



# Study of Safety Rules And Regulations For Precautions of Electrical Hazards Like Fire And Accident

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*Abstract: Electrical hazards are common in industrial, commercial and residential settings, and they can cause serious injuries, fires, and even death. To prevent such incidents, it is essential to implement safety measures and follow rules and regulations in the use of electrical equipment and systems. This paper aims to examine the rules and regulations for the precaution of electrical hazards, including fire and accidents. The paper will explore various safety measures such as grounding, switching off electrical systems when not in use, using personal protective equipment, and regular maintenance of electrical equipment. This paper reviews some regulations such as the Electrical Safety Code, National Electrical Code, and Occupational Safety and Health Administration (OSHA) regulations. Ultimately, the study provides a comprehensive analysis of rules and regulations, highlighting their importance in preventing electrical hazards and ensuring safety in the workplace.*

*Keywords: Electrical hazards, Safety rules and regulations, OSHA regulation.*

## I. INTRODUCTION

Electrical hazards are significant risks in all industries, especially manufacturing and construction. Electrical hazards include not only electric shock but also electrocution, fire, and explosion. Without proper electrical safety precautions, accidents can occur that can result in fatalities or injuries to individuals or damage to facilities. Therefore, it is crucial to study the rules and regulations for the precaution of electrical hazards like fire and accidents. This paper aims to provide a comprehensive overview of the regulations and safety measures for the prevention of electrical hazards.

The purpose of this paper is to highlight some of the safety rules and regulations that must be followed to ensure safety from electrical hazards. These rules and regulations are crucial for both employees and employers to understand and follow.

### Electrical Hazards

Before discussing the safety rules and regulations, it is important to understand what electrical hazards are. Any condition or circumstance that poses a risk of injury or damage to people or property due to the presence or use of electrical equipment is an electrical hazard. There are different types of electrical hazards, including electrical shock, electrical burns, electrical fires, and explosion.

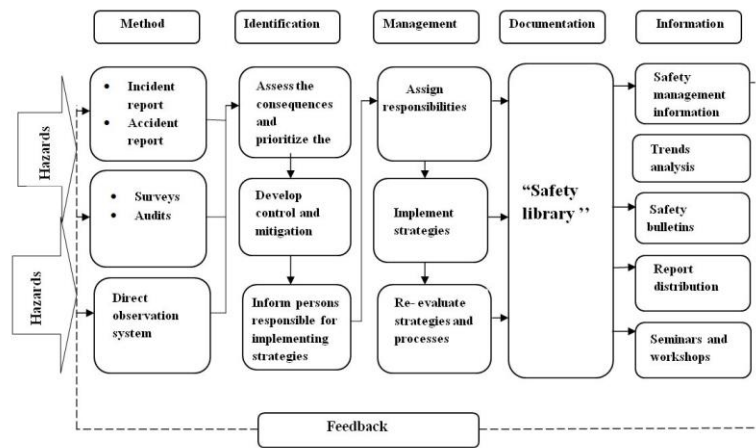


Fig1.General block diagram

## II. LITERATURE REVIEW

Electrical hazards such as fire and accidents can be prevented with proper understanding of the rules and regulations. Here are some studies and literature reviews on the topic:

**Review of the Indian Electricity Act, 2003:** This paper provides an overview of the Indian Electricity Act, 2003, and its impact on the electricity sector in India. It highlights the key provisions of the Act and discusses its implications for the generation, transmission, and distribution of electricity in the country. The paper also discusses the challenges in implementing the Act and suggests measures to overcome them.

**Study of the National Electrical Code of India:** This study provides a summary of the National Electrical Code of India (NEC) and its impact on electrical safety in the country. It evaluates the effectiveness of the code in promoting safe electrical practices and identifies areas where improvements can be made. The study recommends the need for regular updating of the code to keep up with technological advancements.

**Compliance with Indian Electricity Rules, 1956:** A case study: This paper presents a case study of compliance with the Indian Electricity Rules, 1956, in a manufacturing unit in India. It identifies the challenges faced by the unit in complying with the rules and suggests measures to overcome them. The paper emphasizes the need for awareness and training of personnel in electrical safety practices.

**Bureau of Indian Standards Code: A critical review:** This study critically reviews the Bureau of Indian Standards (BIS) Code related to electrical equipment and systems in India. It evaluates the effectiveness of the code in ensuring the quality and safety of electrical products and identifies areas where improvements can be made. The study recommends the need for regular updating of the code to keep up with technological advancements.

