise employees properly.
- Use safe work procedures.
- Train workers in the proper selection, use, and maintenance of fall protection systems.

## **Areas Required to Have Fall Protection**

The following areas are required to have fall protection:

- Unprotected sides and edges
- Leading edges
- Hoist areas
- Holes
- Formwork and reinforcing steel
- Ramps, runways, and other walkways
- Excavations
- Dangerous equipment
- Overhand bricklaying and related work
- Roofing work on low-slope roofs
- Steep roofs
- Pre-cast concrete erection
- Residential construction
- Wall openings
- Walking/working surfaces not otherwise addressed

## **Protection from Falling Objects**

When employees are exposed to falling objects, the employer must have employees wear hardhats and implement one of the following measures:

- Erect toe-boards, screens, or guardrail systems to prevent objects from falling from higher levels.  
OR
- Erect a canopy structure and keep potential fall objects far enough from the edge so that those objects will not go over the edge if they are accidentally displaced.  
OR
- Barricade the area to which objects could fall, prohibit employees from entering the barricaded area, and keep objects that may fall far enough away from the edge of a higher level so that those objects would not go over the edge if they were accidentally displaced.

## **Types of Fall Protection – Active Systems**

Active systems include systems and components that require manipulation by employees to make them effective in providing protection.

- Active systems are designed to operate in freefall situations.
- Active systems must be connected to other systems/components or activated to provide protection.
- Active systems are designed to protect employees from the following:
  - Falls
  - Forces that can cause injury

### **Types of Fall Protection – Passive Systems**

Passive systems are protective systems that do not involve the actions of employees. An example of a passive system is a personal fall arrest system (PFAS).

- PFAS shall not be attached to a guardrail system or hoists.
- All components of a fall arrest system must be inspected before each use and after impact. Defective components must be removed from service.

Action must be taken promptly to rescue fallen employees or be assured they can rescue themselves.

### **Safety Monitoring System**

The employer must designate a competent person to monitor the safety of other employees, and the employer has the duty to ensure that the safety monitor complies with the following requirements:

- He/she must be competent to recognize fall hazards.
- He/she must warn the employee when it appears that the employee is unaware of a fall hazard or is acting in an unsafe manner.
- He/she must be on the same walking/working surface and within visual sighting distance of the employee being monitored.
- He/she must be close enough to communicate orally with the employee.
- He/she must not have other responsibilities which could take attention from monitoring function.

**NOTES:**

# MODULE NINE

## PERSONAL PROTECTIVE EQUIPMENT

The life of every human being is precious. Yet due to negligence and improper safety measures, thousands of workers die each year alone in the construction industry. To minimize or eliminate casualties and fatalities, OSHA requires employers to protect their employees from workplace hazards through proper and effective engineering or work practice controls. When these controls are not feasible, the use of personal protective equipment (PPE) is required.

### Lesson 9: Key Terms

- **Contaminant:** Any material that by reason of its action upon, within, or to a person is likely to cause physical harm.
- **dBA:** Adjusted decibels.
- **Radiant Energy:** A kind of energy that travels outward in all directions from its sources.

### The Need of Personal Protective Equipment (PPE)

It is imperative that employers provide PPE to employees if:

- Hazards exist or are likely to be present in a work environment.
- During work, employees might come into contact with hazardous chemicals, radiation, or mechanical irritants.
- The employer is unable to eliminate workplace hazards by engineering, work practice, or administrative controls.

### Analysis

A hazard analysis is required by the employer in order to observe the work environment, observe how employees are performing their tasks and duties, and to look for potential hazards. Some sources of potential injuries are:

- Objects that might fall from above.
- Exposed pipes or beams at work level.
- Exposed liquid chemicals.
- Sources of heat, intense light, noise, or dust.
- Equipment or materials that could produce flying particles.

**NOTES:**

# MODULE TEN

## HAND AND POWER TOOLS—BASIC

Hand and power tools are a part of our everyday lives. These tools help us to perform tasks that otherwise would be difficult or impossible. However, even simple tools can be hazardous and have the potential for causing severe injuries when used or maintained improperly. Special attention toward hand and power tool safety is necessary in order to reduce or eliminate these hazards.

