OSHA SAFETY TRAINING

FACT SHEETS

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FACT SHEET: INTRODUCTION

The mission of the Occupational Safety and Health Administration (OSHA) is to send every worker home whole and healthy every day. Since the agency was established in 1971, workplace fatalities have been cut by 62 percent and occupational injury and illness rates have declined 40 percent. At the same time, U.S. employment has nearly doubled from 56 million workers at 3.5 million worksites to 115 million workers at nearly 7 million sites. OSHA can be reached by accessing www.osha.gov or calling 1-800-321-OSHA.

OSHA encourages employers and employees to work together to:

- Reduce workplace hazards and implement or improve safety and health programs
- Develop and enforce mandatory job standards in the areas of occupational safety and health
- Maintain a reporting and recordkeeping system to monitor job-related illnesses and injuries
- Provide assistance, training and other support programs to help employees and workers.

Since its implementation in 1971, OSHA has:

- Helped cut work-related fatalities nearly in half
- Helped reduce workplace injuries and illnesses by 40 percent
- Almost eliminated the once-common brown-lung disease from the textile industry
- Cut excavation and trenching fatalities by more than a third

Some of the strategies OSHA has developed to help mitigate workplace problems include:

- Encouraging employers and employees to implement or improve safety and health programs
- Developing and enforcing mandatory job safety and health standards
- Maintaining a reporting and recordkeeping system to track job-related illnesses and injuries
- Providing assistance and training programs to help protect the interests of both workers and employers

When there is no apparent OSHA Standard governing a particular situation, employers are required to adhere to the **OSH Act's General Duty Clause**, as follows:

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."

Any employer with 11 or more employees is required to keep records of all occupational illnesses and injuries.

Recordkeeping forms must be maintained on a calendar year basis. A summary of the records for the previous year must be posted from February until the end of April.

In addition, the records must be kept on-site for 5 years and must be readily available for inspection, by OSHA or by the National Institute for Occupational Safety and Health (NIOSH) or the BLS.

What Are Workers' Responsibilities?

- Read the OSHA poster
- Follow the employer's safety and health rules
- Wear or use all required gear and equipment
- Follow safe work practices for your job, as per your employer
- Report hazardous conditions to your supervisor or safety committee
- If hazardous conditions are not fixed, report them to OSHA
- Cooperate with OSHA inspectors

What Are Worker's Rights?

Section 11(c) of the OSH Act entitles you to take the following actions without fear of reprisal from your employer:

- Identify and correct problems in the workplace, working as much as possible with your employer.

- Notify OSHA about working conditions that are a threat to your health and/or safety. You can make this notification in person or by fax, email, postal mail, or through OSHA's Web site.

What Are an Employer's Rights and Responsibilities?

The OSH Act grants employers important rights, particularly during and after an OSHA inspection. For instance, OSHA is obliged to maintain the confidentiality of an employer's trade secrets. Employers and employees can submit information or comments to OSHA on the issuance, modification, or revocation of OSHA standards and request a public hearing.

When inspections are conducted, the OSHA inspector (CSHO) looks for conditions in the following order, according to priority:

- **Imminent Danger** - Any condition where there is a 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.
- **Fatalities and Catastrophes** – Any condition resulting in hospitalization of three or more employees.
- **Employee Complaints/Referrals**
- **Programmed High-Hazard Inspections**
- **Follow-ups to previous inspections**

FACT SHEET: ELECTRICAL SAFETY

NEC provisions directly related to employee safety:

- Installation Safety Requirements
  [29 CFR 1926.402 - 1926.415]
- Safety-Related Work Practices
  [29 CFR 1926.416 - 1926.430]
- Safety-Related Maintenance and Environmental Considerations
  [29 CFR 1926.431 - 1926.440]
- Safety Requirements for Special Equipment
  [29 CFR 1926.441 - 1926.448]
- Definitions
  [29 CFR 1926.449]

Electrical Terms

Volts – electrical pressure (measure of electrical force)
Amps – the volume or intensity of the electrical flow
Watts – the power consumed
Current – electrical movement (measured in amps)
Circuit – the complete path of the current. Includes the electricity source, the conductor, and the output device (such as a tool, light, etc.)
Resistance – measured in ohms; the resistance of a material to the flow of electricity
Conductors – materials with little resistance
Grounding – a conductive connection to the earth that acts as a protective measure
Insulators – materials with high resistance to electricity; often used to prevent electricity from getting to unwanted places

Four main types of electrical injuries:

- Electrocution
- Electrical shock
- Burns
- Indirect – i.e., a fall from a ladder caused by a shock

A shock occurs when your body offers the path of least resistance for completing a circuit.

Shocks can occur when your body completes the path with:

- Both wires of an electric circuit
- One wire of an energized circuit and the ground
- A metal part that accidentally becomes energized
- Another “conductor” that is carrying a current

A shock’s severity depends on:

- The amount of current
- The current’s path
- The length of time (duration)
- The current’s frequency

General Information

- When electrical shock is sufficient to cause muscle contraction, the “freezing” effect makes it impossible for the person to pull free from the energy source. The current must be shut off immediately to release them!
- Static electricity can also cause a shock, and while the kind you get after shuffling across a carpet is generally mild, static electricity can build up and discharge to an object with very serious consequences. Grounding or other measures are often necessary to prevent static electricity buildup.
- The longer the exposure to the current, the greater the danger.
- Low voltage does not mean low hazard!
- A severe shock often causes more damage than that initially visible: There may be internal hemorrhaging and tissue and nerve damage.

“Clues” that an electrical hazard exists:

- A ground fault circuit interrupter keeps tripping
- Circuit breakers trip and fuses blow, which show that too much current is flowing. This could be due to a number of factors, such as malfunctioning equipment or a short between conductors.
- An electrical tool, wire, or connection that feels warm may indicate too much current in the circuit or equipment.
- An extension cord that feels warm may indicate too much current for the wire size of the cord.
- A cable, fuse box or junction box that feels warm may indicate too much current in the circuits
- A burning odor, which may indicate overheated insulation
- Worn, frayed or damaged insulation around wires or conductors is an electrical hazard because the conductors could be exposed. Contact with

an exposed wire could cause a shock, and damaged insulation could cause a short, leading to arcing or a fire.

