



Electrical Safety: Avoiding Arc Flashes

Have you ever seen a quick spark when working with electrical equipment? Or how about an arc flash—a larger spark that bridges a gap, that lasts longer? An arc flash occurs when electricity travels through the air from one conducting surface to another or to ground. This type of electrical discharge has a high current density and is very dangerous.

Each year, over 2,000 people are burned from arc flash incidents. Many of the burn incidents were the result of human error—not faulty equipment or poorly engineered electrical installations. Here we discuss some practices to create an electrically safe work condition.

An arc flash can occur when circuit breakers and disconnects are opened and closed, when exposed electrical equipment is touched with a tool, or when equipment fails. The most effective way to prevent an arc flash is to de-energize or disconnect and lock out the power source before starting any maintenance or repair work.

Worker responsibilities

An *unqualified person* is an employee who works around exposed, energized electrical equipment but does not have any specialized knowledge or training in the construction or operation of the equipment. Such a worker never works directly on or close to the live equipment or parts. If you are in this category of worker, you should still know how to remain safe around the equipment in your work area.

If you are a *qualified person*, you need to know and follow these procedures to create an electrically safe work condition:

1. Determine all the possible sources of energy supply to the equipment.
2. After shutting off or isolating the load current, open the disconnecting device (s) for each energy source.
3. Verify all elements of the disconnecting device are open or that circuit breakers are in the fully disconnected position.
4. Apply lockout/tagout devices according to established procedures.
5. Test the voltage using only testing equipment that is in perfect working condition and that is rated for the equipment being tested.
6. Apply appropriate grounding devices as necessary in case stored electrical energy exists.

It is important to never take a shortcut—if you don't shut off the power and lock out the power source, this could lead to an arc flash that can cause you great bodily harm in just a few milliseconds.

The importance of PPE

Even when these procedures aren't followed, and an arc flash does happen, you can avoid injury by wearing appropriate personal protective equipment (PPE). You should do the following:

- Wear all arc-rated PPE, such as nonconductive head protection, safety glasses, and arc-rated face shield.
- Never wear synthetic materials made of nylon, acetate, or rayon as outer clothing—they will burn or melt when exposed to an arc flash.
- Don't wear metal objects on clothing—no metal buttons and zippers.
- Make sure your protective clothing is rated flame-resistant.

Get a handle on hand tools *Know how to use them safely*

Hand tools—from axes to wrenches—are powered manually. But just because they don't have a power cord, that doesn't mean you can't get hurt.

A few general rules of thumb will help ensure that no fingers or other body parts are injured while using hand tools.

- When using blades, knives, or other tools, always direct the tools away from aisles and away from other employees working nearby.
- Keep knives and scissors sharp, because dull knives can cause more hazards than sharp ones.
- Cracked saw blades must be removed from use.
- Don't use wrenches if the jaws are sprung to the point that slippage occurs.
- Be vigilant to the presence of sparks when using iron or steel hand tools, which can be a source of ignition around flammable substances. Instead, use spark-resistant tools where flammables are used or stored.

Also, be aware that it's all about using the right tool for the job. According to the National Institute for Occupational Safety and Health (NIOSH), non-powered hand tool use can contribute to musculoskeletal disorders. The solution is to choose the right tool for the job. Know how to identify the tools that will accomplish the specific purpose at hand.

Always be aware of the dangers of using hand tools in awkward postures, which can create unnecessary demands on the body. The best hand tool is one that requires the least continual force. This can reduce pain and fatigue by keeping the neck, shoulders, and back relaxed.

Reduce risk by using hand tools that:

- Do not have sharp edges or finger grooves on the handle,
- Are coated with soft material,
- Have an angle that allows work to be done with a straight wrist,
- Can be used with either hand, *and*
- Have a nonslip surface for better grip.

Speak up when you feel discomfort while using a hand tool (or any tool, for that matter). Advise your supervisor or member of the safety staff if you experience these symptoms:

- Tingling;
- Swelling in the joints;
- Decreased mobility;
- Decreased grip strength; *or*
- Pain related to movement, pressure, or exposure to cold or vibration.

