NORTH AMERICAN WOOD POLE COUNCIL

No. 21-D-205

TECHNICAL BULLETIN

Sustainable Wood Pole Design For Overhead Systems

Prepared by:

H.M. Rollins, P.E.
H.M. Rollins Company, Inc.

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. Website: ***wwpinstitute.org***

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. Website: ***spta.org***

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. Website: ***woodpreservation.ca***

Sustainable Wood Pole Design For Overhead Systems

Prepared by
H.M. Rollins, P.E.
H.M. Rollins Company, Inc.

Introduction

In recent years, there has been an increased focus by the general public as well as utility regulators on the performance of overhead power and communication systems in extreme weather events. Although field reporting indicates that most pole issues are associated with secondary damage such as falling trees and windblown debris, many utilities are endeavoring to "harden" their systems.

Some utilities are accomplishing this by increasing the design load on the overhead system and improving right-of-way clearances by requiring more frequent tree trimming near poles. In some cases, utilities have opted to replace wood poles with non-wood poles based on the incorrect belief the alternatives are in some way superior to wood.

In fact, the average wood pole has a much larger inherent overload capacity than a comparable non-wood pole and typically provides better performance in extreme weather events.[1]

Most utilities recognize this and are hardening their systems using wood poles. Unfortunately, the natural growth of trees and sustainable forestry are rarely considered by utilities in terms of impacts on system hardening with wood poles.

Utility designers and forest managers should work together to understand their respective needs in ensuring sustainability and enhancing system resiliency. Forest health and community safety require a maintainable, long-term solution to system hardening and future maintenance, including emergency response in future extreme weather events.

Hardening options using wood poles are best described in two different engineering scenarios: 1) using stronger class poles at current spans, or 2) using similar class poles placed closer together. These two methods are discussed in this paper.

Sustainability and System Hardening

When most utilities undertake structural hardening of their overhead system, the focus often is specifying a pole with higher strength. While simply employing a stronger pole seems like an easy solution, it is debatable as to the positive benefit.

Data provided to the Florida Public Service Commission after the 2005 hurricane season indicated other system components, such as conductors, insulators or crossarms, failed at a rate much higher than the failure rate of poles.

This paper is not intended to debate the wisdom or effectiveness of the hardening efforts undertaken by utilities. Instead, it is presented to discuss the design methods currently used and to explain how forest sustainability should be considered in the overhead system hardening decision process.

This paper will explain why the most common practice of specifying wood poles two to four classes stronger than the previous design may not be the best process from a forest sustainability and future storm response perspective.

Bigger Not Always Better

The method used by most utilities is to apply a higher design load to the existing system and determine what pole class is needed to carry this load in accordance with the safety requirements of the National Electrical Safety Code (NESC). This process often employs the same conductor sizing, location and span length as the prior design, which is typically designed to NESC Grade C requirements.

ANSI size dimensions used to determine the class of a pole are based on minimum circumferences 6 feet from the butt and at the top of pole. This is essentially a measurement of the taper of the pole. Thus, when the pole class is increased, the circumference at the base and at the top increases as well.

Typically, when increasing the design wind load, utilities will maintain the same span length and pole height but increase the pole class by three or four classes larger. So, a distribution design based on a 40-ft. Class 4 (40/4) pole may need to change to a 40-ft. Class 1 or even H-1, if the design is changed to meet the extreme wind requirements in coastal areas.

Considering the natural taper of a standing tree, such an increase in classes requires bigger and taller trees to be significantly shortened. As shown in Figure 2, this can result in removing 15 to 25 feet of excess wood.

It is worth noting this is true for several different sizes and classes. A 45-ft. Class 2 pole is approximately the same diameter as a 55-ft. Class 3, a 65-ft. Class 4 or even a 40-ft. Class 1 pole. All these sizes use the same age and size of tree in the forest, thus their availability is limited to fulfill all of these sizes without wasting valuable wood.

Natural Growth Considerations

This approach to hardening is problematic for forest sustainability because it ignores the natural growth properties of trees used for utility poles

Today, more than 80 percent of distribution poles installed in the U.S. are Southern Yellow Pine (SYP). Douglas Fir (DF) and Western Red Cedar (WRC) make up the remainder of other poles in use. The growth rate of DF and WRC is typically slower than that of SYP, so the issue discussed here would be even more pronounced for those species.

