ECS™
The Electrical Cable Specialists

Skin Effect on Cable Ampacity

Since cable ampacity is about thermodynamics, electrical engineers may find it puzzling that as a conductor size increases, its ampacity does not increase in the same proportion as the conductor cross section.

Air has a much lower ability to absorb heat than the insulations we provide. As a result, more insulation helps dissipate the heat. Thus, the thicker insulation on the higher voltage cable gives a small additional ampacity. The conductors are also spaced further apart which impacts the thermal resistance each conductor sees.

However, as the conductor size increases, the skin effect increases. A longitudinal element of the conductor near the center of the axis is surrounded by more lines of magnetic force than near the perimeter of the conductor. Therefore, there is higher inductance toward the center which pushes the current toward the perimeter. The decreased area of effective conductance causes an apparent increase in resistance and an attendant increase in heat generated by current flow. It can be visualizes as though the current is unevenly distributed across the conductor. In very large conductors this forces a significant portion of the current through a limited percentage of the total copper or aluminum.

Since the heat generated is a function of the current per cross-section of conductor, the heat generated in this smaller portion of the conductor is high. In large conductors (500 kcmil and above) this skin effect noticeably reduces the cable ampacity.

Call us if you or your team wants to discuss this topic in more depth.

Electrical Cable Specialists
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