

Overview: Accident Causes and Prevention

- I. Accident causes and prevention
 - A. Accident statistics
 1. Accidents are the fourth principal cause of death in the US, and the leading cause of death among persons from 1-38 years of age.
 - a. Natural disasters such as floods, hurricanes, tornadoes, and earthquake account for a very small percentage of accidents.
 - b. The majority of catastrophes are caused by some kind of human failure that may result in airplane or automobile crashes, mine cave-ins, explosions, and so on.
 2. Very few lives are lost in catastrophes in comparison to the total number of deaths resulting from other ordinary, unpublicized accidents.
 3. Cause of accidents
 - a. "Horseplay"
 - b. Inadequate lighting
 - c. Undesirable location of equipment
 - d. Low ceilings
 - e. Unguarded belts, gears, pulleys, blades, cutters, etc.
 - f. Failure to allow for adequate safety zones around equipment
 - g. Improper type and location of switches
 - h. Poorly located, constructed, and maintained storage
 - i. Waste materials, stock supplies, or liquids on the floor
 - j. Improperly maintained tools and equipment
 - k. Improper use of tools and equipment

- l. Inadequately ventilated work areas
- m. Failure to use proper protection equipment
(EXAMPLE: Safety glasses)
- n. Failure to adhere to personal grooming standards as related to the operation of equipment and/or the use of tools
(EXAMPLES: Loose clothing; dangling jewelry; long, loose hair)

B. Dangers of lightning

- 1. The average death toll for lightning is greater than for tornadoes or hurricanes; however, this fact is not publicized as much because hurricanes and tornadoes usually affect a larger area and cause more property damage.
- 2. Do not use the telephone during an electrical storm. If lightning strikes a phone line, it can travel through the telephone.
- 3. It is estimated that lightning strikes the earth 100 times each second.
- 4. Lightning may contain as much as a half a million amperes of electricity.

(FOR EXAMPLE: It can cause the sap in a tree to boil instantly and evaporate.)
- 5. The width of the average lightning bolt is about 1/2 to 1/3 of an inch thick, and is surrounded by 4 inch thick channel of super-heated air.
- 6. The length of a strike may vary from 2,000 to 15,000 feet or more.
- 7. Most victims are not struck directly.
 - a. Those standing under a tree get only a small part of the current that passes through the tree and onto the surface of the ground.

- b. The human body cannot tolerate more than a very small amount of electricity.
 - (1) A fraction of an ampere for one or two seconds can easily cause death.
 - (2) A high-voltage injury from a high-intensity electrical charge is almost always lethal.
- 8. It is important to turn off televisions, computers, and other devices that may attract lightning and cause damage to them.
- 9. Precautions about lightning.
 - a. Get inside a home or large building, or inside an all-metal (not convertible) vehicle. Turn off and disconnect major electrical appliances—televisions, computers, and so on.
 - b. Do not stand underneath a natural lightning rod, such as a tall tree, in an open area.
 - c. Avoid projecting above the surrounding landscape, such as on a hilltop or open field, on the beach, or when fishing from a small boat.
 - d. Get out of and away from open water such as pools, lakes, and ponds.
 - e. Get off and away from motorcycles, scooters, golf carts, and bicycles. Put down golf clubs and baseball bats.
 - f. Get away from tractors and other metal farm equipment.
 - g. Stay away from wire fences, clotheslines, metal pipes, rails, and other metallic paths which could carry lightning to you from some distance away.
 - h. In forests, seek shelter in a low area under a thick growth of small trees.
 - i. In open areas, go to a ravine or valley.
 - (1) If you feel your hair stand on end, drop to your knees.

(2) Do not lie flat on the ground.

(3) This will minimize the danger of your body acting as a conductor.

10. Results of lightning hitting a person

a. Sometimes only causes burns and tissue destruction.

b. Serious effects are the loss of respiration and interference with the rhythmic beat of the heart.

C. Electricity

1. Electrical injuries constitute nearly 1,200 fatalities in the U.S. each year. These fatalities could be prevented if safety guidelines were followed.

