

Electrical Fires in Residential Premises (2008 – 2010)

The Singapore Civil Defence Force (SCDF) responds to all reported fires in Singapore for firefighting and fire investigation. The archiving of detailed records for all these fires has enabled these studies for the purposes of public education and fire prevention.

The SCDF Fire Analysis Report series aim to make sense of similar fires seen over the years. Each report will provide details on the trends, patterns and other findings from the analysis of a specific type of fire or fire-related topic. Relevant examples of actual fire incidents will also be presented. In addition, fire safety tips or references to sources of information relating to fire prevention will be provided.

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Key Findings

- Electrical fires in residential premises are least likely to occur between 5 a.m. – 6 a.m. Thereafter, it increases gradually throughout the day with the peak between 7 p.m. – 8 p.m.
- There are higher numbers of residential electrical fires on Saturdays and particularly, Sundays.
- There are lesser electrical fire occurrences in the months of January, June and December.
- Most residential electrical fires occur in the living room.
- The most prevalent electrical fires in residential premises are those involving the power meter and electrical boxes outside the residential unit.
- Within the residential unit, the most common electrical fires involved the consumer unit.

Number of Electrical Fires in Residential Premises

Electricity remains 1 of the top 3 causes of fires in Singapore residences. As shown in **Figure 1**, the number of fires, occurring in residential premises¹, determined to be of electrical origin ranged from 141 to 154 for the 3-year period from 2008 to 2010. This works out to approximately 12 to 13 cases each month. On average, residential electrical fires constitute about 4.3% of all residential fires [1].

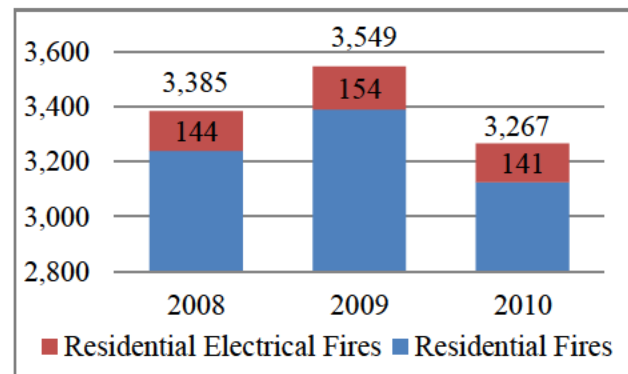


Figure 1: Residential Electrical Fires (2008 – 2010)

¹ Residential premises refer to residential units, including air-conditioning ledges and facade as well as the common areas such as the corridor, staircases and lift lobbies, where there are electrical fixtures and installations.

Time of Fire Occurrence

As seen in **Figure 2**, residential electrical fires are least likely to occur between 5 a.m. – 6 a.m. Thereafter, it increases gradually throughout the day up with the peak at 7 p.m. – 8 p.m. before gradually falling to the lowest point between 5 a.m. – 6 a.m. This general trend is also seen in the United States [2] where the lowest and highest points are similarly between 5 a.m. – 6 a.m. and 7 p.m. – 8 p.m. respectively.

