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WAYS TO MITIGATE

UTILITY LINE  
CLEARANCE VIOLATIONS

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Recently, I participated in a kickoff meeting for a new line clearance project that stirred a vivid memory from my undergraduate years. One afternoon, while walking home from class, I saw an 18-wheeler that had just crashed into the underside of a bridge. The result was over a foot of metal scrap hanging from the top of the truck. The bridge was marked with a bright yellow sign communicating the clearance height as “11 ft. 11 in.” On average, 18-wheelers are approximately 13 feet 6 inches tall. Despite the clear signage, the warning did not prevent the accident from blocking the high-traffic road for the rest of the afternoon.

In the wake of the project’s kickoff meeting and strolling down memory lane, I found myself thinking about safety in general and how it pertains to the work I do in the utility industry. As a distribution engineer, I’ve encountered countless distribution utility poles, some of which present potential risks. I tried to remember an instance where a clearance sign was posted near the utility pole. No such sign came to mind, and I quickly realized the significance of my new project and its potential to improve public safety. It brought to light an aspect of electrical utility distribution that most individuals often overlook.

**This article highlights five distinct scenarios involving clearance violations by utility conductors that I encountered while working on this project, along with the corresponding mitigation strategies.**

## ROOF ABLAZE

As I was photographing this site, an employee of the building came out to talk to me. He shared a recent incident where the roof of the building had caught fire due to a live conductor blowing into it. No wonder this location was flagged for a clearance violation!

- ⚠️ **Clearance Violation:** Conductor is placed within 7ft. 6in. horizontally of the building.
- ✅ **Mitigation:** Increase conductor height to meet vertical clearance requirements to the top of the building.



The pole line pictured above runs along a fence that separates a narrow walkway and a parking lot. Unfortunately, I was unable to relocate this pole in the horizontal direction, as that would impede on the parking lot and violate the existing utility easement. However, to fix the clearance issue, I used an alternative strategy. Instead, I increased the height of this pole and its adjacent counterpart to meet

vertical clearance to the roof. Making this adjustment eliminated the risk of the conductor blowing horizontally into the building and causing another fire.

**NOTE!** Horizontal clearances should also account for wind. Depending on the span length and wind force, this may add an additional 6 to 24 inches of horizontal clearance to account for.

## UNDERGROUND SOLUTION

The original plan to rectify this vertical clearance issue involved increasing the heights of the pole pictured above and the adjacent one. This pole line runs through a parking lot that frequently experiences heavy truck traffic. To pass structural analysis of these taller poles and accommodate the new pole tension, the installation of a down guy was deemed necessary. However, using a down guy proposed a new challenge as it would not offer enough space for the parking lot's truck traffic.

- ⚠️ **Clearance Violation:** Existing conductor is within 13ft. 6in. vertically to the building.
- ✅ **Mitigation:** Remove the overhead conductor and neutral; and bury underground to avoid the building

I decided to install new primary riser poles on each side of the building to avoid the possibility of a truck hitting the down guy's anchor. The primary conductor and the neutral wire can be hidden underground by setting up a new cable around the building. This new cable will bring electricity to the transformer pole,



which will then supply power to the building from the opposite side. Using this technique allows the building to get its power supply without any visible wires above the roof.

It's important to note that vertical building clearances can vary by one foot or more depending on the voltage of the conductors and whether the roof is pedestrian accessible. If a designer is unsure whether a roof is pedestrian accessible, it is best practice to use the larger vertical clearance.

## LEANING POLE OF PISA

At first glance, this utility pole does not appear to be leaning much. However, a closer look tells a different story. If you draw an imaginary vertical line from the base of the pole, it will align with the far-right conductor on the cross arm, where the pole top of a perfectly straight pole would be located. Replacing the pole without any reframing will inevitably result in the same situation in the future.

- ⚠️ **Clearance Violation:** Existing conductor is within 7ft. 6in. horizontally to the building.
- ✅ **Mitigation:** Replace and reframe the pole. Install alley arm on adjacent pole.



