Look Up and Live:
Prevention for Electrical Injuries

A Campaign Kit for Burn Awareness Week 2005

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Introduction and Overview

Our lives are dependent on electricity. We wake up in the morning and turn the light on to get ready for work, and in the process we use a number of electrical appliances and devices. At work we use any number of other electrical devices and home again for recreation where we again may watch television or use a computer. We often take electricity for granted. In our experience as burn professionals we see the results, often devastating, when electricity is taken for granted. It is our desire in this campaign to bring about an awareness of the power of electricity and offer valuable prevention information that can be used to save lives.

Incidence

The number of electrical injuries cared for in hospitals is estimated as many as 50,000 yearly which accounts for approximately 3-7% of all burn injuries. The effect of electrical injuries is staggering on the US economy. In 1997 the National Institute for Occupational Safety and Health estimated a one billion dollar impact on the American economy due to electrical injuries. Lightning, a naturally occurring phenomenon is also considered to be an electrical injury and annually causes 300 - 600 deaths. More annual deaths have been attributed to lightning than any other natural hazard in the US.

World-wide electrical injuries are on the increase. Several factors have affected this, including an increasing population and increased access to electricity. Developing nations are particularly affected with one physician in the Dominican Republic reporting that 39% of his admissions to a local hospital involve electrical burns. This also may reflect better reporting.

In the United States, more than 1000 deaths are reported yearly caused by electrical injuries, with approximately 50% of those sustained by low voltage (less than 1000 volts). Patients with low voltage injuries appear to have a disproportionately high mortality rate as compared to high voltage injuries. In high voltage injuries, victims are frequently thrown back away from the source, stopping the flow of current, however extensive injury has often been sustained as the current seeks the ground. Additionally, a violent muscle contraction can occur causing the victim to release from the source. In lightning injuries, less than 30% are fatal, possibly due to the flash mechanism. The highest incidence of electrical injuries occurs in the male population, ages 15 to 40, mostly high voltage and work related. Some injuries also occur amongst teenage youth ages 11-18, primarily from touching high power lines while engaging in high-risk activities. Approximately one-third of electrical injuries occur in children younger than 6 years of age. Usually these injuries are of low voltage, often to the mouth from toddlers chewing on electrical cords, and young children placing objects into electrical outlets.

Understanding Electricity

- Electricity is such an important part of our day to day living that it is almost impossible to fathom a world without electricity. Knowing how electricity works, travels and is used helps us understand it as a powerful force that, without serious caution, can be deadly.

- Although electricity is invisible, odorless and has no shape or form, the earth's atmosphere is charged with electricity. You'll see proof of it's presence in a lightning storm. Though the electricity we use in our daily lives is manmade, it is a natural phenomenon with absolute characteristics.

- Electricity always seeks a path to ground. All electrical contact accidents occur when a person accidentally becomes part of electricity's pathway to the ground.

- Electricity travels at the speed of light. It is made up of electrons that flow rapidly in an electrical current. Electrical current moves so quickly that it can, in fact, travel the distance of the world's circumference 7.5 times per second.

- Electricity is attracted to materials known as conductors that allow it to flow rapidly. Some conductors include metal, water, wet objects, trees, (they contain moisture) and people (bodies contain water).

- Electricity does not flow easily through certain insulating materials. Some insulators include rubber, glass, plastic, and porcelain.

- Anyone working around electricity should always be aware of their surroundings, especially of power lines either overhead or beneath the ground. As electrical workers know, electricity has no respect, therefore we treat electricity with respect.

Safety Practices for Working with Electricity

While working on or near power lines, use all protective devices as required to cover, spread, or de-energize the system. Always work according to your company's accident prevention manual rules and regulations. Always use the proper tools and equipment when doing the job. Never take short cuts, or use improper tools, or use an insufficient number of people for the job. When starting a job always talk over the job with the people who are going to do the work. Go over each planned step. Show all the phases and potential hazards.

- **Covering of Conductors** Identify any possible points of contact in or around the work area where clearances may be infringed. Points of contact include anything that creates a circuit if contacted: conductors, equipment, grounded surfaces, or wires and guys. Never allow contact with any conduction surface or wire when applying, working around, or removing any insulated covering. Be aware of the location of all grounds. Insulated covers and rubber

goods shall be applied, as specified by the safety rules, using rubber gloves or hot sticks, as applicable to the voltage being worked.

- Apply insulated covering to only one phase, wire or conductive surface at a time.

- Apply any additional covering as needed if exposed surfaces or wires are discovered after work has begun.

- Always cover wires and conductive surfaces from the bottom to the top, from closest to furthest away from the employee. Cover from below conductors or equipment, if at all possible.

- Remove insulated covering the reverse order that it was applied.

- **Spreading of Conductor** Use proper hot sticks and equipment to spread conductors away from work area.

- **Grounding of Conductor I**f insulated covers cannot be safely applied to protect employees, then the circuit or equipment shall be de-energized, tested and grounded prior to work.

  - The purpose of a grounding procedure is to provide personal protection for the worked on de-energized power lines or equipment. Grounding will protect the worker against possible injury from potentially hazardous voltage by limiting the voltage rise at the work site to a safe value, in the event of unplanned line energizing.

- **Requirements of a Personal Protective Ground** The main purpose of personal protective grounding is to limit the voltage difference between any two accessible points at the work site to a safe value. To assure this safety factor, protective personal grounds should be used when working on de-energized power lines or equipment.

- **Care and storage of grounding cables**

  - Only grounding cables, clamps, grounding elbows, and grounding cluster bars approved and specified shall be used for personal protective grounding.