Besides PPE, other vital methods of protection when working around power lines include:

- Post warning signs near overhead power lines and buried power line indicators
- Contact utilities for buried power line locations
- Stay at least 10 feet away from overhead lines
- Assume that lines are energized unless you've established otherwise
- Have the lines' owner or operator deenergize them before work begins on them
- Use wood or fiberglass ladders in lieu of metal

The safety of equipment must be determined by the following:

- Suitability for installation and use in conformity with the provisions of the standard – that is, suitability of equipment for an identified purpose evidenced by a listing, by labeling, or by certification for that identified purpose.
- Mechanical strength and durability. For parts designed to enclose and protect other equipment, this includes the adequacy of the protection thus provided.
- Electrical insulation
- Heating effects under conditions of use – if it starts to overheat disconnect it!
- Arcing effects
- Classification by type, size, voltage, current capacity, and specific use

To protect you from harm due to the poor condition of cords and wires:

- Insulate live wires
- Check before use
- Use only 3-wire-type cords
- Use only cords marked for hard or extra-hard usage
- Make sure your cords are equipped with strain-relief
- Unplug cords by grasping the plug, not pulling the cord
- Take unmarked or modified cords out of service

Four components comprise a typical extension cord grounding system:

- A third wire in the plug, called a ground wire;
- A three-pronged plug with a grounding prong on one end of the cord;
- A three-wire, grounding-type receptacle at the other end of the cord;
- A properly grounded outlet

The National Electrical Code (NEC) requires that GFCIs be used when:

- Electricity is used near water (a common example is a hair dryer, which are now required to have GFCIs lest they fall [or be “accidentally” dropped] into a bathtub or sink…)
- Temporary wiring or extension cords are being used
- Circuits are providing power to outdoor receptacles or portable tools

Common misuses of electrical equipment to avoid:

- Using multi-receptacle boxes that are designed to be securely mounted as “portable” stations by fitting them with a power cord and putting them on the floor
- Using equipment that is specifically labeled for use in dry, indoor locations only outside.
- Attaching ungrounded two-prong adapter plugs to three-prong cords and tools
- Using circuit breakers of fuses with the wrong rating for overcurrent protection
- Using cord or tools that have been modified from the way they were manufactured and/or meant to be used – for example, removing a face plate, insulation, or ground prongs
- Using cords or tools with exposed wires, and fraying, cut or worn insulation

Use the three-stage safety model to stay safe: **recognize, evaluate, and control** hazards. To be safe, you must think about your job and plan for hazards. To avoid injury or death, you must understand and recognize hazards. You need to evaluate the situation you are in and assess your risks. You need to control hazards by creating a safe work environment, by using safe work practices, and by reporting hazards to a supervisor.

If you do not recognize, evaluate, and control hazards, you may be injured or killed by the electricity itself, electrical fires, or falls. If you use the safety model to recognize, evaluate, and control hazards, you are much safer.

FACT SHEET: FALL PROTECTION

OSHA ground rules have established that employers and employees need to do the following:

- Where protection is required, 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 all protection systems.

When Should Fall Protection Be Provided?

- Where there is a walking or working surface that has one or more unprotected edges
- When a worker is building a leading edge
- When there is a danger that a worker could fall through a hole in a walking or working surface
- When an employee is working on the face of formwork or reinforcing steel
- On ramps, runways, or other walkways
- At the edge of an excavation, hole, well, pit, or shaft
- When employees are working above dangerous equipment (even if it is less than six feet above such equipment)!
- When a worker is doing overhand bricklaying or related masonry work
- When an employee is working on a roof
- When a worker is doing precast construction erection (with some exceptions)
- During certain types of residential construction.

The following have been determined to be contributing factors in many fall-through accidents:

- Inadequate safety programs and worker training
- Failure to identify and eliminate fall hazards or to provide an adequate fall prevention system
- Removal of hole covers by workers
- Failure to protect workers from fall hazards during bad weather conditions
- Inappropriate task assignments for young workers
- Lack of written agreements between general contractors and subcontractors to clearly describe how safety responsibilities will be handled and how workers will be protected from hazards at the worksite

The four most common types of fall-prevention equipment are:

- Personal Fall Arrest System (PFAS)
- Guardrail or Railing Systems
- Safety Net Systems
- Covers

Employees must be trained in the following areas:

- The nature of fall hazards in the work area;
- The correct procedures for erecting, maintaining, disassembling, and inspecting fall protection systems;

- The use and operation of controlled access zones and guardrail, personal fall arrest, safety net, warning line, and safety monitoring systems;
- The role of each employee in the safety monitoring system when the system is in use;
- The limitations on the use of mechanical equipment during the performance of roofing work on low-sloped roofs;
- The correct procedures for equipment and materials handling and storage and the erection of overhead protection;
- The employees' role in fall protection plans; and
- The standards of Subpart M

FACT SHEET: STRUCK-BY ACCIDENTS

If vehicle safety practices are not observed at your site, you risk being pinned between construction vehicles and walls, being struck by the rotating boom of a crane or by swinging backhoes, being crushed beneath overturned vehicles, having a truck or a piece of heavy equipment back into you (particularly if visibility is poor due to inclement weather or poor lighting) or other similar accidents. If you work near public roadways, you risk being struck by wayward trucks or cars that unexpectedly swerve or leave the highway. If you are the operator of the vehicle, you must beware of vehicle rollovers or crashes.

The most struck-by injuries are caused by the following hazards:

- ***Vehicles*** – Most likely trucks or cranes

- ***Falling or Flying Objects*** – Examples are something falling from a scaffold; or something flying at you when someone is using a power tool and an object chips off.

- ***Constructing Masonry Walls*** – Lifting large loads of heavy slabs and more presents hazards.