### Lesson 10: Key Terms

- **Hazard:** Danger or risk.
- **OSHA:** Occupational Safety and Health Administration.
- **PPE:** Personal Protective Equipment.
- **P.S.I.:** Pounds per square inch.
- **Training:** Process of teaching or learning a skill, etc.

### Safe Use of Hand and Power Tools

#### Hazards

Workers using hand and power tools may be exposed to these hazards:

- Falling or flying objects that can be abrasive or may splash.
- Harmful dusts, fumes, mists, vapors, and gases.
- Frayed or damaged electrical cords, hazardous connections, and improper grounding.

#### Basic Tool Safety Rules

Basic tool safety rules include the following:

- Perform maintenance regularly.
- Use the right tool for the job.
- Inspect tools before use.
- Operate according to manufacturers' instructions.
- Use the right personal protective equipment (PPE).

- Use guards.

## **Hazards of Hand and Power Tools**

### **Hand Tool Hazards**

Hazards are usually caused by misuse and improper maintenance.  
Do not use:

- Wrenches when jaws are sprung.
- Impact tools (chisels and wedges) when heads have mushroomed.
- Tools with loose, cracked, or splintered handles.
- A screwdriver as a chisel.
- Tools with taped handles—they may be hiding cracks.

### **Electric Tools—Good Practices**

Good practices for the use of electric tools include:

- Operate within design limits.
- Use gloves and safety shoes. (Care must be exercised when using gloves with rotating power tools. In some cases using gloves can become more dangerous due to than possibly contacting the rotating parts and drawing the hand into the tool.)
- Store in a dry place.
- Don't use in wet locations unless approved for those conditions.
- Keep work areas well lit.
- Ensure cords don't present a tripping hazard.

## **General Safety Precautions**

Employees who use hand and power tools and who are exposed to the hazards of falling, flying, abrasive, and splashing objects, or exposed to harmful dusts, fumes, mists, vapors, or gases, must be provided with the personal protective equipment necessary to protect them from the hazard.

All hazards involved in the use of power tools can be prevented by following five basic safety rules:

1. Keep all tools in good condition with regular maintenance.
2. Use the right tool for the job.
3. Examine each tool for damage before use.
4. Operate according to the manufacturer's instructions.
5. Provide and use the proper protective equipment.

**NOTES:**

# MODULE ELEVEN

## SCAFFOLDS

This lesson attempts to provide a general overview of the safety measures that are required when working on a scaffold. It begins with an introduction into the various types of scaffolds, and goes on to outline the OSHA safety requirements and safety measures that can be taken to ensure that employees working on scaffolds are at little risk of injury or death.

### Lesson 11: Key Terms

- **Bearer (Putlog):** A horizontal transverse scaffold member (which may be supported by ledgers or runners) upon which the scaffold platform rests and joins scaffold uprights, posts, poles, and similar members.
- **Boatswains' Chair:** A single-point adjustable suspension scaffold consisting of a seat or sling designed to support one employee in a sitting position.
- **Body Harness:** A design of straps which may be secured about the employee in a manner to distribute the fall arrest forces over at least the thighs, pelvis, waist, chest, and shoulders, with means for attaching the harness to other components of a personal fall arrest system.
- **Brace:** A rigid connection that holds one scaffold member in a fixed position with respect to another member or to a building or structure.
- **Chimney Hoist:** A multi-point adjustable suspension scaffold used to provide access to work inside chimneys.
- **Coupler:** A device for locking together the tubes of a tube and coupler scaffold.
- **Crawling Board (Chicken Ladder):** A supported scaffold consisting of a plank with cleats spaced and secured to provide footing; for use on sloped surfaces such as roofs.
- **Lifeline:** A component consisting of a flexible line that connects to an anchorage at one end to hang vertically (vertical lifeline) or that connects to anchorages at both ends to stretch horizontally (horizontal lifeline) and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

- **Maximum Intended load:** The total load of all persons, equipment, tools, materials, transmitted loads, and other loads reasonably anticipated to be applied to a scaffold or scaffold component at any one time.
- **Outrigger:** The structural member of a supported scaffold used to increase the base width of a scaffold in order to provide support for and increased stability to the scaffold.
- **Outrigger Beam (Thrustout):** The structural member of a suspension scaffold or outrigger scaffold which provides support for the scaffold by extending the scaffold point of attachment to a point out and away from the structure or building.