2. Inadequate or damaged wiring is a major contributor to electrical hazards. Some indications of inadequate wiring are:

a. Lights dim when an appliance goes on.

b. Fuses blow or circuit breakers trip frequently.

c. Toasters and irons fail to heat properly.

d. Television picture fades.

e. Motors slow down.

3. Electrical burns

a. Electrical current passing through living tissue generates extreme heat.

(1) Injuries are worse than they appear outwardly.

(2) Wound may be deceptive because the skin hides the massive tissue damage.

- b. Severe electrical burns occur when a person makes contact with an electrical source in situations such as:
 - (1) Linesmen contacting "hot" wires.
 - (2) Persons making contact with high-tension lines through machinery.
 - (3) Persons installing a television, CB radio, or other antennae.
 - (4) Hang gliders or balloonists falling into power lines.
 - (5) Children climbing power line poles.
 - (6) Being struck by lightning, or sticking pins or other metal objects into electrical outlets.
 - (7) Working on high voltage transformers—in televisions, computers, or other electrical equipment—without taking the proper precautions.

- 4. Misuse of electrical cords
 - a. Cords should be the proper type—large enough to carry the volts used.
 - b. Place cords out of the way where they will not cause falls or be exposed to excessive wear.
 - c. Do not twist or place cords near heat or in water.
 - d. Electrical outlets and cords should not be overloaded.

- 5. Six factors influencing the affect of electricity on the human body
 - a. The type of current
 - (1) Two types—alternating and direct.
 - (2) Alternating is more dangerous because it produces muscular spasms.

- (3) Victim is unable to let go of the energized object and suffers a more serious injury.
 - (4) Direct current does not produce strong muscular contractions.
- b. The intensity or value of the current
- (1) Measured in milliamperes (amps).
 - (2) As the value increases, so does the severity of the injury. The effects of various current values range from:
 - a. A tingling sensation (1 milliamp)
 - b. A painful sensation (5 milliamps)
 - c. Asphyxia (30 milliamps)
 - d. Ventricular fibrillation (60 milliamps)
 - (3) Fifteen milliamps is known as the "let-go-current" or the maximum value or current from which a victim can manage to release his grip on the energized object.
 - (4) Current causes severe spasms of muscles and prevents the victim from releasing a source of electricity.
- c. The voltage or force of the current
- (1) The force of the current is the voltage.
 - (2) Two kinds:
 - (a) Low voltage—10,000 or fewer volts
 - (b) High tension—over 10,000 volts

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- (3) The greater the voltage, the more extensive the injury.
 - d. The resistance of the body
 - (1) Resistance is caused by the skin at the point of contact and internal resistance of firm tissues.
 - (2) After entering the body the current travels along the path of least resistance, usually nerves and blood vessels.
 - e. The pathway of the current—if the pathway does not include vital organs—heart, lungs, brain, kidneys, the injury is less likely to be fatal.
 - f. The duration of contact
 - (1) Affects the outcome of the injury.
 - (2) The longer the duration of contact, the greater the damage.
- D. Fire safety
- 1. Fires kill about 6,000 people in the United States each year.
 - 2. Fires need three ingredients to burn:
 - a. Fuel
 - (1) Every fuel has its own "ignition temperature"—the temperature to which the fuel must be heated in order for its vapors to combine with oxygen and start to burn.
 - (2) Solid fuels do not produce vapors until they are heated to their ignition temperature.
 - b. Oxygen
 - (1) When vapors are given off and combine with oxygen, burning begins.

- (2) Ignition points of some solids are:
 - (a) Cotton sheets—454 degrees F
 - (b) Paper—around 450 degrees F
 - (c) Wood—about 500 degrees F
 - (d) Match flame—2,000 degrees F
 - (e) An electric arc (caused by 2 exposed, crossed electrical wires) has an ignition point of 2,000 degrees F.

c. Heat

- (1) Burning begins when heat is high enough to ignite the vapors of a fuel.
- (2) Heat warms other fuels in the area to their ignition temperatures, and they begin to burn as well.
- (3) As fire grows, it can produce so much heat that it even heats fuels that are beyond range of the fire.

3. Fire victims

- a. Most die by inhaling smoke or toxic gases before the flames have reached them.
- b. A person caught in a burning building has between a few seconds and an hour to escape, to reach an area of refuge, or to be rescued.
- c. Temperatures of about 300 degrees F can cause death in minutes.
 - (1) Air temperatures near the ceiling of a burning room can reach 1,000 degrees F or more.