Workers are most at risk from falling objects when standing or working under scaffolds, cranes, workers performing masonry, workers setting the beams of a building in place, scaffolds, or wherever overhead work is being performed. The danger from flying objects exists when power tools – such as grinders – throw off particles; or when pushing, pulling, prying or similar activities causes objects to become airborne. Injuries can range from minor abrasions to concussions, blindness, or even death.

- Wearing hardhats goes a long way towards helping protect you if something falls, flies, or swings into your head. Make sure tools and materials are secured when stored in overhead locations to prevent them from falling on people below. Avoid working underneath loads being moved by cranes, backhoes, and hoists. Barricade hazard areas and post warning signs.

- Use safety glasses, goggles, face shields, etc., where machines or tools may cause flying particles; and always inspect tools, such as saws and lathes, to ensure that protective guards are in good condition. Make sure you are trained in the proper operation of powder actuated tools

To avoid accidents involving the construction of masonry walls:

- Do not place construction loads on a concrete structure until a qualified person indicates that it can support the load.
- Shore or brace structures until permanent supporting elements are in place, or until the concrete has been tested to assure it has sufficient strength.
- Allow only essential personnel who are actively engaged in construction or lifting operations into the work area.
- Take measures to prevent unrolled wire mesh from recoiling, such as securing each end or turning the roll over.
- Do not load lifting devices beyond their capacity, and use automatic holding devices to support forms in case a lifting mechanism fails.

FACT SHEET: CAUGHT-BETWEEN ACCIDENTS

Workers who operate construction vehicles or equipment risk injury due to overturn, collision, or being caught in running equipment. Here are some OSHA and NIOSH recommendations for preventing some common caught-by accidents”

- Ensure that raised dump truck bodies are locked against inadvertent lowering before employees work under them

- Employers should develop, implement, and enforce a comprehensive written safety program for all workers that includes training in the recognition and avoidance of unsafe conditions and in required safe work practices that apply to their work environments.

- Employers should ensure that workers who are part of a multilingual workforce comprehend instructions in safe work procedures for the tasks to which they are assigned.

- Employers should instruct forklift operators to ground the forks of the forklift, turn the forklift off, set the parking break, and neutralize the controls prior to dismounting the machine.

- Employers should instruct forklift operators never to stand inside the cage of the forklift while it is in operation.

- Ensure that all exposed and accessible sections of conveyors on machines are guarded
- Employers should perform a hazard analysis prior to equipment use to ensure it is safe for employees

- Employers should provide training for employees on the proper use and the hazards of equipment at the workplace

- Employers should develop, implement and enforce the basic elements of a lockout/tagout program.

Proper training, proper PPE and keeping one’s extremities out of the way of the moving parts of a machine are essential to safe work practices. Make sure you read training materials and signs, attend training classes when offered, and wear the proper gear when operating machinery. Above all, keep your eyes open and stay alert; expecting the unexpected may help save your life.

FACT SHEET: PERSONAL PROTECTIVE EQUIPMENT

Hazards in your workplace can be sharp edges, falling objects, flying sparks, chemicals, noise, or many other potentially dangerous situations. The Occupational Safety and Health Administration (OSHA) requires all employers to protect their employees from workplace hazards. Controlling a hazard at its source is the best way to protect employees.

Personal Protective Equipment in construction is commonly required to protect:

- The head
- The feet and legs
- The arms and hands
- Hearing
- Eyes and face

Elements of an appropriate PPE program:

- The employer uses engineering and work practice controls to eliminate or reduce hazards before using PPE.
- The employer assesses the workplace for hazards.
- The employer selects appropriate PPE to protect employees from hazards that cannot be eliminated.
- Employees are informed about why the PPE is necessary and when it must be worn.
- Employees are trained in proper use and care of the PPE.
- Employees are required to wear PPE as protection from identified and likely hazards in their work area.

PPE Requirements

The best way to ensure a safe workplace for everyone is for employers and employees to cooperate and assume joint responsibility. In general, your employer is responsible for:

- Continually working to identify and control hazards.
- Providing appropriate PPE for employees.
- Training employees in the use and care of the PPE.
- Maintaining PPE, including replacing worn or damaged PPE.
- Periodically reviewing, updating and evaluating the effectiveness of the PPE program.

In general, employees should:

- Attend training sessions and know how to use their PPE.
- Properly wear PPE.
- Care for, clean and maintain their PPE
- Always inform a supervisor if PPE needs to be repaired or replaced

In general, your employer should provide PPE at no cost.

Under a rule published to the Federal Register November 15, 2007, all PPE (with a few exceptions) must be provided at no cost to the employee. OSHA anticipates that this rule will have substantial safety benefits that will result in more than 21,000 fewer occupational injuries per year. You can read more about the Final Rule at http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=FEDERAL_REGISTER&p_id=20094.

When employees are required to use PPE, training for each specific type of PPE should include:

- Why it is necessary
- How it will protect them
- What its limitations are
- When and how to wear
- How to identify signs of wear
- How to clean and disinfect
- What its useful life is and how to dispose of it

Assessing Hazards

The employer's first responsibility is to assess the workplace for hazards that are present or that are likely to be present which will necessitate PPE for any part of the body. Per OSHA 1926.95(a) and (b), employers must provide PPE for employees if:

- Their work environment presents a hazard or is likely to present a hazard to any part of their bodies;
- Their work processes present a hazard or are likely to present a hazard to any part of their bodies;
- During their work, they might come into contact with hazardous chemicals, radiation, or mechanical irritants;
- They are unable to eliminate employee exposure or potential exposure to the hazard by engineering, work practice, or administrative controls.

Seven items that should be covered during PPE training:

- Why training is necessary.
- How the PPE will protect the wearer
- What the PPE's limitations are
- When and how to wear the PPE
- How to identify signs of wear
- How to clean and disinfect the PPE
- What the useful life of the PPE is, and how to dispose of unusable equipment

FACT SHEET: SCAFFOLDS

By definition a scaffold is a temporary, elevated platform that construction workers use for working safely at elevations.