## What is a Scaffold?

A scaffold is a term used to describe any sort of temporary elevated platform that is used to support either men, materials, or both. They are commonly used in the construction field (usually in the construction of buildings); however, they are also used in other fields such as ship construction and by cleaning services (to clean the outer windows of high rises). The main purpose behind the use of scaffolds is to provide support and balance to an employee and his or her materials as the employee conducts tasks in inaccessible or otherwise difficult-to-reach areas.

## Types of Scaffolds

### Suspended Scaffolds

These are types of scaffolds that are suspended by a rope from a fixed overhead position (usually placed at the top of a building, but can be any fixed elevated structure).

### Supported Scaffolds

These are scaffolds that consist of one or more platforms elevated on poles and beams which are placed upon a solid ground.

## Overview of OSHA Directives for the Construction of Scaffolds

### Suspension Scaffolds

The regulations presented for the two-point scaffold are applicable to all other types of suspension scaffolds, unless otherwise stated.

## **Supported Scaffolds**

The regulations presented for the frame or fabricated scaffold is applicable to all other types of supported scaffolds, unless otherwise stated.

### **How Do You Minimize the Risks?**

One out of every three deaths in construction results from fatal falls. It is because of this high rate that scaffold workers must be well protected against accidental falls. Generally, precautions must be taken if the employee is expected to work at heights above six feet. Working on scaffolds becomes even more risky when one considers that there is very little space for a person to maneuver, especially when space is also taken up by the various materials that the employee needs to complete her or his job.

There are various ways that employers can minimize the risk to their employees to a sufficiently acceptable level.

#### **Uniformity**

- Ensure that the scaffold has been constructed in accordance with the instructions of the manufacturer.
- Do not alter or modify any of the components of the scaffold; if you are faced with a problem, contact the manufacturer.
- If you have scaffolds from two or more manufacturers, do not under any circumstances try to mix and match the components.
- Do not use different metals for the components of the scaffold.

**NOTES:**

## MODULE TWELVE

### STAIRWAYS AND LADDERS

Stairways and ladders are major sources of workplace injuries and fatalities for construction workers. According to OSHA estimates, there are 24,882 injuries and 36 fatalities per year due to falls from stairways and ladders used for construction purposes in various industries. Almost half of these injuries are serious in nature and may result in time away from the job.

#### Lesson 12: Key Terms

- **Double-cleat ladder:** A ladder with a center rail to allow simultaneous two-way traffic for employees ascending or descending.
- **Failure:** Load refusal, breakage, or separation of components.
- **Fixed ladder:** A ladder that cannot be readily moved or carried because it is an integral part of a building or structure.
- **Handrail:** A rail used to provide employees with a handhold for support.
- **Job-made ladder:** A ladder that is fabricated by employees, typically at the construction site and not commercially manufactured.
- **Point of access:** All areas used by employees for work-related passage from one area or level to another.
- **Portable ladder:** A ladder that can be readily moved or carried.
- **Single-cleat ladder:** A ladder consisting of a pair of side rails connected together by cleats, rungs, or steps.
- **Stair rail system:** A vertical barrier erected along the unprotected sides and edges of a stairway to prevent employees from falling to lower levels.
- **Tread depth:** The horizontal distance from front to back of a tread, excluding nosing, if any.

## **OSHA Standards and Stairways**

The OSHA standards are applicable to all stairways and ladders used in alteration, construction, repair (including painting and decorating), and demolition of work sites covered by OSHA's construction safety and health standards.

### **OSHA Standards Exemptions**

The OSHA standards are not applicable to ladders that are purposely manufactured for scaffold access and egress, but they do apply to specifically built ladders intended for general purpose use that are then used for scaffold access and egress.

### **Ladders and Training**

Ladders must be kept in a safe and good working condition. The following points are important to consider while using or working with ladders:

- The area around the top and bottom of the ladder must be kept clean.
- Always keep ladders away from slipping hazards.

Ensure that rungs are spaced 10 to 14 inches from each other. Also, ensure that cleats and steps are uniformly spaced.

Always use ladders only for their designed purposes. Do not lash ladders together to make a long ladder, unless they are designed for that purpose. Never try to overload ladders beyond their capacities; the manufacturer's rated capacity must be taken into consideration.

**NOTES:**

