

ELECTRICAL SAFETY WORK PRACTICES AND PERSONAL PROTECTIVE EQUIPMENT

Any employee who works in/around energized equipment and has the potential to come into contact with "live" exposed parts must be provided and use **Personal Protective Equipment (PPE)**. The following are basic guidelines for the proper use of electrical PPE.

- PPE should be used whenever you could come into contact with exposed electrical parts. Give this statement some thought. An example of a situation in which you could inadvertently come into contact with live voltage is while resetting a switch that is located inside a panel box that contains exposed live wires, etc.
- PPE must be designed for the work being performed. You must make sure that electrical gloves, insulated tools, etc. are rated for the voltage levels they will be used around. Electrically rated tools will be clearly labeled with the amount of voltage for which they are approved. Do not exceed the tool's electrical rating!
- Always inspect your electrical tools and PPE before each use to make sure they are in good condition and will work properly. If you find that a tool has been damaged, or that PPE has tears or holes, you need to replace the item before conducting the assigned work. In order to protect electrical insulated gloves from puncture, they are often worn under thicker, heavier leather gloves.
- You must wear non-conductive head protection if you are working in a location that present a possible electrical hazard to your head (bumping into exposed lines, parts, etc.). Class A hard hats provide limited protection against electricity up to 2,200 volts. Class B hard hats are highly resistant to electricity up to 20,000 volts.
- You must wear eye and face PPE, such as face shield and safety glasses, whenever there is a possibility of electrical arcs or explosion. Safety glasses should always be worn underneath a face shield. A face shield alone does not provide enough protection.
- All test instruments and equipment (volt, ammeters, ohm meters) and associated leads, cables, power cords, probes, and connectors must be visually inspected for external defects and damage before the equipment is used. If any defect or damage is noted remove the item from service.
- All Qualified Electrical Workers are required to wear electrically rated steel-toed boots at all times.

- Utilize approved fuse handling equipment that is insulated for the circuit voltage to remove or install fuses. Never use a non-insulated tool to remove a fuse. Many electrical related deaths have occurred when an employee uses a pair of channel locks or pliers to remove a live fuse.
- You may be required to utilize insulating materials, such as non-conductive matting and insulated blankets. If used properly, these pieces of equipment provide a barrier between your body and the energized part.

SAFE WORK PRACTICES

Now that we have reviewed some of the basic electrical PPE and tools that a qualified employee may be required to use, let's review some common sense Safe Work Practices that you need to remember.

The following work practices need to become an integral part of you day to day activities as a qualified employee.

- When normally enclosed live parts are exposed for maintenance or repair, they shall be guarded to protect unqualified persons from contact with live parts. Barricades may be used if necessary. If barricades are not sufficient, then attendants must be used. Safety signs and tags must be used to warn employees of electrical hazards which may endanger them.
- When trouble shooting energized components, you should always wear the correct rated PPE and use the correct insulated tools. After identifying the problem, all LOTO procedures for the control of energy must be utilized along with verification of energy control. After repairs have been made, all electrical covers shall be replaced and secured, and all employees cleared from the immediate area before removing LOTO and energizing components. This will help prevent the chance of injury associated with incorrect wiring or Arc Flash.
- Qualified employees may not approach, or take any conductive object without an approved insulating handle, closer than 4 feet to any exposed energized parts. Approved electrical gloves, sleeves, fire resistant clothing, and tools must be utilized if approaching closer than 4 feet.
- Conductive items, such as jewelry, watch bands, bracelets, rings, key chains, necklaces, may not be worn if they might contact exposed energized parts.
- Always use ladders with non-conducting side rails when working around electricity. Metal ladders should never be used when working around electrical installations.

- **Ground Fault Circuit Interrupters (GFCI's).** GFCI's are electrical devices that are designed to detect ground faults. Ground faults occur when electrical current is "leaking" somewhere outside it's intended pathway. If your body provides the path to ground for the leaking current, you could receive a shock, or be electrocuted. GFCI's should be used in all wet locations and on outside outlets.