There are three basic types of scaffolds:

Supported scaffolds are comprised of one or more platforms supported by outrigger beams, brackets, poles, legs, uprights, posts, frames, or similar rigid supports.

Suspension scaffolds are comprised of one or more platforms suspended by ropes or other non-rigid means from an overhead structure.

Aerial lifts are vehicle-mounted devices such as cherry pickers or boom trucks used to get a worker to an elevated position.

The first step in building a scaffold includes a site inspection to:

- Identify site-specific hazards not identified in the preplanning stage, and
- Ensure that the specific characteristics of the site are considered in the scaffold design

Meanwhile, erectors should ***inspect all scaffold parts before use,*** checking for:

- Cracks
- Dents
- Bends
- Breaks
- Corrosion, and/or
- Bad welds

on all metal pieces.

The employer shall have each employee who performs work while on a scaffold trained by a person qualified in the subject matter to recognize the hazards associated with the type of scaffold being used and to understand the procedures to control or minimize those hazards. The training shall include the following areas, as applicable:

- The nature of any electrical hazards, fall hazards and falling object hazards in the work area;
- The correct procedures for dealing with electrical hazards and for erecting, maintaining, and disassembling the fall protection systems and falling object protection systems being used;
- The proper use of the scaffold, and the proper handling of materials on the scaffold; and
- The maximum intended load and the load-carrying capacities of the scaffolds used.

The employer also needs to train each employee who is involved in erecting, disassembling, moving, operating, repairing, maintaining, or inspecting a scaffold trained by a competent person to recognize any hazards associated with the work in question. The training shall include the following topics, as applicable:

- The nature of scaffold hazards;
- The correct procedures for erecting, disassembling, moving, operating, repairing, inspecting, and maintaining the type of scaffold in question;
- The design criteria, maximum intended load-carrying capacity and intended use of the scaffold; and
- Any other pertinent requirements of this subpart.

Examples of Scaffolding Rules

- Workers will use only the installed ladders for access and will never climb a scaffold using the cross braces or guardrails as ladders
- Scaffolds must never be modified by anyone without permission from the supervisor designated as a “competent person”, including “just removing that brace for a minute to paint behind it....” or doing other seemingly harmless activities
- Any damage to the scaffold has to be reported to the competent person immediately
- Scaffolds cannot be used in high winds or electrical storms; the competent person has the final word on what constitutes these prohibited conditions
- Snow and ice must be cleared from the scaffold before workers attempt to use it

If a worker on a scaffold can fall more than 10 feet, they must be protected by guardrails and/or personal fall arrest systems (PFAS). The type of fall protection required will depend upon the type of scaffold being used.

NIOSH recommends the following measures to prevent serious injuries and fatal falls while working from suspension scaffolds:

1. Comply with the current and proposed OSHA regulations for working with scaffolds.
2. Assure that design and construction of scaffolds conform with OSHA requirements.
3. Shield scaffold suspension ropes and body belt or harness system droplines (lifelines) from hot or corrosive processes, and protect them from sharp edges or abrasion.
4. Inspect all scaffolds, scaffold components, and personal fall protection equipment before each use.
5. Provide personal fall protection equipment and make sure that it is used by all workers on suspension scaffolds.
6. Use structurally sound portions of buildings or other structures to anchor droplines for body belt or harness systems and tiebacks for suspension scaffold support devices. Droplines and tiebacks should be secured to separate anchor points on structural members.
7. Provide proper training for all workers who use any type of suspension scaffold or fall protection equipment.
8. Follow scaffold manufacturers' guidance regarding the assembly, rigging, and use of scaffolds.

FACT SHEET: CRANES & DERRICKS

The main four causes of crane accidents are **contact with power lines, overturns, falls,** and **mechanical failure.**

Improper maintenance and failure to conduct regular inspections can also be harbingers of trouble, and dropped loads, boom collapse, rigging failures, workers being struck by the chassis as it rotates, lack of training, lack of communication, and other mishaps cause accidents as well. Following safe work practice and complying with OSHA's standards for crane safety can help minimize these risks.

There are a number of different types of cranes for both general and more specific uses, including

- Mobile
- Hydraulic
- Overhead
- Gantry
- Tower

Preparation Before Startup – The Seven Sisters of Safety

Before beginning to use any crane, all the steps on the checklist below need to have been completed.

1. Level the crane and ensure the support surface is firm and able to support the load.

2. Contact power utility owners and determine precautions, including whether lines will need to be deenergized for safety's sake. Know the location and voltage of the overhead power lines!

3. Know the capacities of your crane and its limitations, as well as any restrictions particular to your job site such as unstable soil, the location of underground power lines, utilities, or a predisposition for high-winds.

4. Make sure other personnel on the site are aware of hoisting activities and the operational range of the boom (swing radius).

5. Barricade areas within the swing radius of the boom.

6. Ensure cranes have been properly maintained and inspected. Remember that the competent person must inspect all machinery and equipment prior to and during each use to make sure it is in safe operating condition. If it needs fixing, take it out of service and don't use it until it is fixed!

7. Determine safe areas to store materials and place machinery.

Mobile Cranes – The Four Lifting Principles You Must Know

- Center of Gravity
- Leverage
- Stability
- Structural Integrity

In general, clearance of at least 10 feet should be maintained between power lines and any part of the crane or load.

Proper training of crane operators in the mandatory use of load charts is important for safe hoisting operations. Crane operators need to know and understand how to use load charts provided by the crane manufacturer. LMI devices are an important safety feature on modern cranes. However, these devices cannot replace the judgment of a trained and qualified operator who has knowledge of safe practices regarding hoisted loads, swing radius, and load chart information. LMI devices should be checked per the manufacturer's recommendations and if not working properly, tagged out-of-service until repairs are made.

Crane operators and workers must follow the manufacturer's recommendations for crane set-up and rigging.

Workers must use caution so that they do not place themselves in dangerous areas where they can be struck by falling loads or by falling or collapsing crane components.

Managers and safety professionals need to consider safe work practices for workers who are required to work on or near operating cranes. All workers should use and follow established hand signals such as the standard hand signals listed in ANSI B30.5–2004.

