ELECTRICAL CONTACT RELEASE TRAINING
FACT SHEET

LENGTH: 18 MINUTES

PROGRAM SYNOPSIS:
People who receive an electric shock are unable to release themselves from contact with an energized conductor or circuit part. And without immediate assistance gaining release, these incidents likely prove fatal. It is important to be aware of your surroundings when around electrical parts and equally as important to try your best to not come in contact with live electrical parts.

PROGRAM OBJECTIVES:
After watching the program, the participant will be able to explain the following:
- How the human body acts as a conductor with electrical currents;
- The effect electrical currents have on the human body;
- The best way to recognize and assess a shock event;
- How to perform first aid for someone who's been a victim of a shock event.

INSTRUCTIONAL CONTENT:

BACKGROUND
- An electrical worker contacts an energized conductor and can't let go. A construction worker grasps a damaged extension cord and is unable to release it. A shop worker inadvertently touches an exposed wire and her grip contracts involuntarily.
- In each of these instances, and in many similar incidents each year, people who receive an electric shock are unable to release themselves from contact with an energized conductor or circuit part. And without immediate assistance gaining release, incidents like these are likely to prove fatal.
- In this program, we will explain why this happens and examine the effects of electric current on the human body.
- Most importantly, we will teach how a victim of electric shock can safely be released from the grip of an energized circuit.
- Commonly referred to as "Contact Release," learning this critical skill is important for electrical workers, their coworkers and any potential first responders.
- This is why the NFPA 70E requires that all workers who may be exposed to electric shock receive annual contact release training as well as those who are responsible for responding to a shock event. The NFPA 70E is a safety standard published by the National Fire Protection Association and is widely considered to be the leading authority for electrical safety in the workplace.

THE HUMAN BODY IS A CONDUCTOR
- In order for electricity to perform useful work, it must travel through a conductor.
- The flow of electricity through a conductor is referred to as electric current and its unit of measure is the ampere, commonly called an "amp."
- There are a variety of materials that make good conductors. Aluminum, copper, steel and other metals make excellent conductors of electricity.
- Another good conductor of electricity is water. Electric current can easily flow through water, as well as anything that has become wet or damp.
- This is why we are so vulnerable to being shocked. The human body is largely made up of water and can easily become a conductor of electricity when we come into direct contact with an energized circuit.
- When a person comes into contact with an energized conductor, the amount of electric current that flows through their body depends on the voltage present and the resistance of their body.
- The term "resistance" is a measure of how easily electric current will flow through a material. The unit of measure for resistance is the Ohm.
- The average human body, in normal conditions, has approximately 1,000 Ohms of resistance.

- Much of this resistance is contained in the skin, and when the skin is wet or damaged, the body's resistance can decrease to around 300 Ohms or less.
- Ohm's Law can be used to calculate the amount of electric current flow by dividing the voltage of the power source by the resistance of the conductor, in this case the human body.

THE EFFECT OF ELECTRIC CURRENT ON THE HUMAN BODY

- Fatal levels of current flow can occur at very low voltages. And the current flow will increase as voltages increase; and/or the body's resistance decreases due to sweat, humidity, damaged or burnt skin or other variables.
- When a person receives an electric shock in the range of 10 to 25 milliamps, they may experience a loss of muscle control.
- This loss of muscle control can result in a sudden involuntary reaction that jerks or throws the person away from the energized source, which can lead to a variety of indirect injuries, such as falling off a ladder or coming in contact with other hazards.
- However, this same 10 to 25 milliamp shock may also cause the muscles to involuntarily contract, leaving the shock victim unable to free themselves from the energized circuit.
- When this occurs, shock victims are unable to release themselves from direct contact with the energized circuit without assistance. This creates a very dangerous situation because the shock victim is also energized and is now part of the electric circuit.
- While being shocked, the skin at the contact points may also become burned or damaged. When this occurs, the body's resistance is significantly reduced, allowing even more electric current to flow.
- When current levels increase to the range of 30 to 50 milliamps, breathing becomes difficult or impossible and suffocation may occur. A 50-milliamp shock can easily occur at voltages of 50 Volts.
- Current levels in the range of 75 to 100 milliamps are likely to result in ventricular fibrillation. Ventricular fibrillation occurs when the heartbeat becomes erratic and ineffective, leading to low blood pressure, loss of consciousness and death. A 120-milliamp shock can easily occur at voltages of 120 Volts.
- When current levels reach 200 milliamps or more, the body's tissues begin to be burned and when current levels reach approximately 400 milliamps, the heart may stop completely.
- During a shock event, the length of time a shock victim remains in contact with an energized circuit has a direct impact on the amount of damage caused by the flow of electric current through the body and plays a large part in determining if the victim will survive the incident.