  - Store approved grounding cables in a clear, dry, protected environment.

  - Each grounding cable shall be thoroughly inspected prior to installation or storage. Pay specific attention to the following:

    a. Check the condition of the cable at each ferrule and ensure that a current inspection tag is in place.

b. Ability of the clamps to close tightly.
c. General mechanical condition of the hardware.
d. All connection, nuts and bolts, or clamps and ferrules, are to be inspected for tightness.
e. Clean the cables and connection, including crushing connective surfaces.

- **Annual testing of grounding cables**

  - All grounding cables shall be tested, verified and tagged at least annually.

  - Grounding equipment shall be properly cleaned and inspected prior to testing.

  - Test grounding cables using an approved ground cable tester.

  - Procedure for testing: (instructions for the Safety Line model GT400 or GT 400HD tester)

    - Make sure power is in the "**OFF**" position and the amperage control knob is turned fully counter clockwise to zero.

    - Ensure that tester, operator, and cable are insulated from ground.

    - Install the test studs into the threaded terminals provided on the sides of the tester, and tighten securely.

    - Plug the power cord into any 115v AC outlet rated for 10 amperes or higher.

    - Measure the grounding cable to the nearest foot to determine expected voltage drop.

    - Clamp the grounding cable to the test stud, making sure clamps are properly tightened. For cables less than 10 feet, the cable should be closely paralleled for as much of the cable as possible. For cables greater than 10 feet, the cable shall be twirled at least once every 10 ft of cable. **DO NOT** loop the cable.

    - Turn the power switch to the "**ON**" position.

    - While observing the digital ammeter, slowly turn the amperage control knob clockwise until the amperage in the grounding cable reaches its rated value. (See voltage drop table below).

    - Observe the voltage reading on the digital voltmeter; compare this reading with the values in the table below for the length and size cable being tested.

    - If the voltage reading is equal to or less than that specified in the table, the grounding cable passes the test. If the voltage reading is greater than that specified, the grounding cable fails the test.

- Rotate the amperage control knob fully counter clockwise to the zero position, and turn the power switch to the "**OFF**" position before removing the clamps.

- **Caution**: If the grounding cable being tested has a defect, then the defective area can get hot enough to burn within a few seconds. The operator shall wear proper hand protection when handling grounding cables when testing, and shall not allow any body contact with the cable.

- If no problems are discovered during the inspection and the cable tests good, apply a new inspection tag to the cable insulation near on end, marking the month and year of inspection.

- If inspection or testing has revealed problems with the grounding cable, send it to the nearest qualified repair facility for repair or replacement.

Voltage Drop Table

(Cables over 60 feet tested at 70% of ASTM Continuous Current Rating)

Cable Size and Applied Amperage			Cable Size and Applied Amperage		
Cable Length (feet)	2/O Voltage Drop (volts)	4/O	Cable Length (feet)	2/O Voltage Drop (volts)	4/O
4	0.29	0.33	35	1.16	1.17
6	0.35	0.38	40	1.3	1.3
8	0.4	0.42	45	1.44	1.44
10	0.46	0.49	50	1.58	1.57
12	0.52	0.54	55	1.72	1.71
14	0.57	0.6	60	1.86	1.84
16	0.63	0.65	65	1.41	1.38
18	0.68	0.71	70	1.5	1.48
20	0.74	0.76	75	1.6	1.57
22	0.8	0.81	80	1.7	1.67
24	0.585	0.87	85	1.8	1.76
26	0.91	0.92	90	1.9	1.86
28	0.97	0.98	95	1.99	1.95
30	1.02	1.03	100	2.09	2.04

Personal protective grounding is a necessary safety procedure intended to protect a worker on a de-energized conductor on the event that unplanned energizing occurs. These recommendations are intended to provide the worker with the maximum protection currently available. This procedure will require a full capacity personal ground at the workstation only. This procedure is known as "equipotential grounding."

Where as no grounding procedure can be considered entirely safe, this method has been compiled from the latest sources of information throughout the electrical utilities industry. It represents the safest measures that can be taken given the current knowledge available.

- **Grounding Cables** The following are the minimum grounding cables sizes for personal protective grounding:

Substation	4/0 cu.
Transmission	4/0 cu.
Distribution	2/0 cu.

- The main purpose of personal protective grounding is to limit the voltage difference between any two accessible points at the work site to a safe value. To assure this safety factor, personal protective grounds shall be used when working on de-energized conductor or equipment.

- Personal Protective grounds must conform to the following criteria for proper protection:

    a. Low Resistance to Earth
        -Clean and tight connections at proper points.

        -Sufficient capacity of grounding equipment to handle the anticipated fault current.

    b. Grounds must be as close to the work site as possible

    c. On multi-grounds Wye systems, the system neutral shall be used as the ground source. If a system neutral is not available, an existing or a temporary driven ground rod shall be used. If the system neutral is suspect, an existing or temporary driven ground rod shall be used in conjunction with it.

    - Restrict movement of protective ground cables. The strong magnetic fields produced when large currents flow in grounding cables can cause the cables to whip violently. Therefore, the cables must be kept as short as possible and secured to the pole so that personnel will not be exposed to injury if cable whipping should occur.

    - The grounding connections should be made outside the immediate work area. Cables should be carefully trained and tied securely so that they will not present a hazard or interfere with the work.

- **Grounding Procedures** Personal protection grounds shall be installed when working on de-energized lines or equipment, except when work activities such as phase testing the circuits, conductor identification, or fault locating requires the removal of such grounds. No electrical circuit, equipment, or apparatus is to be considered safe for work until it is de-energized, tested and grounded in accordance with the following procedures:

- All grounding clamps shall be installed and/or removed from primary conductors with an approved hot stick. Proper safety procedures will be observed.