Personnel Platforms

A qualified engineer, or another competent specialist qualified in structural design, should design all lifting platforms. The platforms should meet the following requirements:

- Support platform weight and at least five times the maximum intended load.
- Minimize tipping caused by personnel movement on platforms by having an appropriate suspension system.
- Keep tools, materials, and equipment from falling on employees below by having a standard guardrail system that is enclosed from the toeboard to the mid-rail.

Platform loading standards require that:

- Personnel platforms must not be loaded in excess of their rated load capacity or maximum intended load as indicated on permanent markings.
- Only personnel instructed in the requirements of the standard and the task to be performed—along with their tools, equipment, and materials needed for the job—are allowed on the platform.
- All materials and tools must be secured and evenly distributed to balance the load while the platform is in motion.

Material Hoists

As with personnel hoists, employees and contractors should always be aware of the manufacturer's specifications as well as any limitations applicable to the operation of all hoists and elevators. Safe work practice requires the rated load capacities, recommended operating speeds, and any warnings or instructions about special hazards to be posted on hoist cars and platforms.

FACT SHEET: HAND & POWER TOOLS

Workers using hand or power tools should be particularly aware of these categories of hazards:

- Objects that fall or fly,
- Objects that are abrasive
- Substances that splash
- Harmful dusts, fumes, mists, vapors, and gases
- Frayed or damaged electrical cords, hazardous connections, or improper grounding

The greatest hazards posed by hand tools result from misuse and improper maintenance. Many injuries from hand tools are painful but relatively minor; however, that's not to say you can't lose an eye if a piece of wood or metal goes flying.

The most common injuries caused by power tools can also be minor, but are more liable to be serious because of the addition of electricity and force. Some examples:

- Electric shock or electrocution from a ground fault or defective device
- Flash burns
- Eye injuries (metal filings or shavings getting in the eye)
- Crushing or losing a body part (chainsaws, anyone?)

The following general precautions should be observed by power tool users:

- Never carry a tool by the cord or hose.
- Never yank the cord or the hose to disconnect it from the receptacle.
- Keep cords and hoses away from heat, oil, and sharp edges.
- Disconnect tools when not in use, before servicing, and when changing accessories such as blades, bits and cutters.
- All observers should be kept at a safe distance away from the work area.
- Secure work with clamps or a vise, freeing both hands to operate the tool.
- Avoid accidental starting. The worker should not hold a finger on the switch button while carrying a plugged-in tool.
- Tools should be maintained with care. They should be kept sharp and clean for the best performance. Follow instructions in the user's manual for lubricating and changing accessories.
- Be sure to keep good footing and maintain good balance.

- The proper apparel should be worn. Loose clothing, ties, or jewelry can become caught in moving parts.
- All portable electric tools that are damaged shall be removed from use and tagged "Do Not Use."

Guards should protect the operator and others from:

- Point of operation,
- In-running nip points,
- Rotating parts, and
- Flying chips and sparks.

Critical safety precautions for powder-actuated tools include the following:

- These tools should not be used in an explosive or flammable atmosphere.
- Before using the tool, the worker should inspect it to determine that it is clean, that all moving parts operate freely, and that the barrel is free from obstructions.
- The tool should never be pointed at anybody.
- The tool should not be loaded unless it is to be used immediately. A loaded tool should not be left unattended, especially where it would be available to unauthorized persons.
- Hands should be kept clear of the barrel end. To prevent the tool from firing accidentally, two separate motions are required for firing: one to bring the tool into position, and another to pull the trigger. The tools must not be able to operate until they are pressed against the work surface with a force of at least 5 pounds greater than the total weight of the tool.

FACT SHEET: EXCAVATIONS

While cave-ins are the most feared excavation hazard, other potentially fatal dangers also exist. These include asphyxiation due to lack of oxygen in a confined space (for instance, if you are running gas-powered machinery that causes a buildup of carbon monoxide and depletes oxygen), inhalation of toxic fumes, drowning, and more. Electrocution or explosions are possible if workers unknowingly come in contact with underground utilities. OSHA requires that workers be protected and that safety and health programs address the variety of hazards they face.

Benching is a useful protective system when one can excavate the sides of a hole out to form one or more horizontal levels (with vertical platforms in between) so that the shallowness of the finished product can make a cave-in less likely.

Shoring or shielding is used when the location or the depth of the cup makes sloping back to the maximum allowable slope impractical. There are two basic types of shoring: timber and aluminum hydraulic.

Trench boxes differ from shoring in that instead of supporting the trench face, they serve mostly to protect workers from cave-ins. The area between the trench box and the face of the actual trench should be as small as possible, and it may be backfilled to prevent lateral movement of the box. The shields should never exceed the load for which they are rated. It should also be noted that trench boxes may be used in conjunction with sloping and benching.

OSHA does not require a protective system if the excavation is made entirely in stable rock, or is less than 5 feet deep, as long as a competent person has examined the ground and found no indication of a potential cave-in.

Maintenance of Protective Systems

- Materials and equipment should be free from damage or defects.
- Manufactured materials and equipment should always be used and maintained in a manner consistent with the manufacturer’s recommendations.
- A competent person must examine any damaged materials or equipment. Always remove unsafe materials and equipment from service until a registered professional engineer can evaluate and approve them for use.

Competent Person: Must have had specific training and be knowledgeable about:

- Soils classification
- The use of the different types of protective systems
- The requirements of the OSHA standard.

