MAJOR PROGRAM POINTS

"ELECTRICAL SAFETY IN THE WORKPLACE"

Part of the "GENERAL SAFETY SERIES"

Quality Safety and Health Products, for Today...and Tomorrow

Outline of Major Points Covered in the "Electrical Safety" Course

The following outline summarizes the major points of information presented in the course on "Electrical Safety". The outline can be used to survey the course before taking it on a computer, as well as to review the course when a computer is not available.

- **When we discuss electricity there are a number of terms we need to be familiar with.**
  - "Current", "volts", "amperes" and "watts" are the most important.

- **"Current" is the intensity of electricity, and is measured in amperes or "amps".**
  - Most household and industrial electric wiring carries 15 to 20 amps.
  - The thicker the wires, the more current they can usually hold.

- **It's important to remember that it's amps that deliver electric shocks.**
  - It doesn't take many amps to cause a serious injury.
  - In fact, contact with the amount of electricity that's needed to power just a Christmas tree bulb can be fatal if it passes through your heart.

- **"Volts" are another term we hear a lot. They measure the force behind the current that's flowing.**
  - In North America, most power tools and household appliances run on 120 volts.
  - But some specialized and heavy-duty equipment that requires "extra" power often runs on 220 or more volts.
  - Like amps, the higher the voltage the greater the danger.

- **"Watts" are a third term that's frequently encountered when we discuss electricity.**
  - Watts can be thought of as the combination of amps and voltage.

- **You can determine how many amps something uses by dividing its wattage rating by the voltage in the electrical system its running on.**
  - For instance, if your home has a 120 volt electrical system, a 120 watt light bulb uses one amp of power…120 watts divided by 120 volts.
  - A 60 watt bulb only uses half an amp.
  - A 1200 watt hair dryer would use 10 amps… (which explains why the lights sometimes go dim when someone turns a hairdryer on).

- **Now let's take a look at how an electrical system works.**
  - Electricity "flows" when a "loop" or "circuit" is completed.
  - This loop is created when an uninterrupted stream of electricity passes through a piece of equipment and returns to the power source.
  - Only when a circuit is complete will our tools and machinery be powered up and ready to go.

- **To control these circuits, tools and machines have an "ON/OFF" switch.**
  - When the switch is ON, the circuit is completed and electricity will flow.
  - Moving the switch to the OFF position breaks the flow of electricity and stops the equipment from running.

- **An electrical outlet is a circuit that's waiting to be completed.**
  - A single electrical outlet can actually create a number of different circuits, since each tool, light or piece of equipment that's plugged into the outlet establishes its own "loop."

- **When too many pieces of equipment are hooked into the same outlet, all trying to draw the current they need, that circuit can become overloaded and heat up.**
  - This excess heat can damage tools, equipment, or even the wiring itself.

- **To help guard against these types of situations, "circuit breakers" and "fuses" are built into electrical systems.**
  - If they detect too much electricity flowing through the wiring, they'll "break the circuit".
  - This stops the flow of electricity before problems can develop.

- **Circuit breakers, fuses and wires are all rated by how much electricity they can safely carry.**
  - You should never install breakers or fuses with higher ratings than the wires they're connected to (the breakers would allow too much electricity to pass through the wires and increase the risk of a short circuit or fire).
  - If a breaker trips, you need to remove some of the equipment from the circuit, so that the remaining machinery can operate safely.

- **One of the most important things to remember about electricity is that if it somehow "leaks" or "jumps" from the conducting wire, it will still try and complete a "circuit", by finding the shortest path to the ground.**
  - Unfortunately this can lead to a nasty shock if you're in its path.

- **"Controlled grounding" is what helps to keep us safe if this occurs**
  - For instance, if electricity "leaks" through cracked or defective wiring, a ground wire can direct the electricity back through the electrical circuit to the "ground".
  - You can see the ground wire easily in three pronged plugs, it's the wire that ends in the round prong.

- **But in order for a ground wire to work, the outlet that it's plugged into must be "grounded" as well.**
  - Just because an outlet can take a three pronged plug doesn't necessarily mean that it's grounded.
  - The only way to be certain that the outlet is grounded it to test it.

