



TO: To Whom It May Concern

FROM: Paul W Abernathy, Manager of Codes and Standards

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RE: Aluminum Conductors, Aluminum Oxide and Termination Recommendations

Encore Wire's Codes and Standards team is frequently asked about aluminum conductors and oxidation at terminations. In this month's article, we are going to discuss a condition called "Surface Oxidation". There are two types of oxidations that affect Encore Wire conductors in the field. There is *copper oxide* for copper conductors and *aluminum oxide* for aluminum conductors. This article mainly focuses on aluminum oxidation.

The National Electrical Code® [NEC®] states in section 110.14 that the use of oxidation inhibitors are permitted, not required, for both Copper and Aluminum conductors as long as the compounds used do not have an adverse effect on the conductors. It is also important to understand that some inhibitors are designed specifically for aluminum while others are specific to copper so choosing an inhibitor that is compatible to the conductor material is very important and quite frankly, what section 110.14 of the NEC® is demanding.

It is important to understand that aluminum oxide is not a concern within the conductor assembly itself concerning conductivity of the aluminum material because it just under the insulation and can serve as a protective barrier to the actual conductive material. However, if surface oxidation on any conductor (Copper or Aluminum) is observed, the surface contact resistance at terminations, that were prematurely stripped, exposes the conductive material to atmospheric conditions at vital connection points, which can raise the resistance at the termination and can lead to premature failure over time.

When employed on aluminum conductors to rectify the aforementioned condition, it is the recommendation of Encore Wire's Codes and Standards team to prep the exposed aluminum conductors for termination as followed and employ the use of anti-oxidation compounds.

1. After stripping the insulation off the aluminum conductor; take a wire brush or emery cloth and clean the entire surface of the exposed aluminum conductors.
2. Immediately apply a uniformed coating of a UL listed, anti-oxide inhibitor compound to the conductor to ensure a protective barrier to future oxidation at the contact points of the conductor.
3. Terminate the conductor to a terminal that is listed and identified for use with aluminum conductors. Properly torque the termination in accordance with UL 486A-B and/or NEC® Informative Annex I.

Note: If oxide inhibitor is not applied immediately after wire brushing the conductor, proceed back to item 1 and re-brush the conductor and continue to item 2.

In closing, it is important to understand that the NEC® provides no requirement to the direct use of oxidation inhibitors or compounds on Aluminum or Copper wire. Section 110.14 of the NEC® states, "Where employed, shall be suitable for the conductors, installation and equipment." If the electrical equipment's installation manual, which is part of its UL listing, states the use of oxidation inhibitor is required then not using it so would be a violation of NEC® Section 110.3(B), which states you install the electrical equipment in accordance with the manufacturers listed instructions. If the manufacturer does not make such a statement then the oxide inhibitor or anti-oxidation compounds are not required but are always highly recommended.

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