The competent person must also be capable of identifying hazards, and be authorized to immediately eliminate hazards

- **Excavation** – a man-made cut, cavity, trench, or depression formed by earth removal.
- **Trench** – a narrow excavation. The depth is greater than the width, but not wider than 15 feet.
- **Shield** – (shield system) a structure able to withstand a cave-in and protect employees within the structure. Shields can be permanent structures or can be designed to be portable, so they can be moved as the work progresses. Also known as a trench box, a trench shield, or a welder's hut.
- **Shoring** (shoring system) -- a structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.
- **Sloping** (sloping system) -- protects employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation to prevent cave-ins. The angle of incline varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

FACT SHEET: MATERIALS HANDLING & STORAGE

In the case of materials handling, storage, use and disposal, remember that the main hazards are injuries from:

- Improper manual lifting or carrying loads that are too heavy, large or unwieldy
- Being struck by materials or being caught in pinch points
- Being crushed by machines, falling materials or improperly stored materials
- Incorrectly cutting ties or securing devices

Manual materials handling (lifting, carrying, pushing, pulling) is the most common category of compensable injuries in the United States work force, with four out of five of those injuries involving the lower back.

OSHA recommends using a formal training program to reduce materials handling hazards. The content of the training should emphasize factors that will contribute to reducing workplace hazards, including:

- Alerting the employee to the dangers of lifting without proper training.
- Showing the employee how to avoid unnecessary physical stress and strain.
- Teaching workers to become aware of what they can comfortably handle without undue strain.
- Instructing workers on the proper use of equipment.
- Teaching workers to recognize potential hazards and how to prevent or correct them.

A training program to teach proper lifting techniques should cover the following topics:

- Awareness of the health risks to improper lifting — citing organizational case histories
- Knowledge of the basic anatomy of the spine, the muscles, and the joints of the trunk, and the contributions of intra-abdominal pressure while lifting
- Awareness of individual body strengths and weaknesses—determining one's own lifting capacity
- Recognition of the physical factors that might contribute to an accident, and how to avoid the unexpected

- Use of safe lifting postures and timing for smooth, easy lifting and the ability to minimize the load-moment effects
- Use of handling aids such as stages, platforms, or steps, trestles, shoulder pads, handles, and wheels
- Knowledge of body responses—warning signals—to be aware of when lifting

To reduce potential accidents associated with workplace equipment, employees need to be trained in the proper use and limitations of the equipment they operate. This includes knowing how to effectively use equipment such as forklifts (also known as powered industrial trucks), earth-moving equipment, conveyors, cranes and slings.

Safety precautions the user can observe when operating or maintaining any of these powered industrial trucks include:

- That high lift rider trucks be fitted with an overhead guard, unless operating conditions do not permit.
- That fork trucks be equipped with a vertical load backrest extension according to manufacturers' specifications, if the load presents a hazard.
- That battery charging installations be located in areas designated for that purpose.
- That facilities be provided for flushing and neutralizing spilled electrolytes when changing or recharging a battery to prevent fires, to protect the charging apparatus from being damaged by the trucks, and to adequately ventilate fumes in the charging area from gassing batteries.
- That conveyor, overhead hoist, or equivalent materials handling equipment be provided for handling batteries.
- That auxiliary directional lighting be provided on the truck where general lighting is less than 2 lumens per square foot.
- That arms and legs not be placed between the uprights of the mast or outside the running lines of the truck.
- That brakes be set and wheel blocks or other adequate protection be in place to prevent movement of trucks, trailers, or railroad cars when using trucks to load or unload materials onto train boxcars.
- That sufficient headroom be provided under overhead installations, lights, pipes, and sprinkler systems.
- That personnel on the loading platform have the means to shut off power to the truck.
- That dock boards or bridge plates be properly secured, so they won't move when equipment moves over them.
- That only stable or safely arranged loads be handled, and caution be exercised when handling loads.
- That trucks whose electrical systems are in need of repair have the battery disconnected prior to such repairs.

- That replacement parts of any industrial truck be equivalent in safety to the original ones.

There are six general types of rigging equipment slings, which are those made from:

- Alloy steel chain,
- Wire rope,
- Metal mesh,
- Natural fiber rope (conventional three-strand construction),
- Synthetic fiber rope (conventional three-strand construction), and
- Synthetic web (nylon, polyester, and polypropylene).

Each type has its own particular advantages and disadvantages. Factors that should be taken into consideration when choosing the best sling for the job include the size, weight, shape, temperature, and sensitivity of the material to be moved, as well as the environmental conditions under which the sling will be used. In general, use and inspection procedures tend to place these slings into three groups: alloy steel chain, wire rope and mesh, and fiber rope web.

Alloy steel chain, wire rope and synthetic web slings are most commonly used.

There are four primary factors to take into consideration when safely lifting a load with a sling. They are:

(1) The size, weight, and center of gravity of the load;
(2) The number of legs and the angle the sling makes with the horizontal line;
(3) The rated capacity of the sling; and
(4) The history of the care and usage of the sling.

Storing and stacking materials **can be dangerous if workers do not follow safety guidelines. Falling materials and collapsing loads can crush or pin workers, causing everything from minor injuries to death. In order to help prevent injuries when stacking materials, workers must do the following:**

- Observe height limitations; for instance, stack lumber no more than 16 feet high if it is handled manually, and no more than 20 feet if using a forklift;
- Remove all nails from used lumber before stacking;
- Stack and level lumber on solidly supported bracing;
- Ensure that stacks are stable and self-supporting;
- Do not store pipes and bars in racks that face main aisles to avoid creating a hazard to passersby when removing supplies;
- Stack bags and bundles in interlocking rows to keep them secure; and Stack bagged material by stepping back the layers and cross-keying the

bags at least every ten layers (to remove bags from the stack, start from the top row first).

During materials stacking activities, workers must also do the following:

- Store baled paper and rags inside a building no closer than 18 inches to the walls, partitions, or sprinkler heads;
- Band boxed materials or secure them with cross-ties or shrink plastic fiber;
- Stack drums, barrels, and kegs symmetrically;
- Block the bottom tiers of drums, barrels, and kegs to keep them from rolling if stored on their sides;
- Place planks, sheets of plywood dunnage, or pallets between each tier of drums, barrels, and kegs to make a firm, flat, stacking surface when stacking on end;
- Chock the bottom tier of drums, barrels, and kegs on each side to prevent shifting in either direction when stacking two or more tiers high; and
- Stack and block poles as well as structural steel, bar stock, and other cylindrical materials to prevent spreading or tilting unless they are in racks.

