A CRITICAL ANALYSIS OF THE EFFECT OF ELECTRICAL FAULTS ON FIRE DISASTER IN UYO METROPOLIS, AKWA IBOM STATE

ARC. AKWAOWO, Dianabasi Reuben
Department of Architecture
Akwa Ibom State Polytechnic
Ikot Osura

AND

Edidiong Isonguyo SILAS, *Ph.D*
Department of Technical Education
Electrical-Electronic Unit
College of Education, Afaha Nsit

ABSTRACT

Electrical faults are the most possible cause of fire disasters. Therefore, more attention should be paid to electrical faults in residential buildings. The causes of such fires include erratic power surges, illegal electrical connections, improper electrical fittings, substandard electrical materials, and the use of indoor generators. However, the paper carefully evaluated the effect of electrical faults on fire disaster in Uyo metropolis of Akwa Ibom State. In the paper, it was observed that electrical faults originating from electric wires, cables, circuit breakers, and within electrical components may occur in electrical panels from overloaded circuits or the ageing of the panel and can lead to a disastrous fire outbreak in buildings and structures. However, kinks in wiring can also cause electrical resistance within the wire, which creates heat and could lead to an instantaneous electrical fire. Furthermore, the paper concluded that electrical faults are a common cause of residential fires, and their potential hazard is increasing as more electrical appliances are being used in each family nowadays, and wiring has a higher possibility of being ignited. One of the recommendations is that the fire service department should be well-equipped with up-to-date equipment and facilities to put out fires within the shortest minimum time. The new strategic techniques should also be practiced by the firefighters of the state.

KEYWORDS: Electrical Faults, Fire Disaster, Residential Buildings and Akwa Ibom State.

Introduction

Electrical faults in fire disasters in residential buildings are most commonly the result of human activities. They are classified as events inflicting significant property damage and endangering human health and life in general (Cassuto & Tarnov, 2003). A significant number of fire disasters in residential buildings were due to electrical faults, non-combustible disposal of smoking materials in waste paper baskets, as well as flaws

in prevention and safety regulations (Chisti & Rahman, 2020). The expression of an electrical fault in residential buildings, as utilised in fire disaster information examinations, incorporates properties ordinarily referred to as "homes," regardless of whether they are one, two, or multifamily properties (Adekunle, Arowolo, Omojola, & Ibrahim, 2020). Fire disasters lead to life and property losses. Electrical faults are one of the causes of fire disasters in residential buildings, and their potential hazard is increasing as more electrical appliances are found in each household unit nowadays. Statistical data compiled by the government authorities indicated a high rate of fire disasters in residential buildings in Akwalbom State. Electrical appliances are being used in each family unit. The outer-casing of those electrical appliances and other related components such as insulators or even interior parts might be damaged by striking against hard objects, say by children repeatedly, resulting in defects or poor electrical connection (Taipei City Fire Department, 2010). An increase in electrical loading might cause a potential fire hazard. Electrical faults are the most possible cause of fire disasters. Therefore, more attention should be paid to electrical faults in residential buildings. The causes of such fires include erratic power surges, illegal electrical connections, improper electrical fittings, substandard electrical materials, and the use of indoor generators. According to Ibhadode, Adekunle, Banjo, & Atakpu (2020), effective fire safety management is based upon enforcing fire prevention legislation, which will enforce the identification of all the potential risks associated with the various premises and effectively carry out an assessment of the adequacy of the measures provided.

Fire disasters in buildings are among the known man-made disasters with the most devastating events that cost life and property (Shaluf 2007; Xin & Huang 2013). Many recurring fire incidents have been reported globally (Ibe et al. 2014). Apart from loss of property and life, fire disasters have been associated with the prevalence of diseases that have been reported to contribute about 1% of the global disease burden (Leistikow et al. 2000). The most devastating effects caused by fire in buildings, as recorded in literature, include the collapse of the World Trade Centre (Cowlard et al. 2013), the fire disaster that occurred in a prominent supermarket in Akwa Ibom State, destroying millions of worth of goods and properties.

Concept of Electrical Faults

An electrical fault in an electric power system can be defined as any abnormal condition of the system that involves the electrical failure of the equipment, such as transformers, generators, bus-bars, etc. Electrical fault inception is also involved in insulation failures and conducting path failures, which result in short circuits and open circuits of conductors (Electronics Hub, 2015). An electrical fault refers to an abnormal condition caused by equipment failures such as transformers and rotating machines, human errors, and environmental conditions. These faults cause interruptions to electric flows, equipment damage, and even the death of humans, birds, and animals. An electrical

fault is the deviation of voltages and currents from nominal values or states (Madhav University, 2018). Under normal operating conditions, power system equipment or lines carry normal voltages and currents, which results in the safer operation of the system.

