

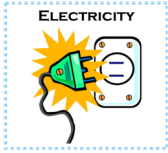


Training Circular

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Risk Management Issues

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Working Safely with Electricity



Working with electricity can be dangerous. Engineers, linemen, electricians, and others work with electricity directly, including overhead lines, cable harnesses, and circuit assemblies. Office workers and offenders work with electricity indirectly or directly and may also be exposed to electrical hazards. Accidental contact with electrical currents can cause injury, fire, extensive damage and even death. It is very important to remember that working with and around electricity requires your full attention and respect.

zero energy state prior to beginning electrical work. Refer to NFPA 70E for information regarding Arc Flash Safety.

ground all exposed metal parts of equipment.

- Do not grab a person that is being shocked by electricity.

Avoid standing in wet areas when using portable electrical power tools.

Inspections

Inspect your electrical tools on a regular basis, including large tools such as table saws, drill presses, and bench grinders. Test your equipment first before starting to work. If any tool gives you a slight shock, or smokes and sparks when the power is turned on, do not use it.



Electrical Incidents

If the power supply to the electrical equipment is not grounded or the path has been broken, fault current may travel through a worker's body, causing electrical burns or death. Even when the power system is properly grounded, electrical equipment can instantly change from safe to hazardous because of extreme conditions and rough treatment.

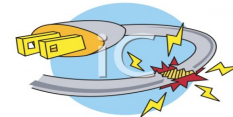


Ensure Safe Working Environment

Electrical safety involves more than just ensuring that electrical equipment is in good working order, it also involves ensuring that you can get to the main power source as quickly as possible without climbing over obstructions in the event of an emergency.

Keep the aisles, walkways, and workspaces clean and clear of garbage, and make sure all flammable liquid, such as gases or chemicals, are stored away from the area where any electric tool will be operated. Many electric tools produce sparks, which could ignite the flammable liquid's fumes and cause extensive damage. Follow RM-20 "Control of Potentially Hazardous Energy (Lockout/Tagout)" to verify a

- Visually inspect electrical equipment before use. Take any defective equipment out of service.
- Ground all power supply systems, electrical circuits, and electrical equipment.
- Frequently inspect electrical systems to insure that the path to ground is continuous.
- **Do not remove ground prongs from cord- and plug-connected equipment or extension cords.**
- Use double-insulated tools and



Inform Your Supervisor of Faulty Equipment

Contact with electricity does not have to happen if you follow a few simple guidelines. Do not attempt to repair the equipment yourself. Lock out the equipment or, at the very least, tag it so others are aware that the equipment is damaged. Follow procedures outlined in AD-10.20 for state owned units and facilities or the Office of Space Management (OSM) Tenant Manual to report any deficiencies.

Wear Protective Clothing

You should make it part of your routine to wear rubber gloves and rubber-soled shoes or boots, especially if you are working around electricity in a damp environment.

Equipment

Due to the dynamic, rugged nature of construction work, normal use of electrical equipment causes wear and tear that results in insulation breaks, short-circuits, and exposed wires.

GFCIs

-A ground fault circuit interrupter (GFCI) is a device that shuts off an electric power circuit when it detects that current is flowing along an unintended path, such as through water or a person.

A GFCI is a fast-acting circuit breaker that senses small imbalances in the circuit caused by current leakage to ground and, in a fraction of a second, shuts off the electricity. The GFCI continually matches the amount of current going to an electrical device against the amount of current returning from the device along the electrical path. Whenever the amount "going" differs from the amount "returning" by approximately 5 milliamps, the GFCI interrupts the electric power within as little as 1/40 of a second. (See diagram.) The GFCI, however, does not protect from line-to-line contact hazards—such as a worker holding two "hot" wires or a hot and a neutral wire in each hand. It protects against the most common form of electrical shock hazard—the ground fault, and protects against fires, overheating, and destruction of insulation on wiring.

You must have a GFCI if it is within 6 feet of a water source. Coin operated vending machines are required to be GFCI protected.



Power Strips

"Power strips" (as they are most commonly referred to) "Surge/Spike Protectors" or "Portable Outlets," typically consist of several components, such as multiple electrical receptacles, on/off power switch, circuit breaker, and a grounded flexible power cord. Power strips are designed for use with a number of low-powered loads, such as computers, peripherals, or audio/video components. Power loads are addressed by 29 CFR §1910.304(b)(2), *Outlet devices: "Outlet devices shall have an ampere rating not less than the load to be served."*

Power strips are not designed for high power loads such as space heaters, refrigerators and microwave ovens, which can easily exceed the recommended ampere ratings on many power strips.

These are some of the most common findings written up during inspections.

