What Is Electricity

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Electricity has long been recognized as a serious workplace hazard. The electrical standards are designed to protect employees exposed to dangers such as electric shock, electrocution, fires, and explosions.

Electricity is a form of energy. Electricity is the flow of electrons. All matter is made up of atoms.

Statistics reported that around 350 electrical related fatalities occur each year. An average of one worker is electrocuted on the job every day.

The objective of OSHA's electrical standards is to minimize the potential hazards of electricity by specifying design characteristics of safety in use of electrical equipment and systems.

What is Electricity?

There are two kinds of electricity

Static (stationary) – Static electricity is an imbalance of electric charges within or on the surface of a material.

Dynamic (moving) – Dynamic electricity is the flow of electric charges through a circuit and always travels in the path of least resistance.

Electrical Terminology

Current – The flow of electrons.

Resistance -electricity is the obstruction in the flow of electricity through a device such as a light bulb. Resistance electricity opposes the passage of electrons. opposition to current flow,

Voltage – is defined as the potential difference between two points. It is a measure of difference of electron concentration.

Conductors – substances, such as metals, that have little resistance to electricity

Insulators – substances, such as wood, rubber, glass, and plastic, that have high resistance to electricity

Electrical earthling: – works as simply as grounding an item to stop a continuous flow of electricity. It is basically grounding the building's electrical components**.**

What are the Hazards of Electricity?

Whenever you work with power tools or on electrical circuits there is a risk of electrical hazards, especially electrical shock.

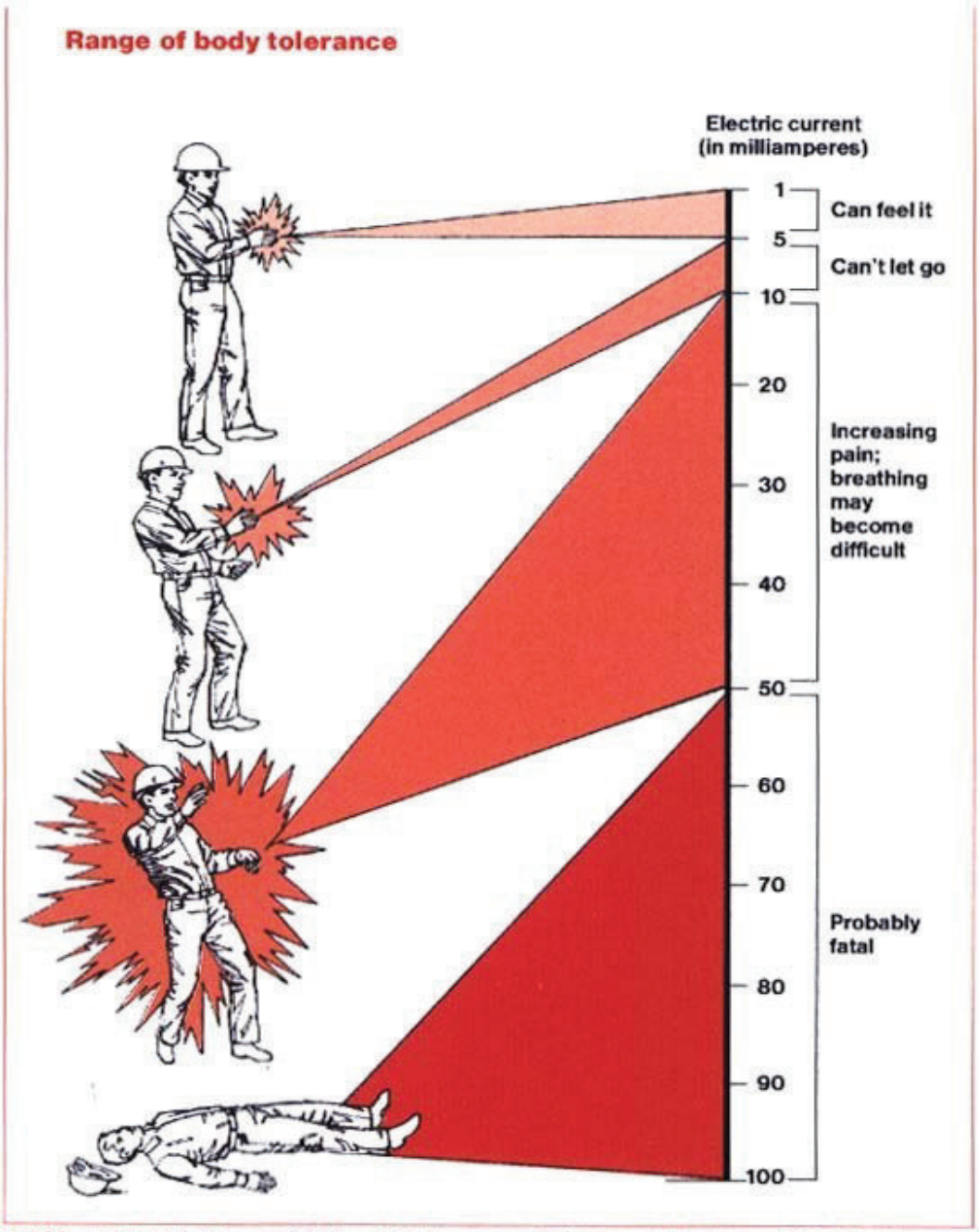
Anyone can be exposed to these hazards at home or at work. Workers are exposed to more hazards because job sites can be cluttered with tools and materials.