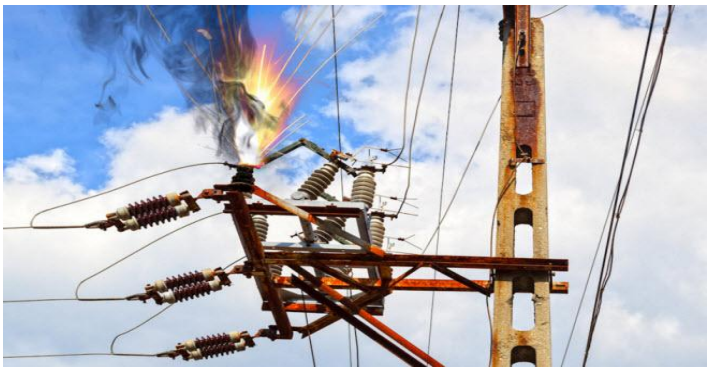

Fig.1: *Electrical Fault*

Concept of Fire Disaster

Fire is the rapid oxidation of a material (the fuel) in the exothermic chemical process of combustion, releasing heat, light, and various reaction products. At a certain point in the combustion reaction, called the ignition point, flames are produced. The flame is the visible portion of the fire. Flames consist primarily of carbon dioxide, water vapor, oxygen, and nitrogen. If hot enough, the gases may become ionized to produce plasma. Depending on the substances alight and any impurities outside, the colour of the flame and the fire's intensity will be different (Helmenstine, 2009). A disaster is something that poses danger, peril, risk, or difficulty. On the golf course, a lake can be disastrous. A wet floor can be a slipping disaster. This module covers three other types of disasters: common fire disasters, special fire disasters, and disastrous materials. Part of this module covers fire disasters and part covers disastrous materials.

The term "fire disaster" is used by both fire professionals and the lay public. What does it mean? Any actions, materials, or conditions that might increase the size or severity of a fire or that might cause a fire to start are called "fire disasters." The disaster might be a fuel that is easy to ignite or a heat source like a defective appliance. The hazard could be an action like thawing a pipe with a torch or an omission like failing to have a wood stove chimney cleaned. Common fire hazards are found in most occupancies and are not associated with any special occupancy. Smoking, trash, electrical appliances, storage, and heating are common to most occupancy types. However, smoke-free workplaces are making smoking a less common problem. Special fire hazards are linked to some specific process or activity in particular occupancies. Chemicals, spray painting, welding, combustible dust, and flammable liquids are examples of special fire hazards.

Concept of Residential Building

Residential buildings include all buildings intended for private occupancy, whether on a permanent basis or not. Dwellings are divided into the following types: single-family,

mobile, cottage, semi-detached, row houses, and apartment buildings. It can also be seen as a building that provides more than half of its floor area for dwelling purposes. In other words, a residential building provides sleeping accommodation with or without cooking or dining facilities.

Types of Residential Buildings

Residential buildings are divided into following types:

- **Individual houses or private dwellings:** Individual houses or private dwellings are generally owned by members of a single family only. If more than one family resides in that building, then it is called a "multiple family private dwelling."

Fig.2: *A Private Dwelling*

- **Lodging or rooming houses:** Lodging or rooming houses are multiple or groups of buildings which come under one management. In this case, accommodation is provided separately for different individuals on a temporary or permanent basis.

Fig. 3: *A Lodge*

- **Dormitories:** Dormitories are another type of residential building in which sleeping accommodation is provided for different individuals. School hostels and military barracks come under this category.

