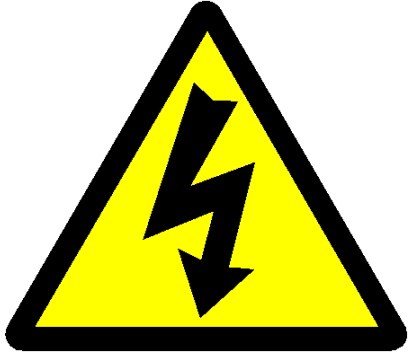
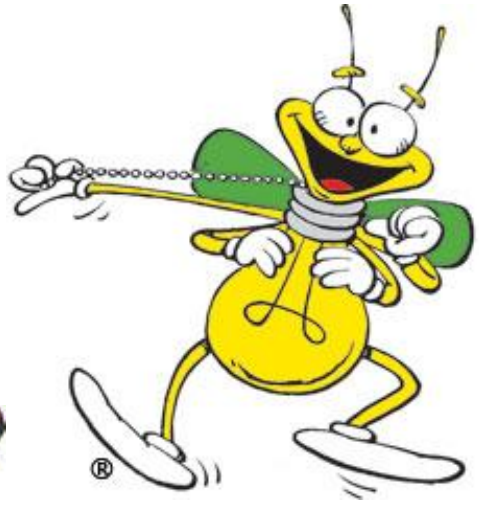
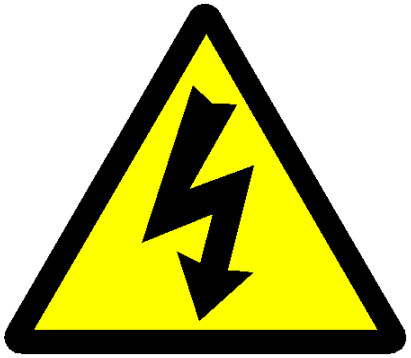
Electrical Safety





Did you do your safety ?



Electrical Hazard

Three factors determine the resistance of a substance to the flow of electricity:

- What it is made of.
- Its size.
- Its temperature.
- Substances with very little resistance to the flow of electrical current are called ***conductors.*** Examples are metals.
- Substances with such a high resistance that they can be used to prevent the flow of electrical current are called ***insulators.*** Examples are glass, porcelain, plastic, and dry wood**.**
- Pure water is a poor conductor of electricity, but small amounts of impurities, such as salt and acid (perspiration contains both), make it a ready conductor. Therefore, although dry wood is a poor conductor, when saturated with water it becomes a ready conductor.
- The same is true of human skin. When skin is dry, it is a poor conductor of electrical current. When it is moist, it readily conducts electricity. Use ***extreme caution*** when working with electricity where there is water in the environment or on the skin

How Shocks Occur

- Electric shock occurs in one of three ways. Individuals, while in contact with the ground, must come in contact with:

		
Both wires of an energized circuit.	**One wire of an energized circuit and the ground.**	**A metallic part in contact with an energized wire while the person is also in contact with the ground.**

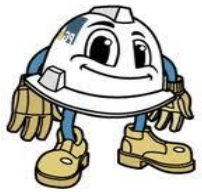
How Electrical Current Affects the Human

- Three primary factors affect the severity of the shock a person receives when he or she is a part of an electrical circuit:
  - Amount of current flowing through the body (measured in *amperes*).
  - Path of the current through the body.
  - Length of time the body is in the circuit.

Continue…

How Electrical Current Affects the Human

- Other factors that may affect the severity of the shock are:
  - The voltage of the current.
  - The presence of moisture in the environment.
  - The phase of the heart cycle when the shock occurs.
  - The general health of the person prior to the shock.



How different levels of exposure to electricity can affect people

Exposure Level	Impact on Body	Other Potential Outcomes
2-10 mA	Minor shock is possible.	If working from an elevation, could cause a person to fall
10-25 mA	May lose muscle control and may not be able to release or let go of the circuit	Rescuer may receive shock trying to assist a victim.
25-75 mA	Painful and may lead to collapse or even death	The longer the person is exposed to this electrical current, the more likely death will occur.
75-300 mA	Even for a quarter of a second, this exposure is almost always immediately fatal.	Causes ventricular fibrillation (the rhythmic pumping action of the heart ceases)

Wet conditions are common during low-voltage electrocutions. Under dry conditions, human skin is very resistant. Wet skin dramatically drops the body's resistance.

