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Estimated Service Life of Wood Poles

Prepared by:

Jeffrey J. Morrell
Department of Wood Science & Engineering
Oregon State University

About NAWPC

The North American Wood Pole Council (NAWPC) is a federation of three organizations representing the wood preserving industry in the U.S. and Canada. These organizations provide a variety of services to support the use of preservative-treated wood poles to carry power and communications to consumers.

The three organizations are:

Western Wood Preservers Institute
With headquarters in Vancouver, Wash., WWPI is a non-profit trade association founded in 1947. WWPI serves the interests of the preserved wood industry in the 16 western states, Alberta, British Columbia and Mexico so that renewable resources exposed to the elements can maintain favorable use in aquatic, building, commercial and utility applications. WWPI works with federal, state and local agencies, as well as designers, contractors, utilities and other users over the entire preserved wood life cycle, ensuring that these products are used in a safe, responsible and environmentally friendly manner.

Southern Pressure Treaters' Association
SPTA was chartered in New Orleans in 1954 and its members supply vital wood components for America's infrastructure. These include pressure treated wood poles and wood crossarms, and pressure treated timber piles, which continue to be the mainstay of foundation systems for manufacturing plants, airports, commercial buildings, processing facilities, homes, piers, wharfs, bulkheads or simple boat docks. The membership of SPTA is composed of producers of industrial treated wood products, suppliers of AWPA-approved industrial preservatives and preservative components, distributors, engineers, manufacturers, academia, inspection agencies and producers of untreated wood products.

Wood Preservation Canada
WPC is the industry association that represents the treated wood industry in Canada. WPC operates under Federal Charter and serves as a forum for those concerned with all phases of the pressure treated wood industry, including research, production, handling, use and the environment. WPC is dedicated to promoting and supporting a stronger Canadian wood treating industry; informing the public on the benefits to be gained from the use of quality wood products; and preserving the integrity of the environment through the promotion of responsible stewardship of our resources.

Estimated Service Life of Wood Utility Poles

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Jeffrey J. Morrell
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Introduction

Utilities are often faced with questions about how long a pole lasts once it is placed in the ground. Why does it matter? There are a number of important reasons for paying attention to service life.

First, utilities want to maximize their capital dollars and longer service life reduces the need for pole replacements. More recently, utilities have begun to examine their carbon footprint. Trees fix or sequester carbon from the atmosphere as they grow and this carbon remains locked in the wood once the pole is manufactured.

While thousands of tons of carbon are stored in the utility wood pole plant, a relatively small portion of a utility's total carbon footprint is represented by the electric transmission and distribution system.

Efforts to reduce this footprint can have important public relations value. Wood poles offer an opportunity for atmospheric carbon sequestration not provided by other materials.

Assumptions About Service Life

An Electric Power Research Institute study suggested that wood poles lasted 50 years. Most utilities assume that their poles provide 30 to 40 years of service life. Which is really true or are they both wrong? How would you find out? How do you compare these numbers with claims by producers of competing materials that their poles will last 80 or more years?

There are a variety of competing claims about how long poles last. In some cases, such as for wood, lattice steel and pedestal-mounted thick-walled steel poles, the claims are based upon actual performance data.

However, there is little or no long term data for many more recently developed materials, or new use patterns such as direct-burial of steel poles. Instead, the producers of these products depend upon accelerated testing or extrapolations from the performance of similar materials to support claims.

The assumptions about the service life of a treated wood utility pole represent a wide range in terms of years. In 2000, an Oregon State University survey of utilities across the U.S. revealed that a majority of respondents believe that their poles last between 31 and 40 years.

An updated survey of utilities was conducted by OSU in 2013 and it determined the replacement rate indicates pole service lives "are far in excess of the 30 to 40 years estimated by many utilities."

There is compelling evidence indicating that the estimated 30-year pole service life originated from curves developed to estimate economic service rather than actual service life. The goal was to determine when the investment had been returned, rather than when the pole had actually failed.

Service Life Factors

Actual pole service life is a function of many factors including the specification, the quality of treatment, the conditions to which the pole is exposed, and how well the pole is maintained during use. In a single utility, one can look at pole records to estimate service life.

Many utilities record the date of pole installation along with supplier, wood species and treatment details. They may also record inspection dates along with any supplemental treatments applied and, finally, they record when the pole is changed out.

Final information may not be directly tracked because new pole information automatically populates the data base replacing original data. But if it is, the utility can directly calculate service life.

As you might expect, pole quality can have a major effect on service life. All poles should be specified to the standards of the American Wood Protection Association (AWPA). These consensus standards

provide minimum levels of treatment for all native pole species currently listed within the American National Standards Institute (ANSI) Standard O5.1.

Although there will be differences in characteristics of poles treated with various preservatives, new formulations are assessed by the technical committees that set AWPA standards with the assumption that they should all provide similar resistance to deterioration.

