



Electrical Safety Basic Awareness

OSHA 29 CFR 1910 Subpart S





Electrical Injuries

An Average of one worker is electrocuted on the job every day!

There are four main types of electrical injuries:

- Electrocutation (death due to electrical shock)
- Electrical shock
- Burns
- Falls





How is an Electrical Shock Received?

An electric shock occurs **when a person comes into contact with an electrical energy source**. Electrical energy flows through a portion of the body causing a shock. Exposure to electrical energy may result in no injury at all or may result in devastating damage or death.





Electrical Burns

- Are the most common shock related nonfatal injury
- Occur when you touch electrical wiring or equipment that is improperly used or maintained
- Typically occurs on the hands
- Very serious injury that needs immediate attention





Falls

- Electrical shock can also cause indirect or secondary injuries.
- Employees working in an elevated location who experience a shock can fall resulting in serious injury or even death.





Inadequate Wiring Hazards

A hazard exist when a conductor is too small to safely carry the current.

Example: Using a portable tool with an extension cord that has a wire too small for the tool

- Tool draws more current than cord the cord can handle= overheating, possible fire without tripping the circuit breaker
- Circuit breaker could be the right size for the circuit but not for the smaller wire extension cord



Hazards of Overloading

- Too many devices plugged into circuit = wires heat to very high temperature = possible fire.
- Wire insulation melts = arcing may occur = fire in area where overload exists (even inside a wall).





Electrical Protective Devices

- Shut off electricity flow in the event of an overload or ground-fault in the circuit.
- Include fuses, circuit breakers, and ground-fault circuit interrupters (GFCI).
- Fuses and circuit breakers are “over current” devices (too much current = fuses melts and circuit breakers “trip” open).



Ground Fault Circuit Interrupter

- Detects a difference in current between the black and white circuit wires (could happen when electrical equipment is not working properly causing a current “leakage” known as ground fault).
- Ground fault detected= GFCI can shut off electricity flow in as little as 1/40 of a second protecting you from a dangerous shock.





Examples: OSHA Electrical Requirements

The path to ground from circuits, equipment, and enclosures must be permanent and continuous.

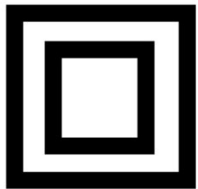
The violation shown here is an extension cord with the third/ground prong missing.





Examples: OSHA Electrical Requirements

Double insulated symbol



- Hand-held electrical tools pose a potential danger because they make continuous contact with the hand. *(Unless they are properly insulated)*
- To protect you from shock, burns, and electrocution, tools must have a 3 wire cord with ground and be plugged into grounded receptacle.





Guarding Live Parts

Must guard “live” parts of electric equipment operating at ≥ 50 volts against accidental contact by:

- Approved cabinets/enclosures or
- Location or permanent partitions (thereby only accessible to qualified persons)
- Mark entrances to guarded locations with conspicuous warning signs



Guarding Live Parts

- Where electrical equipment is in locations that it can suffer physical damage it must be guarded.

The violation shown here is physical damage to conduit.





Cabinets, Boxes, Fittings

- Junction boxes, pull boxes, and fittings must have approved covers.
- Unused openings in cabinets, boxes and fittings must be closed (no missing “knockouts”).

Photo shows violations of these two requirements.





Use of Flexible cords

- Flexible cords more vulnerable than fixed wiring.
- Flexible cords must be made by industrial commercial quality.
- Flexible cords may not be used as permanent wiring.
- Improper use of flexible cords can cause shocks, burns, or fire.
- Approved by a recognized testing agency.



**Underwriters
Laboratories**





Flexible cords

- Uncoil an extension cord fully before use.
- Be sure the amperage of the cord is appropriate for the job you are doing.
- Do not use equipment that delivers mild electrical shocks, gives off unusual heat or smells odd.
- If in doubt, have it checked and repaired or replaced.





Flexible cords

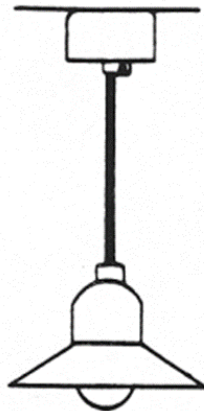
Extension cords shall not be fastened with staples, hung from nails, or suspended by wire.



