

East Marginal Way Storm Report – FAQs

Oct. 4, 2019

EVENT

On Friday, April 5 around 3:50 p.m., during a storm event with high winds and rain, 26 utility poles came down along East Marginal Way South in Tukwila. The 26 poles that fell were a mixture of individually owned and jointly owned poles with both Seattle City Light and communication entities' equipment attached.

INVESTIGATION

To ensure full accountability and impartiality, Seattle City Light requested the City Attorney's Office coordinate an investigation into the cause with third-party consultants:

- **Nelson G. Bingel, III**, mechanical/structural engineer; expert in wood pole strength and loading, and electric overhead lines; chairman of the National Electrical Safety Code (NESC); past chair of NESC strength and loading subcommittee.
- **David J. Marne**, electrical engineer; expert in transmission and distribution line engineering, and joint use (power and communication) engineering; nationally recognized NESC expert; member NESC overhead lines-clearances subcommittee; authored McGraw-Hill's NESC Handbook.
- **Jerrold E. Winandy, Ph.D.**, wood science and engineering; expert on the properties and durability of wood; adjunct professor, Department of Bioproducts and Biosystems Engineering, University of Minnesota.
- **Nicholas Bond, Ph.D.**, University of Washington principal research meteorologist and climatologist for the state of Washington.

The inspection process included reviewing previous inspection records, construction standards and other relevant records, inspecting the damaged poles and equipment, which were collected and transported to a secure Seattle City Light facility, as well as obtaining and reviewing any available video from the vicinity.

After receiving a draft report of the experts' findings that indicated deficiency in our pole rating system (described in more detail below), City Light asked the experts to provide their recommendations for improving our process. That additional work continues and will be finalized in part two of the final report later this fall.

Seattle City Light received the first part of the final report, the findings, on Sept. 30, 2019.

POLE INSPECTIONS

1. What is City Light's pole inspection process?

Seattle City Light maintains approximately 91,000 wooden poles in its service territory. City Light's "Inspection Procedures for Wood Pole Assessment" were developed in conjunction with a third-party vendor and are carried out by another third-party vendor. The inspection process

includes a visual, sound and bore partial excavation inspection as demonstrated in this [2017 Seattle Channel video](#) and described in this [2014 blog post](#).

In 2008, City Council requested that City Light implement an asset management program. To establish a baseline, over 2009-2010 all wooden utility poles were inspected visually and using a basic hammer sounding technique. This technique involves hitting a pole with a hammer; a healthy pole should produce a solid-wood sound while a pole with internal decay will produce a hollow sound. From 2011 on, we began inspecting approximately 10% of our wooden utility poles per year using more thorough boring inspection and subsurface excavation methods.

Seattle City Light has been on a steady-state program cycle to reinspect and test 10% of our poles per year. Depending on testing results, poles will be treated or replaced as appropriate. With this strategy we will visit all poles once every 10 years.

Pole longevity can vary widely based on the wood species, treatment and the environment where it is placed. A typical modern pole should last 40-60 years. City Light does have some poles much older than that; older poles were often made from old growth timber and subject to preservation methods that extended the useful life much more than modern treatments.

2. How does City Light prioritize poles for replacement?

As part of the development of the asset management program in 2008, City Light hired a consultant to develop a classification system for rating poles. This classification system was updated in 2011 (table below). Each pole inspected is assigned a priority rating from 1 to 5; poles identified as P1 or P2 are flagged for replacement, although P2 poles do not require immediate replacement.

Priority Rating	Maintenance Required	Description
P1	Replace	RSM* is 25% or less – Pole requires Replacement – Immediate Action Required – Notify CITY LIGHT if pole poses an Imminent public safety hazard.
P2	Replace	RSM is 75% or less than and greater than 25% – Pole requires Replacement – Maintenance Required within Practical Timeframe – not a candidate for truss reinforcement.
P3	Reinforce	RSM is 75% or less and greater than 40% – Maintenance Action Required within Scheduled Timeframe. Candidate for truss reinforcement.
P4	None	RSM is greater than 75% – Pole is Serviceable based on an above ground level sound and bore inspection only (non-excavatable). No Remedial Maintenance Required – Inspect next cycle.
P5	None	RSM is greater than 75% – Pole is Serviceable – No Remedial Maintenance Required – Inspect next cycle.

*Residual Section Modulus (RSM) calculates the remaining bending strength of a wood pole at ground line.

3. How often does City Light replace poles?

As part of our asset management program, we are continuously replacing poles, prioritizing first those identified as P1 and then those designated P2. From 2010 through 2018 City Light replaced approximately 11,300 poles. Coming into 2019, our goal was to replace 800 poles this year; we have replaced 559 poles as part of the asset management program so far. Additionally, we have replaced 904 poles as part of normal business, which includes service requests, street work, construction, unexpected damage (e.g., car/pole incidents), etc.

NELSON RESEARCH REPORT PART ONE: FINDINGS

4. Were the poles properly engineered for the loads they carried?

Yes. The report concluded the design for each pole exceeded the design requirements established by the National Electrical Safety Code (NESC).

5. What was the condition of the poles that came down?

These poles were inspected in 2016 by a third-party vendor. At that time, we treated several poles and identified several for replacement over the coming years. None were identified as P1 (in need of immediate replacement) or posing an imminent public safety hazard.

The report identified the two poles that failed first and estimated they had a remaining strength of 57% and 33%. They had been rated as P2 in the 2016 inspection. Several other poles that fell were also below the NESC requirements for remaining strength, however, several had no decay.

