

ti Current Trends

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2. Improper Termination

Switchgear components like **MCCBs (Moulded Case Circuit Breakers)**, **MCBs (Miniature Circuit Breakers)**, **ELCBs (Earth Leakage Circuit Breakers)**, **RCCBs (Residual Current Circuit Breakers)**, and **RCBOs (Residual Current Breaker with Overload Protection)** play a pivotal role in protecting electrical circuits from overloads, short circuits, and earth leakage. When these components are improperly terminated or installed, the risk of electrical faults and fires increases drastically.

2.1. Poor Wire Termination

2.1.1. Loose Connections: Loose connections in MCBs, MCCBs, and other switchgear components can result in an increase in resistance at the contact points. Over time, the loose connections cause heat buildup, which can melt the insulation, potentially causing fires. This is a common issue in many electrical installations.

2.1.2. Incorrect Tightening: Improper tightening of terminals can lead to faulty connections. A common tendency among electricians is to connect flexible, multi-stranded wires without using lugs, which can eventually slip out or lose contact during operation, causing arcing and generating heat that may ignite surrounding materials

2.1.3. Corrosion: In environments with high humidity, poor-quality terminals can corrode, reducing their effectiveness. This corrosion increases the contact resistance, causing local heating and eventually leading to fire hazards.

2.2. Improper Crimping

In most cases, electricians fail to use proper **crimping tools**, leading to **improper crimping of lugs**. Crimping is a crucial step in creating a reliable electrical connection, where a metal lug is securely attached to the wire to ensure a solid, long-lasting connection. When electricians skip or improperly use crimping tools, the result is a weak or inconsistent crimp. This can lead to several problems:

2.2.1. Inadequate Electrical Contact: Improper crimping causes poor contact between the wire and the terminal, which increases electrical resistance at the point of connection. This resistance generates heat, especially under load conditions, which can cause the wire or terminal to overheat and, in the worst-case scenario, catch fire.

2.2.2. Points of High Resistance: A non-crimped or poorly crimped connection creates small, localized points of high resistance. Even though the wire and terminal might appear connected, these weak spots significantly disrupt the flow of current. The heat produced at these high-resistance points can escalate over time, weakening the insulation of the wire and potentially leading to an electrical fire.

2.2.3. Increased Risk of Corrosion: Improper crimping can also leave the connection exposed to moisture and air, leading to **corrosion**. Corroded terminals particularly in the areas near the sea, have even higher resistance and are more prone to overheating, which further increases the risk of a fire.

2.2.4. Intermittent Connections: A poorly crimped connection may not hold securely, causing an intermittent electrical connection. This can lead to sparking or arcing at the contact points, which not only causes heat generation but also increases the risk of igniting surrounding materials.

For these reasons, it's essential that electricians use the correct crimping tools and techniques to ensure that lugs are securely crimped onto the wires. Crimping tools are designed to apply the right amount of pressure to form a strong, reliable bond between the wire and the lug, preventing the issues caused by poor connections and reducing the risk of electrical fires."

2.3. Multiple wire connection at one point

In the case of **MCBs (Miniature Circuit Breakers)** and **ELCBs (Earth Leakage Circuit Breakers)**, manufacturers typically design the terminals with the capacity to connect a maximum of **two leads** at each connection point. This design ensures that the electrical load is evenly distributed, and the connections remain secure. However, due to a lack of knowledge or awareness, electricians sometimes connect **multiple wires** to a single connection point, exceeding the manufacturer's intended limit. This leads to improper connection does initially its start as overheating and subsequently which may either lead to short circuit or it may burn the surrounding flame able materials **thus, leading to fire.**

2.4. Overheating Due to Inadequate Design

2.4.1. Overrated Circuits: Circuits designed to carry more current than necessary can be a fire hazard. For instance, the improper termination of wires in oversized MCBs can lead to current flowing continuously even if there is an overload condition, which could lead to overheating of wires, circuit breakers, and connected appliances.

Two Predominant Factors That Contribute to Loose Connections:

2.4.2. Alternating Current (AC) Distribution System:

The electrical distribution system in most residential buildings operates on alternating current (AC), where the current flow direction continuously changes. This cyclic flow of current can cause mechanical vibrations within the electrical connections, gradually loosening the wires. Even minor movements in the wires due to the AC's alternating nature can eventually lead to poor contact, increasing resistance and heat generation at the connection points, which is a potential fire risk.

2.4.3. Temperature Fluctuations:

Another significant factor contributing to loose connections is the wide fluctuation in room temperature during the day and night. Electrical components and wires expand and contract with changes in temperature. This expansion and contraction can affect the tightness of wire connections in the MCB, ELCB, and DB. In areas where the temperature swings are significant, this constant movement of materials can cause connectors to loosen over time. The lack of regular checks on these components means that these subtle changes can go unnoticed, eventually leading to electrical faults or fires.

3. Lack of Maintenance of MCBs and ELCBs:

It is a widely observed issue that MCBs (Miniature Circuit Breakers) and ELCBs (Earth Leakage Circuit Breakers) in residential, commercial and hospitals are often not maintained regularly. There exists a common misunderstanding that these smaller rating protective devices in the distribution board do not require maintenance or inspection once installed. This oversight can significantly contribute to electrical hazards, including fires.

Key Reasons for the Lack of Maintenance:

1. Assumption of No Maintenance Requirement:

Many property owners and even electricians mistakenly believe that once an MCB or ELCB is installed, it does not require further maintenance or testing. This false assumption stems from the misconception that these devices are built to function indefinitely without any attention. However, like any electrical equipment, MCBs and ELCBs are subject to wear and tear, especially under heavy or fluctuating electrical loads.

Loose Wire Connections in Distribution Boards (DBs): In Distribution Boards (DBs), there are often multiple wire connections made to the terminals of the MCBs and ELCBs. Over time, these connections may loosen due to various factors, leading to increased resistance at the connection points. Even under normal load conditions, these loose connections can cause arcing, which generates heat and can eventually lead to fire hazards. Without regular maintenance, there is no way to detect or fix these loose connections before they cause damage.

2. Importance of Regular Maintenance:

To prevent such risks, regular inspection and maintenance of MCBs, ELCBs, and DBs are essential. This includes checking for any loose connections, cleaning any accumulated dust or dirt that could interfere with proper functioning, and testing the devices to ensure they operate as intended under load conditions. Regular maintenance can help identify potential issues, such as arcing, overheating, or wear on the internal components, before they escalate into dangerous situations. Furthermore, electrical connections should be tightened periodically, ensuring they remain secure and can handle the electrical load without the risk of malfunction.

By educating both property owners and electricians about the importance of routine maintenance, many fire risks can be mitigated, creating a safer living environment in residential complexes.

To be continued in next edition...

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