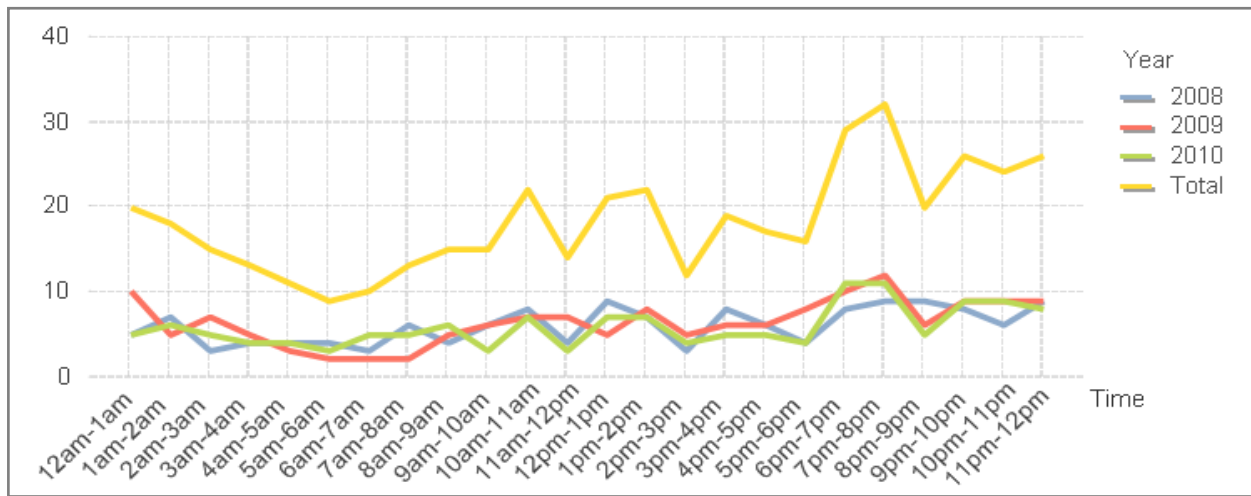


Figure 2: Occurrence Time of Residential Electrical Fires (2008 – 2010)

Day of Occurrence

There appears to be higher numbers of residential electrical fires on Saturdays and particularly Sundays (see **Figure 3**).

As these are generally non-working days, there is a greater likelihood that residents would be at home and consuming more electricity (from the use of fans, air-conditioning, radio, television and other electrical appliances) than other days.

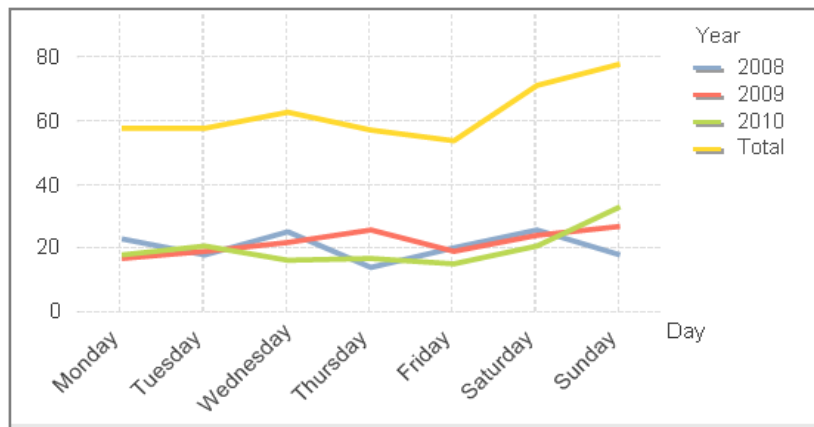


Figure 3: Breakdown of Residential Electrical Fires by Day of the Week

Month of Occurrence

Figure 4 shows a monthly breakdown of electrical fire incidents in residential premises. There are lesser electrical fires occurrences in the months of January, June and December while there are seemingly more cases in February, April, August and October.