The primary Hazards of electricity and its use are:

- **Shock**
- **Burns**
- **Arc-Blast**
- **Fires / Explosions**

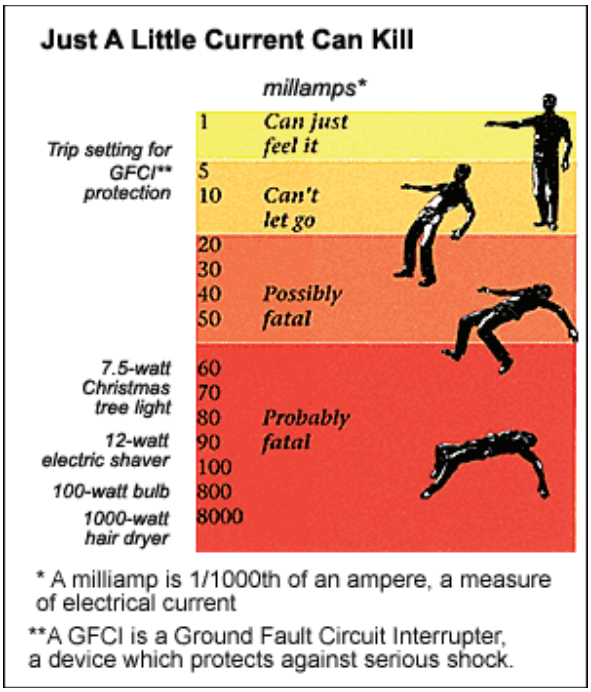
Shocks

- Electric shock is the most common cause of injury to people working with electrical equipment and circuits.
- Electrical current will always try to get back to its source. If it can't go through the wires, it will try to get back through your body.
- **You can receive a shock when:** You become part of an electrical circuit, when coming in contact with conducting part of electrical equipment.
- **Electric Shock Severity Depends On** – The route the electrical current takes through the body.
- The type and amount of voltage present.
- The surface where the person is standing. Wet or dry.
- The exposure time.
- The persons (Wet or dry) resistance of individual person / body.



A 100 watt light bulb uses 1000 mA (milliamperes) of current. It takes only 5 mA to trip a ground fault circuit interrupter (GFCI). A small amount of current running through the body for a few seconds can give the effects shown in the table.

Body tolerance



Effect of Electric Current in human body

Burns

- When you receive an electric shock you can also suffer burns to the skin severe enough to be third degree.
- This is due to the extremely high heat that is generated.
- High voltage electrical workers have lost fingers, arms, and legs because of electrical burns.

Heat Injury

Heat from electrical current can cause severe Burns.

Arc – Blast

The fault current magnetic fields make conductors to separate producing an arc. In other words, **arc flash** is caused by uncontrolled conduction of electrical.

- Arc-Blast occur when high-amperage jump from one conductor to another through air.
- Generally during opening or closing circuits, or when static electricity is discharged.