- **Make sure equipment cords are in good condition.** Equipment cords should be free of cracks and should not be frayed, or have exposed copper wire. Electrical extension cords are an acceptable means of providing temporary electrical power, however they cannot be used to substitute for permanent electrical installations. When using extension cords, observe the following guidelines: 1. Make sure extension cords are UL or Factory Mutual listed and are of the three prong type; 2. Use only power bars that have a fuse or breaker incorporated into the bar itself; 3. Do not use two prong, ungrounded cords in a laboratory setting; 4. Make sure the extension cord is protected from damage - periodically inspect the cord for damage and wear; 5. Do not run cords through walls, doors, under rugs, or across aisles; 6. Do not wrap extensions cords around electrical fixtures or ventilation pipes; 7. Do not attempt to repair extension cords with electrical tape, or wire nuts - purchase a new cord; 8. Make sure the total number of watts connected to the extension cord does not exceed the rating of the cord. An extension cord can be overloaded if you attach too much equipment to the cord. Heavy duty extension cords may be needed for high-wattage appliances and equipment.

- **Make sure plugs fit your outlets.** Never remove the third prong (ground pin) to make a three prong plug fit a two prong outlet. Never force a plug into an outlet that it does not fit. Plugs should fit securely into outlets. Avoid overloading outlets with too many appliances.

- **Do not leave plugged-in appliances/tools where they might come into contact with water.** If a plugged-in tool falls into water, **NEVER** reach in to pull it out, even if it is turned off. **ALWAYS** unplug the tool first.

- **Poor housekeeping is a major factor in many electrical accidents and fires.** A cluttered area is both unsafe and inefficient. Electrical boxes should remain accessible at all times and should never have equipment, etc. placed in front of them. Flammable materials should not be stored in electrical equipment rooms at any time. Use instructions, signs, or barriers to protect people from electrical hazards.

- **Always consider electrical equipment energized unless proven otherwise.** Electrical devices should not be modified beyond the intent of their design. Some examples of misuse include: Pulling out a plug by the cord rather than the plug, inserting wires or objects other than a standard plug into a receptacle, constructing homemade extension cords from

standard junction boxes and receptacles, modifying a plug to enable it to fit a receptacle for which it was not intended.

RESCUE PROCEDURES

Now that we have reviewed some common sense Safe Work Practices that you will use when working around electricity, let's review what you should do in the event of an emergency.

- Electricity, even at small voltages (110V) can cause severe injury or death by causing a person's heart or lungs to stop working. In addition, electricity can also cause minor to severe burns. Serious electrical burns often times appear to be minor, due to the fact that body tissues and organs are damaged internally. If a co-worker has come into contact with electricity they may not be able to remove themselves from the electrical source. **DO NOT ATTEMPT TO PULL THE PERSON FROM THE ELECTRICAL SOURCE WITH YOUR BARE HANDS, YOU MAY BE ELECTROCUTED.** Remember, your body is a good conductor of electricity, if you touch the person while they are connected to the electrical source, the electricity will flow through your body causing electrical shock. You should first attempt to turn off the source of the electricity (disconnect). If you cannot locate the electrical isolating source, you can use a non-conducting object to remove the person from the electrical source. Emergency medical services should be called as soon as possible.
- Once you have removed the victim from the electrical source, check to see if the person is breathing and if they have a pulse. If necessary, administer CPR (if you are trained) until emergency personnel arrive at the scene.
- Never go near a victim that has been electrocuted by a high voltage line, because the electricity can travel several feet through the air and you could be electrocuted during rescue procedures.

These are basic electrical safe work practices and should be included for Electrical Arc Flash Protection. If at any time you are unsure of conditions or work practices that pertain to electrical work or exposure in the work place, stop immediately and get your plant management to get clarification.