

ti Current Trends

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Detailed Technical Analysis on Electrical Fires in India

Introduction

Electrical fires have become a significant safety concern in densely populated metro cities where high-rise buildings, aging infrastructure, and rapid urbanization considerably increase fire risks.

According to the Chief Fire Officer of the Mumbai Fire Brigade, electrical short circuits account for approximately 70% of all fire incidents in the city. But is this a fact? Or are we merely focusing on the effects rather than identifying the root causes?

Despite this alarming statistic, the underlying causes of these fires often remain unaddressed, with many incidents broadly attributed to "electrical short circuits" without thorough investigation.

In most cases, attention is directed toward visible symptoms, such as a short circuit, while the underlying factors—including improper component selection, substandard installation practices, and inadequate maintenance—are overlooked. This report delves into the primary causes of electrical fires in residential and commercial complexes, with a focus on:

- 1. Improper Selection of Electrical Protection Devices**
- 2. Improper Termination (connections) of Switchgear Components**
- 3. Lack of routine Maintenance & Testing of MCBs and ELCBs**

Additionally, the report highlights common installation practices in electrical setups across residential, commercial, and hospital environments that increases the risk of electrical fire incidents.

Key Causes of Electrical Fire:

- 1. Improper Selection of Electrical Protection Devices:** The correct selection and sizing of electrical protection devices are essential for ensuring electrical safety. A misjudgement in selecting the correct **MCB**, **ELCB**, or **RCCB** can leave the entire electrical system vulnerable to faults, and this could be a significant cause of electrical fires.

1.1. Incorrect Selection of MCB's:

1.1.1. Under-Rated MCBs: Sometimes, electricians install MCBs with lower current ratings than required, leading to frequent tripping. While this may appear to be a protective measure, it often causes inconvenience and is eventually bypassed. This significantly increases the risk of circuits not being isolated during faults.

1.1.2. Over-Rated MCBs: The more significant issue, however, is the installation of **over-rated MCBs**. For example, many electricians install **63A MCBs as mains switches** for residential flats, even though the expected load is significantly lower. As a result, these MCBs may not trip in the event of a short circuit or overload. Overloaded circuits could continue to carry current, potentially leading to overheating, fire, or total failure of the wiring or equipment.

1.2. Improper ELCB Selection

1.2.1. Incorrect Sensitivity: One of the most common issues with ELCBs in residential settings is the use of devices with incorrect sensitivity. A 100mA or 300mA ELCB, frequently installed in flats, is not sensitive enough to detect small leakage currents. In our opinion, the Fire and Electrical Authorities should enforce a prohibition on using ELCBs rated beyond 30mA in all residential complexes. Additionally, the Association of Electrical Contractors and the Fire & Security Association of India (FSAI) should take the lead in educating electricians on the implications of leakage currents exceeding 30mA, which can cause severe electrical shocks and, over time, lead to significant fire hazards.

1.2.2. Failure to Detect Earth Leakage: In some instances, electricians encounter nuisance tripping of the ELCB (Earth Leakage Circuit Breaker), where the ELCB trips unexpectedly, disrupting the electrical supply. Often, electricians are unable to identify the exact cause of the tripping, whether it's due to faulty equipment or improper wiring. Frustrated by this recurring issue, the electrician may convince the property owner that the ELCB is faulty or unnecessary, deeming it a "nuisance" device. Due to a lack of knowledge or awareness of the ELCB's importance, the property owner, who is often unaware of the risks, may agree to have the ELCB bypassed.

1.2.3. This decision to bypass the ELCB can have severe consequences:

1.2.3.1. Risk of Electric Shock: The primary function of the ELCB is to detect earth leakage currents, which can occur when there is a fault in the electrical system, such as when current escapes to the ground through damaged insulation. By bypassing the ELCB, any leakage currents that could have been safely detected and interrupted will continue to flow unchecked. This

exposes anyone who comes into contact with the affected equipment to the risk of a fatal electric shock, particularly when using handheld devices or faulty appliances.