ARC Blast Hazard

There are three **Primary hazards** associated with an arc-blast:

- Arcing gives off thermal radiation (heat) and intense light, which can cause burns.
- A high-voltage arc can produce a considerable pressure wave blast.
- Also can cause many of copper and aluminum components in electrical equipment to melt.

Fire/Explosions

Electrical fire occurs due the following faults in electrical circuits:

Short circuiting: – This occurs when in a single phase circuit, phase line touches the neutral line or in 3-ph circuit, one phase line touches the other, as a result of failure of insulation.

Over Loading:

- Over loading means drawing of more current than it's rated capacity, which occurs due to failure of insulation of any equipment.
- Short circuit current is about 3.5 times more than the normal rated current.
- The heat developed due to passage of current is directly proportional to the square of current, resistance of the conductor and period of flow.

Loose Connections

- Loose connections in electrical circuits result in formation of arc at junction points of cables and fittings.
- This arc in turn develops into fires.
- Any combustible materials, oils, bunches of cables etc. lying around the arc, will further aggravate the fire.
- In all the above the three fault conditions, heat is generated in the conductor or wire.
- The wire in turn heats up the insulating materials (PVC, Rubber etc.) of the conductor to catch fire.
- Basic causes of electrical fire are improper maintenance of earthing system, use of over size fuse and failure of insulation.

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Explosions

Explosion takes place in an electrical equipment, when fire due to short circuit originates in a confined space filled with oil, such as “Oil circuit breaker , Transformer” etc.

Fall injuries due to electrical shocks

Electric shock can also cause indirect or secondary injuries Workers in elevated locations who experience a shock can fall, resulting in serious injury or death

Prevention of Electrical Accidents

- **Isolation**
- **Electrical Protective Devices**
- **Guarding**
- **Earthing/Grounding**
- **PPE,s**
- **Safe Work Practices**

Isolation

- All electrical equipment should be isolated from accidental contact & approach by unauthorised men. Providing barrier
- Panel boards, generators, large motors, batteries should be enclosed
- Low & medium voltage OH lines should be kept 19’ above the ground

Isolation Switches

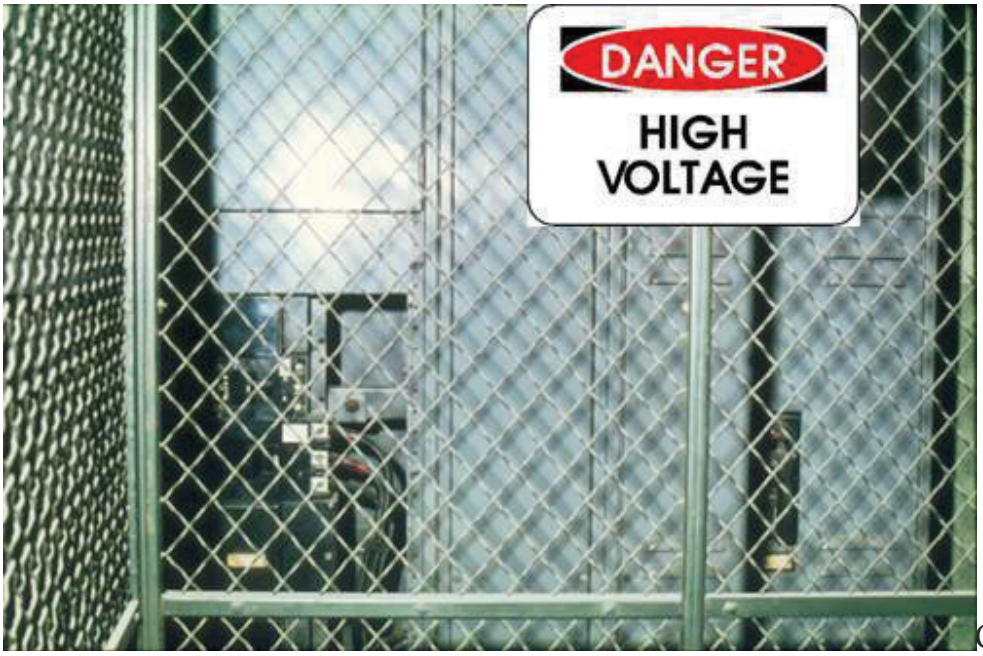
- The switches should be connected in phase only
- The switches should be easy and free to operate
- Body of the metallic switches should be earthed
- Every DB should be provided with a on/off switch
- It is advisable to keep switch as near as possible to the work-place