The OSHA standard dictates rules for the disposal of waste materials in a relatively short and straightforward manner. It is most easily explained simply by reading the five short paragraphs addressed in 1926.252, which are printed within the module.

OSHA recommends that employers establish a formal training program to teach workers how to recognize and avoid materials handling hazards. Instructors should be well-versed in safety engineering and materials handling and storing. The training should reduce workplace hazards by emphasizing the following factors:

- Dangers of lifting without proper training
- Avoidance of unnecessary physical stress and strain
- Awareness of what a worker can comfortably handle without undue strain
- Proper use of equipment
- Recognition of potential hazards and how to prevent or correct them

FACT SHEET: DEMOLITION

Before the start of every demolition job, the manager and safety personnel for the demolition contractor should take a number of steps to safeguard the health and safety of workers at the job site.

Prior to starting all demolition operations, OSHA 1926.850 (a) requires that ***an engineering survey of the structure be conducted by a competent person.***

One of the most important elements of the pre-job planning is the location of all utility services. All electric, gas, water, steam, sewer, and other services lines should be shut off, capped or otherwise controlled at or outside the building before demolition work is started.

Prior to starting work, **provisions should be made for prompt medical attention** in case of serious injury.

A "fire plan" should be set up prior to a demolition job. The plan should outline the assignments of key personnel in a fire, and provide an evacuation plan for workers.

Mechanical demolition refers to demolition using equipment like a jackhammer or wrecking ball, rather than explosives.

The different forms of construction used in a number of more or less conventional structures built during the last few decades will give rise to a variety of problems when the time comes for them to be demolished. **Prestressed concrete** structures fall in this general category.

There are four main categories of prestressed members. The category or categories should be determined before attempting demolition, bearing in mind that any prestressed structure may contain elements of more than one category. This is an important step of the planning process, since prestressed members present particular safety concerns.

Confined Spaces

The hazards encountered when entering and working in confined spaces are capable of causing bodily injury, illness, and death. Accidents occur among workers because of failure to recognize that a confined space is a potential hazard. It should therefore be considered that the most unfavorable situation exists in every case and that the danger of explosion, poisoning, and asphyxiation will be present at the onset of entry.

Safe Work Practices When Demolishing a Chimney, Stack, Silo, or Cooling Tower

Inspection and Planning

When preparing to demolish any chimney, stack, silo, or cooling tower, the first step must be a careful, detailed inspection of the structure by an experienced person.

When hand demolition is required, it should be carried out from a working platform.

- Experienced personnel must install a self-supporting tubular scaffold, suspended platform, or knee-braced scaffolding around the chimney. Particular attention should be paid to the design, support, and tie-in (braces) of the scaffold.
- A competent person should be present at all times during the erection of the scaffold.
- It is essential that there be adequate working clearance between the chimney and the work platform.
- Access to the top of the scaffold should be provided by means of portable walkways.
- The platforms should be decked solid and the area from the work platform to the wall should be bridged with a minimum of two-inch thick lumber.
- A back rail 42 inches above the platform, with a midrail covered with canvas or mesh, should be installed around the perimeter of the platform to prevent injury to workers below. Debris netting may be installed below the platform.
- Excess canvas or plywood attachments can form a wind-sail that could collapse the scaffold.
- When working on the work platform, all personnel should wear hard hats, long-sleeve shirts, eye and face protection, such as goggles and face shields, respirators, and safety belts, as required.
- Care should be taken to assign the proper number of workers to the task. Too many people on a small work platform can lead to accidents.

General Safe Work Practice

Prior to the blasting of any structure or portion thereof, a complete written survey must be made by a qualified person of all adjacent improvements and underground utilities. When there is a possibility of excessive vibration due to blasting operations, seismic or vibration tests should be taken to determine proper safety limits to prevent damage to adjacent or nearby buildings, utilities, or other property.

Vehicle Safety

Vehicles used for transporting explosives shall be in good mechanical condition, and have tight floors, and any exposed spark-producing metal on the inside of the body shall be covered with wood or some other nonsparking material. No passengers should be allowed in any vehicle transporting explosives.

Explosives, blasting agents, and blasting supplies shall not be transported with other materials or cargoes. Blasting caps shall not be transported in the same vehicle with other explosives. If an open-bodied truck is used, the entire load should be completely covered with a fire and water-resistant tarpaulin to protect it from the elements. In no case should the explosives be piled higher than the closed sides and ends of the body.

Every motor vehicle or conveyance used for transporting explosives shall be marked or placarded with warning signs required by OSHA and the DOT.

Inventory Handling and Safe Handling

All explosives must be accounted for at all times and all not being used must be kept in a locked magazine. A complete detailed inventory of all explosives received and placed in, removed from, and returned to the magazine should be maintained at all times. Appropriate authorities must be notified of any loss, theft, or unauthorized entry into a magazine.

Proper Use of Explosives

Certain precautions must be taken to prevent accidental discharge of electric blasting caps from current induced by radar, radio transmitters, lightning, adjacent power lines, dust storms, or other sources of extraneous or static electricity.

These precautions shall include:

- Ensuring that mobile radio transmitters on the job site that are less than 100 feet away from electric blasting caps, in other than original containers, shall be de-energized and effectively locked.
- The prominent display of adequate signs, warning against the use of mobile radio transmitters, on all roads within 1,000 feet of the blasting operations.
- Maintaining the minimum distances recommended by the IME between the nearest transmitter and electric blasting caps.
- The suspension of all blasting operations and removal of persons from the blasting area during the approach and progress of an electric storm.

Disposal of Explosives

In general, explosives should be disposed of by burning them at an isolated outdoor location, at a safe distance from thoroughfares, magazines, and other structures.

FACT SHEET: HEALTH HAZARDS IN COMMUNICATION, NOISE and HEARING CONSERVATION and SILICA

It is important that safety and health programs contain provisions to protect workers from health hazards, including those presented by toxic or hazardous chemicals, elevated levels of occupational noise, and crystalline silica dust (a byproduct of operations in which quartz is ground into an airborne inhalant). Here, we give an overview of the major points covered in the module named above.

