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ELECTRICAL

FIRES

Beyond Short Circuits

Cover Story

Electrical Fire Safety in Residential Buildings

Expert Speak

Electrical Fires - Beyond Short Circuits

Special Report

Safety Audit to Identify Potential Hazards in Industrial Operations

Solutions

Lightning Protection & Earthing System in Commercial & Industrial Buildings

Guest Article

Short Circuit Current Enhancement for Disconnectors

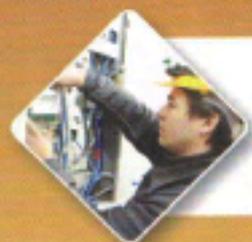
In Depth

Cause of Fire and to Prevent Fire in Electrical Installations in Residential Buildings and Industrial Plants

As Per BS7671:2008 and IEC Standards 60364

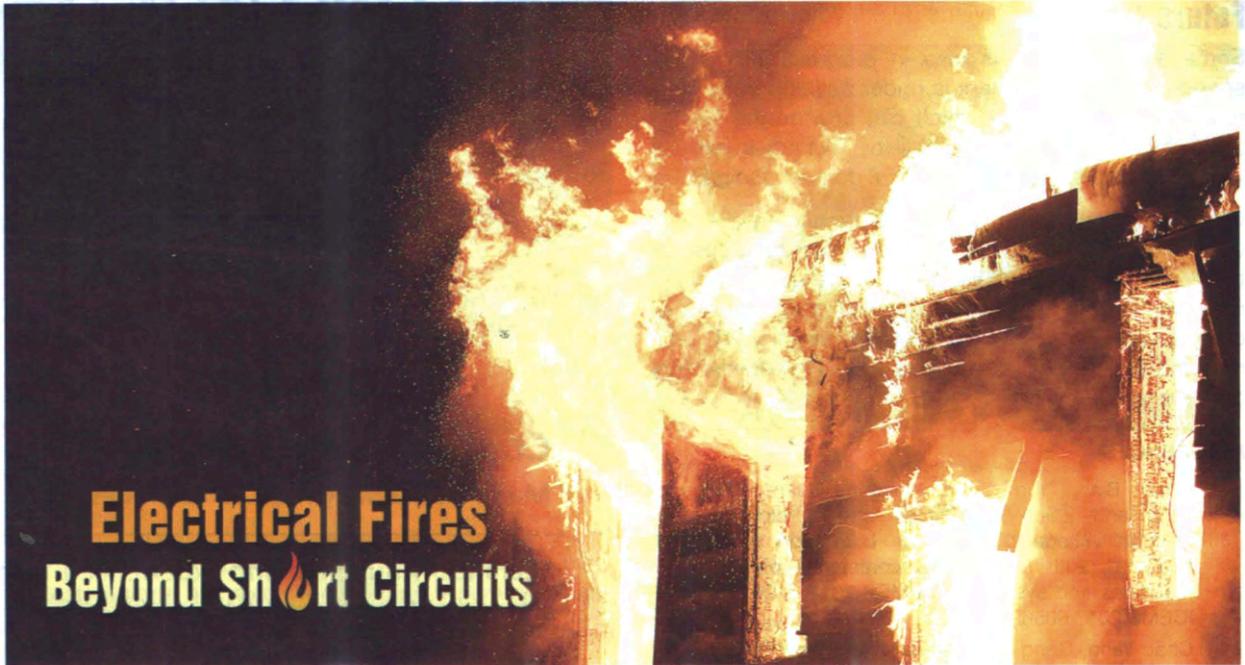
View Point

Electrical Fire Safety - An Over View



ELECTRICAL
FIRE SAFETY
CONCLAVE

29th June, 2018, Mumbai



We use electricity knowing that it is dangerous. We feel safe, because we have installed protection devices such as circuit breakers and fuses. We assume that it ought to disrupt power in case of risk to human life or property. We trust these protection systems with our lives. Have we asked ourselves – are they enough? How often do you see a nuisance tripping of your circuit breaker? The circuit breaker trips, we turn it back on and circuits are working just fine. We have all experienced it. We all have. Experiencing frequent nuisance tripping is certainly not a good sign. It is an indication that your electrical systems need to be examined. It could also mean that your circuit breakers are getting old and need to be changed. But, amongst the many evils this is by far better, in comparison to a circuit breaker not tripping when there is actually a significant electrical risk. How is that possible you might ask.