Electrical Protective Devices (safety Device)

- Fuses
- Circuit Breakers/overload trippers
- ELCB,MCB,RCCB

Guarding

- Any live parts of electrical equipment at 50 volts or more must be guarded:
- Locating machines or equipment in a room, enclosure, or a vault accessible only to qualified personnel.
- Behind screens or partitions on a balcony, platform or gallery area which is elevated and not accessible.
- At least eight feet above the floor of the work area.
- Grounding
- The path to ground from circuits, equipment, and enclosures must be permanent and continuous



Guarding

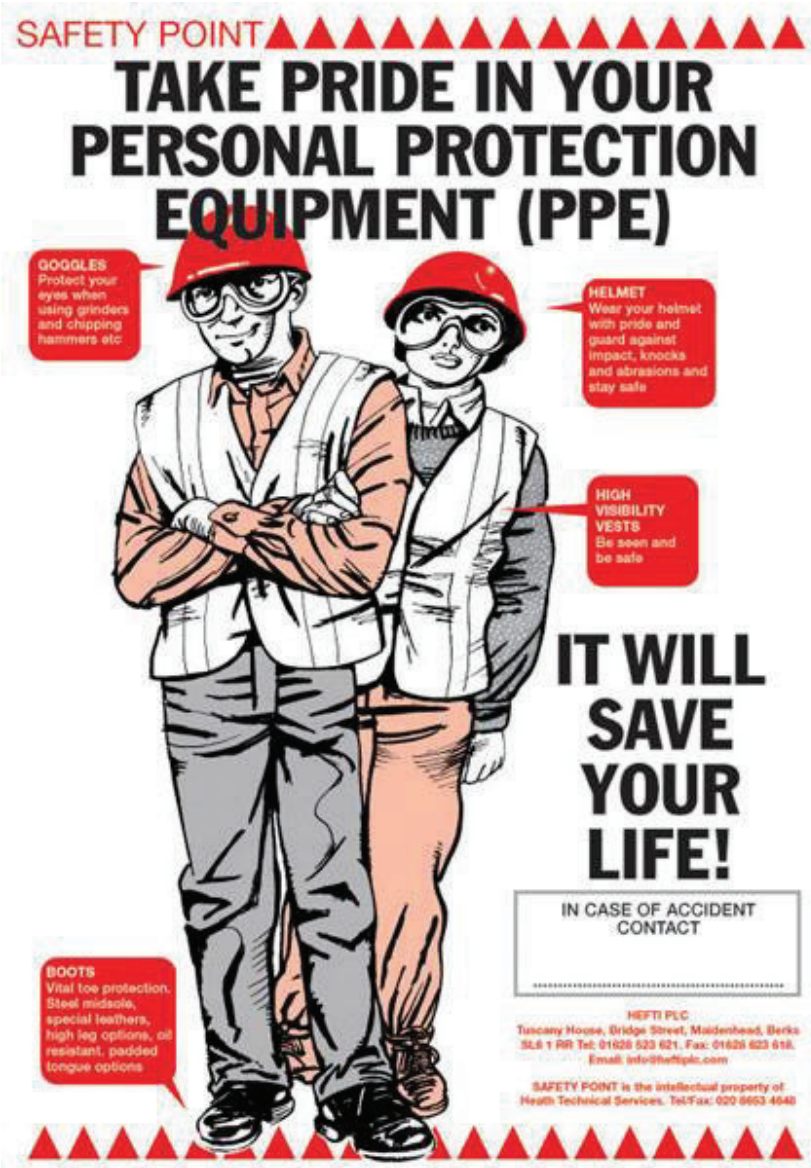
Earthing/Grounding

Potential shock hazards exist when an equipment grounding conductor is not used. If a fault occurs, most of the current will follow the path of least resistance.