For more than a century, wood poles have served as the backbone of the North American electrical distribution system. They remain the top choice of utilities for a variety of reasons, from extensive availability and documented durability to renewability and ease in climbing and maintenance.

Perhaps most importantly, utility companies have designed overhead lines to make effective use of the natural growth characteristics of the forest resource. Utilities have designed distribution lines that effectively use poles of Class 4, 5 and 6 because these classes are the dominant sizes found in natural forests which can yield poles in desired lengths.

Pole Size Availability

In the last 10 years, utilities have moved to a slightly larger pole due to the increased use of third-party attachments and the general increase in power demand that requires larger conductors. Today the production of Class 3 poles has increased while the production of Class 5 and 6 poles has declined.

Based on 2019 pole production data from the Southern Pressure Treaters' Association (SPTA), the 40-ft. Class 4 pole is still the most popular size, followed by 40-ft. Class 3 and 45-ft. Class 3. Production of these three classes and lengths constitute approximately 36 percent of the utility poles produced in the region.

The forest resource has been able to support this relatively small increase in pole sizes. However, should the average class size of poles increase by two to four classes, with higher demand for Class 2, 1 and H-1 poles becoming comparable to today's Class 3 and 4 poles, the forest resource supply chain will be stressed (*see Table 1*).

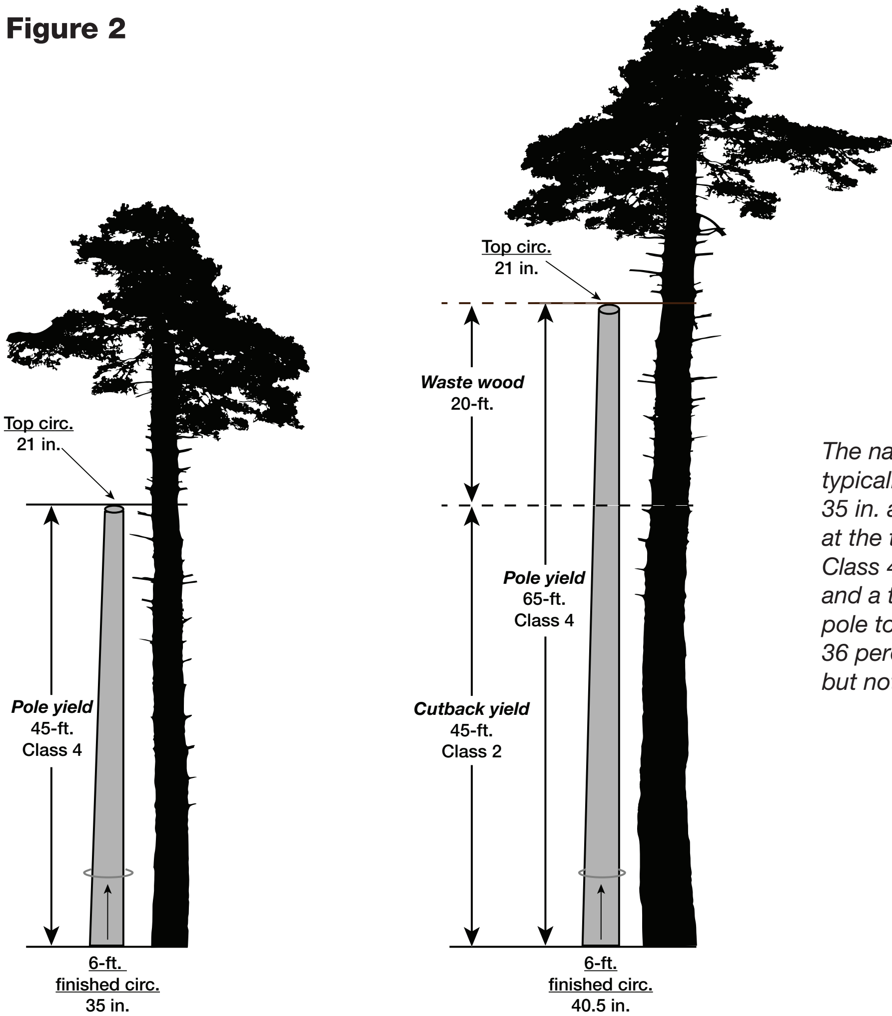
Also, this will result in ineffective use of the natural resource by not utilizing the full length. It would shift procurement and forestry practices in an effort to obtain these materials in ways that will most

