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Hot-Dip Galvanized vs. Aluminum

One of the most important choices when designing a cable tray system for corrosive or outdoor environments is the material. Steel cable tray with a Hot-Dip Galvanized after Fabrication (ASTM A123) finish has been used successfully for many years.

Increasingly, however, aluminum is becoming the material of choice for cable tray systems. In these days of shrinking construction budgets, why would engineers, contractors, and end users choose aluminum cable tray, which typically has a slightly higher initial cost, over Hot-Dip galvanized steel cable tray? The answer lies in aluminum's many advantages in design, installation, delivery, performance and total cost over the lifetime of the installation.

Design and Installation

Most people know of aluminum's superior strength-to-weight ratio. For example, a 36" wide, 24-foot section of ladder cable tray with a 6" side rail, NEMA 20C hot-dip galvanized steel cable tray weighs about 200 lbs, whereas the same cable tray in aluminum weighs only about 100 lbs. When installers must carry and put cable tray sections into place, which may be 30' or more above ground, aluminum's lighter weight can mean the difference between needing just two installers instead of four.

Field cuts are also much easier with aluminum cable trays, not only because aluminum is easier to cut, punch, and drill, but there is no need to apply a protective coating to the exposed edges. The hot-dip galvanized coating on steel must be repaired with a zinc rich paint (also called cold galvanizing) which is inferior to the original galvanizing, leaving a chink in the steel's armor against corrosion. Of course, there is always the chance that some contractors may not repair the cuts at all, further impairing the cable tray's corrosion resistance.

Because aluminum cable tray components are extruded, material can be used more efficiently and tolerances remain tighter. Some manufacturers have used this to the contractor's advantage by creating splice joints and other features which offer better performance and require less labor to install. And when using cable tray as an equipment grounding conductor (EGC), aluminum's superior current carrying capacity reduces the need to purchase and install a separate EGC (in qualifying industrial installations) and also increases the safety of the installation by providing a better fault current path.

Delivery and Availability

Aluminum cable tray systems can normally be shipped from the factory in a short period of time. Small orders can ship in just a few days, depending on the manufacturer's work-load. Hot-dip galvanized cable tray systems typically take several days to fabricate, hot-dip galvanize, and prepare for final shipment.

All cable tray manufacturers must ship their cable trays to a third party to have them galvanized. This requires that the cable tray be manufactured, packed and shipped to the galvanizer. Some manufacturers return the material to their plants after galvanizing to inspect and deburr the product prior to packing and final shipment. Other manufacturers rely on the hot-dip galvanizer to inspect, deburr, and pack the material for shipment. The cost of a delay in getting material to the jobsite is many times the cost of the material itself and using aluminum cable tray helps to minimize the chance of delays.

Hot-dip galvanized steel cable tray covers pose another problem. Placing thin gauge steel covers in a hot zinc bath will often cause the covers to warp. To avoid this problem, thicker material is used and the covers are limited to six feet long. The extra material and the extra labor required to install shorter covers has a significant impact on the cost of the entire cable tray system.

Performance

Aluminum cable tray has excellent corrosion resistance in many chemical environments and has been used for over thirty years in petro-chemical plants and paper mills along the gulf coast from Texas to Florida. The aluminum alloy used by American cable tray manufacturers is 6063-T6, which is considered copper-free and sometimes referred to as marine grade aluminum. Although copper-free aluminum may experience some chloride pitting in a marine environment, this corrosion is limited and does not affect the structural integrity of the system.

Galvanizing on steel cable trays is designed to slowly wear away as it protects the steel; any place where the coating is thin or has been removed can prematurely limit the product's service life. Since aluminum cable trays are homogenous material throughout, their service life is unaffected by scratches and field modifications. When aluminum cable trays are used with stainless steel hardware, the system can perform indefinitely, with little or no degradation over time, making it ideal for many chemical and marine environments.

Total Cost

Aluminum's many advantageous features like its corrosion resistance, superior strength-to-weight ratio, ease of field modification, fast delivery and availability, and labor saving installation all add up to a system well worth the extra 10% to 15% in initial price. Recently, the relative cost of aluminum to steel has been decreasing, making the choice between aluminum and steel no contest.

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1300 North 17th Street, Suite 1752, Rosslyn, Virginia 22209

www.cabletrays.com