How different levels of exposure to electricity can affect people

Current level (in milli amperes)	Probable effect on human body
1 mA	Perception level. Slight tingling sensation. Still dangerous under certain conditions.
5 mA	Slight shock felt; not painful but disturbing. Average individual can let go. However, strong involuntary reactions to shocks in this range may lead to injuries.
6-30 mA	Painful shock, muscular control is lost. This is called the freezing current or "let-go" range.
50-150 mA	Extreme pain, respiratory arrest, severe muscular contractions. Individual cannot let go. Death is possible.
1000-4300 mA	Ventricular fibrillation (the rhythmic pumping action of the heart ceases.) Muscular contraction and nerve damage occur. Death is most likely.
10,000 mA	Cardiac arrest, severe burns and probable death.

Burns and Other Injuries

Shock-related injuries include burns, internal injuries, and injuries due to involuntary muscle contractions**.**

Burns

The most common shock-related injury is a burn. Burns suffered in electrical incidents may be one or more of the following three types:

- **Electrical Burns cause tissue damage, and are the result of heat generated by the flow of electric current through the body. Electrical burns are one of the most serious injuries you can receive and should be given immediate attention.**
- **High temperatures near the body produced by an electric arc or explosion cause Arc or Flash Burns. They should also be attended to promptly**
- **Thermal Contact Burns occur when skin comes in contact with overheated electric equipment, or when clothing is ignited in an electrical incident.**

Continue…

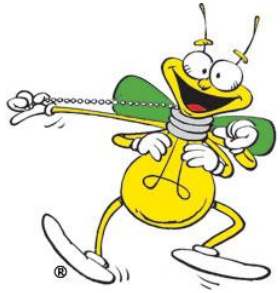
Burns and Other Injuries

Internal Injuries

- Excessive electricity flowing through the human body can cause serious damage to internal organs. Resulting medical problems include hemorrhage (or **internal bleeding**), **tissue destruction**, and **nerve or muscle damage**. These internal injuries may not be immediately apparent to the victim or observers; however, left untreated, they can **result in death**.

Involuntary Muscle Contraction

- Normal muscle contraction is caused by very small amounts of electricity that are created within our bodies. Muscles violently contract when stimulated by excessive amounts of electricity. These involuntary contractions can **damage muscles, tendons, and ligaments**, and may even **cause broken bones**. If the victim is holding an electrocuting object, hand muscles may contract, making it impossible to drop the object and prolonging contact with the current. Also, injury or death may result when violent muscle contractions cause workers to fall from ladders and scaffolds or inadvertently strike other objects.



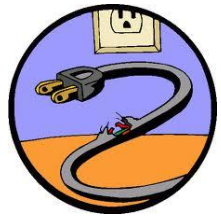
Lack of Ground-Fault Protection

Due to the dynamic, rugged nature of construction work, normal use of electrical equipment at your site causes wear and tear that results in insulation breaks, short-circuits, and exposed wires]. If there is no ground-fault protection, these can cause a ground-fault that sends current through the worker's body, resulting in electrical burns, explosions, fire, or death.

How to Avoid Hazards?

- Follow manufacturers' recommended testing procedure to insure GFCI is working correctly.
- Use double-insulated tools and equipment, distinctively marked.
- Use tools and equipment according to the instructions included in their listing, labeling or certification.
- Visually inspect all electrical equipment before use. Remove from service any equipment with frayed cords, missing ground prongs, cracked tool casings, etc. Apply a warning tag to any defective tool and do not use it until the problem has been corrected.

Electrical Incidents:
Path to Ground Missing or Discontinuous



If the power supply to the electrical equipment at your site is not grounded or the path has been broken, fault current may travel through a worker's body, causing electrical burns or death. Even when the power system is properly grounded, electrical equipment can instantly change from safe to hazardous because of extreme conditions and rough treatment.

How to Avoid Hazards?