- **In addition to being grounded, now-a-days many outlets are fitted with a "Ground Fault Circuit Interrupter", or GFCI. This device can be a life saver.**
  - It immediately shuts off the flow of electricity when it senses a change in the strength of the current in the circuit.
  - For instance, if a cracked cord in a tool allows electricity to leak out and reduces the strength of the current in the system, the Ground Fault Circuit Interrupter will cut off the electricity before it has a chance to hurt you.

- **Once you know how electricity "works", you next need to learn how to recognize, and avoid, potential hazards.**
  - Remember, electricity can be dangerous…just like the signs say.

- **Electrical hazards most often result in:**
  - Shocks
  - Burns
  - Fires.
  - So you need to be on the lookout for conditions that can cause these problems.

- **A number of accidents are the result of faulty wiring.**
  - So be sure to look at the insulation on all power cords for cracks and other defects (don't forget extension cords).
  - Report any problems, and have damaged cords repaired or replaced immediately.

- **Overloaded circuits are another problem. Drawing too much current can cause wiring to heat up, which increases the risk of a fire.**
  - Keep your eye out for outlets with lots of cords plugged into them, or the excessive use of "power strips".
  - Look for other outlets nearby, that are on separate circuits, where you can plug in some of the equipment.

- **Limit the use of extension cords to temporary set-ups.**
  - Be sure to choose a cord that can handle the amount of electricity you're going to be using.

- **Remember, all electrical equipment should be properly grounded.**
  - Look for adapters being used with old two-pronged outlets without the ground wire being connected, or three pronged plug's that have been altered to fit into a two-pronged outlet.
  - If you find any, determine what needs to be done to remedy the situation.

- **You also need to exercise caution when selecting electrical equipment.**
  - Use double-insulated tools whenever possible. They have "built-in" protection against shock.
  - In the event of a problem, the safety shielding inside these tools conducts stray electricity away from you.

- **If you're working with electrically powered machinery, be on the lookout for sparks.**
  - They often indicate that there are damaged connections, and that can lead to a serious problem.

- **If you do encounter an electrical problem, don't try to fix it yourself unless you're "qualified".**
  - Instead, advise your supervisor about the situation and contact a repair person.

- **If you're a qualified worker who services electrically powered equipment and machines, make sure to disconnect all power sources before making repairs or adjustments.**
  - Don't forget to use proper lock-out/tag-out procedures.

- **If a machine has been locked and tagged by someone else, don't try to restore power before all the necessary repairs have been made, and the locks and tags have been removed.**

- **Never try to override safety devices like electrical interlocks.**
  - These keep machines from being powered up before it's safe.

- **If you're working around energized lines or machinery, remove key chains, metal jewelry, and other objects that can conduct electricity.**
  - Just putting them in your pocket isn't enough.

- **Materials that are used around electricity can cause problems, too.**
  - For instance, excess grease and debris can cause motors to overheat.
  - So keep your eyes peeled for them.

- **Don't use conductive materials like liquids, steel wool or even metal hand tools near energized parts unless you take the proper precautions.**

- **Flammable materials are another thing that doesn't "react" well with electricity.**
  - Make sure you're aware of any flammable materials in your work areas (look for labels on the containers).

- **Your last line of defense when you're working around electricity is personal protective equipment, such as insulated gloves and rubber-soled shoes.**
  - What you need can vary from job to job.
  - If you have questions, ask your supervisor about the equipment that is right for what you're doing.

- **Some work environments have special electrical hazards.**
  - In these situations, extra caution is required.

- **For example, we've talked about the fact that water conducts electricity.**
  - Its presence can create a situation that is really "shocking".
  - Never plug in cords that are wet.
  - Don't touch electrical equipment if your hands are wet.

- **If you encounter water, try to get rid of it before you begin work.**
  - If that's not possible, use safety devices such as double-insulated tools, Ground Fault Circuit Interrupters and PPE (like rubber-soled shoes) to give you some protection.
  - They're especially important in these situations.

- **With little room to maneuver, "confined spaces" can be cramped and dangerous, especially if they contain live wires or electrical equipment.**
  - If you're working in a confined or enclosed space you need to be particularly careful.
  - To avoid accidental contact with energized lines, you should insulate electrical materials or use protective shields or barriers.
  - Secure hinged panels and doors, so that they don't release and knock you into energized lines.