Analyzing the uneven horizontal tension explains the pole's leaning posture. There is a set of secondary conductors and communication fiber running from the pole to the left, as seen in the photo. The transformer bank is installed with one central transformer can and another on the same left side towards which the pole is leaning.

**NOTE!** If a building has a balcony that extends further than the building wall, the horizontal clearance should be met from the balcony to the live conductor.

I repositioned the transformers to the center and right side of the pole to help balance the pole tension. The left conductor was relocated to the pole top to help increase the horizontal clearance. Lastly, the adjacent pole arm was replaced with an alley arm pointing away from the residence to meet the horizontal clearance. Due to these adjustments, there was no need for a guy on the right side of the featured pole. A comprehensive structural analysis was completed for the reframed poles and their adjacent counterparts to ensure no additional improvements were necessary.

## COMMUNICATIONS BREAKDOWN

Clearance violations do not always pertain to the electrical conductors on a utility pole. Communication fibers must be installed below the distribution neutral or secondary conductors as seen on the pole pictured below. In this situation, clearance between the secondary conductor powering the light and the top communication fiber is met. However, the bottom communication fiber must also meet the clearance requirement to the road below.

**⚠ Clearance Violation:** Existing communication fibers are within 15ft. 6in. to the ground.

**✓ Mitigation:** Contact the communication companies and have them move their facilities higher on the pole.

Communication companies are responsible for relocating their facilities and ensuring vertical clearance to the road is achieved. On this project, I was able to successfully liaise with these companies to address the vertical clearance issue. For this issue to be solved, there must be sufficient space for the upward relocation of the fibers. There is ample space here to reposition the fibers and maintain a 4ft. vertical clearance to the secondary/neutral and 15ft. 6in. clearance to the road. No additional utility work is required at this location due to these convenient circumstances. If vertical clearance could not be met to the secondary/neutral, then a taller pole(s) would be required.



Vertical clearance to the ground varies depending on where the pole is located. Poles located where cars are not accessible, like a backyard, have the smallest clearances to ground. Clearances are largest where conductors run across roads. The 15ft. 6in. clearance discussed above is due to the pole lines running parallel to the road.

## BOX FRAME



- ⚠️ **Clearance Violation:** Existing conductor is within 7ft. 6in. horizontally to the building (pictured on the left photo above).
- ✅ **Mitigation:** Reframe pole and adjacent poles and use the “box build” method (example shown on the right photo above).

As a safety precaution, the conductors on the right span of the pole, as depicted in the photograph, are covered prior to this line clearance design. The rear side of the apartment building is nearly in line with the pole. Unfortunately, an alley arm construction would not offer sufficient horizontal clearance for the left and middle conductors.

To mitigate the clearance issue, I employed a “box build” strategy. This method ensures that the conductors are safely distanced from the building, mitigating any potential risks. The adjacent poles were also reframed using the “box build” design to provide adequate clearance for both spans alongside the building. An example of the “box build” can be seen above. Notice how the conductors are attached vertically instead of horizontally to meet clearance to the building’s side.

Structural analysis should be completed on both the target poles and adjacent poles when using this build. The “box build” may require additional design work on the adjacent poles to account for the new tensions from the conductors.

## IN CONCLUSION...

I hope this article has illuminated the significance of understanding and adhering to clearances in engineering. In distribution utility work, various clearance codes must be followed diligently. Unbalanced tensions on a pole could take years to form a clearance violation as the pole slowly leans toward a building. However, it's crucial to recognize that regardless of the cause of the violation, there exist several strategies to mitigate the issue and establish a safe environment for everyone.

## ABOUT THE AUTHOR



**Leif Cameron** is a Distribution Engineer at Primera Engineers. His expertise is the result of nearly five years of experience working on utility projects throughout the Greater Chicagoland area. He has engineered and designed projects for various distribution systems and excels at QA/QC for the firm's distribution projects. He holds a Bachelor of Science degree in engineering physics from the University of Illinois Urbana-Champaign and is an advocate for mentorship on industry standards and best practices.