PRESENTER'S GUIDE

"ELECTRICAL SAFETY"

Part of the General Safety Series

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

OUTLINE OF MAJOR PROGRAM POINTS

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The following outline summarizes the major points of information presented in the program. The outline can be used to review the program before conducting a classroom session, as well as in preparing to lead a class discussion about the program.

- **Electricity plays so big a role in everyday life that it's easy to forget it can be also be dangerous.**
  - It lights our homes, runs our computers, smartphones, toaster ovens and refrigerators.
  - It powers the equipment and machinery that we use in our jobs.

- **But electricity causes thousands of injuries and hundreds of fatalities every year, and those numbers are increasing.**
  - Electrical energy can also start fires and cause explosions that result in extensive and costly damage.

- **To work safely around electricity, it's important to understand how it "works", itself.**
  - To do that we need to become familiar with a few terms, such as "current", "volts", "amperes" and "watts".

- **Current is the "flow" of electricity, for example in a wire.**
  - The amount of current that is flowing is measured in amperes, or "amps" for short.
  - Most household and industrial electric wiring carries 15 to 20 amps.

- **It’s the electric current that gives you a shock.**
  - It doesn’t take much current to hurt, or even cause a serious injury.
  - The amount of electrical current that’s needed to light up a holiday bulb can be fatal if it passes through a person's heart.

- **"Volts" are another term we hear a lot when we're talking about electricity.**
  - "Volts" describes the amount of "force" behind the flow of current.
  - In North America, most power tools and household appliances run on 120 volt current.
  - Some specialized and heavy-duty equipment that you may encounter on the job can require 220 volts or more.

- **The term "watts" describes how much energy a piece of electrical equipment uses when it's operating.**
  - An incandescent night light burns about 5 watts of electricity.
  - A three-foot ceiling fan running on "high" uses about 50.
  - A small window air conditioner draws about 500 watts.
  - An electric clothes dryer uses close to 5,000.

- **When you divide the number of watts by the voltage of the wiring system, the result is the equipment's power usage in amps.**
  - A 500-watt air conditioner running on a 120-volt electrical system draws about 4 amps of current.
  - A 120-watt light bulb only uses a single amp.

- **Running a 1200-watt hair dryer draws 10 amps.**
  - That is sometimes enough to dim the lights when you turn the dryer on!

- **To harness the power of electrical energy, we take advantage of the fact that electricity naturally flows in a "loop", called a "circuit".**

- **A circuit begins at the power source, continues through wires and electrical equipment, and then returns to the source.**
  - In order for power to flow so that electrical equipment can run, the circuit has to be "complete", with no interruptions.

- **As you might expect, an "on/off" switch works by making and breaking the electrical circuit.**
    - When the switch is "on", the circuit is complete, electricity flows and the equipment runs.
    - Moving the switch to the "off" position breaks the circuit, which stops the flow of electricity and the equipment.

- **To understand how an electrical outlet works, you could think of it as "half a circuit" that's waiting to be completed.**
    - When you plug in an electrical device, you're attaching the rest of the circuit.
    - When you turn the power switch "on", you're completing the circuit.

- **But plugging in too many pieces of equipment, or connecting devices that draw too much power, can "overload" the receptacle and the wiring that supplies it with power.**
    - An overload condition can cause the wiring to get hot enough to damage the equipment and possibly start a fire.

- **The "circuit breakers" and "fuses" that are built into electrical systems have been designed to prevent overloads.**
    - If equipment tries to "pull" too much electricity through the wiring, these safety devices automatically break the circuit, to stop the flow of energy.

- **A device called a "ground fault circuit interrupter" (GFCI) performs a similar function within the electric outlet itself.**
    - If the GFCI senses a dramatic change in the flow of current through the receptacle, such as when a cracked power cord starts "leaking" power to ground, it breaks the circuit.

- **Electricity will always try to find the shortest and easiest way to get back to the beginning of the circuit or to the earth itself, whichever it can find first.**

- **This "return path" is called "ground", and if that path leads the electricity through you, you're in for a nasty shock, or worse.**
    - One way to prevent this from happening is to build a safe return path into electrical devices, so that the grounding is controlled.