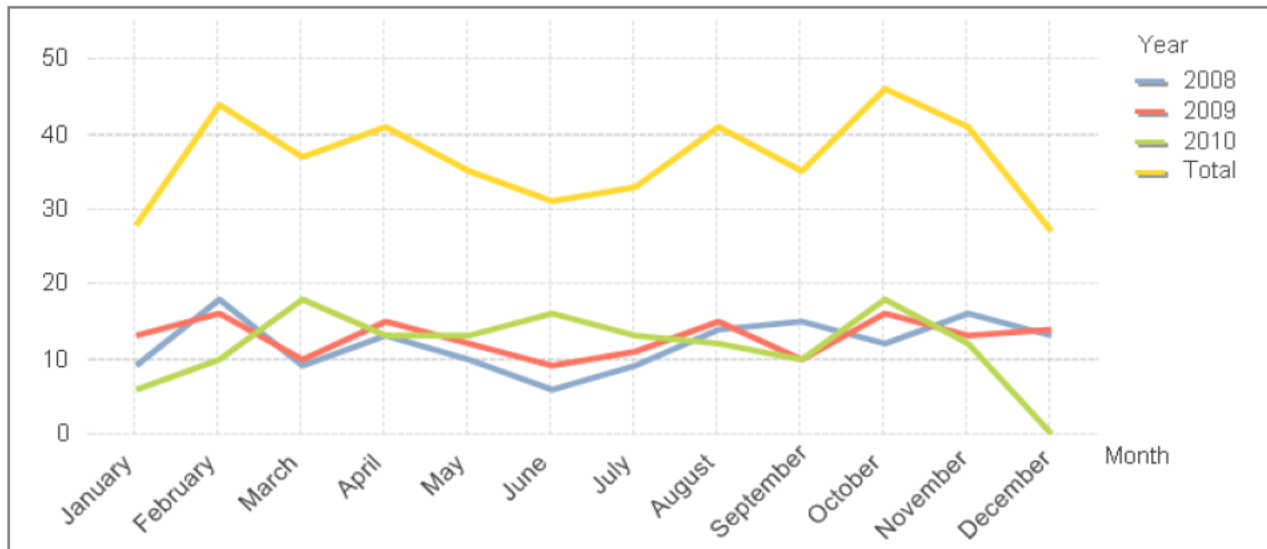


Figure 4: Breakdown of Residential Electrical Fires by Month

Type of Residential Premises where Electrical Fires Occur

Approximately 71.3% of residential electrical fires occurred in public residential premises. Condominiums and landed properties account for the remaining 12.1% and 16.6% respectively² (see **Figure 5**).

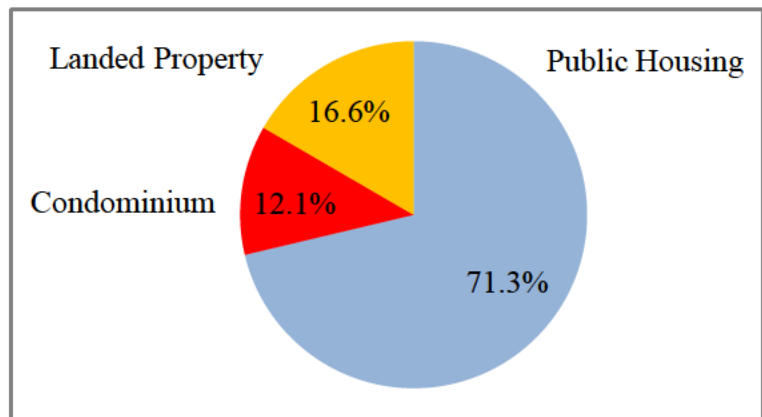


Figure 5: Type of Residential Premises where Electrical Fires Occurred (2008 – 2010)

² For the period 2008 – 2010, about 83% of Singapore households reside in public housing which includes non-privatised Housing and Urban Development Corporation Flats. 11% of Singapore households reside in condominiums and the remaining 6% in landed properties. [3]

Location within Residential Premises where Electrical Fires Occur

Within a residential unit³, the chances of an electrical fire occurring in the living room are the highest at 21.9% followed by the kitchen at 20.7%. The common areas, which refer to shared spaces such as the corridor, lift lobby and void deck, see 21.0% of all electrical fires in residential premises (see **Figure 6**).