- Ground all power supply systems, electrical circuits, and electrical equipment.
- Frequently inspect electrical systems to insure that the path to ground is continuous.
- Visually inspect all electrical equipment before use. Take any defective equipment out of service.
- Do not remove ground prongs from cord- and plug-connected equipment or extension cords.
- Use double-insulated tools.
- Ground all exposed metal parts of equipment.

Portable Electrical Hand Tools

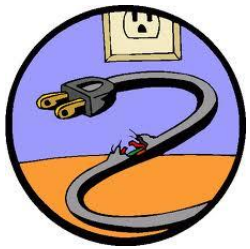
Before using a portable electric tools ensure:-

- It has recently been **tested by LEW** and has a test label tag affixed to it
- Its casing is **not damaged**
- Its **cable and plug are sound and securely fixed**.
- Use tools only on the correct power supply
- Ensure the **power cable is long enough to reach** where you working without straining it
- Keep power **cables off the floor**. They may get damaged or trip somebody
- Keep the **equipment clean and dry** and never stand on a wet or damp surface when using it
- Never connect a **portable electric tools to a lighting socket**
- Always **disconnect tools when you are adjusting, cleaning** or not using them
- Do not use of steel wire or electricity conductive material to **secure of electrical cable.**

Simple Hints for Electrical Hazards

- Install PUB Approved **Earth Leakage Circuit Breaker** (ELCB) and test it **Monthly.**
- Always Engage a **Licensed electrical contractor** to do your wiring.

- Send any damaged or defective electrical equipment or appliances to the **Authorized agents or competent repairers.**
- **Do not overload a socket** outlet by connecting several appliances using multi-way adaptors.



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Simple Hints for Electrical Hazards

- Do not **use appliances** or accessories in electrical installation unless they have been **tested by PSB** and **approved by PUB**.
- **Do not lay any cable near area of hot works** on the floor and in between door hinges.
- **Periodic check on the resistance of the earth circuit** is recommended to be carried out by licensed electrical contractor.

Continue…

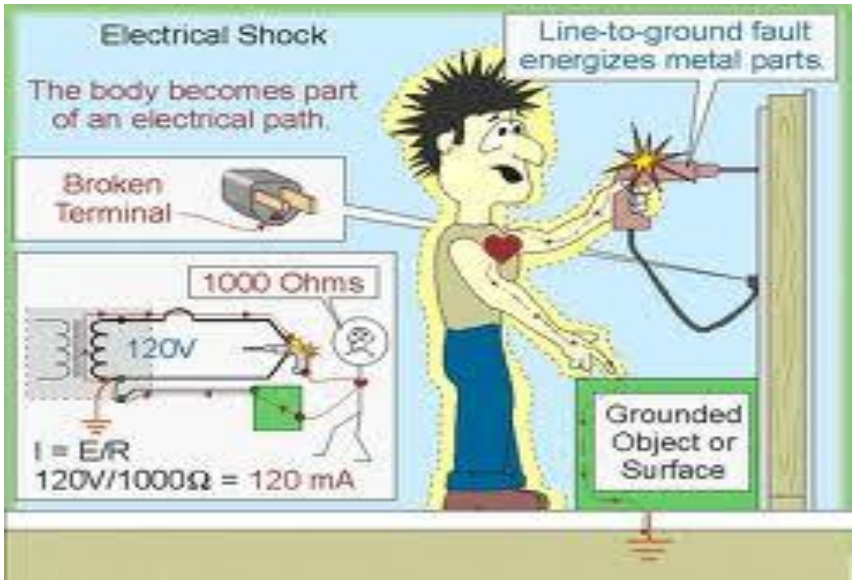
Simple Hints for Electrical Hazards

- **Regularly check and replace all plugs, Switches, sockets outlets and adopters** that are damaged, faulty or worn out.
- **Never insert bare conductors** of flexible cable directly into socket outlet without using a plug.
- **Avoid switching on/off or handling electrical appliances** or accessories when your hands or feet are wet or the ground on which you are **standing is wet**.

Continue…

Simple Hints for Electrical Hazards

- All **exposed conductors** should be **insulated** also kept out of reach.
- Worn and damaged flexible **cables must be replaces** and avoid “knotting” or kinking of flexible cable when they are coiled.



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ELECTRICAL HAZARD

Thank you for taking the time interest to learn about safety and health and how to prevent Electrical injuries and illnesses