Table 1

Current Design				*2 Classes Higher*			*3 Classes Higher*			*15 ft. longer*		
Length	*Class*	*Base Circ.*	*Prod. Pct.*	*Class*	*Base Circ.*	*Prod. Pct.*	*Class*	*Base Circ.*	*Prod. Pct.*	*Class*	*Base Circ.*	*Prod. Pct.*
40 ft.	4	33.5 in.	15.4%	2	38.5 in.	3.9%	1	41 in.	0.4%	4	38 in.	0.09%
40 ft.	3	36 in.	10.4%	1	41 in.	0.37%	H-1	43.5 in.	0.01%	3	40.5 in.	0.6%
45 ft.	3	37.5 in.	10.2%	1	43 in.	1.5%	H-1	43.5 in.	0.05%	3	42 in.	0.24%
40 ft.	5	31 in.	9.1%	3	35 in.	10.4%	2	38.5 in.	3.9%	5	N/A	0.0%
35 ft.	5	29 in.	9%	3	34 in.	1.6%	2	38.5 in.	0.22%	5	34 in.	0.0%
45 ft.	2	40.5 in	5.6%	H-1	45.5 in.	0.05%	H-2	48.5 in.	0.01%	2	45 in.	0.38%
45.ft.	4	35 in.	5.1%	2	40.5 in.	5.6%	1	43 in.	1.5%	4	39 in.	0.05%

Production data from Southern Pressure Treaters' Association
Pole sizes from ASC O5.1

Figure 2



The natural Sothern Yellow Pine tree on the left would typically be a 45-ft. Class 4, with a circumference of 35 in. at 6 ft. from the base and 21 in. circumference at the top. The larger tree on the right can yield a 65-ft. Class 4 pole, with a base circumference of 40.5 in. and a top circumference of 21 in. Trimming the 65-ft. pole to 45 feet to become a Class 2 pole results in a 36 percent waste of wood that would be purchased but not used.

likely increase costs and significantly extend the time required to source larger sized poles.

Impact on Cost, Availability

While there are more trees planted than harvested each year, forestry practices such as average age at harvest are driven by the paper and lumber industries. Even though wood poles are the highest value tree in the forest, only 5 percent to 10 percent of trees in a typical forest have the qualities to become a wood utility pole.

Growing trees for larger poles takes time. To induce landowners to keep their trees growing to a larger size requires they must receive a higher price for the tree when harvested, commenserate with the time-value of the money invested.

The approximate age of distribution poles grown in managed forests today is 35 years. Assuming a 5 percent annual rate of return, by extending the harvest time to 50 years the land owner would need to receive more than twice the dollars per acre. That increased cost must be reflected in the cost of treated utility poles.

Additionally, there are increased costs when a higher class pole is used at the same height, as the upper portion of the tree is discarded.

For example, consider a SYP 40-ft. Class H-1 pole, which has a circumference of 43.5 in. at 6-ft. from the butt, per the ANSI O5.1 dimension tables.[2] The natural growth of the tree is such that it does not reach this circumference before it has grown to a height much greater than 40 feet.

The ANSI tables show this same circumference for a 55-ft. Class 2 or a 65-ft. Class 3 pole. So, to produce the 40-ft. Class H-1 pole, a tree that would have produced a 65-ft. pole is trimmed to remove the top 25 feet.

That tree was purchased at a premium price because it had the quality requirements needed to meet the ANSI O5.1 pole specifications, and the base timber price was higher to account for the longer growing time required for the tree to reach this size.

The volume of a 40-ft. Class H-1 is 38.6 cubic feet, while that of a 65-foot Class 3 is 53.4 cubic feet. The discarded wood has the effect of raising the wood cost for the 40-foot class H-1 by 38.3 percent, just from the discarded wood alone. In addition, there are increased costs on a dollar per ton basis to compensate the landowner for the increased growing time.