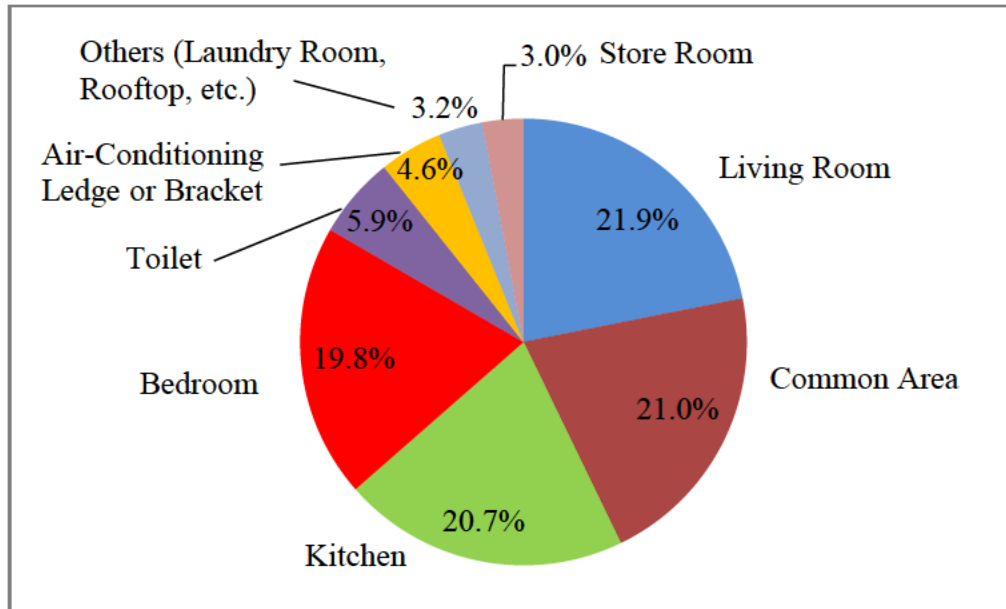


Figure 6: Area of Fire Origin for Residential Electrical Fires (2008 – 2010)

Entities where Residential Electrical Fires Originate

As shown in **Figure 7**, the most prevalent electrical fires in residential premises are those involving the power meter and electrical boxes outside the residential unit. The next most common entity involved is lighting which covers all forms of illumination within the residential unit and in the common areas.

³ Residential unit refers to the dwelling unit which includes the air-conditioning ledges