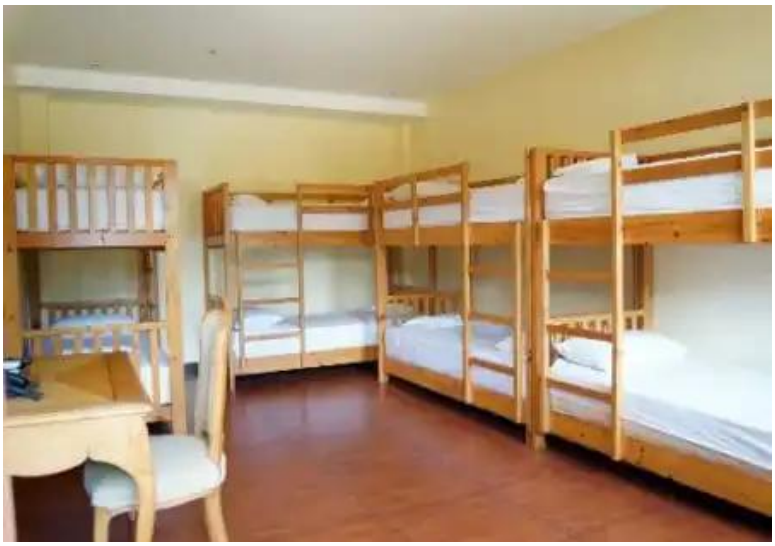

Fig. 4: *A Dormitory*

- **Apartments:** Apartments, or flats, are big buildings that consist of separate dwellings for different families. Each apartment will house at least three families who will live independently of one another.

Fig. 5: *An Apartment*

- **Hotels:** Hotels are just like lodging houses and are also managed by a single management, but they provide accommodation primarily on a temporary basis. Inns, motels, etc. come under this category.

***Fig. 6:** A Hotel*

Building with Electrical Faults

According to Action Service Group (2020), faulty wiring is a blanket term used in reference to an electrical wire that is outdated, damaged, poorly installed, or inadequately maintained. For many buildings, the most common signs of faulty wiring are dimming and flickering of lights and fuses that frequently break. Whether you own a building or just rent one, common electrical problems can lead to serious situations that risk human lives as well as extensive property damage. In fact, according to the National Fire Protection Association, electrical problems were the second leading cause of house fires between 2012 and 2016. This same association also found that 739 employees died from electrical exposure during that same time period. (That means 3 employees died every week over a 5-year period from injuries relating to electrical issues at work!) As an employer, it is your job to ensure your employees are as safe as possible while in your commercial building. Understanding some of the most common commercial building electrical problems can help to make sure you do just that. Electrical wiring for commercial buildings can often be complex. However, a skilled and experienced electrician can help to identify and reduce, if not eliminate, the most common electrical problems within your commercial building:

- Faulty Electrical Wiring
- Grounding Problems
- Disorganized Electrical Panels
- Overcrowded Electrical Wiring

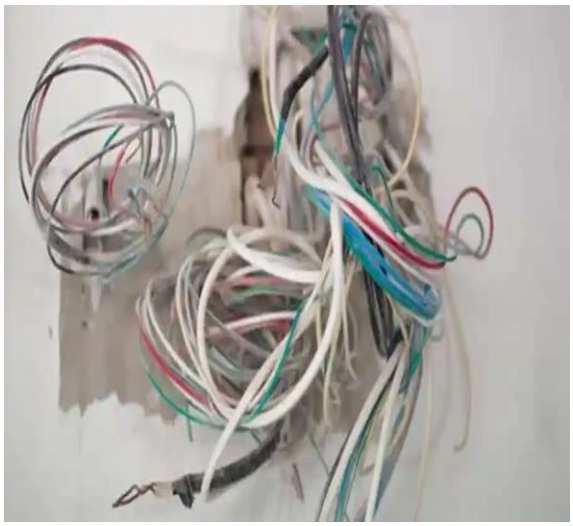

Fig. 7: *Overcrowded Electrical Wiring*

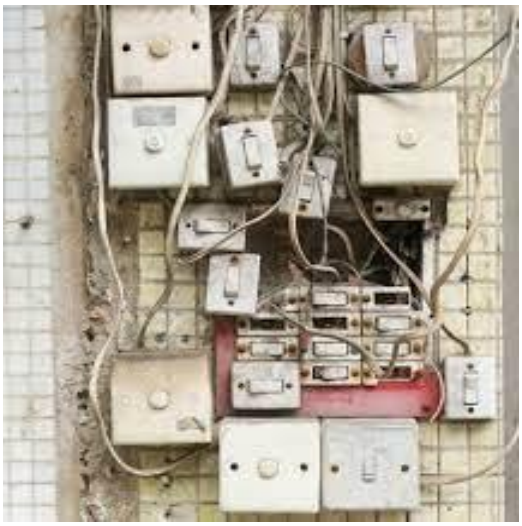

Fig. 8: *Disorganized Electrical Panel*

Fig. 9: *Faulty Electrical Wiring*

Building with Fire Disaster

Fire disasters in buildings can be defined as the potential for accidental or intentional fire to threaten life, structural, and property safety in a building (Dream Civil Team 2022). Fire dangers are the most hazardous of all because, if a fire breaks out in a building, it will not only destroy that portion but quickly spread, possibly resulting in death. Though few fire incidents are avoidable and predicted early, the majority are not; thus, fire safety precautions are necessary.