Impacts on Storm Recovery

Based on production data and current harvest schedules, there are not enough larger trees available to sustainably produce the quantity of 40-ft. poles made today if the poles had to be two to four classes larger. Even if such a shift in size was possible, it would create other challenges for utilities.

During the active 2005 U.S. hurricane season, the SYP utility pole industry manufactured and supplied almost 100,000 distribution poles to utilities in 30 days to restore power to millions of customers. The majority of these poles were Class 3, 4 and 5 poles in lengths of 40 and 45 feet.

Had utilities increased sizes to Class H-1, 1 and 2 poles in their systems, pole manufacturers would not have been able to supply replacements due to limited availability (*see Table 1*).

With the growing intensity of storms today, the ability of wood pole makers to produce large quantities in a short time frame should be a significant consideration in utility line design from a forest sustainability perspective.

Shorter Span Design Examples

Hardening overhead systems by retaining present line span lengths and substantially increasing pole size is not the most sustainable method. This is evident when looking at a typical line configuration example (*see Figure 3*).

For this example, consider a simple three-phase tangent line using Merlin conductors (0.684 in. dia., 0.365 lb/ft.), a Quail neutral (2-0, 0.447 in. dia.), and two telecommunication conductors of 1-in. and 2-in. diameter, respectively. The line is constructed on 40-ft. wood poles using wood crossarms.

The height of the conductors is 33 feet, the neutral is 29 feet, the 1-inch telecom cable is 25.5 feet and the 2-inch telecom cable at 24.5 feet.

The design considers the moment caused by the offset conductor but does not consider what is known as p-delta, or the moment caused by deflection of the pole under load. The span is set at 250 feet.

The tables in Figure 3 show the results of this analysis after application of the load and strength factors required by the NESC. It includes designs for district loads, continental extreme winds of 90 mph and a coastal extreme wind of 120 mph.

This example shows with a 250-ft. span, a Class 3 or smaller pole is acceptable under all NESC Grade C Rule 250B situations. A pole as small as Class 6 could be used in the medium loading district, Grade C not-at-crossings.

However, should a utility elect to harden the system by transitioning from a NESC Grade C not-at-crossings design to a NESC Grade B design, the required pole strength goes up several pole classes. If the utility was in a coastal area and elected to design to NESC Rule 250C criteria and a wind speed of only 120 mph, the pole class required would be Class H-1 for Grade B and Class 1 for Grade C.

As previously noted, changing to a design that employs dominantly Class 2, 1 or H-1 wood poles in distribution lengths is not a desirable design from a forestry and availability perspective. The solution to this problem should be clear: shorten the span length on the design until a Class 3, 4 or 5 pole can carry the required load.

The 150-ft. span table in Figure 3 shows the results using the same overhead equipment but with a span length reduced by 100 feet. In this instance, only a design to 120 mph in a NESC Grade B location would require a Class 2 pole.

It's important to note that Grade B is only required in very limited circumstances, so the actual usage would be small.

The Grade C extreme wind design would only require a Class 3 pole, as noted in the table. As this shows, a utility in the medium loading district would not need to reduce its span length from the original 250-ft. span, as the poles required at that span would be readily available.