Health Hazards in Communication

OSHA's construction industry safety standards for Hazard Communication (*29 Code of Federal Regulations, Subpart Z, Toxic and Hazardous Substances, 1910.1200*) outlines systems and procedures meant to protect employees from the deleterious effects of hazardous chemicals.

"Chemicals pose a wide range of health hazards (such as irritation, sensitization, and carcinogenicity) and physical hazards (such as flammability, corrosion, and reactivity). OSHA's Hazard Communication Standard (HCS) is designed to ensure that information about these hazards and associated protective measures is disseminated."

Source: OSHA; What is Hazard Communication
http://www.osha.gov/SLTC/hazardcommunications/whatishazcom.html

The key elements of a standard chemical hazard communication program are:

***Labeling and Other Warnings* -** All chemicals in the workplace have to be labeled! The name of the chemical, the manufacturer's name and address (or that of the source of the sale), and any hazards it presents are required to be listed on the label. Warning information such as symbols, pictures (such as a skull for poison), etc. must be present, and the labels must be in English and clear and easy-to-read.

Material Safety Data Sheets **-** A readily available document that pinpoints crucial information about a material, including any health and/or physical hazards associated with it.

***Hazard Determination* -** The process of evaluating available scientific evidence to determine if a chemical is hazardous pursuant to the HCS. This evaluation identifies both physical hazards (e.g., flammability or reactivity) and health hazards (e.g., carcinogenicity or sensitization). The hazard determination provides the basis for the hazard information that is provided in MSDSs, labels, and employee training."

***Employee Information and Training* -** Employers must provide employees with effective information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new physical or health hazard employees have not previously been trained about is introduced into their work area.

***Written Hazard Communication* Program -** requires that employers fully document the actions taken to comply with all of the provisions of the standard and to list the person(s) responsible for each area of the program. A copy of the written program must be made available, upon request, to all employees and OSHA officials.

Trade Secrets – A chemical manufacturer may withhold the chemical identity, including the chemical name and other specific information, from the MSDS. In certain circumstances, however (such as an accident involving the chemical), this secret information must be disclosed to health care professionals or designated employees or representatives.

Noise and Hearing Conservation

Occupational noise – distracting and/or intrusive unwanted sound - is among the most pervasive occupational health problems, particularly in a field such as construction or manufacturing. **Hearing protection measures are necessary when the level of noise over an 8-hour time-weighted average is 85 dB or higher.**

OSHA's hearing conservation program is designed to protect workers with significant occupational noise exposures. You should not suffer hearing impairment from your job, even if you are subject to high noise over your entire working lifetime. The following components are the most important points in a successful hearing conservation program:

- Monitoring
- Engineering and administrative controls
- Audiometric testing
- Hearing protection
- Employee participation

The following steps should be taken in any monitoring procedure:

- Monitoring should be done at any site where noise exposure might be a problem, and should be repeated if changes at the site might increase the noise exposure.
- The monitoring process must be done during a normal workday, and workers may observe the process if they wish.
- The results of the monitoring should be made available to the employees as soon as possible, and should be in a format which can be easily understood.

Engineering and administrative controls are the first two steps toward resolving hazardous situations: remove the hazard if possible, and if not, then remove the worker from the situation (the third step is employing personal protective equipment (PPE) to minimize the remaining risks).

Your employer has to establish and maintain an audiometric testing program, which must be available free of charge to anyone exposed to 85 dB or more in an 8-hour (TWA) shift. There are several important elements of a testing program:

- Baseline audiograms
- Annual audiograms
- Follow-up procedures

Some types of hearing protection include:

- **Single-use earplugs** are made of waxed cotton, foam, silicone rubber or fiberglass wool. They are self-forming and, when properly inserted, they work as well as most molded earplugs.
- **Pre-formed** or **molded earplugs** have to be fitted for you by a professional, and can be disposable or reusable. Reusable plugs should be cleaned after each use.
- **Earmuffs** require a perfect seal around the ear. Glasses, facial hair, long hair or facial movements such as chewing can reduce the protective value of earmuffs.

Employers must provide their employees with a selection of at least one kind of ear plug and at least one type of earmuff. Workers should decide, preferably with the help of someone trained in OSHA-compliant hearing protection, which size and type of protection is most suitable for their work environment.

Silica

Crystalline silica is a common substance that is the main component of sand, quartz and granite rock. Occupational exposure to crystalline silica dust has long been known to produce silicosis, a dust disease of the lung.

Silica dust is produced during sandblasting, rock drilling, jack hammering, foundry work, stonecutting, quarrying, brick and concrete cutting and sawing, gunite operations, and many more procedures. But perhaps the most familiar use of quartz sand is as an abrasive blasting agent to remove surface coatings – particularly on bridges and concrete structures – prior to repainting or treating.

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

Chronic/classic silicosis, the most common, occurs after 15–20 years of moderate to low exposures to respirable crystalline silica. Symptoms may or may not be obvious, so workers should have a chest x-ray to see if there is lung damage. As the illness progresses, shortness of breath upon exercising and clinical signs of poor oxygen/carbon dioxide exchange may become evident. In the later stages, fatigue, extreme shortness of breath, chest pain, or respiratory failure can occur.

Accelerated silicosis can occur after 5–10 years of high exposures to respirable crystalline silica. Symptoms include severe shortness of breath, weakness, and weight loss. The onset of symptoms takes longer than in acute silicosis.

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

How Can You Protect Yourself?

- Replace crystalline silica materials with safer substitutes, whenever possible.
- Use all available work practices to control dust exposures, such as water sprays.
- Wear only a N95 NIOSH certified respirator, if respirator protection is required.
- Wear only a Type CE abrasive-blast supplied-air respirator for abrasive blasting.
- Wear disposable or washable work clothes and shower if facilities are available.
- Do not eat, drink, smoke, or apply cosmetics in areas where crystalline silica dust is present.

- Provide engineering or administrative controls, where feasible, such as local exhaust ventilation, and blasting cabinets.