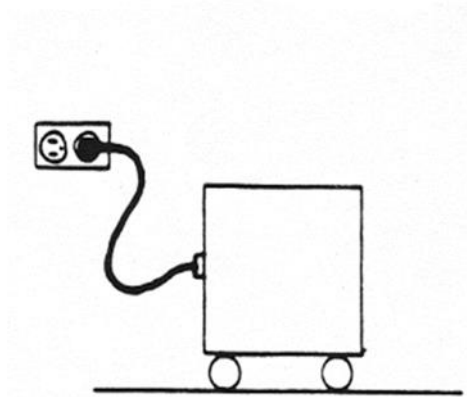


Permissible Uses of Flexible cords

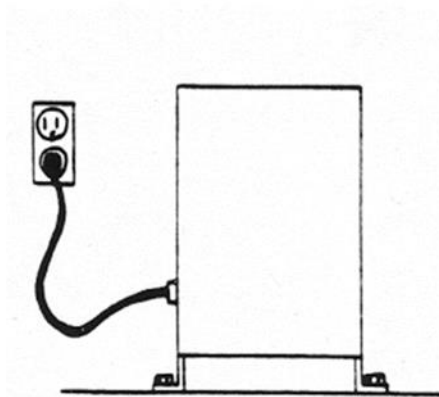
Examples



Pendant or Fixture Wiring



Portable lamps, tools or appliances

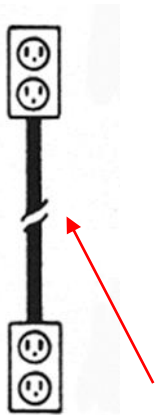


Stationary equipment to facilitate interchange

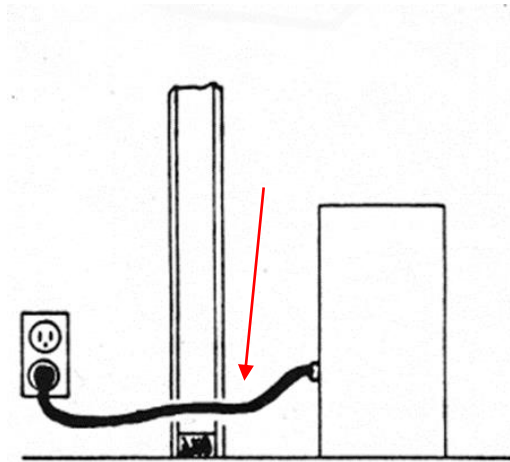


Prohibited Uses of Flexible cords

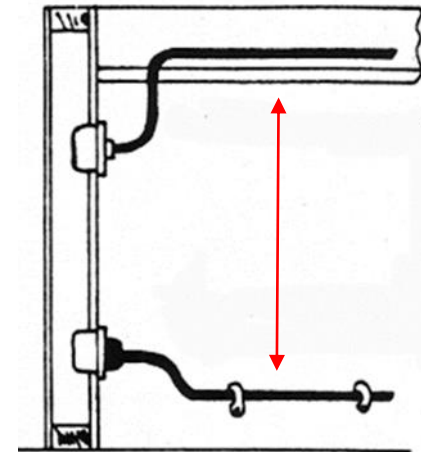
Examples



Substitute for fixed wiring



Run through walls, ceilings, floors, doors, or windows



Concealed behind or attached to building surfaces

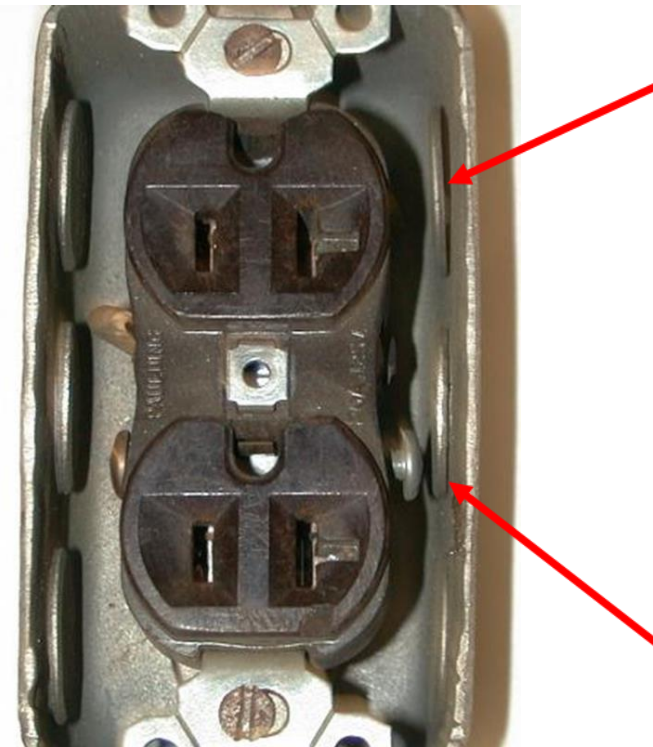


UNSAFE



Left side: We have the insulation removed from the orange extension cord.

Right side: We have a box with knockouts. The grounding screw is also in contact with the box.