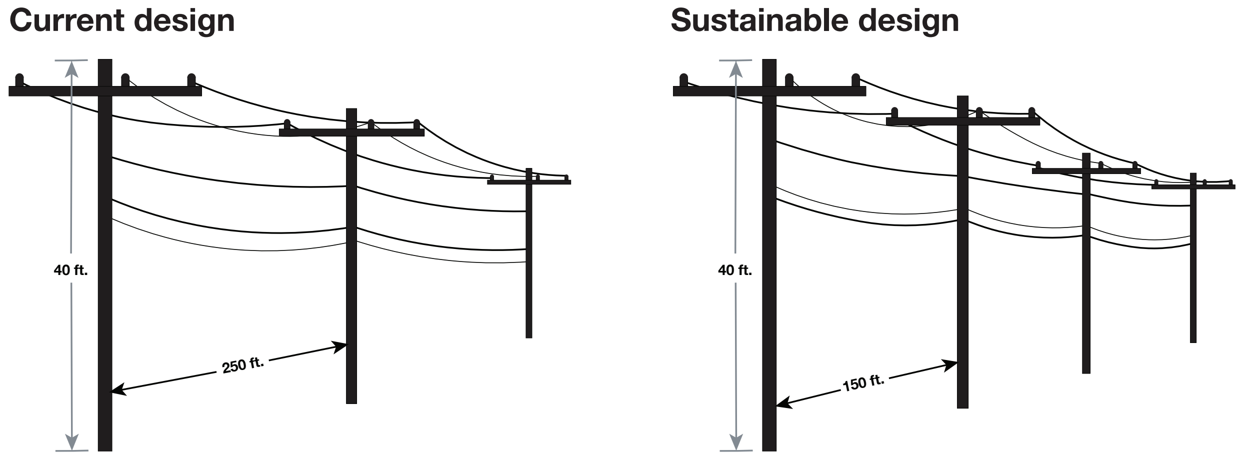
These examples demonstrate how a utility should approach pole design to harden the overhead system. For each utility, the circumstances will be different, but the concept of reducing span length to provide wood pole strength requirements from a readily available supply of poles is applicable to all and is the only environmentally sustainable approach.

Considerations for Hardening

Several factors should enter into the decision on system hardening. Certainly cost is a factor and a utility may resist shortening span lengths because of the perceived higher cost. These costs include more poles per mile, additional equipment such as crossarms and insulators, and more installation labor.

While initial cost should be considered, sustainable use of the pole resource also should be factored into any system resiliency decision. The

Figure 3



3-phase tangent line

Merlin conductor (0.684 in.)	Height: 33 ft.	Telco conductor (1 in.)	Height: 25.5 ft.
Quail neutral (0.447 in.)	Height: 29 ft.	Telco conductor (2 in.)	Height: 24.5 ft.

40 ft. Wood Pole Design - Current — 250 ft. span

	Rule 250 B Light		*Rule 250 B Medium*		*Rule 250 B Heavy*		*Rule 250 C Extreme Wind*		*Rule 250 C Extreme Wind*	
GL Moment	*9 psf*	*Pole Class*	*4 psf & 0.25 in. ice*	*Pole Class*	*4 psf & 0.5 in. ice*	*Pole Class*	*90 mph*	*Pole Class*	*120 mph*	*Pole Class*
Grade B	129,988	**1**	86,648	**3**	115,005	**2**	83,088	**3**	151,928	**H-1**
Grade C at Crossings	86,013	**3**	57,096	**5**	77,292	**3**	72,309	**4**	130,939	**1**
Grade C Elsewhere	67,862	**4**	45,243	**6**	61,371	**4**	72,309	**4**	130,393	**1**

40 ft. Wood Pole Design - Sustainable — 150 ft. span

	Rule 250 B Light		*Rule 250 B Medium*		*Rule 250 B Heavy*		*Rule 250 C Extreme Wind*		*Rule 250 C Extreme Wind*	
GL Moment	*9 psf*	*Pole Class*	*4 psf & 0.25 in. ice*	*Pole Class*	*4 psf & 0.5 in. ice*	*Pole Class*	*90 mph*	*Pole Class*	*120 mph*	*Pole Class*
Grade B	82,820	**3**	54,153	*	70,950	**4**	54,620	**5**	101,365	**2**
Grade C at Crossings	54,240	**5**	39,534	*	47,207	**6**	46,824	**6**	86,941	**3**
Grade C Elsewhere	42,567	**6**	29,123	*	37,651	**6**	46,824	**6**	86,941	**3**

Medium loading district not shown, as poles required at 250 ft. span are readily available

available supply of larger class poles in the forests must be considered from both long- and short-term sustainability perspectives.

As shown in Figure 3, the design with 250-ft. spans requires a Class 1 wood pole to meet the 120 mph extreme wind load requirements of NESC Grade C Rule 250C.

By changing the design span to 150 feet, the Grade C design would require a Class 3 pole. Changing from a 250-foot span to a 150-foot span would require going from 21 poles per mile to 35 poles per mile.

Offsetting the cost of more poles per mile is the higher cost associated with the procurement of the Class 1 poles. There is also the potential to use less expensive conductors due to the shorter spans.

