



ALUMINUM WIRING IN ONTARIO HOMES

Aluminum wiring was used extensively in homes throughout North America between the mid 1960's until the late 1970's, primarily due to the high cost of copper wiring at the time. If buying a home built during this time period, there is a good chance that it contains aluminum wiring. But is aluminum wiring safe? The short answer is, yes. It is still in use in many applications even today, though not in residential branch circuits.

Did you know:

"... Aluminum wiring in residential installations will operate as safely as any other type of wiring if the proper materials are used and it is installed as per the manufacturer's instructions and the Ontario Hydro Electrical Safety Code."

Home buyers and owners are finding that many insurance companies will not provide or renew insurance coverage on properties with aluminum wiring unless it is inspected by the Electrical Safety Authority (ESA) of Ontario, and repaired or replaced as necessary to make it safe. A copy of the inspection certificate will often need to be provided to the insurer before the property can be insured. In some cases, the insurer will require replacement of the aluminum wiring with copper wiring, but this is rare and in most cases not necessary. Check with your insurance company for their requirements.



What's Wrong with Aluminum Wiring?

It is estimated that there are over 450,000 homes in Canada that are entirely wired with aluminum. Reported problems are mostly related to the overheating and failure of aluminum wiring terminations, sometimes resulting in a fire. Some studies have shown that **homes with aluminum wiring are 55 times more likely to have existing fire hazard conditions compared to homes with copper wire**. Problems are due to aluminum's tendency to expand and contract at a higher rate than copper, and to oxidize at termination points resulting in overheating and failure. As such, it is incompatible with devices designed for use with copper wiring. Older solid aluminum wire also had problems with a property called creep, which, over time, make the wire permanently deformed under load / no-load conditions resulting in terminations that can become loose, heat up or arch.

Symptoms that may indicate a problem with aluminum wiring include:

- Flickering lights that cannot be traced to a failed bulb or other external cause
- Switch plates and receptacles covers that are warped, discoloured or warm
- A smell of hot burning plastic around switches and receptacles
- Smoke or sparking around electrical devices or outlets
- Plugs that do not work even when the circuits are energized
- Unusual static from electronic equipment, such as, the radio, TV or computer
- Circuit breakers or fuses that trip for no apparent reason



The Good News

The good news is that because all the problems that occur with aluminum wiring occur at the devices and junction boxes, there is usually no need to rewire the house. The wire running through the walls is normally in good shape and does not need to be replaced.

Problems that exist with aluminum wiring are typically found at termination points. An inspection by ESA involves the opening of all outlets (receptacles, switches, fixtures, appliance connections, and electrical panels) and visually inspecting terminations for signs of failure and overheating without actually removing or disturbing the devices or wiring. Signs of overheating include darkened or discoloured connections, melted insulation, melted device, etc. Where problems are found, the damaged aluminum conductor should be cut back to remove the damaged portion before necessary repairs are made.



Fixing Aluminum Wiring Problems

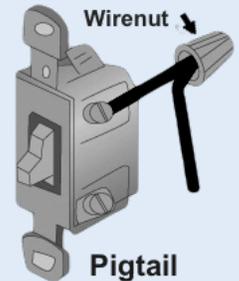
As stated above, as the problems with aluminum wiring occur at the termination points, replacing the receptacles and switches with an approved type for aluminum wiring is an easy enough fix. Devices designed for aluminum wiring will have special markings, such as "CO/ALR", "AL-CU" or "CU-AL" on them. These outlets are more expensive than those made exclusively for copper wire, and normally don't come in the newer, Decorra-style designs. Estimate cost to be about \$10.00 per device. These devices are available through **Leviton**. They may be special order through your local hardware retailer.



Devices with "push-in" terminations cannot be used with aluminum conductors, due to the wire's tendency to expand and contract more than copper.

In Canada, a less expensive and still approved alternative to using dedicated copper/aluminum devices is to connect a short piece of copper wire to the ends of the aluminum wire before connecting to a device approved for copper only. This is called a "pigtail". Using this method, the newer Decorra-style and GFCI outlets may be used. In this case, the connector used for the pigtail joint must be an approved

type. In Canada, the Marrette No. 63 and No. 65 or the Ideal 65 connectors are rated for connecting aluminum to copper wire. These wirenuts, as they are sometimes called, are brown or purple (Ideal 65) in colour. Many electricians believe the purple ones are the better of the two, though failures of the Ideal 65 connectors have been reported in the United States.



Other special considerations required when correcting aluminum wire issues include:

- Adequate precaution is to be given to the termination and splicing of aluminum conductors, including the removal of insulation, the cleaning of the bared conductor, and the compatibility and installation of any fittings.
- Aluminum conductors cannot be nicked, cut, or crushed during termination. Any nicks, cuts, or crush spots at terminations create weak areas that may result in breakage of the conductor or a hot spot.
- Though not required by code, it is recommended that bare ends of solid aluminum conductors be coated with an approved joint compound, called an anti-oxidate. This helps prevent corrosion of the exposed wires.
- Where pig-tailing is used, the box must be large enough to contain the new and existing wires plus the connectors.

A third, more labour intensive and costly solution would be to rewire the entire home. Obviously this is the best and safest long term solution, but may be cost prohibitive. Expect to spend anywhere from \$7,000 to \$20,000 plus, depending on the size and complexity of the home. Costs may be reduced when rewiring can be coordinated with other major or structural renovations.

What Are You Required To Do

If you own, or are considering purchasing, an older house that contains aluminum wiring, are you required to have all non-CU/AL devices replaced with devices approved for connection to aluminum wiring, or have copper pigtails installed?

As per the **Electrical Safety Authority bulletin (09-08-FL)**, "**No, if the devices are the original ones installed and show no visible signs of overheating or other damage, then they are not required to be replaced (it is recommended only)**". If a device shows any visible signs of overheating or other damage, then replacement is required. If any of the devices have been replaced in the past with newer devices (ie: Decora style), then they are not original and are required to be replaced with a Code compliant installation."

Where there is no evidence of deterioration of the wire, the termination, or the device, the Electrical Safety Authority does not require that repairs be made, they only recommend it.

If you own a home that has aluminum wiring and you suspect problems may exist, it is highly recommended you consult with a qualified electrician, experienced in aluminum wiring, to obtain professional advice particular to your situation. Each home is wired differently and must be assessed on an individual basis to determine the best and safest solution. In all cases, any electrical work should always be done by a licensed electrician. Remember, final approval comes from the ESA inspector. If he doesn't approve the existing conditions or the repair work done, he will require it to be done over before signing off. Better to get it right from the start.

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