NORTH AMERICAN WOOD POLE COUNCIL

TECHNICAL BULLETIN

Estimated Service Life of Wood Poles

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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. 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.

A recent 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.

Discussion

A 1999 Oregon State University survey of utilities across the U.S. revealed that a majority of respondents believe that their poles last between 20 and 40 years. 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.

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. The final information may not be directly tracked because the new pole information automatically populates the data base replacing the original data but if it is, the utility can directly calculate service life. Utilities can also examine pole purchasing records to infer replacement rates, but this also 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.

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 Standard O5.1. Although there will be differences in characteristics of poles treated with various chemicals, new chemicals 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 chemicals that may produce poles that are different colors, vary in fire resistance, or differ in climbing characteristics, but they should provide similar service with regard to resistance to fungal or insect attack. 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.

The environment to which a pole is exposed can have a major effect on service life. On a national scale, the AWPA Standards divide the country into 5 different decay zones (see Figure 1), with Zone 1 having the lowest risk of decay and Zone 5 the highest. Clearly, a pole treated to similar levels will perform better in a given Zone, but the AWPA Standards address this issue by providing several retentions that can be specified for a given chemical. The assumption is that poles exposed to a higher decay hazard will be treated to higher chemical loadings.

Maintenance can also be a major factor in pole service life. 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

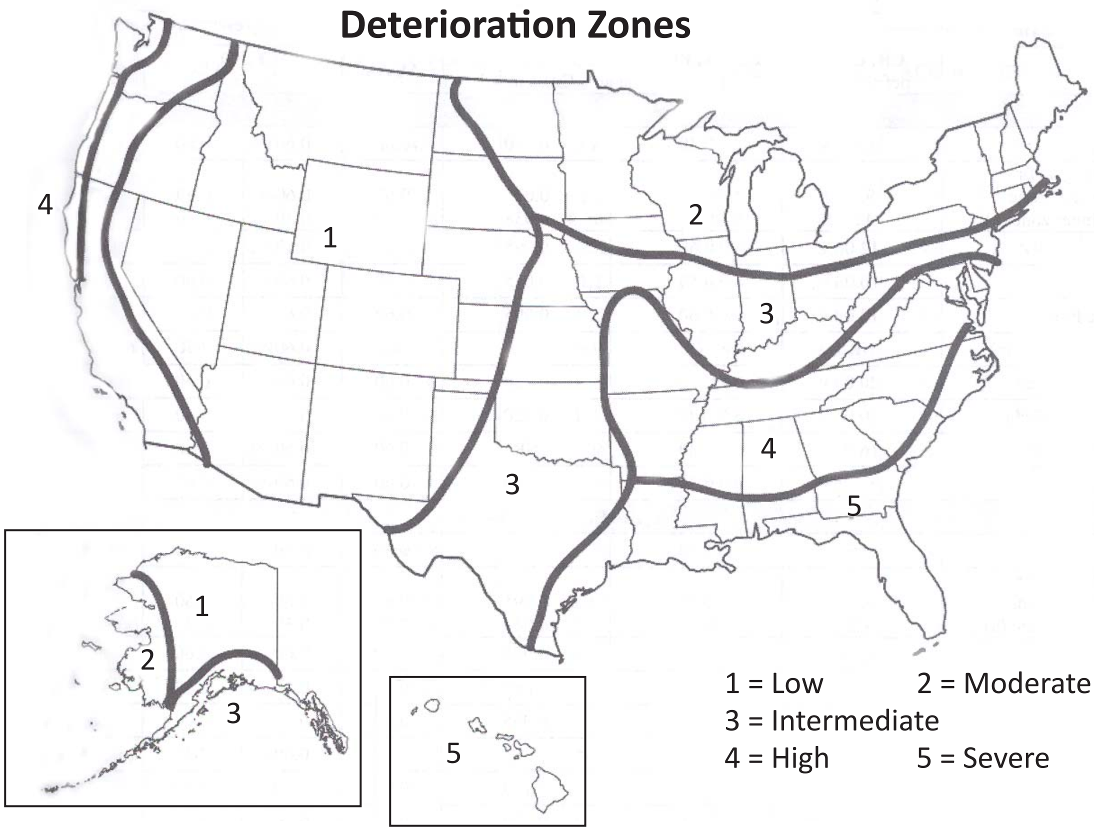

Figure 1. Map showing the decay hazard zones for the United States where 1 is a low hazard and 5 is a severe decay hazard (Courtesy American Wood Protection Association). In certain modified environments such as banks along irrigation canals or irrigated residential or agricultural lands, a higher degree 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 deterioration than the region as a whole.

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. There is compelling evidence to show that these procedures, coupled with application of remedial treatments and the use of reinforcements, markedly extend pole service life.

So, how can we estimate pole service life across the United States? Pole purchases vs total poles in service can be used to estimate overall replacement rates. In a survey of 261 utilities across the United States that owned over 42 million poles, utilities reporting purchasing approximately 252,000 poles of various species per year. This figure represented all purchases including those for upgrades, accident poles and poles failing due to deterioration. This represents a 0.6 % annual replacement rate. A similar 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 % vs 0.6 % in the larger survey). Over half of the poles removed from service (56 %) were decayed; however, poles removed for road widening or upgrades represented 38.1 % 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 to 0.5 % per year.

If we use this 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 1950's where the vast majority of the poles remain in service. It is also important to remember that like most materials used by utilities, wood pole quality has improved. Over the intervening 50 years since the U.S. expanded the electrical grid, the AWPA specifications have shifted from gauge to results type treatments which means that actual chemical content in the wood is assayed. In addition, most utilities now inspect every pole, ensuring that all poles installed in a system are properly treated. Finally, the development of effective maintenance programs further extends the life of the pole. All of these actions have resulted in wood poles that will perform more reliably for longer than ever before.

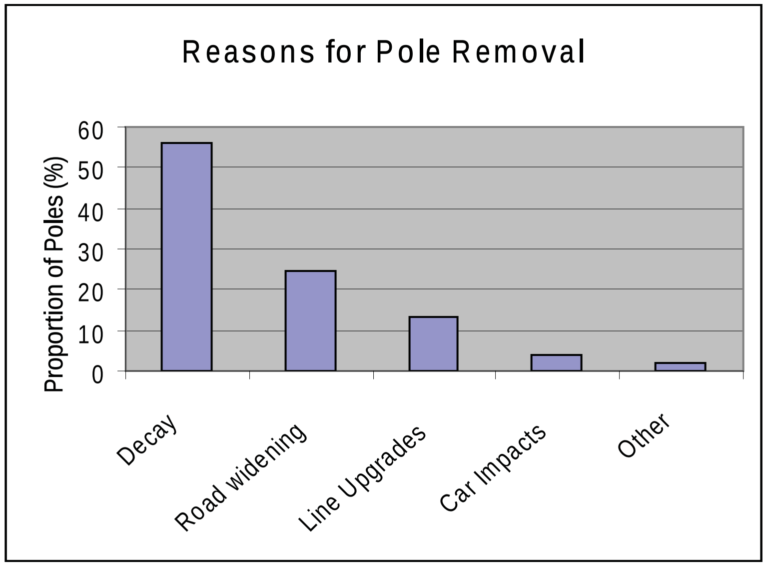

Figure 2. Causes for rejection of poles removed from service in the Pacific Northwest (based upon 52,375 poles)

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. 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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