

Aluminum wiring

By Richard van Leeuwen

Back in the 1960s and '70s, when copper prices were high, aluminum wiring replaced copper wiring. It seemed like a good idea at the time because aluminum cost less and weighed less.

Unfortunately, there were a few problems. The electrical conductivity of aluminum isn't quite as good as copper, so a wire size of about two wire sizes greater had to be used for aluminum wiring. But it was still cheaper and lighter, so most electricians were comfortable with that and installed it in homes.

A second problem was that aluminum develops an oxide coating quickly, almost as quickly as it is exposed to air. Unluckily, aluminum oxide does not conduct electricity, so a chemical compound had to be used to prevent oxidation. Hopefully, electricians making electrical connections didn't forget to use it.

Once wiring had been installed in many homes and time passed, many of the aluminum connections at outlets and switches were failing – and occasionally starting fires. The cause was due to the differences in the coefficient of thermal expansion and “cold flow” that caused the aluminum to expand more than the space allowed at higher temperatures; flow to fit in the space, and then, when the temperature lowered, it would become loose. Of course, once the connection is loose, corrosion gets in and causes the connection to heat and eventually fail.

If that doesn't keep you awake at nights, there is another problem. Connection devices were improved and marked CU/AL, a device specification standard created in the late 1960s. Unfortunately, CU/AL switches and receptacles failed to work well enough with aluminum wire, and a new specification called CO/ALR (meaning copper-aluminum, revised) was created.

To make matters even worse, connecting of aluminum wire to copper wire is problematic. Since aluminum and copper are dissimilar metals on the galvanic scale, galvanic corrosion can occur in the presence of an electrolyte, and these connections can become unstable over time. Due to the reduced weight of aluminum, however, it is still used in aircraft wiring and power distribution overhead wiring. Aluminum wiring is also permitted by the Canadian Electrical Code.

In my experience in B.C., aluminum connections have been the root cause of several fires after premature failure, and it is one of the issues that should be considered when investigating an electrical issue, especially if it is suspected to be the cause of a fire.

The electrical conductivity of aluminum isn't as good as copper, so a larger wire size had to be used. In the 1960s and '70s most electricians continued to install aluminum in homes because it cost less and was lighter. Aluminum connections have been found to be the root cause of some fires.

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