

Safeguarding Lives with Electrical Safety Practices

Marwan Alasami¹; Muhanad Alarfaj²

^{1,2} Saudi Aramco Company

Publication Date: 2025/05/13

Abstract: This report underscores the critical importance of electrical safety in both homes and workplaces, highlighting the pervasive risks associated with electricity. Dealing with the issues of education, awareness, and compliance with safety procedures and standards, the document focuses on the risks of severe injuries and fatalities due to electrical incidents. Knowledge of the essentials of electricity, especially on its conduction and insulation are very relevant on minimizing risks which is more so especially in areas where there is moisture which enhances the risks. At workplaces, safety with reference to OSHA is a requirement, and this entails aspects such as protective gear, inspections, safe procedures among others. Likewise, in homes people's compliance to building codes, and proper practices and service from professional contractors dramatically improves security. Informing people on electrical dangers, as well as ensuring that they acquire safe behaviors that include appliance handling and disaster management prevent injuries. On the last note, the proper care and attention to the need of electrical safety make people and their property safer, and hence experience reduce incidence of accidents.

Keywords: Safety, Industry, Appliances, ELCB (Earth Leakage Circuit Breaker), Electrical Hazards.

How to Cite: Marwan Alasami; Muhanad Alarfaj. (2025). Safeguarding Lives with Electrical Safety Practices. *International Journal of Innovative Science and Research Technology*, 10 (4), 3353-3357.
<https://doi.org/10.38124/ijisrt/25apr2103>

I. INTRODUCTION

Electricity is a fundamental aspect of modern life, powering homes, workplaces, and industries. Although it is cannot do without, it also can be potent with danger if it is not well managed. Thus, electrical safety is a very sensitive area and if not well handled could lead to powerful consequences such as electrocution, fire outbreaks among others.

A. Basis of Electricity

Electricity is conducted through objects which are good conductors of electricity like the metals, but are resisted by substances that are insulators like glass or the dry wood. Water or any substance which is dissolved in it makes the insulators to become conductor and potentiality of the electrical related accidents increases in the damp or wet conditions.

II. ELECTRICAL HAZARDS

At the workplace, electricity remains a major danger factor that leads to deaths and or accidents like electric shock, burns and fire outbreaks. These hazards are electrical shock, burns and blast effects and to reduce the risks of these, there are specific measures adopted (Study Guide Electrical Safety Hazards Awareness). Despite the great nuisance that electricity has eradicated in homes and workplaces, it has the following risks. These include:

A. Electric Shock:

This commonly happens when an electrical current is taken through the body causing burns, heart attack or even death.

Table 1 Effects of Electric Current on Human Body

Electric current (contact for 1s)	Effect
Below 1 mA	Not perceptible
1 mA	Threshold of feeling, tingling
5 mA	Slight shock. Not painful. Average individual can let go. Involuntary reaction can lead to indirect injuries
6-25 mA (women)	Painful shocks. Loss of muscle control
9 to 30 mA (men)	Freezing current, "can't let go". The person may be thrown away from the power source. Individual cannot let go. Strong involuntary reaction can lead to involuntary injuries
50 to 150 mA	Extreme pain. Respiratory arrest. Muscles reactions. Possible Death.
1 to 4.3 A	Fibrillation of the heart. Muscular contraction and nerve damage occur. Likely death.
10 A	Cardiac arrest, severe burns. Death is probable

Table 2 Human Resistance to Electrical Current

TYPE OF RESISTANCE	RESISTANCE VALUES
Dry skin	100,000 to 600,000 Ohms
Wet skin	1,000 Ohms
Hand to Foot	400 to 600 Ohms
Ear to Ear	100 Ohms

B. Fire Hazard:

In some instances, there can be improper installation or even poor maintenance of the electrical systems hence leading to overheating, sparking and even fire outbreaks.