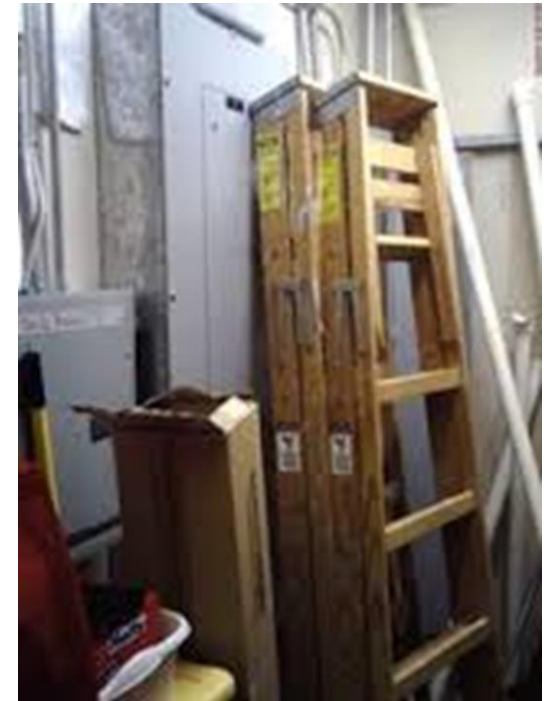


UNSAFE

Right side: We do not chain materials to electrical lines; if the material falls it puts a strain on the line or separates the line from its connections.

Left side: Ladders against the box contribute combustible materials should there be an electrical fire. Also, this limits access which may be required to shut the system down or isolate breakers (OSHA states there should be at least 3 feet of clearance around an electrical box).

Also, if there is a fault in the electrical box, could the current flow to the outside of the box contacting conductive materials and be a possible shock or electrocution hazard?





UNSAFE



Left side: Another situation where combustible storage obstructs the box.

Left side: Portable power tool with damaged cord. Also appears to be resting on a conductive surface.



UNSAFE



Right side: Missing insulation on cords.

Left side: Permanency attempted by screwing a "bridge" between extension cord and adapter. Again, "Homemade" might get you hurt!

Professionally manufactured cords must abide by specific standards. They also go through extensive quality control.

Quality Control for "homemade" stuff is usually, "Yep, looks good to me." This does not assure safety.



UNSAFE



Left side: Extension cord under carpet permits foot traffic to compress cord and insulation to the point of thinning and distressing the insulation. Potential fire and shock hazard.
Right side: Multiple lines into a power strip permits cords to heat up. Fire hazard.



UNSAFE



Left side: Grounding prong in receptacle. Seek professional help to remove and replace receptacle.
Right side: Damaged insulation and wiring. Destroy and replace.





UNSAFE



Left side: Cord is tangled; tripping hazard.
Right side: Multiple gang boxes showing the possibility of appliances and tools to far exceed the voltage restrictions on the line.



Top 5 – Electrical Fire Causes

1. Most electrical fires are caused by faulty electrical outlets and old, outdated appliances.

Removing the ground plug from a cord so it can be used in a two-prong electrical outlet can also cause a fire.

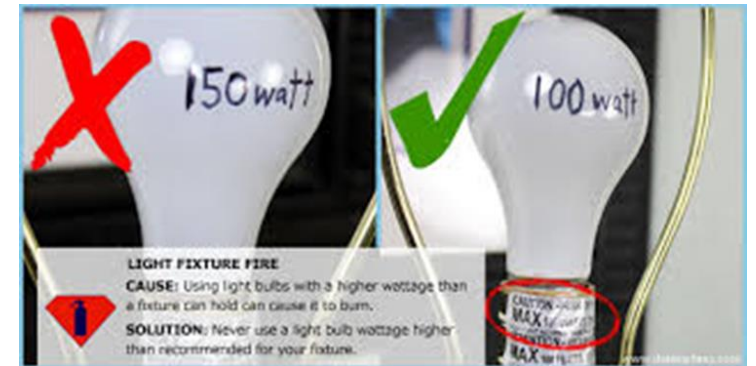




Top 5 – Electrical Fire Causes

2. Light fixtures, lamps and light bulbs are another common reason for electrical fires.

- Installing a bulb with a wattage that is too high for the lamps and fixtures is a leading cause of electrical fires.
- Always check the maximum recommended bulb wattage on any lighting fixture or lamp and never go over the recommended amount.