LOW VOLTAGE CAN BE DEADLY

- Electrical workers consider voltages of 600 volts or less to be "Low Voltage" and unfortunately sometimes let their guard down when working at voltages of 120, 240 or 480 volts.
- It's important to understand that these low voltages can easily provide a shock current large enough to cause the victim to involuntarily grasp the energized part or receive a fatal shock.
- Low voltage electrocutions kill far more people each year than high voltage electrocutions.

RECOGNZING AND ASSESSING A SHOCK EVENT

- Electrical workers, their coworkers and potential first responders should be aware of the signs and symptoms of someone receiving an electrical shock.
- Many shock victims are unable to talk and are unable to respond to questions. Their face may be grimaced, or the jaw may be clamped shut. The victim may make guttural, unintelligible sounds.
- While actively being shocked, the victim's body may react in a variety of ways, anything from being frozen in an awkward, rigid position to flailing wildly.
- Once a suspected electrocution victim has been identified, it's critical to have someone summon emergency medical assistance right away. Once freed from the electric current, prompt medical attention may be critical to saving the victim's life.
- As a potential rescuer, you must understand that attempting to release a victim who is in contact with an energized circuit carries risk. In addition to the risk of being shocked, consider if there are other hazards such as stored energy, fire, elevated surfaces or if the victim is in a confined space.
- The rescuer must quickly evaluate these risks and then make a decision as to whether or not it is safe to attempt a rescue.
- When making this assessment, always assume the victim is energized and understand that the rescue must be done

without directly contacting the victim. A rescuer who touches an energized victim with an unprotected hand may also be shocked, which can quickly lead to the would-be rescuer becoming a second victim.

- The safest method to release a shock victim while also avoiding direct contact is to quickly disconnect the electrical supply to the energized source. This may mean unplugging the tool or machine if it is powered by a single cord. This may mean turning off the electrical disconnect feeding the equipment. It may mean turning off the light switch supplying the electrical fixture. Or this may mean turning off the power supply to the entire building or area.
- This is why electrical workers, their coworkers and potential first responders should be familiar with the electrical equipment in their work areas and the location of the disconnecting switches or isolating devices for each.
- When it's not possible to quickly or safely disconnect the power source, the second option is to forcibly remove the shock victim from the energized conductor or circuit parts by using non-conductive objects. When this is the case, it's important to identify all energized components which the victim could be contacting and any other nearby components, conductors or circuit parts that may also be energized and present a danger to you or other rescuers.
- If, after assessing the situation, you decide to proceed, then you should attempt to dislodge the victim from the energized parts with a nonconductive object, suitable for the expected voltage, while avoiding direct contact at all times.
- Ideally, the rescuer will be a nearby qualified electrician, who is able to quickly don voltage rated gloves for shock protection and carefully grasp the victim and pull them free.
- Even better, some companies maintain a dielectric rescue hook specifically designed for contact release situations. If this is the case, be sure you know where this rescue device is stored so it may be located quickly.
- Of course, in most cases you will not have voltage rated gloves handy and a dielectric rescue stick won't be readily available. So, let's talk about other options.
- For voltages of 600 volts or less, practically any nearby, non-conductive, dry object will work. For example, when an electrical worker became a shock victim, his coworker responded. After quickly assessing the situation, she selected a dry 2x4 and safely released the victim from the energized equipment.
- Other non-conductive items such as PVC pipe or a dry, wooden broom handle could have also been used. The key is avoiding direct contact with the victim or any energized parts. Here's another scenario.
- When this service technician contacted a live wire and couldn't let go, a quick-thinking bystander, trained in contact release, pushed him clear using a rubber trash can.
- Again, any dry non-conductive object can be used to free someone being shocked as long as direct contact with the victim is avoided.
- But what if there is no nonconductive object nearby that can be used to PUSH the victim free? Then consider what might be available to safely PULL the victim free.
- As another example, when the service technician is being shocked, the same nearby worker uses a leather belt to pull him free. A leather belt can be turned into a non-conductive rescue device, making sure to avoid direct contact while placing it around the victim.
- An extension cord is another non-conductive object that is often on hand that can be used to pull a shock victim clear of an energized circuit. The rubber insulation of the cord is designed to be nonconductive.
- In some instances, a victim's own bodyweight may be enough to break contact. This can happen by accident, such as when a shock victim collapses, or on purpose if the victim is able to consciously relax their knees and sink to the ground.
- Keep in mind that dry boards, extensions cords, leather belts, PVC pipe and similar objects should only be used for a low voltage contact release where the voltage is 600 volts or less. These types of makeshift objects should never be used to make direct contact with higher voltages.