- **Equipment that has this "controlled grounding" feature is called "grounded" equipment.**
    - Grounded equipment will have a three-prong plug on the power cord.
    - The round connector on the plug is the "ground" prong.
    - It connects to ground through the outlet, so that any stray electricity can be channeled safely out of the equipment.

- **For this to occur, the outlet itself must also be grounded, with an electrical connection to the earth.**
    - Don't assume that an electric outlet has this connection just because it can accept a three-pronged plug!
    - The only way to be certain that an outlet is grounded is to test it.

- **Electricity can be dangerous. In addition to thousands of injuries, electricity is involved in more than 300 workplace fatalities each year.**
    - To stay safe, you need to be able to recognize potential electrical hazards... and know how to avoid them.

- **Start by always inspecting power cords and extension cords for wear and damage <u>before</u> you plug them in.**
    - Look for worn or cracked insulation, exposed or fraying wires and other defects.
    - If you find problems, take the cords out of service immediately, then have them repaired or replaced.

- **You should watch out for overloaded outlets as well.**
    - Plugging too many cords into a single outlet can damage the wiring it is attached to, or even start a fire.

- **You can prevent an overload by plugging some of the equipment into other outlets that are on different circuits.**

- **While extension cords can be convenient, they can create problems as well.**
  - Remember that they are safe only for temporary set-ups.
  - They're not designed to be used as permanent power-supply solutions.

- **To prevent overloading a cord, be sure to choose one that's rated to handle the amount of electricity you're going to be using.**

- **All electrical equipment should be properly grounded.**
  - So watch out for adapters that are being used to connect three-prong plugs into two-prong outlets.
  - If the adapter's ground wire isn't connected to a grounding source, it's a dangerous set-up.

- **Another bad idea is trying to make three-prong plugs more "versatile" by removing the ground prong.**
  - If you find plugs that have been altered this way, take them out of service and have them repaired or replaced.

- **But you shouldn't try to repair any electrical problem yourself unless you're qualified to do so.**
  - "Winging it" could endanger both you and your coworkers.
  - Instead, tell your supervisor about the problem so they can get a qualified repair person to handle it.

- **Before a qualified electrician tries to service or repair electrically-powered equipment, they will:**
  - Disconnect all power sources.
  - Then follow proper lock-out/tag-out procedures to ensure the power is not turned back on by mistake.

- **If you encounter equipment in your workplace that has been locked and tagged by someone else, do not try to restore power.**
    - Never remove locks or tags unless you are authorized to do so and you had installed them yourself.

- **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 should wear can vary significantly from job to job.
    - To find out what PPE is right for you, talk to your supervisor.

- **Some work environments create special electrical hazards.**
    - It's important for you to know about these situations, so you can take appropriate safety precautions.

- **The first thing to remember is that water conducts electricity.**
    - Using electrical equipment in the rain or areas that are wet creates very serious shock hazards.
    - Even "double insulated" tools can give you a shock if water gets inside them.

- **OSHA recommends not using electrical tools in damp conditions at all... unless the tool is connected to a ground fault circuit interrupter (GFCI).**

- **You should keep power and extension cords out of puddles as well.**
    - Make sure your hands are dry before you plug anything in.
    - Never plug in extension cords or electrical equipment that have gotten wet.
    - It's also a good idea to wear shoes with non-conductive soles.

- **High-voltage power lines also create special hazards.**
    - If possible, the lines should be de-energized before you begin working near them.

- **When that's not possible, it's crucial to stay a safe distance away.**
    - Keep yourself, and any conductive object that you're holding, at least 10 feet away from any power line that's carrying up to 50,000 volts.
    - If the voltage is higher, you should stay even further away!

- **It's critical to remember that you must also maintain these distances if you're driving a vehicle or operating equipment such as a forklift or a boom crane.**
    - If they get too close to a live wire, the electricity can try to go to ground through them... and you.