C. Arc Flashes and Explosions:

Fire is also a major issue in electrical equipment; the electrical arcs releases energies that causes explosion hence leading to severe injuries and destruction of equipment.

III. ELECTRICAL SAFETY

Measures that are established in electrical safety include RCDs which are used to monitor faults and instantly interrupt power reducing the probability of shock and fire incidents. It is very important to have proper and frequent checkups and overhauls of electrical equipment to avoid mishaps and only safe electrical equipment should be used (7671:2008, 2011).

A. Office Hazards;

Based on the literature findings, several electrical risks occur in offices, which are generally considered as low-risk settings, including overloaded circuits, faulty equipment, and

the improper usage of extension cords and power strips. To manage these risks and secure the safety of worker, it is required to teach and follow the safety measures (Safety and Health Magazine, 2016).

B. Tips for Minimizing Electrical Hazards:

Appliances should be switched off when not in use, many outlets should not be loaded and cords should be checked frequently for damages. Employment of qualified personnel in the installation of new outlets helps to minimize the use of the extension cords and hence improve safety at the workplace (High Speed Training Website, n.d.).

IV. STEP AND TOUCH POTENTIAL

A. Step Potential:

In a ground fault, current looks for the earth return path hence establishing a voltage gradient on the surface of the earth. This can result in potential difference or what is commonly referred to as step potential and this depends on distance from the point of entry of the fault. Employees should not move around equipotential regions to avoid getting into accidents.

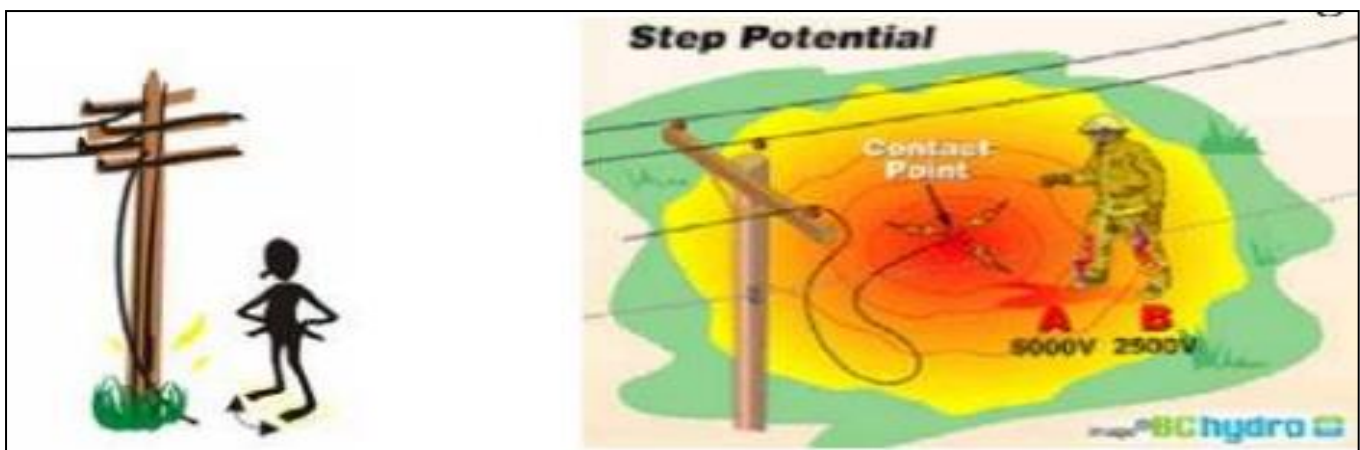


Fig 1 Image Illustrate Step Potential

B. Touch Potential

Touch potential involves a voltage difference due to fault current flow between an earth contact point and nearby conductive structures. Protective measures include using switch operating platforms and ground grids to manage these

voltage gradients effectively. Touch potential occurs due to the presence of a voltage difference in an earth contact point, and neighboring structures, by effect of the fault current. Measures to avoid these voltage gradients include using switch operating platforms and ground grids to control them.