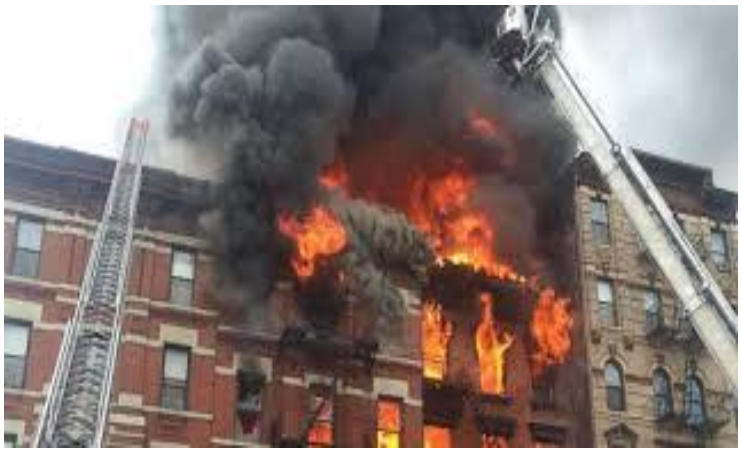

Fig. 10: *NYC Building Fire (Shapiro, 2015)*

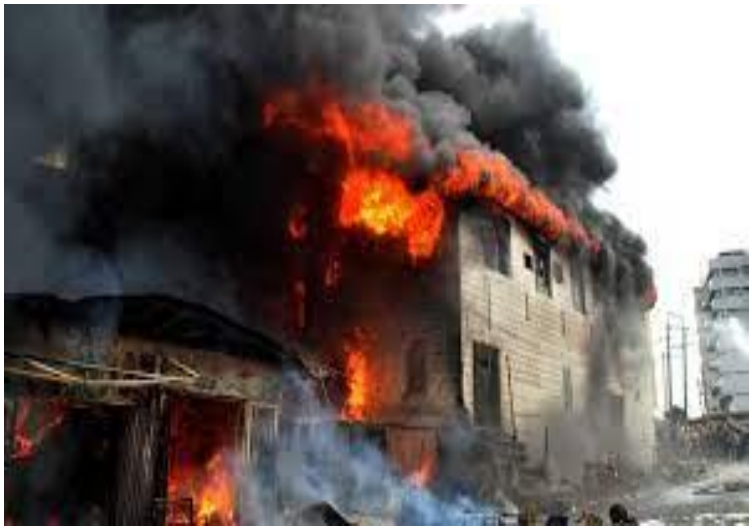

Fig. 11: *A building housing some shops in flames at Dugbe Market in Ibadan, Oyo State (Adeyemi and Agboluaje, 2020)*