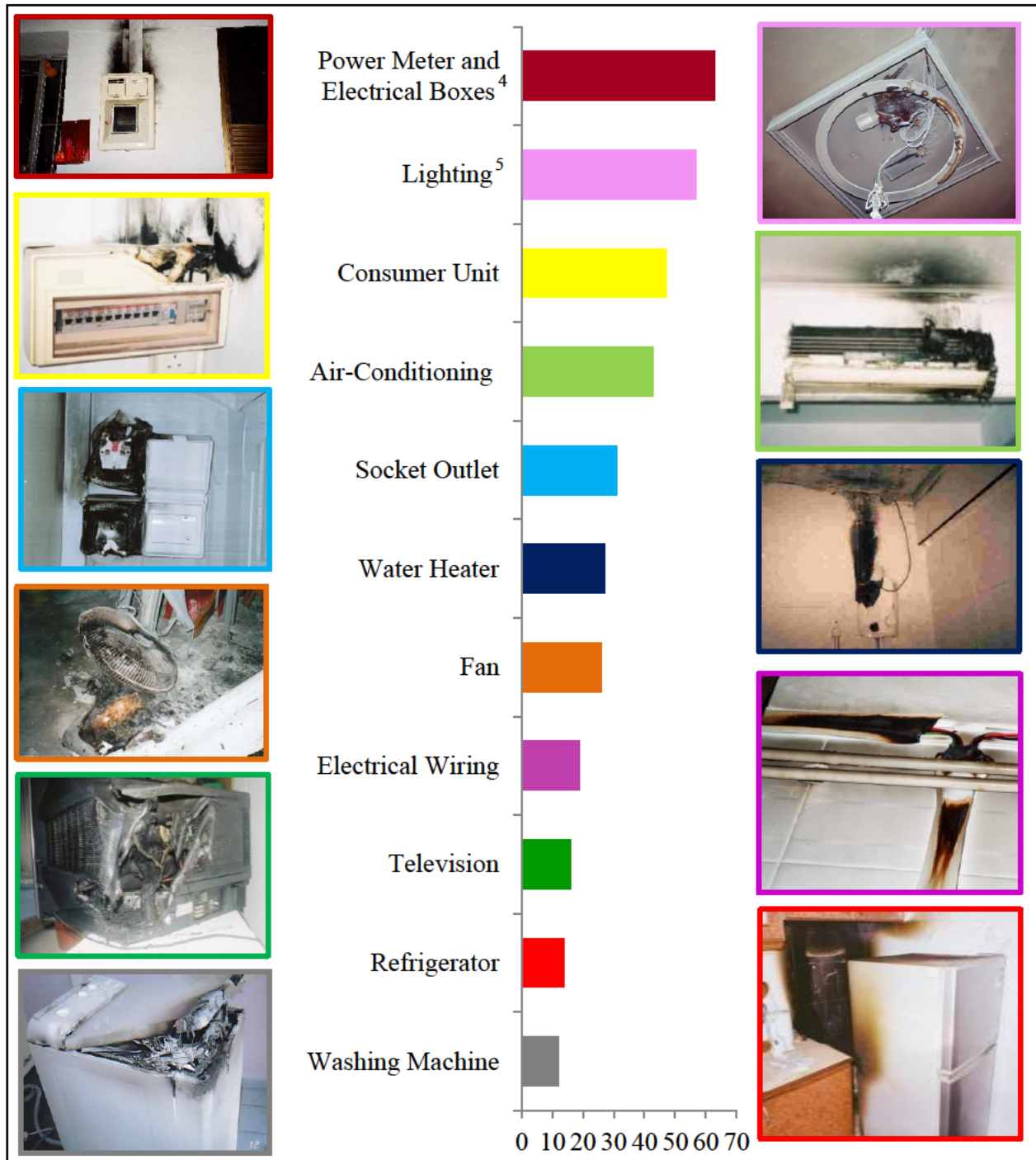


Figure 7: Entities Commonly Involved in Residential Electrical Fires

⁴ This includes sub-mains, electrical risers and fixtures in electrical boxes; all of which are in common areas.

⁵ Within residential unit and in common areas. Lighting within residential units include ceiling lightings, nightlights, praying altar electrical candles and other forms of illumination.

From the Case Files

Case #1: February 2008, Bukit Batok

An 8-year-old girl was having a nap in the master bedroom, at the lower deck of a double-decker bed. Her father came to check on her and saw fire at the upper deck. He tried to put out the fire with a pail of water but was unsuccessful. The fire developed very quickly and they evacuated. The entire master bedroom was gutted by the fire (see **Figure 8**) while other parts of the unit sustained severe heat and smoke damage (see **Figure 9**). The burnt remains of a portable socket outlet, hi-fi set and electrical wirings were recovered in the Area of Fire Origin. The cause of fire was determined to be accidental and of electrical origin.



Figure 8. The entire master bedroom was gutted by fire



Figure 9. Other parts of the unit sustained severe heat and smoke damage

Case #2: March 2008, Jurong West

Mr Li was 1 of 6 occupants in the bedroom where the fire originated (see **Figure 10**). He had just returned home and he saw fire under a clothing rack when he entered his room. He shouted 'Fire!' to alert the other occupants of the unit and several of them tried to fight the fire but to no avail. The fire spread to the adjacent mattresses and developed rapidly. Mr Li sustained burn injuries when he tried to retrieve his luggage bag from underneath the burning bed. The fire consumed the wooden partition between the bedroom and the living room; and spread into the living room (see **Figure 11**).

Mr Li explained that there was a portable socket outlet connected to a stand fan and microwave oven at the Area of Fire Origin. Both appliances were not in use at the time of the fire but the power to the portable socket outlet was always left 'ON'. The cause of fire was determined to be accidental and of electrical origin at the portable socket outlet.



Figure 10. A section of the living room was partitioned up and used as a bedroom



Figure 11. The fire consumed the wooden partition and spread into the living room

Case #3: August 2008, Farrer Road

It was about 4 a.m. in the morning and all 4 members of this family were asleep in their respective bedrooms. They were all awoken by ‘popping’ sounds and the smell of something burning. 2 of them came out of their rooms and saw fire at the porch and roof. The family evacuated immediately and called SCDF for assistance. The fire developed and burned into the rooms (see **Figure 12**) and adjacent terrace house. The motorcycle and car (see **Figure 13**) at the porch were also damaged. The burn patterns indicated that the Area of Fire Origin was at the porch where a consumer unit was mounted. There were no indications of other possible accidental fire causes and there were no indicators of incendiarism. The cause of fire was established to be accidental and of electrical origin at the consumer unit.