1.2.3.2. Increased Risk of Electrical Fire: When the ELCB is bypassed, earth leakage currents, which can be caused by faulty wiring or insulation degradation, are no longer detected. These undetected leakage currents can lead to overheating of the wires and components, eventually causing them to melt or ignite, resulting in a fire hazard.

1.2.3.3. Damage to Equipment and Property: In addition to the risk of shock and fire, bypassing the ELCB can lead to irreversible damage to electrical equipment. Without the ELCB's protection, faulty wiring or equipment can cause long-term harm to both the electrical infrastructure and sensitive devices, leading to costly repairs or replacements.

1.2.3.4. Violation of Electrical Safety Standards: Bypassing or disabling safety devices like the ELCB also violates electrical safety standards and regulations, which are put in place to protect both property and lives. By disabling such protective measures, the overall safety of the electrical system is compromised, leaving the premises vulnerable to serious accidents.

In light of these risks, it is critical that both electricians and property owners understand the essential role of the ELCB in preventing electrical hazards. Instead of bypassing the device, any nuisance tripping should be properly investigated and rectified by identifying the root cause of the fault, whether it's due to faulty equipment, poor wiring, or incorrect installation. The importance of earth leakage protection cannot be overstated, and bypassing the ELCB can lead to catastrophic outcomes. Therefore, electricians must emphasize safety and follow correct procedures to ensure that electrical protection devices like the ELCB remain operational at all times.