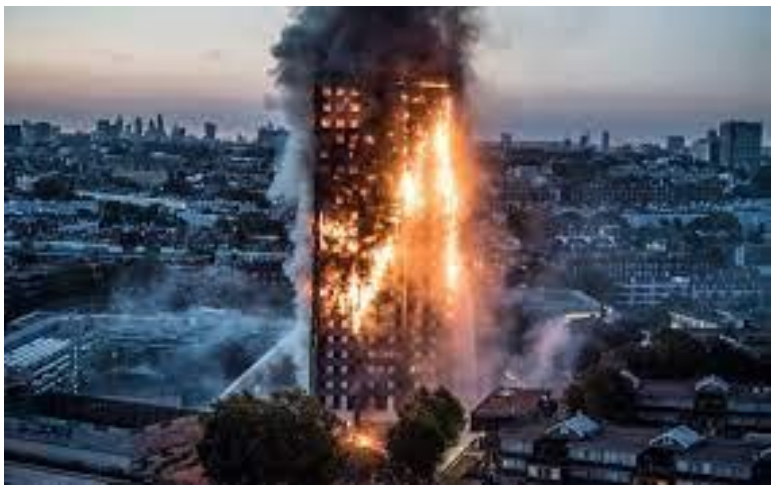

Fig. 12: *Green Tower in Notting Hill (Dixon, 2017)*

Effect of Electrical Faults on Fire Disaster

Electricity is something we all depend on to drive the operation and comfort of our businesses and homes. And we expect our electrical installations to be safe, protecting people from the risk of shock or electrocution, and protecting buildings from the risk of electrical fire. While local electrical safety regulations and protective technologies continue to advance, there are still many hazards that exist today (Belhaja, 2018). A failure or malfunction within the electrical components of equipment or machinery can cause electrical fires. Electrical fires originate in electric wires, cables, circuit breakers, and within electrical components. Fires start in electrical panels from overloaded circuits or the ageing of the panel. The panel and circuits become overloaded when the distribution of electricity is inadequate. Occasionally, lighting equipment acts as a source of heat that is too close to easily combustible materials (Mein, 2019). Electrical fires can lead to fire disasters in buildings and structures. Poor maintenance is the leading cause of electrical fires. Kinks in wiring cause electrical resistance within the wire, which creates heat and could cause an electrical fire. Arcing can lead to a fire and occurs in electrical panels and enclosures, frayed wires and extension cords, and even in damaged phone chargers. Aging equipment and appliances cause a staggering number of electrical fires. According to the U.S. Fire Administration, 19% of non-residential building fires and 13% of residential fires are due to equipment, appliance, or electrical malfunctions. When there's a rise in current that exceeds the capacity of the cable, it will cause it to overheat, which can, in turn, cause a fire. When contact inadvertently happens between two conductors, the current will take the shortest route from one to the other without travelling through the rest of the circuit. This type of fault causes an increase in current and a subsequent rise in the temperature of the conductors. This can ultimately destroy the supply circuit and cause a fire.

According to Imukudo (2022), a fire razed a popular supermarket, Nteps Supermarket, in Uyo, Akwa Ibom State on Friday night. The supermarket shares a perimeter fence with First City Monument Bank (FCMB) along Oron Road. The destroyed building had housed a warehouse from where products were supplied to its two other branches in the city and another one at Ikot Ekpene, outside Uyo. The fire reportedly started around 11 p.m., according to a witness. It burnt off the body of the building and the roof, and destroyed goods worth millions of naira. The fire is said to have been caused by an electronic inverter inside the building.