**Central Electricity Authority Regulations:** A comparative study: This paper presents a comparative study of the Central Electricity Authority (CEA) regulations related to power generation, transmission, and distribution in India. It evaluates the effectiveness of the regulations in promoting the efficient and reliable operation of the electricity sector and identifies areas where improvements can be made. The study recommends the need for regular review and updating of the regulations to keep up with technological advancements and changing market conditions.

Overall, the literature highlights the importance of codes and standards in ensuring the safe and efficient operation of the electricity sector in India. It also emphasizes the need for regular updating and review of these codes and standards to keep up with technological advancements and changing market conditions.

## III. METHODOLOGY

The study on rules and regulations for the precaution of electrical hazards like fire and accidents begins with a detailed analysis of the dangers and risks associated with electrical work. This analysis helps in identifying the specific areas where safety regulations and guidelines need to be implemented. The methodology adopted for the study involves a thorough review of relevant literature, safety standards, and guidelines issued by national and international regulatory bodies. This study involves an examination of the safety measures adopted by different organizations and industries to mitigate hazards associated with electrical work. The study focuses on identifying the common causes of electrical incidents and accidents and proposing safety guidelines to minimize the risks. The study also includes an analysis of the legal and ethical aspects of safety regulations and guidelines for electrical work. Overall, the methodology adopted for this study aims to provide comprehensive insights into safety regulations and guidelines for electrical work, with a focus on preventing hazards like fire and accidents.

#### IV. TYPES OF ELECTRICAL HAZARDS

There are several types of electrical hazards that can be encountered in colorful settings. There are several typical forms of electrical hazards, which include:

**Electric shock :-** Electric shock is the most common electrical hazard. It's caused when a person gets exposed to an electrical current. It can beget becks, muscle condensation, and indeed death.

**Burns :-** Burns are caused by exposure to heat or electrical current. Electrical becks can be veritably severe, leading to towel damage, scarring, and indeed amputation in some cases. Electric fire Electrical fires can do due to short circuits or load of electrical systems. They can beget significant property damage and may affect in injury or death.

**Explosion :-** Electrically powered outfit can explode, blowing up its covering, and injuring or killing workers.

**Arc flash: -** An bow flash occurs when electrical energy is released from an electrical system due to a fault, performing in a burst of light and heat that can beget becks, eye damage, and indeed blindness.

It's important to be apprehensive of these electrical hazards and take applicable preventives to help accidents and injuries.

#### V. CEA 2010 REGULATONS (CENTRAL ELECTRICITY AUTHORITY)

The CEA 2010 regulations encompass multiple facets of electrical safety, which include the installation, operation, maintenance, and testing of electrical equipment and systems. These regulations also establish qualifications and training requirements for individuals involved in electrical work. The key provisions of these regulations comprise the following:

The installation and maintenance of electrical systems and equipment should comply with Indian Standards (IS) and the National Electrical Code (NEC). Proper identification and labelling of electrical equipment and systems should be implemented to ensure secure operation and maintenance. Individuals working with electrical systems and equipment must undergo training and certification. Regular inspections and maintenance of electrical systems and equipment are necessary to guarantee their safe operation. Provision of personal protective equipment (PPE) is required for individuals working with electrical systems and equipment.

The Central Electricity Authority (CEA) is a regulatory organization in India responsible for developing and regulating the power sector. In 2010, the CEA introduced a set of regulations for preventing electrical hazards, which includes the following significant regulations:

**Regulation 31 - Testing of Electrical Installations.** Electrical installations must be designed and constructed in adherence to appropriate codes and standards, and maintained in a secure condition.

**Regulation 72 - Earthing.** All electrical installations must be adequately earthed to ensure that current flows to the earth instead of any person or equipment in the event of a fault.

**IEC 60364-4-43 - Overcurrent Protection.** Electrical circuits should be safeguarded against overcurrent by using fuses or circuit breakers.

#### VI. TYPES OF ACCIDENT

There are different types of accident .they are shown in below:

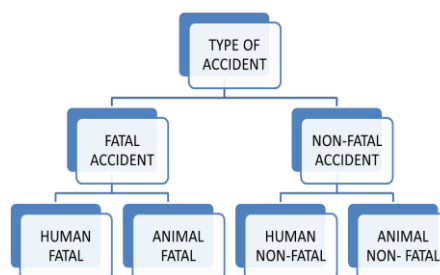


Fig.2. Types of accident

**Fatal accident:-** A fatal accident refers to an incident that can lead to death, permanent total disablement, permanent partial disablement, or fatal injuries.