The worker can provide that path to ground as an alternate to the white circuit grounded conductor (neutral) for some portion of the current. The shock severity will depend on the amount of current that flows through the worker.

PPE's

Personal Protective Equipment



Safe Work Practices –

- Lock-Out & Tag-Out
- Replace damaged cords or plugs

- Never run cords under rugs
- Always pull an electrical cord from outlet by the plug and never by the cord
- Make sure electrical connections are tight to avoid loose connections which might lead to sparks and fires
- Always use properly rated fuses and in case of tripping of circuit breakers or melting of fuses check the reasons before replacing the fuses.
- Avoid overloading electrical outlets.

Lockout and Tagging of Circuits (LOTO)

- Apply locks to power source after de-energizing
- Tag deactivated controls
- Tags must identify equipment or circuits being worked

Manpower/workers

- Qualified electrician, preferably 'B' license holders
- Identification of the electrician – red helmet

Working Safely at Work:

Safety should be foremost in your mind when working with electrical equipment. You face hazards from the tools themselves and the electricity that powers them.

It's up to you to wear personal protective equipment whenever it's specified, use all safety procedures, and work with tools correctly.

Never let over confidence or complacency lead to taking unnecessary risks. If you're not sure – don't touch.

General rules of electrical equipment

The following general rules apply to every piece of electrical equipment you use:

- Be sure your electrical equipment is maintained properly. Regularly inspect tools, cords, grounds, and accessories. Make repairs only if you are authorized to do so. Otherwise, arrange to have equipment repaired or replaced immediately.

- Be sure you use safely features like three-prong plugs, double-insulated tools, and safety switches. Be sure machine guards are in place and that you always follow proper procedures.
- Install or repair equipment only if you're qualified and authorized to do so, a faulty job may cause a fire or seriously injure you or other workers.
- Keep electric cables and cords clean and free from kinks. Never carry equipment by its cords.
- Use extension cords only when flexibility is necessary:
- Don't touch water, damp surfaces, ungrounded metal, or any bare wires if you are not protected. Wear approved rubber gloves when working with live wires or ungrounded surfaces, and wear rubber-soled shoes or boots when working on damp or wet surfaces.
- Don't wear metal objects (rings, watches, etc.) when working with electricity. They might cause arcing.
- If you are working near overhead power lines of 50 kilo-Volts (kV) or less, you or any equipment you are using must not come any closer than 10 ft from the lines. Add 4 inches of distance for every 10 kV over 50 kV.

Electricity Safety FAQ

What is electricity explain?

Electricity is a form of energy. Electricity is the flow of electrons. All matter is made up of atoms, There are two kinds of electricity – static (stationary) and dynamic (moving). In order for electricity to work it must have a continuous loop from its source through the conductor and back to the source.

What are 5 electrical safety tips?

5 electrical safety tips you should know

1. Ensure that all electrical appliances, cords and fixtures carry ISI mark
2. Keep all electrically powered appliances and equipment dry and away from places where water is used.
3. Unplug electrical appliances when not in use.
4. Turn off electrical equipment while leaving the place.
5. Don't overload circuits. Install additional circuits if needed

What are the 3 hazards of electricity?

The main hazards with electricity are:
1. Electrical shock
2. Burns
3. Electrical fire & Explosion

What are some electrical safety rules?

8 Safety Precautions Every Electrician Student Should Know –

1. Make sure your electrical equipment is maintained properly. Regularly inspect tools, cords, grounds, and accessories. Make repairs only if you are authorized to do so. Otherwise, arrange to have equipment repaired or replaced immediately.
2. Make sure you use safely features like three-prong plugs, double-insulated tools, and safety switches. Be sure machine guards are in place and that you always follow proper procedures.
3. Call electrician to carry out electrical repairs and lay wiring. (Only allow competent and qualified electrician)
4. Cover all unused electrical outlets
5. Avoid use of electrical extension cords. If their use is necessary ensure that they are of correct rating and not run through doors, walls, floors or any other location where they could be damaged.
6. Never use worn, frayed or damaged cords or appliances.
7. Follow correct specifications when replacing electrical fuses
8. Keep electric cables and cords clean and free from kinks. Never carry equipment by its cords.