ELECTRICAL SAFETY AT HOME

- Make sure cords are in good condition. A frayed or cracked cord could cause a shock or fire. Replace old and damaged extension cords with new ones having the certification label of an independent testing laboratory on the cord.

- Check to see that extension cords are not overloaded, as indicated by the ratings labeled on the cord and the appliance. Overloaded extension cords could cause fires. Change the cord to a higher rated one or unplug some appliances, and remember that extension cords should only be used on a temporary basis and are not intended as permanent household wiring.

- To reduce the risks of electric shock, make sure that GFCI protection is provided for outlets at kitchen counters, in bathrooms, and at outdoor receptacles. Test GFCIs monthly to make sure they are working properly.

- Check the wattage of all bulbs in light fixtures and lamps to make sure they are the correct wattage. Replace bulbs that have a higher wattage than recommended to prevent overheating that could lead to a fire.

- Check to see that fuses are the correct size for the circuit. Replacing a correct size fuse with a larger size fuse can present a serious fire hazard.

- If an appliance repeatedly blows a fuse, trips a circuit breaker, or has given you a shock, unplug it and have it repaired or replaced.

- Check to see if outlets and switches are unusually warm or hot to the touch. If so, an unsafe wiring condition could exist. Do not use the outlet or switch and have a qualified electrician check the wiring as soon as possible.

BETTER SAFE THAN SORRY

Taking precautions against electrical disasters

According to the latest statistics from the National Fire Protection Association (NFPA), the U.S. Consumer Product Safety Commission(CPSC), nearly three people die each day in residential electrical-related home fires and accidental electrocutions in the home. Statistics from the Occupational safety and Health Administration(OSHA) indicate that 285 people were electrocuted on the job in 2001. To help prevent more electrical-related deaths and injuries, the Electrical Safety Foundation International (formerly the National Electrical Safety Foundation) supports the recognition and promotion of May as Electrical Safety Month.

The NFPA statistics point out that approximately 111,400 home fires per year are caused by faulty electrical distribution systems, electrical appliances and equipment, or heating and air conditioning systems, causing nearly $1.3 billion in property damage. Additionally, millions of dollars are lost in corporate and personal productivity along with the tremendous costs associated with health insurance and workers compensation claims and litigation.

"Technology can only do so much to keep us safe," said ESFI Executive Director Michael Clendenin. "The key element to electrical safety is awareness. If people are aware of the hazards present around them at home, at work, at school and at play, and of the many simple ways they can keep safe, those statistics can be dramatically reduced."

> "The key element to electrical safety is awareness."

ESFI is doing its part by educating the public about the importance of respecting electricity and using electrical products safely around the home, school and workplace, and by supporting other organizations as they get the word out in their communities.

Inspect and protect

Aging homes and growing power demands could mean the electrical system behind your walls are at the same time deteriorating and becoming overburdened. That is a recipe for disaster, according to ESFI. In its new "Inspect and Protect" campaign, ESFI

ELECTRICAL SAFETY AT WORK

When planning and preforming work on electrical systems and equipment, keep these principles in mind:

- Plan the job from start to finish, and think about the things that could go wrong.
- Wear protective clothing and equipment and use insulated tools in areas where there are possible electrical hazards. Isolate your equipment from energy sources.
- Use procedures, drawings and other documents as tools to help you do the job properly.
- Identify the electrical shock and arc flash, as well as other hazards that may be present.
- Never work alone. Be sure there are others around who can help in case of an emergency.
- Lockout/tagout and ground (where appropriate) before working on equipment.
- Test every circuit and conductor each time before you touch them.
- Use personal protective equiptment as a last line of defense, in case something goes wrong.
- Never use water on an electrical fire, you could be electrocuted.
- Deenergize and visibly guard (where possible) whenever contact with uninsulated overhead power lines is possible.
- Check and double check the safety regulations when a ladder or parts of any vehicle or mechanical equipment structure will be elevated near energized overhead power lines. Call your local electric utility for assistance. People standing on the ground may be particularly vulnerable to possible injury.

says the way to avert that disaster is to have your home electrically inspected.