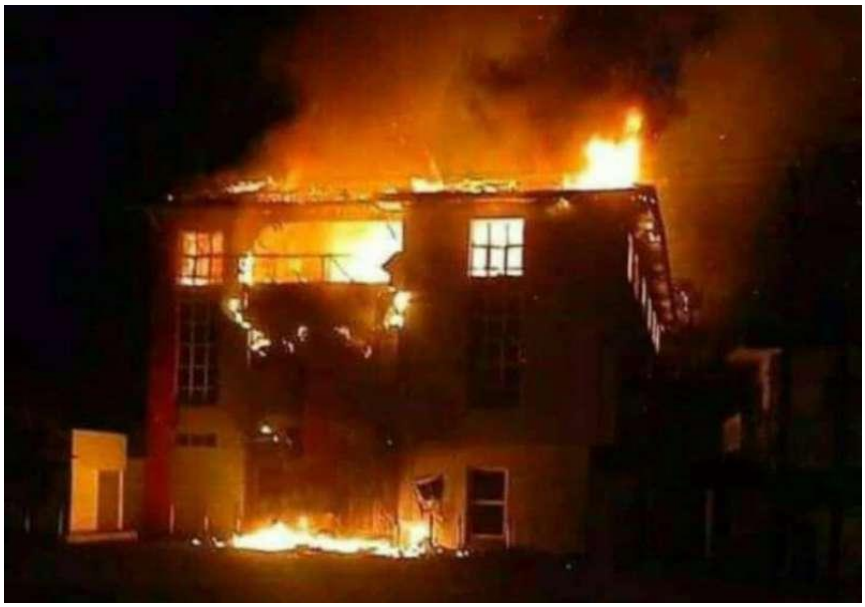

Fig. 13: *Nteps Supermarket during the disaster*

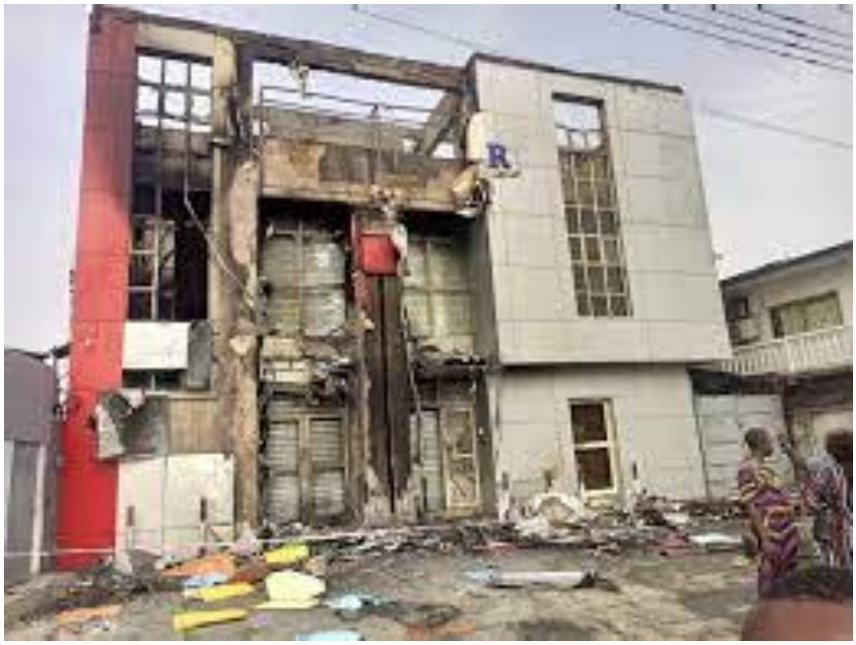

Fig. 14: *Nteps Supermarket after the fire disaster*

A large fire destroyed the depot of the Nigerian Bottling Company (NBC) in Uyo, Akwa Ibom. The incident precisely occurred at the company's office located on Abak Road in Uyo. It was reported that the fire started from where the pallets were packed and engulfed the entire packing zone. The quick intervention by the firefighters minimised the damage that would have been caused. The cause of the fire was said to be careless and fake electrical installations (Gbadeyanka, 2017).

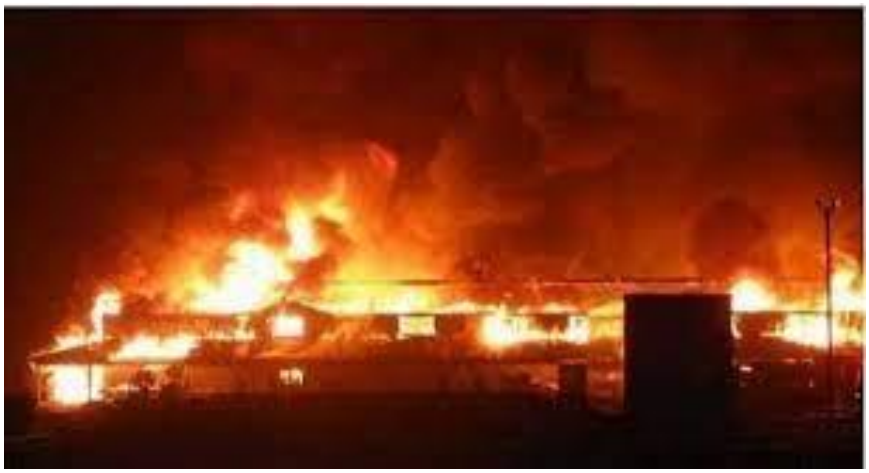

***Fig. 15:** The Nigerian Bottle Company (NBC) in Flames*

Conclusion

Electricity is something we all depend on to drive the operation and comfort of our businesses and homes. Electrical faults are a common cause of residential fires, and their potential hazard is increasing as more electrical appliances are being used in each family nowadays, and wiring has a higher possibility of being ignited. Physical damage and improper installation are some of the reasons for causing electrical fires. It is concluded that the highest rate of fire disasters is caused by electrical faults. According to the study, the leading cause of electrical fires is poor maintenance; kinks in wiring cause electrical resistance within the wire, which creates heat and could cause an electrical fire; arcing can lead to a fire and occurs in electrical panels and enclosures; frayed wires and extension cords; and even damaged phone chargers. Aging equipment and appliances cause a staggering number of electrical fires.

Recommendations

It is therefore recommended that:

1. Electrician who is contracted for wiring of a given building should be a licensed one and while he is performing the tasks the architect that did the building design should closely supervise him for strict adherence to the design in order to avoid errors and electrical defects that could cause fire disaster.

2. While it is advisable for every building to have a fire extinguisher, the fire service department should be well-equipped with up-to-date equipment and facilities to put out fires within the shortest minimum time. The new strategic techniques should also be practiced by the firefighters of the state.

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