The cubic volume of a 40-ft. Class 3 SYP pole (40/3) is 24.5 cubic feet and a 40-ft. Class 1 (40/1) is 32.6 cubic feet. The ratio of these volumes is 1.33. If the cost of each pole was the same on a dollar per cubic foot basis, the 40/1 would cost 33 percent more than the 40/3.

However, as noted earlier, the net wood cost of the 40/1 will be substantially higher on a finished cubic foot basis because of the excess associated with the unused top. The price of the log used to make a 40/1 pole will be higher due to the longer rotation time required to produce a larger diameter pole.

Pole Cost Comparisons

The natural growth of the tree with a circumference of 41 in. at 6 ft. from the butt will be a Class 3 pole of 55 to 60 feet in length. The cost increase in this case for the discarded wood is 31.5 percent. If a conservative estimate of only a 40 percent increase in wood cost due to the longer growth period required is used, the total net increase in wood cost is approximately 84 percent.

The finished cost of treated utility poles can be broken out as 1/3 the cost of the wood, 1/3 preservative cost and 1/3 manufacturing cost. Using this rule of thumb, an 84 percent increase in wood cost would result in an increase in unit cost on a cubic foot of treated wood basis of approximately 28 percent.

A typical treated wood distribution pole such as a 40/3 costs approximately $11 per cubic foot (cf), or a total of $270. If the cost for the 40/1 is $14.08/cf, the cost per pole is $459. Thus, the ratio of the costs for the 40/1 vs. the 40/3 is 1.63.

Using these figures, the cost of poles on a dollars per mile basis is $9,639 for the 40/1 poles compared to $9,450 for the 40/3 poles. The result is that the pole cost is essentially the same for both hardening scenarios.

Additional Cost Considerations

There are additional costs associated with reducing span length, including per pole costs for crossarms, insulators, ground wires and other pole hardware. These costs may represent approximately $170 per pole, or approximately $2,380/mile in additional costs.

However, shortening the span can lead to other potential cost savings. At reduced span lengths, it may be possible to switch to all-aluminum conductor (AAC) from the aluminum conductor steel reinforced (ACSR) conductor typically used.

For the conductors specified in the design example, the cost savings in using AAC conductors instead of ACSR conductors could be in the range of $4,000/mile. Applying this savings to the additional hardware cost yields an excess of some $1,600 that could be applied to offset a portion of the additional installation labor.

Another engineering benefit in using more poles per mile is load sharing. Though NESC does not allow for accounting of load sharing, it does occur for wood poles, due in part to the natural deflection of the wood.

Considering all of these factors, the total cost to harden a line by reducing span length to use more readily available pole classes may be somewhat more expensive today than using Class 1 poles. But because the market price today reflects the small number of Class 1 poles produced, these prices do not indicate the future cost if they were needed in larger quantities.

Should demand for these larger poles rise, the prices for the Class H-1, 1 and 2 poles will escalate to where the cost for their use will be far above that of using a larger number of Class 3, 4 or 5 poles.

System Resilience

It is impossible to avoid damage to all poles and other line equipment during extreme storm events. However, there are some things that can be done to reduce the number of failures and insure timely restoration of service for the utility:

- Design with wood and be cautious of alternative materials claiming “wood equivalency”[3]
- Utilize the unique overload capacity of wood poles.[1]
- Harden by using standard class sizes installed closer together.
- Effectively use all of the serviceable forest resource as it grows.
- Shorten lead times for replacement with a standard pole inventory readily available.
- Simplify work orders by having easy to handle replacement poles installed closer together that can also remain as the hardened line.

Even though hardening systems by employing shorter spans and the use of readily available pole classes may be modestly more expensive, it is the more sustainable method from a timber resource perspective. Additionally, it is the only method that results in a line design that includes the resilience needed for recovery in extreme weather events.

When major storms occur, the ability to obtain thousands of poles in a very short time is critical to a utility’s ability to restore power in a timely manner. Following Hurricane Katrina in 2005, the wood pole industry supplied 20,000 poles in a period of three days and almost 100,000 poles in 30 days.

If the poles needed were Class H-1, 1 and 2, the response time would have been extended by at least an order of magnitude or more.

Some may suggest that non-wood poles are a viable option because they can be made to a Class 1 equivalent groundline moment capacity as easily as that of a Class 4 groundline moment capacity. While that is true, the cost for the non-wood pole would be much higher than a wood pole.

