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POLEPRINCIPLES

Guidance for specifying and using preservative-treated wood poles

Myths and truths: wood vs. alternatives

Wood poles and crossarms comprise some 75 percent of North America's electrical distribution overhead structures. With a proven track record of performance, wood poles have dominated the market for well over a century.

Despite this record of performance, alternative materials such as composite fiberglass are often promoted as better because they are "new" and "innovative." However, some of the superiority claims of these materials don't always stand up to scruitiny. Below are common myths and truths about many of these claims.

As utilities seek to maintain and harden existing electrical distribution systems while also expanding capacity to meet growing demands, their materials choices have far-reaching impacts.

MYTH:

Composite and steel poles are "engineered" and therefore must be stronger than wood poles.

TRUTH:

Claiming one material is "stronger" than another oversimplifies how a pole's strength, its ability to carry defined loads and withstand defined forces without failing, is determined. All pole materials have inherent structural capabilities based on their natural or manufactured configurations.

The real trouble may come when the structures in a system become overloaded for any reason.

By design, the materials used to fabricate composite fiberglass and steel poles are relatively uniform in structural capabilities. As such, poles produced with these materials can be fabricated to meet precise design standards, allowing manufacturers to keep costs down by not "over-engineering" the poles.

Wood poles come from trees. Because no two trees are exactly alike, no two wood poles are exactly alike. Because of wood's inherent wide range of variabilty (often referred to as "coefficient of variation")[1] wood's design values are conservative and additional safety factors are built into engineering standards to ensure systems designed with wood poles will perform as expected.

Because of wood's wide coefficient of variation and conservative design criteria, there's an excellent chance any given wood pole in service is actually able to withstand much higher loads than those for which it was designed[2]. Alternative materials, by comparison, have a high chance of failure when loads exceed their structural rating.

MYTH:

Composite poles have a much longer service life than wood poles.

TRUTH:

Many factors impact a pole's service life, regardless of material. More than a century of service life data shows wood poles can remain in place for many decades. Regular inspections and maintenance can significantly extend that life span. A study by Quanta Technology calculated the average expected service life of wood utility poles with an inspection and maintenance program to be 96 years[3].

A survey of utilities conducted by Oregon State University compared actual pole replacement data with the utilities' estimates for wood pole service life[4]. Among the 83 utilities that responded, the average annual removal rate was just 0.56 percent, indicating a much longer in-service life than the 30-40 years those utilities had estimated.

Looking further into the survey results, the researchers found the utilities' estimates were based not on actual service life but instead on economic return on investment predictions they used for financial modeling.

Composite poles have been in service for about 25-30 years. There is no empirical data regarding their service life because none have been in service long enough. Assertions they will last 100 years or longer are based on extrapolated test data gathered in controlled lab conditions. Often this data derives from the ASTM G151 standard for accelerated weathering, of which ASTM itself cautions, "…calculation of an acceleration factor relating X hours of a laboratory accelerated test to Y months or years of exterior exposure is not recommended."

MYTH:

Composite poles are more fire resistant than wood poles.

TRUTH:

Data from comparative tests clearly show composites are no less susceptible to failure due to fire than wood[6]. In fact, tests show the exact opposite to be true.

Fire testing of full-size, load-carrying poles is difficult. However, insights into each material's performance in fire conditions can be gained by testing structurally loaded crossarms. The Western Fire Center in Kelso, Wash., conducted fire tests involving wood and composite crossarms loaded with 300 lbs. at each end. The crossarms were exposed to radiant heat for five minutes, then radiant heat plus flames for an additonal five minutes. If still intact, they were left to smolder for an additional 20 minutes.

In these tests, the wood crossarms burned but remained structurally sound, carrying the loads for the entire 30-minute test. By comparison, the composite crossarms collapsed in less than seven minutes.

During testing conducted at the Western Fire Center in Kelso, WA, this composite fiberglass crossarm ignited after just 2½ minutes of exposure to radiant heat with no flames. Less than 30 seconds later it collapsed. A second composite crossarm crumpled less than 7 minutes into the test. A wood crossarm also ignited, but continued to support its load for the entire 30-minute test duration.

Composite pole makers promoting their poles as "self-extinguishing" when exposed to fire often cite UL Standard 94 to support such claims[7]. However, UL 94 was developed to assess the "safety and flammability of plastic materials for parts used in appliances." This standard is not applicable for assessing the performance of structural composite poles and crossarms in wildfires.

MYTH:

Composite poles make overhead systems more resilient.

TRUTH:

Hurricanes, tornadoes, wildfires and other disasters wreak havoc on power distribution systems regardless of the materials used to build those systems. Engineers can design systems meeting the most extreme conditions and still those systems are likely to sustain damage when subjected to severe conditions.

System *resilience* is about *how quickly service can be restored* when disaster-related outages occur. As every utility knows, when it comes to restoring power, time is of the essence.

The wood pole industry has a long history of responding swiftly to disasters, helping utilities restore service as quickly as possible. There are more than 50 wood pole treating plants located throughout North America, dwarfing the number of composite and steel pole manufacturing facilities.

While wood pole production is not simple, the process is less complicated and much faster than fiberglass, steel or concrete pole production. This allows wood pole producers to provide replacement poles much more quickly than alternative materials.

In September 2024, hurricanes Helene and Milton hit Florida and moved inland through southeastern U.S. bringing down overhead lines. Wood pole producers responded by delivering utility poles to critically affected areas before, during and immediately after the storm, often supplying poles more quickly than they could be installed.

Because of this dependable supply of poles, utilities throughout the region often restored power within a few days despite the dangerous conditions caused by windblown debris.

These steel poles collapsed when an tornado with 161 mph winds hit southeast Texas in late December 2024. The still-standing wood poles in the background survived due to wood's wide coefficient of variance allowing them to withstand forces beyond their assigned design capacity.

MYTH:

Composite poles are better for the environment.

TRUTH:

In terms of environmental sustainability, wood far exceeds all other pole materials. Wood poles come from a natural, renewable resource – trees. The 514 million of acres of U.S. managed forestland known as "working forests" supply about 90 percent of the timber used to make wood products, including utility poles. Annual growth in these forests exceeds harvests by some 43 percent and less than 2 percent of the overall acreage is harvested in any given year[8]. More than a billion trees are planted each year[9] to replace those harvested. There is no cause for concern regarding a potential wood pole shortage due to insufficient trees for harvest.

Life Cycle Assessment comparisons show wood pole production consumes far less water and energy and causes significantly lower carbon emissions than pole production using other materials. A unique benefit of wood poles is they store carbon that was sequestered from the atmosphere while the trees used to make the poles were growing. Because wood utility poles are preservative-treated, the carbon in the poles are stored for many decades -- plenty of time to grow the trees needed for replacement poles.

The benefit of carbon storage often is overlooked when considering environmental impacts of different materials. The estimated 130 million wood poles and crossarms currently in service store enough carbon to offset the average carbon dioxide emissions caused by generating the amount of electricity required to serve the annual needs of more than 15 million U.S. households[10]. No other material can claim this carbon storage benefit.

The wisest choices are informed choices

Decisions utilities make regarding pole materials have long-lasting impacts, for better or worse. Many factors are involved, some more important than others. Wise choices result from becoming well informed and considering the documented benefits of each option objectively.

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