Carbon Monoxide awareness for construction workers

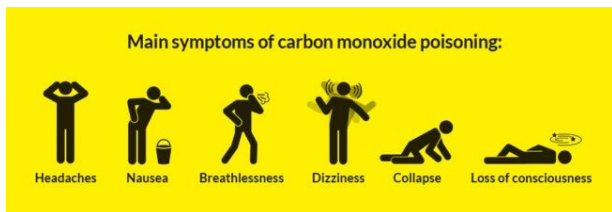
According to the Occupational Safety and Health Administration (OSHA), inhalation of carbon monoxide (CO) is the number 1 cause of death of construction workers who breathe in chemicals. CO is a gas produced by the burning of fuel that contains carbon.

CO is odorless, colorless, tasteless gas so people may not realize they are exposed to it—but exposure to CO without proper ventilation can cause permanent neurological damage or even be fatal. Workers who operate gas-powered equipment are at risk for CO poisoning if care is not taken to ensure that the exhaust from the equipment can escape the work space. Examples of common gas-powered equipment at construction sites include:

- Gas-powered concrete saw
- Portable generators
- Portable industrial heaters
- Trowels
- Water pumps
- Pressure washers

How to keep yourself safe

Alternatives, like hydraulic saws, do not output dangerous exhaust fumes. If possible, work with equipment that does not require gas to run. If you do work with gas-powered equipment, make sure there is adequate ventilation—never let all the doors or windows be covered or closed. Note that just because a door is open does not guarantee your safety. There still may not be adequate ventilation to allow CO to escape quickly and avoid build up. Therefore, always ensure that your work space has a CO detector or that you wear a personal device that will sound an alarm when the level of the gas in the air reaches an unsafe level. If you are feeling dizzy, get to fresh air immediately.



Electrical Safety: Quiz

1. The intensity of an electric shock is primarily controlled by how large the _____ is.
 - A. Voltage (i.e., volts)
 - B. Current (i.e., amperes)
 - C. Power (i.e., watts)
2. Most metal is considered a(n) _____ because electricity flows through it easily.
 - A. Capacitor
 - B. Insulator
 - C. Conductor
3. According to OSHA, _____ is/are the most common electricity-related injury.
 - A. Muscle spasms
 - B. Burns
 - C. Death
4. When working in a damp or wet environment, the risk from electrical hazard increases.
 - A. TRUE
 - B. FALSE

Answers:

1. **Current.** While it is commonly thought that high voltage poses the most danger, it is actually current (the amount of electricity flowing per second) that controls the human physiological response to electric shock. **2. Conductor.** Metal is a good conductor, and that's why it is used to make wires. Wires are usually coated in an insulator, like plastic, because electricity won't flow through it. **3. Burns.** You can sustain burns when electricity flows through the tissue or bones in your body, or when your skin makes contact with a hot surface of something that is electrified. You can also be burned indirectly by the high temperature of an arc or explosion. **4. TRUE.** When skin is moist or wet, it is a better conductor of electricity than when it is dry. Therefore, you must be extra cautious when handling electrical equipment under damp conditions.

Hands-On Safety

According to the Occupational Safety and Health Administration (OSHA), the greatest hazards posed by hand tools are from misuse and improper maintenance. Consider these common hazards:

- If a chisel is used as a screwdriver, the tip of the chisel may break and fly off, hitting the worker or others.
- If a wooden handle on a tool like a hammer or an axe is loose, splintered, or cracked, the head of the tool can fly off and strike the user or somebody nearby.
- If the jaws of a wrench are sprung, the wrench can slip.
- If impact tools like chisels or wedges have mushroomed heads, the heads can shatter on impact, sending shards flying.

Employers are responsible for the safe condition of tools and equipment, according to the regulations. And they must train employees in the proper use and handling of tools and equipment.