- All ground cables will be connected at the ground end first when installing and disconnected at the ground end last when removing.

- Hotline clamps are not approved grounding clamps.

- Grounding clamps must not be installed over armor rods or preformed conductor ties.

- Ground connections shall be made in the following order and must be removed in the reverse order:
    1. Mount ground cluster bar on structure below work area
    2. Connect ground rod if needed to cluster bar.
    3. Clean conductor before installing grounds.
    4. Connect cluster bar to neutral wire.
    5. Connect cluster bar to closest phase wire.
    6. Connect closest phase wire to next closest phase wire.
    7. Connect second closest phase wire to last phase wire.

- Clamps must be tightened to assure a good electrical connection and to prevent the clamps from being "blown off" by mechanical force. If the clamp contains set screws, they shall be tightened securely.

- The covering on ground cables is not electrically- rated insulation. It is only protection for the stranded conductors. Wherever additional insulation is necessary, approved cover-up protection equipment shall be applied.

- **Line Trucks** When line truck work is performed on or near energized primary overhead conductors or equipment, minimum approach distance will be maintained or the energized conductors or equipment will be covered with insulating protective material that will withstand accidental contact, or the Line Truck will:

    - Be grounded using the best available ground to minimize the time conductors remain energized **<u>and</u>**,
    - Multiple pieces of equipment involved with the job will be bonded together to minimize potential differences ***and,***
    - Barricades will be placed around the equipment to guard against any remaining hazardous potential ***and,***
    - During the time the equipment is breaching working clearance, **no one will approach the truck unless ground mats or insulated platform(s) are used.**

- **Bucket Trucks** The insulated portion of the boom may broach the minimum approach distance but the bucket may not. The insulated portion of the boom will not contact the conductor.

- **Working on Energized Conductors** Precautions and Techniques used for safe working on energized primary circuits include:

    - Conduct a thorough site assessment prior to start of work, including:

        1. Positively identify the circuit, even if it means tracing circuit back to substations.

        2. Positively identify the address (actual street address or mile marker and highway number or GPS location)

        3. Inspect the structure, lines and adjacent structures for any potential weakness or hazards, including rot, cracks, tracking, or damaged conductors, ties, or hardware.

        4. Review work to be done.

        5. Review external hazards, such as traffic or public access.

    - Contact the dispatcher, and request and confirm a hold for any circuit breaker (CB) or recloser on the circuit. Verify that no additional sources will be closed in if an Oil Circuit Breaker (OCB) or recloser opens

    - Conduct a tailboard briefing, including all persons working at the site.

    - Secure the site for protection of the public, including any barricading, cones and/or tape necessary to keep foot and vehicle traffic away form the work site.

    - Inspect and clean hot sticks that will be used for the work. Wipe the sticks down with an approved wiping cloth. Verify the stick has a current inspection sticker.

    - Inspect and clean if necessary, rubber insulation goods and covers.

    - Inspect rubber gloves and other personal protective equipment (PPE) to be used.

    - Wear all appropriate PPE when entering or working in an energized primary area.

    - Establish a hard line to safely raise and lower tools and material.

- Use approved hot stick hangers, attached to the pole or bucket truck boom, to store sticks when not in use. **DO NOT** hang hot sticks from a bucket or conductor.

- Ensure that energized conductors and structures are under control at all times when performing hot work.

- Maintain minimum approved distances at all times, including during hot stick use.

Caution: When using an approved hot stick, use the length of the stick, as designed. **DO NOT** allow hands to extend up a stick, effectively shortening the distance to an energized line. Only use approved, standard length sticks for hot work on primary conductors

- Use of insulative covers and blankets on energized conductors and apparatus does **NOT** permit a worker to make contact with an insulative cover or blanket, except with appropriate rubber gloves.

- Use the appropriate hot stick(s) for the work being performed.

Always Remember

“NOT GROUNDED, NOT DEAD”

The Nature and Characteristics of Burns

A burn is damage to the skin and underlying tissue caused by heat, chemicals or electricity - a very simplistic definition for a very complex injury. Burns damage or destroy one or more layers of the skin. Deeper burns may involve the fat, muscle or bone.

The temperature to which the skin is exposed and the length of time the skin is exposed to the burning substance determine the depth of injury. For electrical injury, other determinants include voltage and current encountered, and length of contact with energized electrical circuits or devices.

Burns range in severity from minor injuries that require no medical treatment to serious, life-threatening or fatal injuries. Burns are categorized in terms of degrees, which are described below. Partial thickness injuries to the skin include first and second degree burns. Full thickness injuries encompass third degree and deeper burns.

Type of Burn	Characteristics
Superficial Burn (first degree) • Causes: sunburn, minor scalds • Generally heal in 3-5 days with no scarring	• Minor damage to the skin, painful • Color - pink to red • Skin is dry without blisters
Partial Thickness Burn (second degree) • Damages, but does not destroy top two The skin • Generally heal in 10-21 days • May not require skin graft*	• Skin is moist, wet and weepy • Blisters are present • Color - bright pink to cherry red • Lots of edema (swelling) • Very painful
Full Thickness Burn (third degree) • Destroys all layers of the skin • May involve fat, muscle and bone • Will require skin graft for healing*	• Skin may be very bright red or dry and leathery, waxy white, tan or brown • Charred veins may be visible • Area is insensate - the person is unable to feel areas of full thickness injury

*Although there are many new products and techniques available to burn centers that facilitate burn wound healing, the "Gold Standard" for the healing of a full thickness burn remains autografting-transplanting of the person's own unburned skin to the area of deep burn. Except for very small (about the size of a quarter) burns , full thickness burns will require a skin graft to heal. The patient is taken to the operating room where all the dead tissue is surgically removed. Skin is taken or harvested off an unburned or healed part of the person's body and grafted or transplanted to the clean burn area. In seven to 14 days, this grafted skin "takes" or adheres to the area and becomes the person's permanent skin. The donor site (where the skin was harvested from) is treated like a partial thickness burn and heals within 10 to 14 days.