- **High voltage power lines can be extremely dangerous.**
  - It's important to remain at a safe distance if you're working around them.
  - If possible, the lines should be de-energized to eliminate the hazard.

- **If you're not a qualified electrical worker, OSHA says that you (and any conductive objects that you're holding) should not come within 10 feet of a power line carrying 50,000 volts.**
  - For higher voltage lines you must stay even further away.
  - These clearance distances also apply to vehicles and other equipment that are near overhead lines.
  - If you have questions, ask your supervisor.

- **Don't use metal ladders when working near power lines, wiring or energized machine parts, no matter what the voltage.**
  - The metal will conduct stray electricity straight to your body, and could give you a nasty shock.
  - Use a fiberglass or wooden ladder with non-conductive side rails instead.

- **Flammable materials should be kept away from machinery that could generate sparks or that have open flames.**
  - If you're working in the area, you should avoid using tools that spark or flame as well.

- **Try to avoid "metal-to-metal" contacts (they can also cause sparks).**
  - Use "non-sparking" tools whenever possible.

- **If there's been a leak of a flammable gas or vapor, don't turn equipment on or off.**
  - This could create an electric arc, and result in a fire or explosion.
  - Wait until the atmosphere is clear of flammable vapors before using any electrical equipment.

- **If you're working with electrical systems or equipment that uses more than 120 volts, you need to guard against the possibility of "arc flash."**
  - An arc flash is essentially a giant "short circuit" through the air between two electrical sources, or an electrical source and the ground.
  - This results in an "electrical explosion" that creates a super-heated plasma, which can reach temperatures of up to 5,000 degrees Fahrenheit.

- **Equipment and energy sources where there is a risk of arc flash…such as panel boards, motor control centers, or conduits and disconnect switches that handle high voltage loads…should have "arc flash warning labels" attached.**
  - The best protection against arc flash is to follow normal lock-out/tag-out procedures and de-energize any equipment you're working on.

- **However, some equipment must be kept running 24 hours a day.**
  - When this type of equipment needs to be serviced, special precautions should be taken.
  - This includes wearing appropriate personal protective equipment and using tools that have been specifically designed for arc flash environments.

- **If you encounter situations where arc flash is a potential hazard, see your supervisor before starting any work.**

- **Sometimes despite our best efforts, things go wrong.**
  - In the event of an electrical accident, it's important to be prepared.

- **Never touch a person who is in contact with a live wire.**
  - This will expose you to the same electrical charge that the victim is receiving.
  - Instead, immediately cut the power and call for medical assistance.

- **Electrical fires can be caused by short circuits, sparking and even the heat generated by faulty electrical lines and equipment.**
  - So it's important to know the location of fire extinguishers near your work area (remember, electrical fires require Class C extinguishers).
  - If a fire is too hot to handle, get out and leave fighting it to the professionals.

- **If there is an electrical accident, a working knowledge of first aid can be invaluable.**
  - Cover minor electrical burns with a loose, dry, sterile dressing and bandages.
  - Seek medical attention to avoid any complications.

- **Injuries that cause a lot of pain can throw the body into "shock".**
  - This is when the body tries to "treat" the injury itself, by rerouting the flow of blood to the injured area, which can leave other areas of the body without the blood they need.

- **In these cases it's important to treat the shock victim immediately (if your body is allowed to remain in shock for too long, it can actually kill you.)**
  - Wrap something around the victim to keep them from getting chills. Try to calm them down. (If they get agitated the shock could get worse).
  - Stay with them until emergency help arrives.

- **Electrical injuries are often serious enough that the victim stops breathing.**
  - If this occurs, use CPR if you're trained in administering it.
  - Keep it up until the victim starts breathing again or medical help arrives

***** SUMMARY*****

- **Working safely with electricity isn't a "part time" thing. It's a full time job!**
- **Be on the lookout for electrical hazards like cracked wires and defective equipment.**
- **Report hazardous conditions. Don't make repairs unless you're qualified and authorized to do so.**
- **Follow "safe work" practices.**
- **Use insulated tools and wear appropriate PPE.**
- **Be prepared in case of an emergency.**
- **Because electricity is part of so many of the things that we do, we often forget that it can be dangerous. But by learning to recognize potential hazards, and following proper work practices, we can work with electricity safely!**