This leaves the user with a suite of preservatives that may produce poles that are different colors, vary in fire resistance, or differ in climbing characteristics. However, these preservatives should provide similar service with regard to resistance to fungal or insect attack.

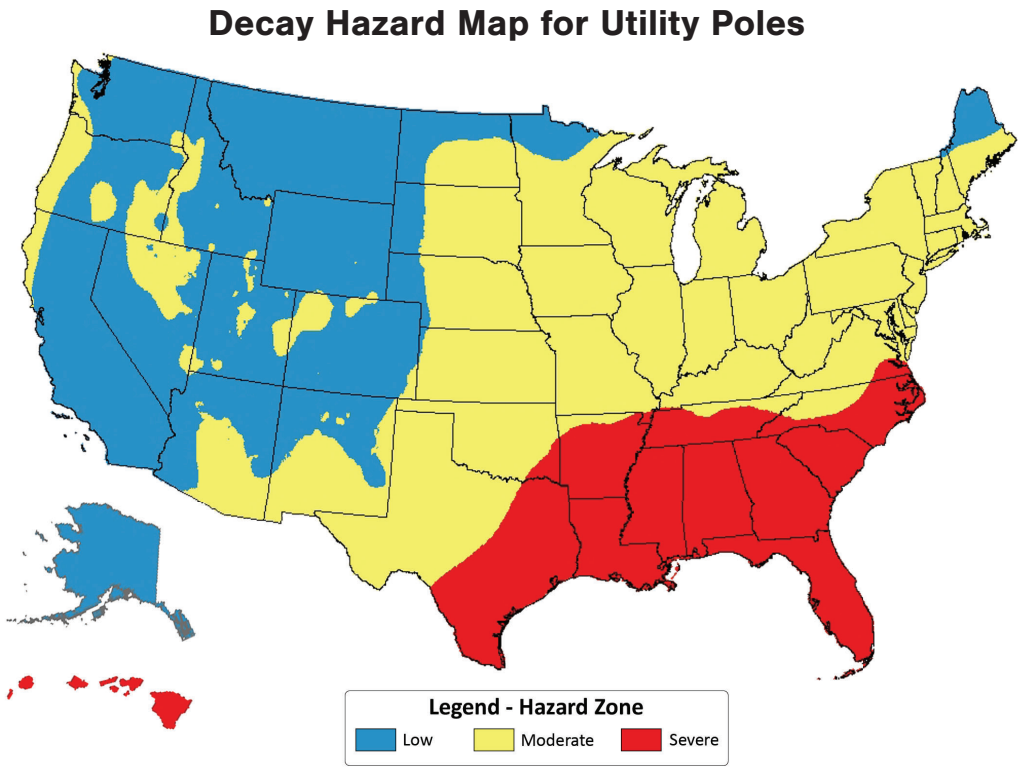

Figure 1 - This map indicates the major region differences in potential for deterioration of wood poles used in contact with the ground. In certain modified environments such as banks along irrigation canals or irrigated residential or agricultural lands, a higher degree of protection might be needed than would be required in the local natural environment. It must also be recognized that within individual regions, certain natural environments such as river valleys or coastlines may present greater potential for wood pole deterioration than the region as a whole. *(Map courtesy of American Wood Protection Assn.)*

Utility enhancements to specifications can also enhance performance. For example, most users of Douglas Fir utility poles through-bore, radial drill, deep-incise or kerf to improve treatment at the groundline and these practices markedly reduce internal decay and extend pole service life.

Environmental Factors

The environment to which a pole is exposed has a major effect on service life. For the U.S., the AWPA standards divide the country into three decay hazard zones, ranging from Low to Moderate to Severe risk of deterioration (see Figure 1). These zones are based on historical pole inspection data from throughout the country.

Clearly, a pole treated to similar levels will perform differently in different zones. However, the AWPA standards address this issue by providing several retentions that can be specified for a given preservative. The assumption is that poles exposed to a higher deterioration hazard will be treated to higher preservative loadings.

Remediation and Service Life

Maintenance is also a major factor in pole service life. A 2012 Quanta Technology study on wood pole service life calculated the average expected lifetime of a wood utility pole with an inspection and treatment program at 96 years.

Osmose Utilities Services reviewed data on 751,000 utility poles inspected across the U.S. between 1988 and 1999. It determined a national predicted service life for poles without remedial treatment at 45 years, with ranges from 40 years in the most demanding conditions and 56.8 years in the low to moderate decay zones.

However, application of a pole inspection and remediation program was determined to significantly add to the service life. Assuming no pole will last longer than 71 years, remediation can increase the service life of a pole by 33 percent, or 16 years. With no cap on the potential length of service, remedial treatment can extend the service life by 60 percent, or some 28 years on average.

