WOOD POLE
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Western Wood Preservers Institute

FACTORS WHICH AFFECT THE SERVICE LIFE OF YOUR POLES

Poles in your service area are exposed to a variety of common environmental conditions that will affect their service lives. Understanding specific environmental and soil conditions as well as selected hostile environments, and how they can affect your poles, is essential in deciding how to design lines for maximum service life and performance.

Wood poles are often selected for use in severe environments where alternative materials may not be appropriate.

CLIMATIC CONDITIONS

There are a variety of ways that climatic conditions can be categorized. Temperature and moisture are the two key atmospheric variables that affect pole durability, hence the following four climatic conditions are addressed:

Dry-Cold
Dry-Hot
Humid-Cold
Humid-Hot

The deterioration of poles under these climatic conditions is controlled by the combinations of the various degradation mechanisms (mechanical, biological, chemical and thermal degradation).

Under dry-cold climatic conditions, most pole types perform well. Chemical, thermal and biological degradation progress slowly. One possible significant factor to consider is blowing snow, sand and dirt particles which may erode a pole's surface; this action can erode preservative coatings on steel and fiberglass poles.

Degradation of poles under dry-hot climatic conditions is similar to dry-cold conditions,

with a few exceptions. One of these exceptions is the increased rate of oxidation of steel, commonly referred to as "dry corrosion."

In humid-cold conditions, moisture is available to carry degrading chemicals to a pole which enhances chemical degradation. A special degradation issue with concrete poles is the freezing and thawing of water in the concrete. The alternating freezing and thawing eventually crack the concrete weakening its structural integrity and exposing its steel rebar. Freezing and thawing also occurs in wood poles but because of the good thermal insulation of wood, the effect of this condition causes minimal degradation.

RELATIVE RISK OF DECAY IN POLES

1 = LOW
2 = MODERATE
3 = INTERMEDIATE
4 = HIGH
5 = SEVERE

The humid-hot climate causes the fastest degradation of poles, but with different degrees of severity depending on the pole material. Pitting of coatings and associated corrosion of steel poles is accelerated in this environment. In this environment, biological degradation is the major cause of wood pole deterioration. This usually includes decay and insect attack. Currently, wood poles are protected from biological attack through broad-spectrum biocides such as creosote, pentachlorophenol, waterborne arsenicals and copper naphthenate. The goal of the preservative systems is to effectively penetrate the sapwood of poles with preservative chemicals. Preservative systems focus on protection from biological degradation and not mechanical, thermal or chemical degradation. Remember, as stated earlier, wood is not typically susceptible to deterioration from chemicals naturally occurring in the environment.

SOIL CONDITIONS

While there are exceptions, soil conditions are generally related to climatic conditions. For example, a humid climate generally produces acidic soil and a dry climate produces alkaline soil. However, because of the potential presence of various chemicals in soils, it is difficult to accurately relate soil type to pole degradation.

Soil conditions can be quite different under a given climatic condition. For example, hilltops are usually drier and the water-table is generally lower than that in valleys. Riverbed areas and areas near irrigation ditches create special localized conditions which may promote certain mechanisms of degradation. These factors all need to be accounted for in considering the degradation resistance of various poles.

Degradation of the below-ground portions of poles will usually occur more slowly in well-drained soils poles than in wet clay-type soils. Acidic soil and / or the presence of sulfites in soils degrade concrete poles at a higher-than-normal rate. Steel poles degrade faster in saline environments. For wood poles, the potential interaction of preservative with chemicals naturally occurring in soils is another factor which needs to be considered on an individual preservative basis when evaluating durability and service life.

AGGRESSIVE CLIMATIC CONDITIONS

Environments that may be considered aggressive from the perspective of degradation include areas with high levels of industrial pollution, areas close to saltwater, damp sites, etc.

One of the most often-encountered aggressive environments is in the vicinity of oceans. Wind-driven saltwater mist can be carried inland several miles and deposited on the surface of poles and into the soil. Steel and concrete poles are highly susceptible to accelerated degradation in saltwater environments while poles offer much more resistance.

Acid rain created by industrial pollution affects poles directly and through alteration of soil chemistry. As mentioned in an earlier section, wood is the only pole material which offers high resistance to acidic conditions. However, fastener corrosion in wood poles can affect the overall performance of wood pole line structures. An acidic condition represents one of the few conditions where fiberglass will degrade at a significant rate.

Environments in which wind-blown erosion of soil is a factor and can compromise preservative coatings on thin-walled steel poles.

It is critical that the effects of the environment on transmission and distribution poles be considered when determining which pole material be used in the line. Consider the study sponsored by Ontario Hydro in the late 1980's and early 1990's. Their in-depth and extensive in-house study of pollution and aggressive climatic conditions on conductors, hardware and wires indicated that the environment has significant mechanical effects on these components and the result of their research led to estimates of life span and development of contour maps of its service to determine which poles, hardware and wires were used in various regions of the territory.

Weathering of steel poles can compromise the protective coating causing pitting or flaking of the steel material.

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