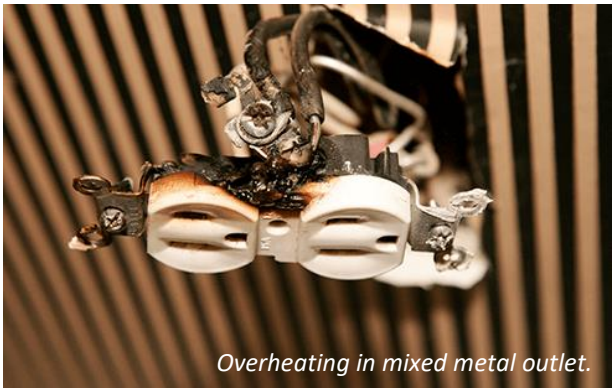
Risk Control Engineering's regular ongoing bulleting on construction, fire protection, equipment hazards and all things risk management.

COPPER/ALUMINUM WIRING SYSTEMS

As copper prices rose in the early 1960's many home developers switched over to single strand aluminum branch wiring systems to reduce their construction costs. This trend continued until 1977 and aluminum wiring systems are present in an estimated 450,000 homes in Canada. Aluminum is a fantastic conductor of electricity and continues to be used to this day in high voltage cables for utility services (multi-strand composite cables). So why is this an issue in residential applications today?



Overheating in mixed metal outlet.

The problem with single strand aluminum wiring comes primarily from issues related to material properties. Single strand aluminum conductors are more prone to breakage cause by repeated stress (fatigue) due to low ductility of aluminum. In addition, aluminum and copper have different rates of thermal expansion causing connections to loosen during heating/cooling cycles. Lastly, the connections between copper and aluminum creates a galvanic cell that causes corrosion and degradation. All of these effects work to degrade connections which can lead to overheating and an increased fire risk. A commonly cited statistic is a 55 fold increase in "fire hazard conditions" for houses with aluminum wiring.[1]

COPALUM Connector

To address this issue, a home or unit owner must ensure that the correct connectors and devices are used at all points in the system. Do-it-yourselfers often use standard outlets and switches instead of CSA approved CO/ALR (Copper Aluminum Revised) components. Improper installation of "pigtails" is another common failure point as many handypersons neglect to employ the correct COPALUM listed marrette connector or anti-oxidant paste that may be required by the electrical code, depending on the connection type. All of these changes and installations are best left to professional electricians.

The most common sense approach to aluminum wiring is for owners to be aware when these systems are present and be cognizant of the special precautions that are required when changing or updating components. A qualified electrician should be used on a regular basis to verify the condition of the system and check connections. Routine inspections of this type can identify improper installations performed by earlier owners, loose or worn connections/terminations and any other degradation of the wiring or components. This action would significantly reduce the potential for any issues resulting from these wiring systems.

Aluminum and copper mixed metal wiring systems can suffer from issues related to the difference in properties between the two metals resulting in degraded connections, overheating and potential fire conditions.

[1] US CPSC Publication No. 516 - CPSC #516, "*Repairing Aluminum Wiring*", June 2014 (https://www.cpsc.gov/s3fs-public/516.pdf)