Additionally, six consecutive poles, including the two that fell first, were supplied by one manufacturer, which went out of business shortly after purchase. The report concluded it is likely these poles were not originally treated appropriately because of the severe advanced decay and at least three of the poles had damage from the presence of Golden Buprestid beetles, which usually only survive in a tree converted to a utility pole if the pole was not properly sterilized during manufacturing.

6. Was weather a significant factor?

The report concluded the design of the poles exceeded NESC design safety loading requirements and the capacity required to support the estimated wind speed of up to 50 mph during this storm. However, given the condition of the poles, the wind was likely a factor in the timing of the pole failure. Of note, the two poles that failed first were also exposed in open ground as opposed to neighboring poles that had some level of sheltering or disruption of the wind from buildings and vegetation. The wind speed exposure for these poles was likely greater than for most of the other poles.

7. Why did the poles come down?

The report concluded that the main issue for this line was a group of sequential poles that had significantly reduced strength due to internal groundline decay (the groundline area of wood utility poles is most subject to deterioration because moisture conditions near and below groundline are most favorable to growth of wood-destroying organisms). The poles were classified as P2s during the 2016 inspection, but that designation covers a remaining strength

ranging from 75% down to greater than 25%. Six consecutive poles near the middle of the failed poles all were in the lower range for P2s, including the two poles that failed first, which had an estimated remaining strength of 57% and 33%. The failure of these two poles created significant additional dynamic loading for poles to the north and south, causing sequential failures of 24 other poles, including poles with no decay.

Next Steps

8. What adjustments to the inspection process/priority assignment is City Light considering due to the findings of the report?

Part one of the final report concluded the range of strength in the P2 rating – 75% or less than and greater than 25% – is too broad. Specifically, that the maintenance required (“within a practical timeframe”) is adequate for those at the higher range, 60%-75%, but those in the lower range, such as 30% or 40%, should be replaced sooner.

City Light acknowledges our existing rating system limited our ability to effectively prioritize replacements, especially among P2 poles. In our commitment to the safety of our community and our workers, City Light will be adjusting that range of strength rating system and the required maintenance timeframe. The specific adjustments will be finalized once we receive the final recommendations in part two of the final report from the third-party experts.

We have acquired additional inspection information from our third-party vendor, and once the new tightened range of strength rating system is finalized, we will use that information to reprioritize all poles rated P3 or lower.

9. How many poles are rated P3 or lower?

Of about 91,000 wooden poles in our service territory, our existing records show approximately 6,000 poles rated P3 or lower. We are actively replacing poles as part of our annual asset management and inspection program since pole longevity can vary widely based on the installation age, wood species, treatment procedures used, and specific environmental conditions where it is placed. As expected, our most recent data analysis shows that the poles rated P3 or lower are evenly distributed throughout our service territory, and there are not any significant concentrations of lower-rated poles in any one geographic area.

10. What is the immediate plan for replacing these poles?

As noted above, we are continuously replacing poles as part of our asset management program, so some of this work has already been scheduled. This work will continue as we also prepare for accelerating the timeline for replacing all P1 and P2 poles based on the report findings and the forthcoming recommendations. We will be prioritizing based on:

- Remaining pole strength.
- Location, e.g., major arterials or criticality of the power corridor.
- Readiness of designs.

Another high priority will be to identify to the extent possible and replace the poles we bought and installed from the manufacturer noted in the answer to Question 5 above. We have identified 360 poles that were placed during that same timeframe, rated P3 or lower, that we will prioritize for replacement. We will also begin reinspecting poles placed during this same timeframe that may have been rated P4 or P5 at last inspection.

To accomplish this additional work, we are initiating an emergency contracting process and will engage third-party contractors for both engineering services and construction. We are also talking with neighboring utilities and could utilize existing mutual aid agreements for pole replacement work.

This immediate plan will extend through the end of the year and likely into early 2020.

We are assigning a program manager dedicated to finalizing this near-term plan, as well as the longer-term plan described below, and guiding implementation of all related work. We have selected Steve Byers, a senior capital projects coordinator. With Seattle City Light since 2002, he has extensive experience in engineering, construction management, contract administration, project accounting, and project management. Most recently, Steve has been responsible for developing and managing the planning, design, scheduling and construction of all phases of utility relocation projects in support of Sound Transit Link Light Rail projects, ensuring all specifications and standards are in compliance.

11. What is the longer-term plan for pole replacements?

As we anticipate the new rating system will result in a greater number of poles identified for earlier replacement, which will require a significant investment of money and workers' time, we are developing a longer-term plan. The goal of the plan will be to replace all P3 and lower poles as soon as is feasible, prioritizing those with the greatest safety considerations. Additionally, with the assistance of the third-party experts, we will be redefining not only the rating system but also a more aggressive replacement program to get to a place where any future deteriorating pole will be addressed in our regular annual inspection, treatment and replacement program.

The timeline for completing the work is to be determined and will be dependent upon many factors, including funding, permitting, contractor and worker availability, and pole inventory. While we are prioritizing this capital improvement program and reallocating resources to expedite the work, some variables are beyond our control.

We are also committed to continued completion of customer-initiated work during this same timeframe.

12. How much will this cost?

The average typical single pole replacement costs around \$13,000. Actual costs depend on complexity, labor and resource availability, required street improvements, etc. Addressing the approximately 6,000 poles identified as P3 or lower is likely to cost in the tens of millions; a more accurate estimate will be developed as the plan is finalized.

13. Will this impact rates?

No. As noted above, we will redirect funds and resources, including staff, from other capital improvement projects. While this will likely mean deferring other projects, we are prioritizing safety above all else. Our direct customer services will not be impacted.