Emergency Care for Burns

For all burns:

- Stop the burning process
- Remove all clothing and diapers from around the burned area - these will retain heat, hide underlying burns and increase the damage to the skin. If material is adherent (stuck) to the skin, cool the area with cool water and seek medical attention. Jewelry and metal, such as belt buckles and zippers, also need to be removed.
- Run cool (not cold) water over the burn area for a few minutes.
- Do not apply ice to the burn. Ice can lower the body temperature and make the burn worse.
- Do not apply creams, ointments or salves. Such products may hold heat in the tissue, making the burn deeper.
- Do not break any blisters unless instructed to by a physician.
- Cover with a clean, dry cloth.
- First and second degree burns smaller than the person's palm can usually be treated at home. Keep the area clean to prevent infection by gently washing with mild anti-microbial soap several times a day. Rinse thoroughly. Cover open areas with a clean, loose dressing. Consult with your family physician or local burn center if the burn does not heal in two to three days or signs of infection appear.

For Electrical Burns:

- Protect yourself. Do not go near or touch the victim until you are sure the power has been turned off, the plug has been disconnected from the source, or the patient is free from the electricity.
- Know the location of the main power grid and how to turn off the electricity in your own home.
- Once the victim is free from the source, treat the burns as described above.
- Electricity can cause the heart and breathing to stop. CPR may be necessary.

When to Seek Medical Attention

- All burns on the face, hands, feet, major joints or genital area and burns that are circumferential (wrap around an arm or leg) should be considered serious and need to be evaluated by a physician immediately. Call your physician or go to your local emergency department and have these burns evaluated for their severity

- All chemical and electrical burns, including lightning injury, should also be seen by a physician; damage might not be immediately obvious.

- Burns occurring in an enclosed space, such as a house or car, may result in smoke inhalation and should be evaluated.

- Burns that are white, gray, leathery or painless should be considered serious and therefore require evaluation by a physician.

- A physician should evaluate burns bigger than the size of the person's palm.

Referral to a burn care center should take place in many instances. A listing of such burn centers can be found in the Burn Care Resource Guide, available on the Publications Page of the ABA website - www.ameriburn.org or by calling the ABA at (312) 642-9260. The ABA Criteria for burns that should be referred to a burn center include:

- Burns caused by electricity including lightning injury

- Chemical burns

- Smoke inhalation injury

- Burns of the hands, face, perineum, feet or crossing major joints.

- Circumferential burns of the chest or extremity

- Burns in a patient with chronic medical illness

- Burns complicated by other traumatic injury

- Partial thickness burns greater than 10% body surface area

- Any full-thickness or third degree burns

- Burns caused by suspected child abuse or neglect

Lightning injury

Thunderstorms produce lightning in varying amounts. Sometimes there is just an occasional flash or two, while at other times the storms produce lightning almost continuously, with lots of flashes to the ground. It is the flashes from the cloud to the ground ("CG flashes" for short) that create problems. CG flashes typically are only a small percentage of the total flashes produced by a thunderstorm, as most lightning stays within the clouds. But it only takes one flash for someone to become injured or killed or for the lightning to cause a fire! Because the human body contains salty water, which conducts electricity better than air, a person's body may present a conduit for the lightning to reach the ground. Although lightning is random, there are some things you can do to minimize your risks of injury if you are caught in the open during a thunderstorm:

- Avoid being the tallest object around. Seek clumps of shrubs or trees of uniform height, ditches, trenches or the low ground. Get as low as you can, but don't he prone on the ground. Go into a squat instead. Seek the best shelter you can find

- It is unwise to be near the tallest object around, such as an isolated tree. Taking shelter from the rain under an isolated tree is hazardous. At high altitudes, seeking shelter among depressions in the rock, or shallow caves will not offer much protection from lightning on a mountaintop. Your best protection is to get down from the peaks as quickly as possible. Leave your gear behind; whatever it contains is not worth risking your life! You can always go back and retrieve your gear after the storm passes.

- There is no "warning sign" that will reliably tell you that lightning is about to strike. Do not depend on having your hair stand on end. The first sign of a CG may be the flash itself.

- Of course, if your hair *does* stand on end, then you should take steps to protect yourself immediately! If no suitable shelter is available, see the above points. Most importantly, IF THERE ARE SIGNS OF LIGHTNING, IMMEDIATELY SEEK SHELTER AND GET OUT AND OFF OF THE WATER.

- The time from the flash to the thunder is a rough measure of how distant the lightning is from you. If you see a flash, count the seconds from the time of the flash to the thunder. Five seconds corresponds to about a mile. However, there is no distance from a thunderstorm that is absolutely safe! If you can *see* lightning, then you are under some threat.

- CGs can occasionally jump out of a thunderstorm and strike the ground miles away, seemingly "out of the blue." The "30-30 Rule" is currently being advocated: Take shelter if the time from seeing a flash until the time you hear thunder is 30 seconds or less, and do not resume activities until 30 minutes have elapsed from the last lightning and thunder.