- **Metal ladders can also create problems because the metal in them will conduct stray electricity straight to your body.**
    - No matter what the voltage is, never use a metal ladder when you are working near power lines, electrical wiring or energized machine parts.
    - Use a non-conductive fiberglass or wooden ladder instead.

- **Sparks are something else you need to watch out for.**
    - Electric tools and machinery can create sparks when they're operating.
    - So they can cause problems in work areas that contain flammable materials, since a stray spark could easily ignite them.

- **If there could be flammable gases or vapors in an area you want to work in, stop! Don’t turn electrical equipment on or off.**
    - This could cause a fire or even an explosion.
    - Make sure the atmosphere has cleared before you touch a switch.

- **When you are working around high-energy electrical systems, it's also important to understand the potential for arc flash.**
    - An arc flash is essentially an "electrical explosion" that creates enough heat, light, noise and power to injure or kill anyone unlucky enough to be near it.

- **There are several things that can cause an arc flash, including things such as:**
  - — Dropping a metal tool into high-voltage equipment.
  - — Digging or cutting into a power line.
  - — "Shorting out" a high voltage electrical panel.

- **Fortunately, most arc flash hazards are clearly labeled.**
  - — Talk to your supervisor before starting any work near a potential arc flash environment.

- **Sometimes despite our best efforts, things still go wrong.**
  - — If an electrical accident occurs in your workplace, it’s important for you to know what to do... as well as what not to do.

- **If a coworker is being shocked by a live electrical source, do not touch them.**
  - — That will expose you to the same electrical charge that they are receiving.

- **Instead, cut the power.**
  - — This might require pulling out a plug or throwing a switch or a circuit breaker.
  - — Do whatever is necessary to turn the electricity off, then assist the victim.

- **An electrical fire can result from a short circuit, sparks or overloaded wiring.**
  - — You can try to put these fires out by using a fire extinguisher, but only if you've been trained how to do it.

- **But you can't use an extinguisher that contains water, because water conducts electricity.**
  - — Wetting down an electrical fire could get somebody killed.

- **In these types of situations you need to use a Class C extinguisher.**
  - — They contain non-conductive fire retardants, and can put out electrical fires safely.
  - — You can find an extinguisher's letter code displayed on its label.

- **Different types of electrical accidents can result in different degrees of injuries, ranging from minor to severe... even life-threatening.**
    - Having a working knowledge of first aid can literally be a lifesaver.

- **Since even minor burns can be very painful, hold them under cool running water to lessen the discomfort.**
    - Then apply moisturizing cream, aloe vera gel or a burn treatment product.
    - If a blister has formed, try not to break it.

- **More serious wounds such as those caused by an arc flash will require medical attention. Call 911 for:**
    - Burns with large blistered areas or charring.
    - Wounds that are deep or have gaping or jagged edges.
    - Spurting blood or bleeding that will not stop.

- **The 911 dispatcher may also be able to advise you on how to care for the victim until the EMTs arrive.**

- **We all know that electric shock can be used to jump start a person's heart, but it can also cause a heart to stop beating.**
    - If a victim of an electrical accident stops responding to you, or stops breathing, they may be going into cardiac arrest.

- **In this situation you should do the following:**
    - Have someone call 911.
    - Begin CPR immediately.
    - Or use an AED (Automated External Defibrillator) if one is available and you know how to administer it.

- **Remember, the best way to deal with electrical accidents and the problems they can cause is to prevent them from happening in the first place.**

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- **Understanding how electricity works can help us to avoid its hazards.**

- **Always inspect electrical equipment for wear and damage before using it, and make sure that it's properly grounded.**

- **If you find problems with extension cords, or electrical tools or equipment, do not use it. Have it repaired or replaced.**

- **Be sure to follow safe practices and wear appropriate PPE when working around electrical equipment.**

- **Learn to recognize the special hazards, like arc flash, that are associated with using electricity in certain environments.**

- **Electricity can be hazardous, but now that you understand how it works, and the safe practices you should use to avoid those hazards, you can help ensure that you go home injury-free at the end of every day!**