"This is not to say that all old homes are death traps, but hazards associated with aging home electrical systems have a way of hiding until they become potentially fatal and certainly traumatic fires," says Clendenin. "You have a good chance of identifying and correcting these hazards with an inspection, but very little chance of avoiding eventual property loss, traumatic injury and even death without one."

ESFI recommends asking the following questions to determine whether you need to have you home electrically inspected.

- Is your home 40 years old or older?
- Has your home had a major addition?
- Have you purchased a major appliance, such as a refrigerator, freezer, air conditioner or electric furnace in the last 10 years?
- Are you the new owner of a previously owned home?
- Do your lights often flicker or dim momentarily?
- Do circuit breakers trip or fuses blow often?
- Are your outlet and light switch face plates hot to the touch or discolored?
- Do you hear crackling, sizzling, or buzzing from your outlets?
- Are extension cords and multiple power strips permanently in use around the house?

If you answered yes to any one of the above questions, you should consider having a qualified, licensed electrical inspector, electrician or electrical contractor perform an electrical inspection. Depending on the size of the home, a basic inspection could take between 30 minutes to an hour. The ESFI recommends that at a minimum the inspection should check the following:

- the condition of the electrical service entrance (if above ground) and perform a load analy sis to determine if the service is adequate to meet the present demand
- proper grounding and polarity in receptacles
- the condition of the panel and its connections
- the condition of the visible wiring
- the presence of GFCIs where required and test each
- voltage drop measurements on a couple of circuits
- proper lamp wattage
- overloaded outlets and improper use of extension cords
- proper installment of smoke alarms and test each

"Because electrical hazards are so uniquely unforgiving, better to take one too many precautions than one too few," says Clendenin. 'The bottom line is inspect and protect."

For these and more electrical safety tips, visit ESFI's website at www.electrical-safety.org or call 703-841-3229.

SAFETY IN THE WORKPLACE

"Workplace" covers a broad spectrum of working environments. And while working environments differ, they all depend on electricity and electrical systems for energy, control, communications and data for virtually every aspect of operations. Electrical accidents can and do happen in all workplace environments, although the frequency or severity may vary—as noted by the following reports from the National Institution for Occupational Safety and Health (NIOSH).

Report 1: On June 30, 1984, at about 1:05 a.m., an 18-year-old male employee with 15 months experience at a fast food restaurant was electrocuted while plugging a portable electric toaster into a 110 volt/20 amp receptacle.

A the time of the incident, employees had closed the restaurant and damp-mopped the floors. About 5 to 10 minutes after mopping, the victim was in the process of plugging the toaster into a floor outlet when he received the shock. The assistant manager and other employees were elsewhere and did not see the victim. The assistant manager heard a scream and investigated. The assistant manager and the other workers then found the victim with one hand on the plug, the other hand wrapped around the receptacle box, and with his face on top of the outlet. An employee tried to take the victim's pulse but was shocked.

The assistant manager went to the breaker box to open the breaker for that circuit, but could not find the specific breaker. He then called the emergency squad, returned to the box and found the right breaker. The victim had by then been in contact with the current for 3 to 8 minutes. An employee checked the victim's pulse and found a very rapid radial pulse. The employee and assistant manager then unlocked the front door

ELECTRICAL INJURY FIRST AID

If someone receives a serious electrical shock, call 911 immediately. If the victim is still in contact with the electricity source, switch off the current if you can. If you can't, push the person away from the electricity with a wooden chair or a broom handle.

High-voltage electricity is usually instantaneously fatal. Never go near a person suffering this type of electrocution.

You may also need to provide first aid for the victim until help arrives. If the victim isn't breathing, give them artificial respiration until they begin to breathe on their own, or until help arrives. You must also give CPR to restore their heartbeat. You need professional training to do either of these. If you don't have the proper training, you could do more harm than good. If you don't have the training, contact the American Red Cross about classes in CPR, artificial respiration and first aid.

If the victim is in shock (weak, rapid pulse; cool, pale skin; irregular breathing), try to find the cause. Check to see if the victim is breathing or bleeding. Treat the cause only if you know what to do. If not, call the hospital or 911.

For victims of serious electrical shock, follow these measures:

• Keep the victim lying down. If they are unconscious and having trouble breathing, lay them on their side to help keep their airway clear. Don't move the victim unless it's absolutely necessary! They might have a neck or spine injury.