- You do not have to be directly hit by the lightning to be affected. Lightning can travel along the ground from a nearby strike to you. It can also jump from nearby objects that are struck.

- Avoid being near fences and power lines that lead into areas where lightning is occurring. An electrical charge can travel along the wires and jump to you or cause an injury if you touch live wires or an energized fence.
- If someone is struck by lightning, go or call for medical help immediately! In the meantime, administer CPR to any victims if their heart and/or breathing has stopped. Cover the victims and do not move them. If they are conscious, reassure them and try to keep them calm. Seventy to 80 percent of victims survive the shock of a non- direct lightning strike. Lightning victims do not retain an electric charge and are safe to handle. Common lightning aftereffects include impaired eyesight and loss of hearing. Electrical burns should be treated as other burns. (See Emergency Care for Burns.)

Personal lightning safety tips:

"If you can see it (lightning), flee it (take shelter)" "If you can hear it (thunder), clear it (suspend activities)"

- Plan your evacuation and safety measures in advance. When you first see lightning or hear thunder, activate your emergency plan. Suspend activities and go to shelter. Lightning often precedes rain, so don't wait for the rain to begin before suspending activities.

- If Outdoors: Avoid water, high ground, and open spaces. Avoid all metal objects, including electric wires, fences, machinery, motors, power tools, etc. These objects may retain more water and more easily conduct an electric current. Avoid contact with two separate objects. Your body may serve as a conduit if the objects are struck by lightning. Unsafe places include underneath canopies, small picnic or rain-shelters, or near trees. Where possible, find shelter in a substantial building or in a fully enclosed car, truck or van, with the windows completely shut. If lightning is striking nearby when you are outside, you should:

    - Crouch down. Put your feet together.

    - Avoid proximity (minimum of 15 ft) to other people. This will allow the current to go to ground more easily, making it less likely for multiple people to be injured.

- If Indoors: Avoid water. Stay away from doors and windows. Do not use the telephone. Take off headsets. Turn off, unplug, and stay away from appliances, computers, power tools, and TV

sets. Because water may travel through and on pipes and tubing, lightning may strike exterior electric and phone lines, inducing shocks to **inside equipment.**

Lightning safety tips:

Lightening Safety Tips	
AVOID:	*SEEK.*
• Open spaces • Waiting under tall trees, umbrellas, or near electric power lines • Use of showers or other contact with Water • Use of the telephone • Contact with metal objects • Use of electric appliances	• Clumps of shrubs or trees of uniform height • Ditches, trenches or the low ground

Lightning safety program for swimming pools

Lightning's behavior is random and thus unpredictable. Preparedness and quick responses are the best defense towards lightning.

Swimming pools, indoor or outdoors, are connected to a much larger surface area via underground water pipes, gas lines, electric and telephone wiring, etc. Lightning strikes to the ground anywhere on this metallic network may induce shocks elsewhere.

At the first signs of lightning or thunder, swimming pools and beaches should be evacuated. ("If you can hear it [thunder], clear it [suspend activities"].) Seek shelter inside the main building, or in a fully enclosed vehicle with the windows up. Pools and beaches should remain cleared for 30 minutes after the last observed lightning or audible thunder.

Information contained in this guide was excerpted from the "Accident Prevention Manual," published by PacifiCorp in Portland, Oregon.

ELECTRICAL SAFETY FACT SHEETS

Fact Sheet: ON THE JOB ELECTRICAL SAFETY

- To provide a safe work environment you must exercise caution when around electricity
- Before you start, ask yourself:
    - What could go wrong?
    - Do I have the knowledge, tools, and experience to do this work safely?
- Plan the work out ahead of time and plan for safety.
- Avoid wet working conditions
- Avoid overhead power lines
- Use proper wiring and connectors
- Use and maintain tools properly
- Wear correct PPE
    - Safety glasses to protect against eye injury
    - Proper clothing-clothing that is neither floppy nor too tight. Loose clothing can catch on corners or rough surfaces. Clothing that binds is uncomfortable and distracting
    - Contain and secure loose hair
    - Wear Proper foot protection – shoes or boots that have been approved for electrical work
    - Wear a hard hat – do not place anything inside of the hard hat as it will no longer provide adequate protection
    - Wear hearing protectors in noisy areas
    - Follow directions for keeping PPE in proper condition
- Work with a “buddy”. Both should be trained in CPR should an accident occur
- Know how to shut off and de-energize circuits (see fact sheet)
- Always lock out and tag out circuits and equipment when work is in progress.

- Remove jewelry and metal objects from your body before beginning work. They can cause burns if worn near high currents and can get caught as you work

- Check all ladders and scaffolding if working in high places to avoid falls.

Fact Sheet: ELECTRICAL BURNS AND OTHER INJURIES

- A severe shock can cause considerably more damage to the body than is visible.

- The most common shock-related injury is a burn.

- Electrical burns are the result of the electric current flowing through tissues and bone. The heat generated by the current flow through the body causes tissue damage. Electrical burns are the most serious injuries you can receive and should be given immediate attention.

- Arc or flash burns, on the other hand, are the result of high temperature near the body and are produced by an electric arc or explosion. They should also be attended to promptly.

- Thermal contact burns are those normally experienced when skin comes in contact with hot surfaces or overheated electric conductors, conduits, or other energized equipment. Additionally, clothing may be ignited in an electrical accident and a thermal burn will result.

Fact Sheet: HOME SAFETY TIPS FOR ADULTS

- Pay attention to the location of all overhead power lines. Make sure to check for power lines in or near trees before pruning branches or climbing in or around trees. Keep the 10-foot rule in mind – always keep you and anything you're handling at least 10 feet or more away from overhead power lines and even farther away from any transmission lines.