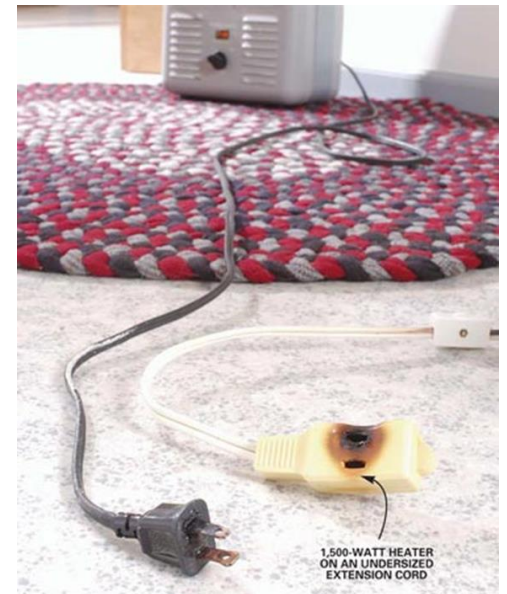




Top 5 – Electrical Fire Causes

3. Misuse of extension cords is another electrical fire cause.

- Appliances should be plugged directly into outlet and not plugged into an extension cord for any length of time
- Only use extension cords as a temporary measure.
- If you do not have the appropriate type of outlets for your appliances, hire an electrician to install new ones.





Top 5 – Electrical Fire Causes

4. Space heaters are a major cause of electrical fires

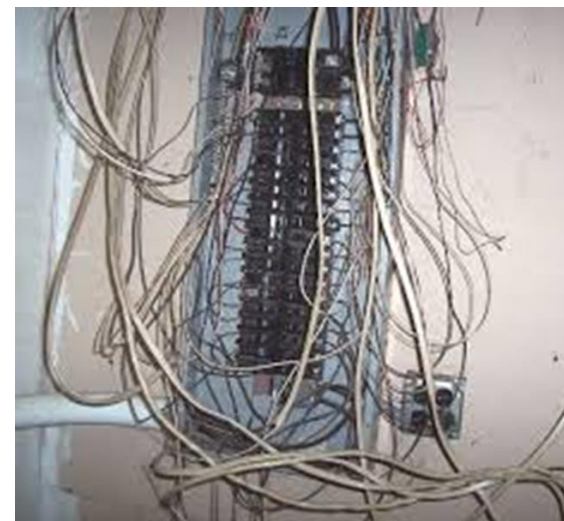
- Because these types of heaters are portable, many times people put them too close to combustible surfaces such as clothing, chairs, and rugs.
- Coil space heaters are especially dangerous
 - If you do use space heaters, use the radiator-type that diffuse heat over the entire surface of the appliance.





Top 5 – Electrical Fire Causes

5. Outdated wiring often causes electrical fires.
 - Breakers should be triggered when circuits get overloaded by too much electricity
 - Outdated breaker boxes often have worn connectors that do not work, causing the system to overload and start an electrical fire.





Safety

- **Check the information on your cord.**
 - Extension cords are labeled with valuable information as to the use, size and wattage rating of the cord.
 - Cords offered in many lengths and are labeled with size or “gauge”.
- **Determine the gauge needed.** All appliances indicate how much wattage is consumed when operated.



Safety

- Decide whether you will be using the appliance indoors or outdoors.
 - Extension cords that can be used outdoors will be clearly marked “Suitable for Use with outdoor Appliances.”
- Never use an indoor extension cord outdoors; it could result in electric shock or fire hazard.





Safety

- **Determine how long you need the cord to be.** A cord, based on its gauge, can power an appliance of a certain wattage only at specific distances.
 - As cord gets longer, the current carrying capacity of the cord gets lower.
 - Example: 16 gauge extension cord less than 50 feet in length can power a 1625 watt (W) appliance; 16 gauge cord that is longer than 50 feet can only power an appliance up to 1250W.



Safety

Place the cord correctly.

- Do not place underneath carpets or heavy furniture.
- Should not be tacked in place to a wall.
 - Use proper fastener.
- Should not be used while coiled or bent.
- Match the length of the cord to the length of your needs.





Training

Train employees working with electrical equipment in safe working practices including:

- De-energizing electrical equipment before inspecting or making repairs
- Using electric tools in good condition
- Using good judgement when working near energized equipment
- Using appropriate personal protection equipment (PPE)



Summary

- Extension cords must be “of proper size and temperature rating to withstand the electrical load and approved by a recognized testing agency.”
- Always check applicable regulations/standards before buying or using extension cords at work.



Summary

Hazards

- Inadequate wiring
- Exposed electrical parts
- Wires with bad insulation
- Ungrounded electrical tools/equipment
- Overloaded circuits
- Damaged power tools/equipment
- Overhead power lines

All hazards are made worse in wet conditions!





Summary

PROTECTIVE MEASURES

- Proper grounding
- Using GFCI's
- Using circuit breakers and fuses
- Proper use of flexible cords
- Training



Contact Information

Golden Nugget Las Vegas
Safety Department