The National Electrical Safety Code mandates that utilities maintain their wood poles so that they retain 2/3 of their original required design strength. In order to meet this requirement, utilities must establish some regular program of inspection and maintenance. Most utilities inspect their poles on a 10-year cycle, using intrusive procedures that include boring into the pole at or below groundline and, for some species, excavating around the pole and examining the surface for external decay.

Estimating Service Life

So, how can we estimate pole service life across the United States? Utilities can examine pole purchasing records to infer replacement rates, but this depends on how much new line construction is occurring within the system.

This data must be viewed carefully because it includes poles removed for all causes, not just those no longer capable of supporting their original design load. Poles may be removed for upgrades, road widening, car/pole interactions, storm damage, or a number of other reasons.

The 2013 OSU survey collected pole purchasing data, with 86 utilities reporting they purchased on average 5,845 poles a year. When compared to the total pole population, the estimated pole replacement rate would be 1.12 percent a year, compared to 0.7 percent indicated in the 2000 survey. However, this rate must be viewed with some caution since the purchases include poles for new line construction.

Pole Removal Data

Pole removals provide a much better measure of pole service life. Data collected in the 2013 OSU survey indicated a replacement rate of 0.56 percent, which suggests an average service life far beyond the 30 to 40 years previously assumed.

A 2006 survey of utilities in the Pacific Northwest found similar results and further segregated the causes for replacement (see Figure 2). In this case, the survey revealed a slightly higher replacement rate (0.8 percent vs. 0.6 percent in the larger survey).

More than half of the poles removed from service (56 percent) were decayed; however, poles removed for road widening or upgrades represented 38.1 percent of poles removed from service.

While some of these poles might have had reduced capacity, they had not deteriorated to the point where their condition necessitated replacement. This means that over a third of the poles removed from service were candidates for reuse and, if these poles could be reused, they would further reduce the replacement rate.

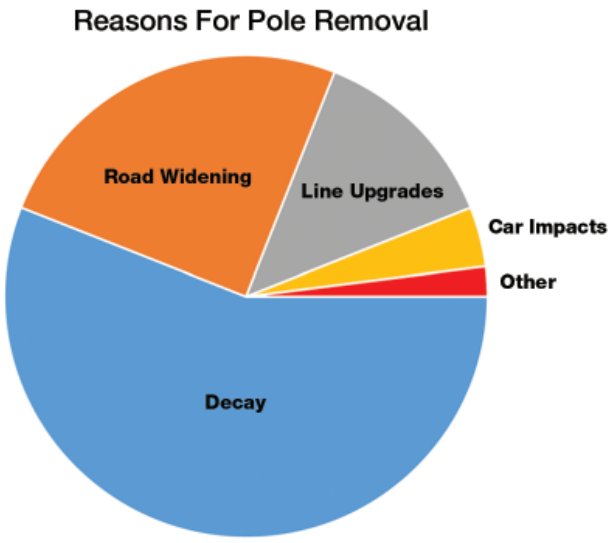

Figure 2 - While decay was the chief reason for removing a wood pole, the number of poles removed for road widening and line upgrades comprised nearly 38 percent of removals according to a survey of utilities. These poles could be candidates for reuse, which should be factored in when determining the overall service life. (Source: 2007 OSU Utility Pole Research Cooperative Annual Report)

Based on the 0.6 percent replacement rate, the average pole service life would easily reach 80 years in many areas of the country, far in excess of the perceived 30 to 40 years. Thus, old wood does not mean weaker wood.

While service life will vary among utilities, if we look in most utility systems, we see enormous quantities of lines installed in the 1950s where the vast majority of the poles remain in service. In 2014, the Los Angeles Department of Water and Power reported that more than half of 320,000 poles in service were 50 years or older, with some exceeding 90 years or longer.

Improving Quality

It is also important to remember that like most materials used by utilities, wood pole quality has improved. Throughout the last century as the U.S. expanded the electrical grid, the AWPA specifications have shifted from gauge to results-type treatments, which means that actual preservative content in the wood is assayed.

In addition, most utilities do regular inspections, ensuring all poles installed in a system are properly treated. Finally, development of effective maintenance programs further extends the life of poles. All of these actions have resulted in wood poles that perform more reliably for longer than ever before.

Epilogue

Wood poles already have substantial advantages over other materials because wood is renewable, sustainable, generates less greenhouse gases during manufacture and provides a long-term repository for atmospheric carbon.

Internationally recognized life cycle assessments confirm the production and use of wood poles has lower environmental impacts and less energy and resource use compared to galvanized steel, concrete and fiber-reinforced composites.

Prolonging the useful life of a wood pole further enhances the carbon footprint through requiring less replacement activities, keeping thousands of tons of carbon stored in the existing pole plant (i.e. utility distribution and transmission system) and allowing growing replacements to continue carbon sequestration in the forest.

Thus, wood poles offer utilities some attractive options as companies move to do their part with regard to global climate change.

The next time you are asked how long a pole will last, remember that the answer is as long as you want it and far longer than you ever thought.

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