- **Call Before You Dig!!!** Before embarking on any digging projects such as putting in fence posts, planting trees or bushes, installing a sprinkler system or doing major excavation work, be sure to call to have your underground utility lines located.

- **Stay away to stay safe.** If you spot an electrical wire down, keep everyone out of the area and immediately call 911 or your local power company.

- Don't allow children to play with or around electrical appliances like space heaters, irons and hair dryers.

- Keep clothes, curtains and other potentially combustible items at least three feet from all heaters.

- If an appliance has a three-prong plug, use it only in a three-slot outlet. Never force it to fit into a two-slot outlet or extension cord.

- Check your electrical tools regularly for signs of wear. If the cords are frayed or cracked, replace them. Replace any tool if it causes even small electrical shocks, overheats, shorts out or gives off smoke or sparks.

- **HAVE A WORKING SMOKE ALARM.**

Fact Sheet: ELECTRICAL SAFETY AWARENESS FOR THE HOME

- Use outlet plug covers if you have small children in the house.
    - Outlet covers that attach to the electrical plate with screws give better protection than the plug-in style outlet caps
    - If you use the plug-in caps make sure they are a similar color as the outlet so as not to draw the child to the outlet.
    - Make sure they are big enough not to become a choking hazard.

- If you put a night light in a child's room refrain from buying those that look like toys as it will encourage the child to play with it.
- As soon as children are old enough to understand teach them to respect electricity (beginning at about age 3)

- Before repairing any appliance, unplug it.
- Use extension cords wisely. Never exceed the load rating; always throw away damaged cords.

- Use three-pronged grounded plugs only in three-prong outlets and never cut he third prong off of a plug.
- Never use electrical appliances near water.
- Use Ground Fault Circuit Interrupters - outlets with red and black “test” and “reset” buttons – in bathrooms, garages, near kitchen sinks and outdoors, as they will shut off power during a short circuit or grounding event.
- When performing electrical do-it-yourself projects around the home, always turn off circuit breakers and then test circuits to make sure they are de-energized before performing any work. Professional electricians can help make sure that large projects are performed according to electrical codes for your home.
- Don’t overload electrical circuits. This is a common cause of fires.
- Attach extension cords to appliances before plugging into outlets. Always disconnect by pulling on the plug, not the cord.
- Electric shock can also cause injuries of an indirect or secondary nature in which involuntary muscle reaction from the electric shock can cause bruises, bone fractures or even death

resulting from collisions or falls. In some cases, injuries caused by electrical shock can be a contributory cause of delayed fatalities.

Fact Sheet: HOUSEHOLD EXTENSION CORDS

- The U.S. Consumer Product Safety Commissions estimates that about 4,700 residential fires originate in extension cords each year, killing 50 people and injuring 280 others.

- Nearly two-thirds of electrical burn injuries among children ages 12 and under.

- Overheating of extension cords can occur at the plug, at the socket, or over the entire length of the cord. Hot plugs and sockets are often caused by deteriorated connections to the cord wires.

- Overheating of the entire cord is usually caused by overloading (connecting appliances that need too much power for the wire size of the cord). Many older extension cords are made with small wire that can overheat easily.

- Consumers should feel the temperature of the cords when they are in use. If they are hot to the touch, disconnect the appliances.

- Never run extension cords under carpet.

- Check new cords to make sure they are listed by a recognized national testing laboratory.

Fact Sheet: ELECTRICITY AND VEHICLE SAFETY

- Assume that all downed lines are energized power lines. Downed telephone or cable TV lines may be recognized as such, but may be touching damaged and energized power lines on nearby poles.

- A downed power line that appears to be dead may suddenly become re-energized as the power company attempts to re-route power.

- If a power line comes down on or near your vehicle, you are safest if you stay inside the car.

    - Stay in the vehicle.

    - Wait until qualified electrical workers turn off the power and tell you that it is safe to leave the vehicle.

    - If you MUST leave the car because of fire or other danger, JUMP away from the vehicle so that you don't touch the vehicle and the ground at the same time. Land with your feet together. Shuffle away, keeping your feet together and on the ground.

- Do not try to help someone else from a vehicle touching or near a downed power line.

- If someone has been shocked, do not touch the person or anything he or she is touching.

- Do not touch an electric shock victim unless you are sure he or she is no longer in contact with the source of electricity. You won't be much help if you get shocked!

- **Car Battery Safety:** When jump starting a battery take the following precautions

    - Wear safety glasses

    - Put out all cigarettes and flames

    - Make sure the vehicles aren't touching. Turn off the ignition.

    - Do not jump-start unless both batteries are negative ground and are the same voltage.

    - When attaching cables, clamp on jumper cable to positive pole of dead battery, then clamp other end to positive pole of good battery. At good battery, clamp second cable to negative jumper pole, then clamp cable's other end to the dead car's engine block on side away from battery.

    - Start the car with the good battery; then start the car with the dead battery.

- Remove cable from engine block and other car’s negative pole; then remove cables from positive poles.

Fact Sheet: STORM SAFETY

- If a storm is coming or under way, get indoors.
- If you must be outside during a thunderstorm, stay near proper shelter.
- If you can't get indoors: Avoid open vehicles, like golf carts & tractors. Lightning is drawn to tall objects and metal. Avoid trees, canopies, small picnic or rain shelters, and anything metal, such as flag poles, metal bleachers, golf clubs, or tall light poles.
- Avoid rivers, lakes and swimming pools. If you are boating, head to shore.
- Avoid wide-open areas, including sports fields.