**Non-fatal accidents:-** It incidents that have a lower likelihood of causing death. Although the person involved survives, they may still experience disabilities or other types of personal injuries. Fatal accidents may result in death, permanent total disablement, permanent partial disablement, or fatal injuries.

## VII. CASE STUDY OF COOLER ACCIDENT

From the investigation of the place of occurrence and recorded statement, it is revealed that village - Bazargaon, Tt. Nagpur Rural, Dist. Nagpur Victims has a slab house.

The house is equipped with 1 phase 3 wire low pressure residential electrical supply. The power supply is connected to the switchboard in the hall of the house from the cut-outs fuse and main switch mounted in the wooden board of the load meter. Permanent wiring in the house is earthed. An iron cooler is installed outside the house near the window to the hall through the said switchboards. In the said cooler, the earthing wire was coming from the container of the cooler. On 31.03.2022 Victims was shocked when he was pouring water into the cooler with a steel bucket. The said cooler motor was found to be in good condition during inspection and when the power supply was connected to the motor, it was found that the motor body was electrified. Therefore, at the time of the accident, the fan-motor connected to the power supply was running, so the cooler must have been electrically charged for a few seconds. Due to the contact of the cooler body with electric charge Electric shock to Victims.

There must have been a fatal accident. Notes taken during inspection :-

- Victims House Names 1 Phase 3 Wire Low Pressure Residential Electrical Connection Outside Hall of House. It is connected to a electric meter on a wooden board mounted on the wall. Customer no. It is 410020167355.
- 6.0 sq. mm of said electricity connection. Of W.P.T.C. Service Cable House opposite LT pole. It was found connected to the electric meter of the house from the pole.
- Phase wire from power meter is 16 amp cut-out fuse and then both phase and neutral 16 amp I. C. D. P. (Main) Switch / S.F.U. is connected to and from there the power supply is connected to the house wiring. During the investigation, it was found that the fuses did not melt during the accident. The customer's earthing was found near the meter. Also, the earthing done in the house wiring was found to be non-functional during the inspection.
- A neutral-to-earth voltage in the house wiring was found to be 08 volts.
- RCCB in house wiring not found to be connected.
- During the investigation, it is understood that the power supply is being connected to the iron cooler outside the house from the wiring switchboard in the hall of the house.
- Megger test of cooler as well as motor (by Megger K. 200467, 2500 Volt, Model Sou. IE 444, IS 2992-1987, Scale 0-2000 Mega Ohm Megger) 100megohms found with cooler body Leakage current was detected in the motor body when the power supply was connected to the motor. But the ground wire in the cooler is the body of the cooler.
- Earth wire found broken/broken.
- Regulations 2010 relating to Accidents RuleNo.12, 49 and 42.

The accident victim himself is responsible for the said accident.

Based on the investigation of the incident site and the recorded statement, the following conclusions are drawn.

Village Bazargaon, Nagpur Rural, Distt. Nagpur The earth wire of iron Body's cooler in the house of Victims is broken from the body of the cooler. Also, the fan motor of the cooler is faulty and when the power supply is connected to the motor, the motor body is momentarily charged. On 31.03.2022, the body of the cooler must have been electrified as the faulty fan motor connected to the power supply of the said cooler was running. Having come in contact with it, Victim may have met with a fatal accident.

## VIII. PRECAUTIONS

Electrical hazards such as fire and accidents can be dangerous and potentially life-threatening if not taken seriously. Here are some precautions you can take to minimize the risk of electrical hazards:

- 1) Keep electrical appliances and cords away from water and damp areas. Water is a good conductor of electricity and can increase the risk of electrocution.
- 2) Do not touch electrical appliances or cords with wet hands, and do not handle electrical equipment when standing on a wet surface.
- 3) Inspect electrical cords and plugs for signs of wear or damage, such as frayed wires or cracked plugs, and replace them immediately if necessary.
- 4) Turn off and unplug electrical appliances before cleaning or making repairs.
- 5) Use of ELCB is must for proper earthing.

## IX. CONCLUSION

Electrical hazards like fire and accidents can be potentially disastrous, resulting in significant loss of life and property. To ensure safety and prevent such hazards, various regulations and safety measures have been established by local and international authorities. Being aware of these regulations and safety measures and following them strictly is crucial to maintain electrical safety in workplaces. Regular inspection, proper training, safety equipment, and grounding electrical equipment are some of the essential precautionary measures that should be taken to prevent electrical hazards. By following these safety measures, accidents and injuries can be reduced substantially.

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