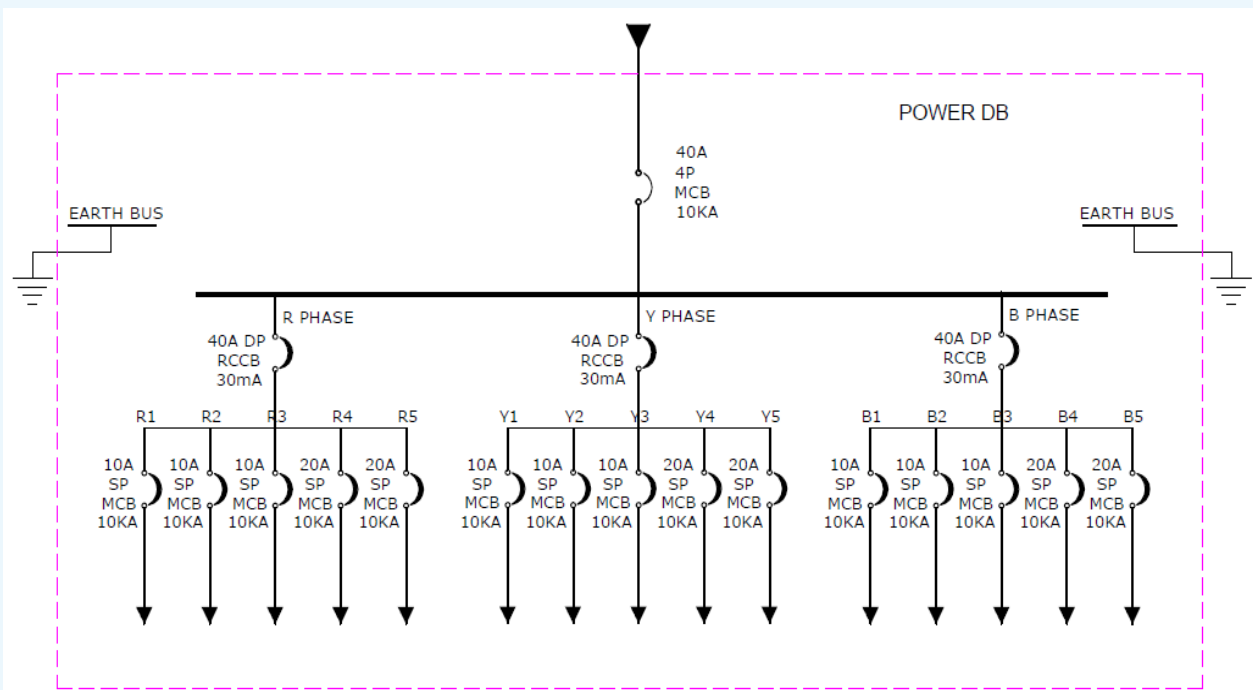
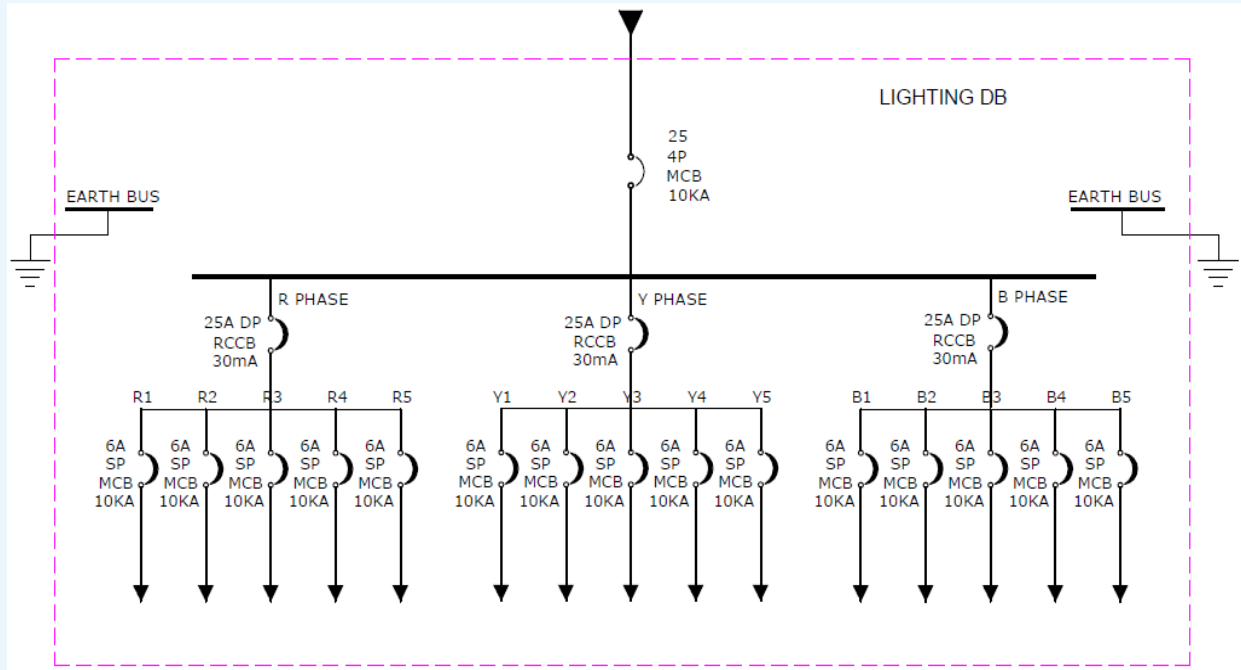
1.3. Typical Electrical Practices: In many 1BHK and 2BHK flats, the electrical setup follows standard practices that often fall short of ensuring safety:

1.3.1. 63A MCB as the Main Switch: Electricians commonly install 63A MCBs as the main switch for such flats, even when the actual load ranges from just 10A to 20A. This over-specification prevents the MCB from tripping when the load exceeds safe limits. Consequently, the wiring is exposed to risks of overheating and potential insulation fires.

1.3.2. 32A MCB for sub-circuits: For various sub-circuits, such as lighting, fans, and sockets, 32A MCBs are frequently used. However, in smaller residential setups, such high ratings are unnecessary. These MCBs often fail to trip under overload conditions, leaving the wiring vulnerable to sustained excessive current, which can compromise safety.

1.3.3. 100/300mA ELCBs: The use of 100/300mA ELCBs in residential flats poses a significant safety risk, as they lack the sensitivity needed to detect minor leakage currents. This can lead to the gradual degradation of wiring and insulation, eventually increasing the likelihood of fires.

We have outlined a typical distribution system for residential and commercial units to emphasize the need for safer electrical practices.



To be continued in next edition...

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