In addition, the unit production time for a non-wood pole is much longer than that for wood poles. Given the complexity of manufacturing non-wood poles, it would be impossible to produce the many thousands of poles that may be needed immediately in an emergency response situation.

When it comes to sustainability, wood is the only pole material that comes from a renewable resource. Steel, concrete, fiberglass and plastic are not renewable resources and therefore not able to be sustainable.

Innovation may seem to favor alternative materials. But wood benefits from a long history of performance and reliability, with continuing innovations in processing and protection.

All materials have an impact on the environment and Life Cycle Assessments (LCAs) show that wood poles have a lower environmental impact overall.[4] Carbon calculators show the benefits of carbon sequestered in wood poles that is not available in alternative materials.[5]

While undergrounding also is a method often advocated for hardening, it is fraught with issues in capital cost and extended repair time that makes it a less desirable option.[6]

Summary

Sustainable line design must incorporate an understanding of the forest resource available for wood poles. Preserved wood poles are truly a renewable resource and serve as a carbon store. A tree for a new pole can easily be grown to the required sizes during the typical service life of a treated wood pole.

However, natural growth properties cannot be altered. Forest management and economics ultimately determine when the trees are harvested.

Given that only a small fraction of trees can meet the quality requirements for a wood pole, the treated pole industry cannot dictate the harvest cycle for a managed forest. Current forest practices will continue to produce distribution poles that are predominantly pole Classes 3, 4 and 5.

Should the utility industry shift to requiring increased pole classes of Class H-1, 1 and 2, the forest resource will be unable to provide the numbers of poles needed. The resilience of the system would be impacted by the inability to obtain large numbers of higher class poles in a very short time after an extreme weather event.

Increasing pole sizes is not sustainable and the utility industry must consider this in their efforts to design more resilient overhead systems.

Designing overhead lines using sizes that are readily available by shortening spans between poles will ensure a sustainable supply of utility poles for generations to come.

References

1. Technical Bulletin - The Unique Overload Capacity of Wood Utility Poles. Rollins, H. M. P.E., H. M. Rollins Company, Inc., June 4, 2019. Published by North American Wood Pole Council – ***https://woodpoles.org***

2. Accredited Standards Committee O5, ANSI O5.1 - 2017, Wood Poles: Specifications and Dimensions, American Wood Protection Association, Birmingham, AL, 2017 – ***https://asco5.org***

3. Technical Bulletin - “Wood Equivalent” Utility Poles and the NESC. Rollins, H. M. P.E., H. M. Rollins Company, Inc., May 5, 2017. Published by North American Wood Pole Council – ***https://woodpoles.org***

4. Life Cycle Assessment of Pentachlorophenol-Treated Utility Poles with Comparison to Steel and Concrete Utility Poles. Bolin, C. and Smith, S. 2011. Renewable and Sustainable Energy Reviews, 15, 2475-2486. Summary at – ***https://woodpoles.org***

5. Technical Bulletin - Calculating Carbon in Wood Utility Poles and Crossarms. Smith, S. P.E., Stephen Smith Consulting, July 7, 2020. Published by North American Wood Pole Council – ***https://woodpoles.org***

6. Technical Bulletin - Undergrounding: Hidden Lines, Hidden Costs. NAWPC, April, 4 2017. Published by North American Wood Pole Council – ***https://woodpoles.org***

Disclaimer - *The North American Wood Pole Council and its member organizations believes the information contained in this document to be based on up-to-date scientific and economic information and is intended for general informational purposes. In furnishing this information, NAWPC makes no warranty or representation, either expressed or implied, as to the reliability or accuracy of such information; nor does the Institute assume any liability resulting from use of or reliance upon the information by any party. This document should not be construed as a specific endorsement or warranty, direct or implied, of treated wood products or preservatives, in terms of performance, environmental impact or safety. The information contained herein should not be construed as a recommendation to violate any federal, provincial, state or municipal law, rule or regulation, and any party using or producing pressure treated wood products should review all such laws, rules or regulations prior to using or producing preservative treated wood products.*

North American Wood Pole Council

NAWPC 21-D-205
02-2021