MEDIA GUIDE

Working with the Media

In working with the media, keep the following tips in mind:

1. It is very important to establish a close relationship with all varieties of news media in your region – newspapers, magazines, radio and television (especially cable). If you do not already have a media list, develop a complete list including the names, addresses, telephone and fax numbers, and email addresses of all media contacts. Be sure to get the name of the media representative at that publication or station that handles health and medical issues. These people change positions and/or responsibilities quite often, especially in the larger cities, so try to update the list at least twice a year. (Note: Your organization's public relations department may already have this information, which could be made available for you to use).

2. Establish deadlines with each contact. Know how much lead-time they need to receive articles for publication, for calendar listings, and for news conferences.

3. Be concise but informative when using press releases. Make it of interest. Use local statistics when possible. Use quotes of key people involved. Be certain to include the date, contact names, and telephone numbers for further information.

4. Allow sufficient time for a news release to be received and then follow up by telephone. Offer additional information if needed. You can make it easier for the interviewer (few notes) by providing supplemental written information or press packets. This also reduces the likelihood that you will be misquoted.

5. Sample public service announcements (PSAs) have been included in this campaign kit. Issue these and/or build your own (using local and /or regional data or incidents when possible). A quote from the medical director of your local burn center and your local fire chief will definitely add credibility and interest to the PSA.

Reaching the Public

There are many ways to publicize Look up and Live: Prevention of Electrical Injuries your electrical campaign. The ABA recommends the following:

- Hold press conferences and provide written supplemental information.
- Sponsor an event (e.g., a safety fair at a local industry or health facility).
- Suggest story ideas to your newspaper's health beat reporters.
- Send timely news releases to reporters and media contacts.
- Use media support materials included in this packet.
- Offer to do guest appearances on local radio or TV talk shows.
- Maintain a list of burn survivors who are willing to share their experiences and who have the attributes necessary to make good spokespersons.

The ABA strongly encourages you to plan a local event and to hold a press conference at the beginning of your campaign. You may want to hold your press conference to kick off National Burn Awareness Week (the first full week in February each year). It must continue to be emphasized however, that this "week" is only a kick off – burn awareness must continue to be promoted all year long. Don't stop at doing just one event. Perhaps you can plan a quarterly event and thereby reach the public four times a year.

Within this packet you will find information about a PowerPoint™ presentation that can be given to employees that work with electricity. Contact your local utility companies and see if they would like to benefit from such a program. This can give you another avenue to discuss the important issue of prevention and safety with electricity. They are usually very interested in guest speakers for their safety meetings

Sample Public Service Announcement (PSA)

Contact
Name: _____
Organization: _____
Telephone: _____

Subject: Electrical burn injuries

Reading Time: 10 seconds
Electricity is in every home and can injure someone you love. Call (insert local identification) for free information on prevention and safety tips when using electricity at (telephone number)

Reading Time: 20 seconds
Electrical burns account for approximately 3-7% of all burn injuries. Although this number is low the cost involved in caring for these devastating injuries is staggering. The (local identification) reminds us to Look up and Live to prevent injuries from overhead power lines. For free electrical burn safety and prevention tips, call (insert local identification) at (telephone number).

Reading Time: 30 seconds
This is Burn Awareness Week and the (local organization) wants you to know that electricity can injure someone you love. Burns caused from electricity can be devastating to the victim and family and may require extended rehabilitation. Remember that when you are planning a project in you home, you should call before you dig to find out where you underground wires are located. For free information on electrical safety and prevention tips, call (insert local identification) at (telephone number).

Sample Public Service Announcement (PSA)

Contact
Name: _____
Organization: _____
Telephone: _____

Subject: Lightning injuries

Reading Time: 10 seconds
300 to 600 people die each year when lightning strikes. Would you know what to do if caught in a sudden storm? Call (insert local identification) for free information on lightning prevention safety tips at (telephone number).

Reading Time: 20 seconds
Severe weather can occur with little warning. Lightning strikes can be very unpredictable. As many as 300 people die yearly from lightning. The (local identification) reminds us to stay inside during severe storms. For additional information and safety tips to prevent lightning injuries, call (insert local identification) at (telephone number).

Reading Time: 30 seconds
This is Burn Awareness Week and the (local organization) wants you to know that lightning can injure someone you love. Victims of lightning strikes can die if care is not provided rapidly. Lightning injuries are the most commonly occurring natural disaster with the highest death toll accounting for as many as 300-600 deaths per year. Remember to be aware of the weather as you plan outdoor activities. For additional life-saving information on lightning safety and prevention , contact (insert local identification) at (telephone number).

Sample Public Service Announcement (PSA)

Contact
Name: _____
Organization: _____
Telephone: _____

Subject: Electrical burn injuries at work

Reading Time: 10 seconds

Working with electricity can be a hazardous job. For free on the job safety information Call (insert local identification) at (telephone number).

Reading Time: 20 seconds

Electrical injuries comprise approximately 3-7% of all burn injuries. They can be severe and life-altering. The (local identification) has information and a short workshop for your workers. For additional information and worker safety tips to prevent electrical injuries, call (insert local identification) at (telephone number).

Reading Time: 30 seconds

This is Burn Awareness Week and the (local organization) wants you to know that electrical injuries on the job are devastating to workers and their families. The (local identification) has a short workshop to help your employees understand the importance of safety when working with electricity. Our goal is to keep all workers safe. For additional life-saving information on electrical safety and prevention on the job, contact (insert local identification) at (telephone number).

REFERENCES

GLOSSARY

Amps (ampere) : The standard unit for measuring electrical current flow.