- (2) That is why it is important to stay near the floor in order to escape from a fire.

4. Fire Safety Rules

a. General rules

- (1) Practice fire prevention.
- (2) Keep a clean work area with flammable materials stored properly.
- (3) Find out what material is burning when a fire starts.

b. Types of Fires

- (1) Class A—ordinary combustibles, such as wood, paper, or cloth
- (2) Class B—flammable liquids or grease, such as gasoline, paints, or oils
- (3) Class C—Electrical equipment, such as motors and switches

c. Types of fire extinguishers and their characteristics

- (1) Multi-purpose dry chemical
 - a. Selected dry chemicals under pressure
 - b. Can be used safely on all classes of fire
- (2) Ordinary dry chemical
 - (a) Selected dry chemicals under pressure
 - (b) Used only for Class B and Class C fires

- (3) Foam
 - (a) A solution of aluminum sulfate
 - (b) Used for Class A and Class B fires
 - (4) Carbon dioxide
 - (a) Carbon dioxide gas under pressure
 - (b) Used for Class B and Class C fires
 - (5) Soda acid
 - (a) Bicarbonate of soda and sulfuric acid
 - (b) Can be used safely only on Class A fires
- d. Being prepared for a fire in the hotel or office.
- (1) Know where the fire exits are located wherever you are—hotels, theaters, or auditoriums. Count the number of doors between your room and those exits.
 - (2) Open the exit door—know what is beyond.
 - (3) Know the layout of your room.
 - (a) Do the windows open? How?
 - (b) What lies outside the window?
 - (c) Is there an air vent in the bathrooms?
 - (4) Know where your room key is at all times.
 - (5) Find the nearest fire alarm.
- e. What to do in case of fire.
- (1) If a fire starts in your room:

- (a) Call the operator
 - (b) Leave the room
 - (c) Close the door behind you
 - (d) Do not try to put out the fire unless you are confident you will be able to do so.
 - (e) Set off the alarm to alert your neighbors.
- (2) If the fire starts somewhere else, you will probably be alerted by a phone call, noise in the hall, an alarm, or smoke.
- (a) Grab your room key—go to the door—crawl out if there is smoke in the room.
 - (b) Feel the door with the palm of your hand.
 - (1) If the door or doorknob is hot, do not leave the room.
 - (c) Protect yourself in your room (see below).
 - (d) Open the door slowly—however, shut it quickly if the smoke is too dense.
 - (e) If you are able to leave your room, close the door behind you.
 - (f) If there is no smoke, walk to the exit.
 - (g) If there is smoke, crawl to the exit—stay on the same side of the hall as the exit, counting doors as you go. It is important to stay oriented as to where you are.
 - (h) If the first exit is blocked by heavy smoke or fire, go to an alternate exit.

- (i) When you reach the exit, remember to close it behind you.
 - (j) Walk down to the ground floor, holding the handrail securely.
 - (k) Exit at ground level, and leave the building.
 - (l) When going downstairs, if you run into heavy smoke, turn around and go up.
 - 1) Do not go through smoke in the stairwell.
 - 2) Exit on the roof, if possible.
- f. Protecting yourself in your room.
- (1) If you can open the window, and need the air, do so.
 - (a) Keep an eye on what is happening outside.
 - (b) However, close the window if flames or smoke develop.
 - (2) Call the hotel operator to inform rescue workers that you are in your room. Hang a sheet out of the window if the phone is not working.
 - (3) If you need ventilation and the hotel window does not open:
 - (a) Break the window cautiously, avoiding cutting yourself.
 - (b) Remember, you will have no way of closing it again.

- (4) Turn on the air vent in the bathroom.
- (5) Fill the tub with water.
- (6) Line the cracks around the doors with wet towels.
- (7) If there is fire outside the window, pull down the drapes, move everything combustible away from the window, and throw water around the window.
- (8) Clear smoke by swinging a wet towel.
- (9) A wet towel over your nose and mouth provides an effective filter for smoke.
- (10) Keep everything wet.
- (11) Don't panic.