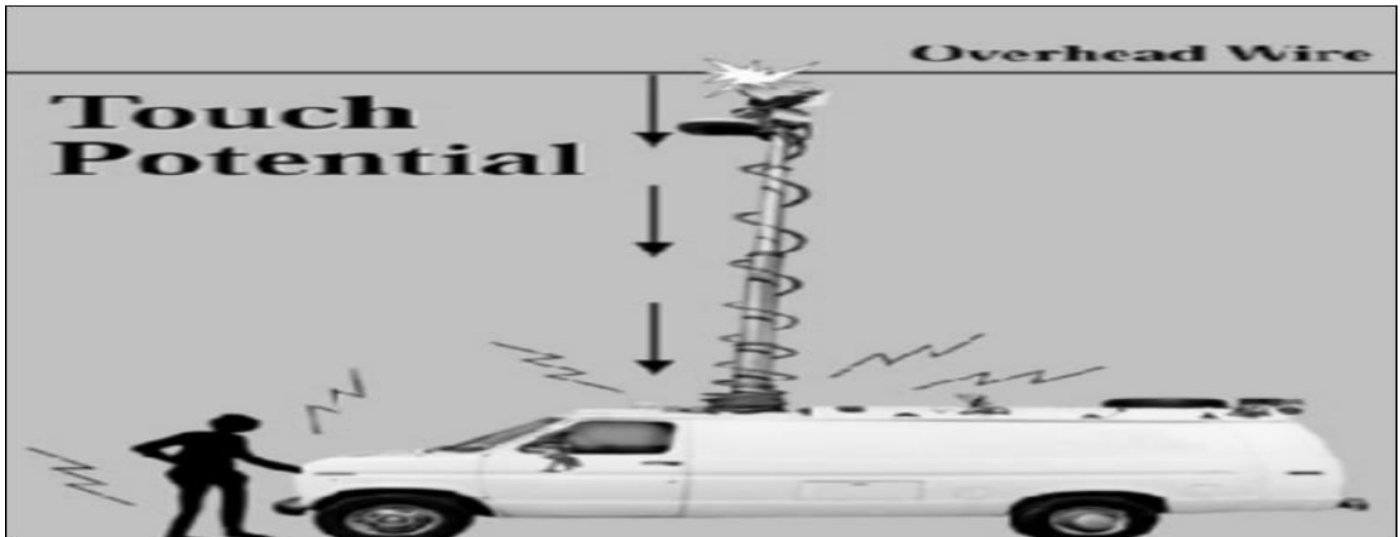


Fig 2 Image Illustrate Touch Potential

V. GENERAL SAFE WORK PRACTICES

Among the most important things pointed out is that the maintenance of safe work practices can greatly assist in preventing electrical risks that may be posing a threat to safety in the workplace. Instructions have to govern activities in relation with energized circuits and should contain information concerning qualifications, protection means, and distances for approach by both authorized and unauthorized individuals.

A. Key Electrical Safety Practices

➤ Proper Installation and Maintenance:

Proper installation and maintenance of electrical systems to recommend the standards of practicing electricians. Over time, it is important that the facilities be checked for any potential problems in their structures and these fixed as soon as possible.

➤ Use of Residual Current Devices (RCDs):

RCDs are used to sense that there is an irregular current and suspend the flow of electricity; this eliminates the risks of electrical shocks and fires.

➤ Overload Prevention:

Do not overload circuits or outlets as that is a fire hazard. Have correct usage of power strips and extension cords using the instructions provided by the manufacturers.

➤ Grounding and Bonding:

Earthing and bonding court and protect by minimizing shock hazard during faults in the structures.

B. Safety Measures in Workplaces

➤ Training and Awareness:

Employees should undergo training on electrical safety measures, on how to handle the equipment, how to recognize hazards and how to act in emergencies.