FIRST AID AFTER THE RELEASE

- Once a shock victim has been safely released from the energized circuit, appropriate first aid must be provided until first responders arrive at the scene.
- If you are appropriately trained in first aid, assess the victim for breathing and a pulse. If no pulse is present, the best course of action is to send someone to retrieve an "AED" while a properly trained person administers cardiopulmonary resuscitation or "CPR."
- An AED or "Automatic External Defibrillator," is an easy-to-use, medical device that analyzes the heart's rhythm and, if necessary, delivers a controlled electric shock, or defibrillation, to re-establish an effective heart rhythm.
- AEDs are designed to be used by people with no training and include easy to follow directions and voice commands. Do not be afraid to use an AED if the situation calls for it.
- If an AED is not available, or the AED is unsuccessful in restoring normal heart rhythm, CPR should be continued until

medical help arrives.

- In some instances, the victim of an electric shock may also have been exposed to an arc flash. If so, they may have suffered burns and their clothing may be on fire.
- A victim with burning clothing should be encouraged to "stop, drop and roll" and continue to do so until the fire is extinguished. If this is not possible, smother the fire with a fire blanket, jacket, shirt or similar item.
- Do NOT attempt to put out a clothing fire with your bare hands which can fan the flames, making them worse. Using your hands will also press the burned material deeper into the burn injuries, causing additional damage.
- Also, do not attempt to remove burned clothing from a burn victim. This can also worsen the damage.
- First aid for burns is to cool the area and stop additional burning by applying cool water. Then loosely cover the area with sterile gauze or clean cloths.
- Watches or rings should be removed as soon as possible before swelling of the affected area begins.
- Stay with the victim until help arrives and be sure to inform those who arrive to assist that an electrical hazard may still be present.
- Victims of electric shock should always seek medical attention, even if they are seemingly unhurt. Electric current can cause internal burns or other damage that may not be readily apparent.

CONCLUSION

- When a person is receiving an electric shock, the length of time they are in contact with the energized circuit, combined with the promptness with which they receive appropriate medical attention, plays a large factor in the victim's chances of survival.
- When electrical workers, their coworkers and potential responders are trained in electrical contact release and first aid, it greatly increases the odds of surviving an electric shock.

ELECTRICAL CONTACT RELEASE TRAINING

ANSWERS TO THE REVIEW QUIZ

1. a
2. e
3. b
4. d
5. a
6. b
7. a
8. a
9. a

ELECTRICAL CONTACT RELEASE TRAINING
REVIEW QUIZ

The following questions are provided to determine how well you understand the information presented in this program.

Name_____Date_____

1. Without immediate assistance gaining release, shock victims could have a fatal outcome.

a. True
b. False

2. Which of the following make good conductors?

a. Aluminum
b. Copper
c. Steel
d. Water
e. All of the above

3. In normal conditions, the average human body has approximately 5,000 Ohms of resistance.

a. True
b. False

4. When a person receives an electric shock in the range of _____ milliamps, they may experience a loss of muscle control.

a. 1 to 2
b. 7 to 9
c. 35 to 50
d. 10 to 25

5. Electrical workers consider voltages of 600 volts or less to be “Low Voltage.”

a. True
b. False

6. All shock victims are still able to talk and respond to questions.

a. True
b. False

7. The best way to release a person in contact with electricity is to quickly disconnect the power source.

a. True
b. False

8 An extension cord is a non-conductive object that can be used to pull a shock victim clear of an energized circuit.

a. True
b. False

9. In some cases, a shock victim can be exposed to an arc flash and should use the “stop, drop and roll” method if their clothing is on fire.

a. True
b. False