• Cover them just enough so that they maintain their body heat.

• If the victim has been burned, the type of first aid will depend on how badly they are burned: If there are minor burns apply cool water, blot dry and apply a dry, sterile bandage; For severe burns, cover the burns with a sterile bandage.

HOW ELECTRICITY AFFECTS THE HUMAN BODY

Current magnitude	Adult weighing 150 lbs.
From 0 to 0.5 mA	No sensation
1 mA	Threshold of perception
From 1 to 3 mA	Weak sensation
From 3 to 10 mA	Painful sensation
10 mA	Muscular contraction in the arms
30 mA	Respiratory paralysis
75 mA to 100 mA	Cardiac fibrillation (probability 0.5%)
250 mA	Cardiac fibrillation with 99.5% probability (up to 5 sec. exposure)
4A	Cardiac paralysis (heart stoppage)
5A	Burning of organic tissue

Source: IPSC.org

and placed another call to the rescue squad. The employee checked the victim's pulse again and found none. An employee living nearby arrived and started CPR, which was continued by the rescue squad upon its arrival. CPR was administered for 1.5 hours. The victim was DOA at the local hospital.

Two different electricians later evaluated the circuit and found no serious problems. It is surmised that while holding the plug, the victim's right hand slipped forward to make contact through the index finger to the energized prong. With his left hand holding the spring-loaded cover open, a current path through the arms, chest, and heart would be established from the prong to the ground. After the accident the employer required employees to open circuits at the breaker box before plugging and unplugging equipment. This strategy is not recommended because it relies on positive human action and places excessive wear on the breakers. NIOSH recommendations:

1. Ground Fault Circuit Interrupter Breakers (GFCI's) would have interrupted the circuit before sufficient current had passed to cause physical damage to the body. They are recommended as the best solution.

2. The location and design of the receptacle, the design of the plug, and the recent mopping contributed to the incident.

3. CPR should be initiated when an unstable pulse is detected, rather than later when no pulse is found.

Report 2: On June 29, 1986, a 34-year-old male maintenance worker temporarily assigned to the night shift was electrocuted while replacing a ballast in a fluorescent light fixture.

The victim had elevated himself 12 feet above the floor on a manlift to work on the 277-volt fluorescent fixture. He did not de-energize the conductor to the lights. He could have easily done so by disconnecting a twist-out outlet box attached to the universal lighting duct. (This would have disconnected three other fixtures as well.) The outlet box was only 20 feet from the fixture on which the victim was working. He could also have removed the universal contact located beneath the metal fixture, though this would have been more difficult because the universal contact helps support the light fixture.

After removing the metal shade and the old fluorescent tubes, the victim did remove the line fuse from the black wire, which he assumed to be the "hot" wire. Unfortunately, the twist-out outlet box and the universal contact were non-polarized units and one was installed backwards; as a result polarity was reversed in the conductors, and the white wire was the hot wire, not the black wire. The black wire was neutral. The victim cut the eight wires to the ballast. While holding the white wire in his left hand, he braced his left index finger against the metal structure supporting the light fixture. He then began to strip the white wire, holding the stripper with his right hand. Electricity passed from the hot white wire through the stripper, to the victim's right hand, through his body, and to ground through his left index finger.

A co-worker heard a noise and saw the victim lying face up on the manlift. She immediately summoned another worker, who lowered the platform. CPR was begun immediately, but to no avail. NIOSH recommendations:

1. Employees who work with electrical conductors should de-energize the conductors and take appropriate action to ensure that the conductors cannot be accidentally re-energized.