➤ Personal Protective Equipment (PPE):

Electrical safety/energy; wearing the right PPE in electrical areas including insulated gloves, safety glasses, and flame-resistant clothing.

➤ Lockout/Tagout Procedures:

Establish ways of disconnection of energy in machines before the maintenance or repair is carried out to keep the workers safe.

C. Safety Measures in Homes

➤ Childproofing:

Put in ground-offering outlets and guard dead outlets to avoid potential for children to stick things into the outlet.

➤ Appliance Safety:

Insist on the proper use of appliances; also, examine appliances for damages on the cords or signs of wear. Most appliances spend much of their time idle and they should therefore be switched off when not in use.

➤ Water and Electricity:

Do not take electrical devices near water sources as this may result to electrocution.

D. Electrical Emergencies

Practical actions to electrical incidents ought to be prompt and appropriate to reduce the numbers of victims killed or hurt gravely. This covers provision of timely medical help and enforcement of the emergency responses for any planned electrical works or maintenance.



Fig 3 Worker with an Electrical Injury (Osha, 1910)

E. Electrical Rescue Techniques

When answering to electrical accidents one must be very careful in order not to worsen the situation. Such measures cut across scene size-up, if it is possible to shut down power circuits, and giving cardiopulmonary resuscitation and other basic first aid while waiting for assistance from medically trained personnel.

F. First Aid

Until the arrival of medical help, the following steps should be taken: Describe briefly the conditions to the medical personnel, check the consciousness of the victim, ascertain the presence of breathing and start performing CPR if the victim is unconscious. Additional information concerning the voltage levels and shock duration is useful in the management of the cases in the hospital.

VI. CONCLUSION

Thus, one can conclude that electrical safety is a very important aspect in, both home and working environments, in order to minimize or eliminate dangers emanating from electrical usage. Therefore, following the correct installation procedures, maintenance and ensuring that people have adequate knowledge regarding security measures would in fact reduce risks in the society. Ongoing vigilance is

accompanied by compliance with the standards and an immediate reaction to electrical risks in order to save people's lives and prevent the destruction of property. The prevention of electrical related risks within the workplace or homes necessitates the accurate set up of adequate safe working practices and emergency precautions plans. Through these practices and responding to the emergencies quickly, organizations are assured of minimizing the risks of electrical accidents and the wellbeing of people's will be enhanced. Consequently, frequent changes of the safety measures and constant training on electrical safety also complement the increased rates of workplace and residential safety.

REFERENCES

- [1]. Elaine L. Chao, John L. Henshaw, "Controlling Electrical Hazards," USA: Department of Labor, Occupational Safety and Health Administration, OSHA 3075, 2002.
- [2]. "Health Safety Executive (HSE)," Saturday October 2016. Available at: www.hse.gov.uk.
- [3]. "Study Guide Electrical Safety Hazards Awareness," Safety Improvement Project.
- [4]. W. Kouwenhoven, "Human Safety and Electric Shock," Electrical Safety Practice, Instrument Society of America, November 1968.

- [5]. British Standards Institution, "Requirements for Electrical Installations," 17th Edition ed., BS 7671:2008, IET Wiring Regulations, 2011.
- [6]. "Safety and Health Magazine," Friday October 2016. Available at: www.safetyandhealthmagazine.com/article/avoid-electrical-hazards-in-the-office-2.
- [7]. Josh, "Best Practices," 30 May 2007. Available at: <http://ehstoday.com/safety/best-practices/ehs-imp-66770>.
- [8]. "High Speed Training," "Electrical Hazards in the Workplace." Available at: www.hightspeedtraining.co.uk/hub/electrical-hazards-workplace/.
- [9]. OSHA, "Electrical Safety Related Work Practices," 29 CFR Part 1910.
- [10]. Ralph H. Lee, "Electrical Safety in Industrial Plants," E. I. duPontdeNemours& Company, 1971.