Let me share my experiences from a few years ago. The date is 23rd February 2014. I had started to observe issues with my electrical supply the night before. I reached home and wanted to watch a football match but the set-top box kept turning off randomly. A closer examination revealed sparking at the spike guard and intermittent supply from the power adapter to the set-top box. I assumed that there was a problem with the adapter. Everything else worked fine at the moment. Later, close to midnight one of the lights near the same set-top box started to flicker. Since the supply to the rest of the house seemed fine, I thought it was too late to bother. I switched off the lights and went to bed. While I was sleeping, close to about 5am I heard a sound, like somebody was knocking at the bedroom door. I woke up, checked the bedroom door and nobody was there, just then I heard the knocking sound again. This

time I realized the spark appearing at the power outlet where my cellphone was charging. I switched off all the devices in my room and went to the distribution board. I was surprised to find none of the circuit breakers had tripped. What was I supposed to do now? I started turning some other devices in the house to see what happened. I stood close to the distribution box and assumed in the worse case I would trip some circuit breakers. Cautiously, I started switching one appliance at a time in the living room. The first switch was for a tubelight, it worked, but output was low. The next switch was for a fan -- that didn't work. Next I tried one of the halogen spotlights in the passage close to my bedroom, and BOOM -- a small explosion!!! The bulb exploded. No breaker tripped and luckily, no other damage. This time the sound was enough to wake up the rest of my family. I turned off the main circuit breaker and then went to ask the others if they noticed anything odd. My father complained, that the AC in his room stopped working and the fan started operating really fast. My brother smelt some burnt electronics in his room.

Sparkling, fans operating at high speeds, bulbs bursting all indicated overvoltage. But, nobody else in the building seemed to be complaining. The problem was localized to my home. How was our flat the only one in the building receiving a higher voltage. We do have a three phase supply at home. It was possible that we were receiving a Phase-to-Phase voltage of 415V at the appliances/outlets, instead of Phase-to-Neutral of 230V. I did not have my voltage meter and could not be sure. But, I still had some lingering thoughts. What was the cause of the Phase-to-Phase voltage? It would have to suggest a Phase-to-Neutral Short. Which should have tripped the circuit breakers. And what was the reason

for the low light output, flickering, random switching off the set top box – all indicated an undervoltage condition or an intermittent power supply.

A few hours later, at a more decent time in the morning morning I went down to the meter room with the local electrician. He measured the incoming supply to the meter and confirmed it was alright. However, the antiquated meter installed in 1981 had a connection in the neutral path that had failed, and about time. The meter had outrun its lifetime. Certainly, it was an oversight on our part. This poor maintenance of the electrical system created a rather scary situation for my family.

The fault that we had experienced is commonly known as a “floating neutral”, “neutral open” or a “neutral fail”. It is one of the more challenging electrical faults to detect and protect. When you face it the effects are catastrophic. The voltage observed at different phases could be anywhere from 0V-415V, but most probably somewhere in between. This rather precarious situation arises from the fact that the neutral is floating and would “assume” a voltage based on loads connected amongst the respective phases.

The floating neutral condition clearly explains why some of the devices were observing a higher voltage and other devices connected to another phase were observing low voltage levels. It also confirms why none of the circuit breaker tripped. There wasn't any short circuit condition. The problem was related to the voltages levels and they were enough to damage appliances and even trigger fires.

Understanding the gravity of the situation I am happy that with Gods grace we avoided a major calamity that day. It makes we wonder how many of the recent fires making daily headlines could have been averted with better more sound protection devices. It is a fact that the circuit protections that we use, rely on, and trust are not designed to cover all known electrical risks. Our application of circuit protection theory needs to be revisited. During the course of the research performed at Jhaveri Power Labs we have identified 20 unique electrical problems that one faces in the Indian environment. Issues such as neutral failure, exposed wires, loose connections, rats nibbling on insulation amongst others are all cause of fires. There are a total of 12 fire causing events that are all misclassified as short circuits. At Jhaveri Power Labs we have indigenously developed the POWEReasy solution that can monitor your electrical supply and protect against 20 unique electrical faults including the 12 fire causing events. It is the only solution to have complete coverage of 20 known electrical faults and comes with additional features to improve electrical quality, maximize equipment life and save energy. ■

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PhD, is Founder, Jhaveri Power Labs LLP



Prevent Fires



Early diagnostics of 8 electrical fire risks

Protect Equipments



Inbuilt stabilizer and surge protection

Diagnose and Prevent



Warning for 20 unique electrical issues

Save Energy



Government verified 18% Electricity Savings



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