Figure 12. Fire developed and burned into the rooms



Figure 13. The motorcycle and car at the porch area were also damaged

Case #4: December 2010, Kovan Road

The occupant experienced a power trip when he switched on all the electrical appliances after returning home. Upon resetting the consumer unit, he went about with his routine but noticed smoke at the second level of the 3-storey terrace house shortly thereafter. Fire damage was severe in the master bedroom (see **Figure 14**) while other parts of the house sustained heat, smoke and water damage. The burn patterns were consistent with that of a fire which originated from a location near the windows, where a computer table used to be. The burned remains of a portable socket outlet was recovered from the determined Area of Fire Origin (see **Figure 15**). According to the occupant, this portable socket outlet was brought over from overseas. The cause of fire was determined to be accidental and of electrical origin at the portable socket outlet.



Figure 14. Fire damage was severe in the master bedroom



Figure 15. The burned remains of a portable socket outlet

Causes of Electrical Fires

Heat will be generated when electricity flows through a conductor. This is known as resistance heating. Even when conductors are thermally insulated and operating at rated currents, enough energy may be available to cause a fault or ignition [4]. The National Fire Protection Association NFPA 921 (Guide for Fire and Explosion Investigations) also provides explanation on how electrical energy can bring about ignition:

- **Heat-Producing Devices:** When misused or when certain malfunction occurs during proper use, such devices can cause fires.
- **Poor Connections:** This results in increased resistance that may promote oxide formation. The circuit will continue to function but the oxide can become sufficiently hot to ignite combustibles in close proximity.

- Overcurrent and Overload: Excessive current through a conductor can cause the conductor itself to get sufficiently hot to ignite adjacent combustibles.

Prevention of Electrical Fires

One of the fundamental conditions for ignition by an electrical source is that the conductor has to be energised. Hence, always switch off appliances at the wall socket when they are not in use. Switching ‘OFF’ at the wall socket effectively cuts off the flow of current from the wall socket to the appliance. Without electricity, ignition at any point along the circuit from plug to appliance is impossible.

Other safety advisories to prevent electrical fires include:

- Never overload electrical outlets with electrical appliances
- Check the condition of wires regularly. Frayed wires or cracked cords should be replaced or repaired immediately
- Do not run wires under carpets or mats and keep wires away from hot surfaces
- Use electrical plugs which carry the Singapore Safety Mark⁶ (see **Figure 16**)



Figure 16. Singapore Safety Mark

More information on safe use of electricity can be found at the Energy Market Authority (EMA) website [6].

The HDB Resident’s handbook is another good resource with good information on the consumer unit, electrical accessories, electrical wirings and electrical hazards. An online copy of this handbook is available at the HDB website [7].

Electrical Safety Tips are also available at the SPRING Singapore website [8]. It is advisable to check the ‘Safety Alerts and Tips’ section of the SPRING Singapore website regularly as it provides information on the latest product safety alerts [9].

⁶ All consumer products designated as controlled goods are required to undergo testing under the Consumer Protection Safety Requirements before they are sold in Singapore. These requirements safeguard consumers' interest by ensuring that locally made and imported products meet specified safety standards. The Safety Mark Scheme tests and certifies products for conformity to the Consumer Protection Safety Requirements. Upon approval, products will be able to bear the Safety Mark which is well recognised by consumers, buyers and traders [5].

Be Warned!

For some electrical anomalies, a fire can break out and continue after the electrical anomalies have stopped. Fire can also come about at a much later time [10]. The circuit breaker is a device to protect a circuit from short circuit and overload damages. It is important to know that not all electrical anomalies will result in tripping of the circuit. If there is indeed tripping of the circuit breaker and fire does not break out at that material time, the circuit breaker will likely be reset and the dangerous condition will not be identified if it was successfully reset. A tripping should, therefore, be thoroughly investigated to ascertain that the electrical problem is resolved.

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