Watt: A unit of electrical power, equal to the power developed in a circuit by a current of one ampere flowing through a potential difference of one volt.

Voltage: Electromotive force expressed in volts. If we were comparing electricity flowing through a wire to water flowing through a pipe, then voltage would be similar to the pressure of the water and amperage would be similar to flow past a given point in gallons or liters per minute.

Circuit Breaker: A device that automatically interrupts the flow of an electrical current.

Breaker Box: An insulated panel on which electrical wires are mounted. Typically fuses, circuit breakers or other current-interruption devices are also included.

Electrical Panel: An insulated panel on which electrical wires are mounted.

Current Flow: The rate of flow of an electrical charge, generally expressed in amperes.

Electrical Load: 1) The amount of power delivered by a generator or carried by a circuit. 2) A device to which the power is delivered.

Ground-Fault Circuit Interrupter (GFCI): A mechanical device to detect grounding problems and shut electricity off to prevent a possible accident.

High Voltage: Term utilized in electrical industry referring to electrical equipment that operates at more than 600 Volts (for terminal to terminal operation) or more than 300 Volts (for terminal to ground operation). Low voltage, high current AC or DC power supplies are also considered to be high voltage. In the burn (medical) literature, electrical potential exceeding 1000 volts is considered to be high voltage.

Hazardous Energy Sources: Stored or residual energy such as that capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure.

Lockout: The placement of a tag on an energy-isolating device. This act prevents workers from operating a piece of equipment until the lock is removed.

Tagout: The placement of a tag on an energy-isolating device. A tagout device is a prominent warning device of a lockout.

Energy-Isolating Device: A mechanical device that prevents the transmission or release of energy.

Authorized Employee: A person who locks out or tags out equipment for service or maintenance. Authorized employees have been formally trained in proper lockout/tagout procedures.

Reference and Resource List

American Burn Association
www.ameriburn.org

United States Fire Administration
www.usfa.fema.gov

National Fire Protection Association
(publishes the National Electrical Code)
www.nfpa.org

PACIFICORP
Pacific Power Utah Power
www.pacificorp.com

National Institute for Occupational Safety and Health
www.cdc.gov/niosh/docs/2002-123/2002-123e.html

SafeKidsCanada
www.safekidscanad.ca/ENGLISH/Safety_Tips/ST

Underwriters Laboratories: www.ul.com
"UL Standards for Safety established the basic safety principles for America"

Consumer Product Safety Commission
www.cpsc.gov/spscpub/pubs

Burn, Electrical (article on burns)
Author Mark A Hostetler, MD, MPH
www.emedicine.com/ped/topic2734.htm

Acknowledgements:

This Campaign Kit was developed by the American Burn Association Burn Prevention Committee Burn Awareness Week Campaign Sub-Committee, 2004-2005

David J. Barillo, MD, FACS – Chair

Ruth Albrecht, RN, BSN - Campaign Chair

Margaret L Brunner, RN

Kenneth R. Diller, ScD

Kathleen E. Jones, CCLS

Barbara A. Latenser, MD, FACS

Fred Hugh Price, Jr, BSN

James C. Boyle, MD

Janet Cusick Jost, RN, MS

David M. Fickler, Fire Marshall

Lisa Marie Jones, BS

Sue Jane Smith, RN, MSN

Jimmy Parks, RN, MS

William L. Quimby

Nicole E. Alden, BSN

Clare Card, RN

Keith R. Charter, RN

Mary E. Dougherty, PT

Stacey M. Dressen, BSN

Jacques Laterjet, MD

Jared L. McFarland, RN, BSN

Sue Burke RN, MSN

Joanne McLaughlin, RN (ad-hoc)

Ernest J. Grant, RN, MSN (ad hoc)

Thomas Weathers, Deputy Chief (ad hoc)

Linda Blowney (ad hoc)

Tony Burke, FF (ad hoc)

Mark Harper Sr, FF (ad hoc

Steve Dietz, FF (ad hoc)

Editorial, Graphic Design and Technical Support

American Burn Association Central Office
625 N. Michigan Avenue, Suite 1530
Chicago, IL 60611
(312) 642-9260
www.ameriburn.org
email: info@ameriburn.org

John A. Kirchbaum, JD, Executive Director
Susan M. Browning, MPH, Associate Executive Director

User Survey

We appreciate your suggestions and recommendations for future Burn Awareness Week campaigns. Please use the reverse side for additional comments. Please complete this form and return to:

American Bum Association
625 N. Michigan Ave., Suite 1530
Chicago, IL 60611
Fax: 312-642-9130

Date:

Profession: Nursing Fire/Life Safety Educator Public Health Educator Other

1. Did the content covered in the campaign kit meet your learning needs? Yes No
   If you answered no, please specify what we can include to meet your needs.

2. Was the length of the subjects adequate to cover all information you feel you needed? Yes No

3. Were the handouts and resource materials helpful? Yes No

4. What did you like most about the campaign?

5. What did you like least about the campaign?

6. How did you hear about the Burn Awareness Week Campaign Kit? Check all that apply.

   ABA website
   Postcard mailed to institution
   Journal of Burn Care and Rehabilitation
   Word of mouth
   Other:

7. How did you obtain the materials?

   Obtained hard copy (of PowerPoint presentation) from the ABA Central Office

   Downloaded from the ABA website
   Other:

8. What pieces of the campaign kit did you use? Please circle all that apply.

   Educator's Guide
   Public Education Materials
   Statistics
   Fact Sheets
   What is a burn?
   Newsletters
   Emergency care for burns guide
   Press Releases Publicity
   Public Service Announcements