2. The correct electrical polarity should be maintained throughout the electrical service area.

AN OUNCE OF PREVENTION

ELECTRICAL INSPECTION HIGHLIGHTS

Electrician's opinions differ as to what an inspection should cover. So ESFI suggests any inspection include the following:

- Check the condition and capacity of the electrical service to the house and perform a load analysis. Is the present service adequate for present and foreseen demands.
- Check the quality of the exposed wiring including the service entrance if above ground.
- Inspect the panel box and check that all connections are safe.
- Check the wiring of receptacles, switches, and light fixtures, and check for proper lamp wattages.
- Measure for voltage drop.
- Verify for polarity and ground wiring at the receptacles.
- Check for required GFCIs and test each.
- Identify the type of wiring (aluminum or copper) and check for proper size of conductors and the presence of overcurrent protection.
- Check the type of wiring insulation (ie. cloth or thermoplastic) and for wiring insulation condition and temperature rating.
- Check the age and type of various components of the electrical system.
- Check for presence and proper placement of smoke alarms and test each.
- Check the appropriate surge suppression, and for areas of the country that experience a lot of lightning, consider a surge arrester.

How can consumers help protect themselves from electrocution and electrical-related injuries? Consumers should check for problems with their home electrical systems, and be ever vigilant for electrical hazards around the home and workplace, like cracked or fraying cords, overheating cords and wallplates, and the presence of overhead and buried power lines when working outdoors. Check outlets and circuits to be sure they aren't overloaded. Make sure to only use the proper wattage light bulbs in light fixtures and lamps. Use extension cords only on a temporary basis and be sure they are properly rated for their intended use. And always follow appropriate safety precautions and manufacturer's instructions on all electrical items.

What is a circuit map? Is it that sticker on the inside of my circuit breaker panel door? A good circuit map details what each circuit serves, every receptacle and fixture. Creating one is a simple but time-consuming process of shutting off a single circuit at a time and determining which outlets and lighting fixtures have been affected each time. You should also include notes on which appliances are plugged into each receptacle.

Finally, add up the power demand of every appliance and fixture drawing power from the circuit. If that total exceeds what the circuit is designed to provide, you may have a dangerous overload. Take immediate measures to alleviate the demands on that circuit by moving some appliances to another less taxed circuit. In fact you may find your total demand exceeds the service to your home and you require a "heavy up," or upgrade to a higher level of electrical service.

How does a three-prong plug work? What is the benefit of using it? The third prong on a plug provides a path to ground for electricity that is straying or leaking from a product. This helps protect the equipment and can help prevent electric shock. Consumers should never remove or bend the third prong to fit a two-slot outlet. Use an adapter or find an appropriate three-slot outlet. Note that GFCIs are required in some places, recommended in others, even if the product has a third wire to ground it. Under some conditions, a shock hazard could still exist even if a product has a grounding wire.

How does a polarized plug work? What is the benefit of using it? A polarized plug is a plug with one large or wide prong and one narrow one. It ensures that the plug is inserted correctly in a socket for proper flow of electric current, and reduces the risk of electrical shock. Consumers should never force a polarized plug into a non-polarized outlet, or shave the wide prong down to fit it. Use an adapter or find an appropriate polarized outlet.

What is a GFCI? What is an AFCI? Ground Fault Circuit Interrupters (GFCIs) constantly monitor electricity flowing in a circuit. If the electricity flowing into the circuit differs by even a slight amount from that returning, the GFCI will quickly shut off the current flowing through that circuit. GFCIs can detect even small variations in the amount of leakage current, even amounts too small to activate a fuse or circuit breaker. GFCIs work quickly, so they can help protect consumers from severe electric shocks and electrocution.

Arc Fault Circuit Interrupters (AFCIs) are a relatively new technology available to homeowners to help protect against fire-causing arcs in the circuit. Like the GFCI, which protects against accidental electric shock or electrocution, the AFCI senses the particular signature of arcing and acts immediately to shut off the circuit, thus depriving the hazard the opportunity to start a fire.

AFCIs are now required by the National Electric Code in all new residential construction in bedroom circuits, but their real value is in the older home that may have developed arc-causing gaps and broken wiring. Homeowners should consult with a qualified, licensed electrician to determine if AFCIs are appropriate for their home, in the bedroom circuits or throughout the home.

What size extension cords should a consumer use? How can you tell if an extension cord is appropriate for intended use? Before purchasing or selecting an extension cord for use, consider how the cord will be used. Make sure the rating on the cord is the same as or higher than the number of watts needed for the product that will be plugged into the cord. Extension cords should only be used on a temporary basis and unplugged safely and stored after every use. Outside the home, use only cords rated for outdoor use, and consider using a portable GFCI.