They must also meet the requirements of (OSHA) §1910.305(g)(1), *Use of flexible cords and cables*. For example, the flexible power cord is not to be routed through walls, windows, ceilings, floors, or similar openings.

Extension Cords

Normal wear on cords can loosen or expose wires. Cords that are not 3-wire type, not designed for hard-usage, or that have been modified, increase your risk of contacting electrical current.

- Use only equipment that is approved to meet OSHA standards.
- **Do not modify cords or use them incorrectly.**
- To reduce hazards, flexible cords must connect to devices and to fittings in ways that prevent tension at joints and terminal screws. Flexible cords are finely stranded for flexibility, so straining a cord can

cause the strands of one conductor to loosen from under terminal screws and touch another conductor. Use only cords, connection devices, and fittings that are equipped with strain relief.

- Remove cords from receptacles by pulling on the plugs, not the cords.

Outlet Safety

Outlets can become a problem when the contacts become weak and cords start falling out of them. The wires inside have a certain tension rating that is required to hold the plug in place. Check for loose electrical connections to the terminals of the outlets and never use the push-in-terminals. Replace cracked or broken outlets and wall plates. Both OSHA and NFPA require that outlets and switches remain covered. If easily combustible materials, such as paper or cardboard, are stored near unprotected energized wiring, a spark or electrical arc could easily start a fire. If you find anything in question please contact maintenance personnel or Risk Management .



Power Lines

Overhead and buried power lines are especially hazardous because they carry extremely high voltage. Fatal electrocution is the main risk, but burns and falls are also hazards.

- Look for overhead power lines and buried power line indicators.
- Stay at least 10 feet away from overhead power lines and assume they are energized.

- De-energize and ground lines when working near them.
- Use non-conductive wood or fiberglass ladders when working near power lines.

Generators

Most generators are gasoline powered and use internal combustion engines to produce electricity. Carbon monoxide is a colorless and odorless gas produced during the operation of gasoline powered generators

When inhaled, the gas reduces your ability to utilize oxygen. Symptoms of carbon monoxide poisoning include headache, nausea, and tiredness that can lead to unconsciousness and can ultimately prove to be fatal.

- **DO NOT** bring a generator indoors. Be sure it is located outdoors in a location where the exhaust gases cannot enter a home or building. **Good ventilation is the key.**
- Be sure that the main circuit breaker is OFF and locked out prior to starting any generator. This will prevent inadvertent energization of power lines from back feed electrical energy from generators and help protect utility line workers from possible electrocution.
- Turn off generators and let them cool prior to refueling.

Never Throw Water on an Electrical Fire

Water and electricity do not mix. In fact, water is an excellent conductor of electricity, and if water is thrown on an electrical fire, it will only spread the fire. Instead, use an appropriate ABC dry chemical fire extinguisher.

Make sure you receive training and know how to operate a chemical fire extinguisher and where the nearest one is in case of emergency. If you have questions or have difficulty locat-

ing an extinguisher, ask your supervisor for help.

CO₂ or Dry Chemical - Carbon Dioxide Extinguishers:

This type of extinguisher is filled with Carbon Dioxide (CO₂), a non-flammable gas under extreme pressure. These extinguishers put out fires by displacing oxygen, or taking away the oxygen element of the fire triangle. Because of its high pressure, when you use this extinguisher pieces of dry ice shoot from the horn, which also has a cooling effect on the fire.

You can recognize this type of extinguisher by its hard horn and absent pressure gauge.






Dry Chemical Extinguishers:

Dry chemical extinguishers put out fires by coating the fuel with a thin layer of fire retardant powder, separating the fuel from the oxygen. The powder also works to interrupt the chemical reaction, which makes these extinguishers extremely effective.

Dry chemical extinguishers are usually rated for class B and C fires and may be marked multiple purpose for use in A, B, and C fires. They contain an extinguishing agent and use a compressed, non-flammable gas as a propellant.

ABC fire extinguishers are red in color, and range in size from five pounds to 20 pounds.

Dry Chemical extinguishers will have a label indicating they may be used on class A, B, and/or C fires.

| CLASSES OF FIRES | TYPES OF FIRES | PICTURE SYMBOL |
|------------------|--|---|
| A | Wood, paper, cloth, trash & other ordinary materials. |  |
| B | Gasoline, oil, paint and other flammable liquids. |  |
| C | May be used on fires involving live electrical equipment without danger to the operator. |  |
| D | Combustible metals and combustible metal alloys. |  |
| K | Cooking media (Vegetable or Animal Oils and Fats) |  |

References:

- OSHA
⇒ <https://www.osha.gov/>
- TDCJ-Risk Management - RM-20
⇒ AD 10:20



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