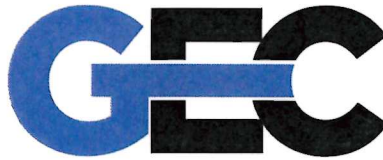


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November 13, 2024

ADCI
Attn: Michael Maas
30 Wisconsin Dells Parkway
Wisconsin Dells, WI 53940

Subject: Riverside Park Shelter Nekoosa, WI – Inspection Services
GEC # 2-0124-59B

Dear Client,

Introduction. General Engineering Company was contacted by ADCI to inspect an open-air park shelter located at Riverside Park in the City of Nekoosa, Wood County, WI. The purpose of this inspection is to evaluate the structure of the park shelter to determine why the shelter is leaning. Robbie Freitag of General Engineering Company completed a visual, non-destructive inspection of the property on November 7th, 2024.

Description of property. The property in question is a city park with multiple park shelters. The shelter in question is a pre-engineered open air park shelter supported by cast in place concrete piers with a cast in place concrete floor slab underneath the shelter.



Figure 1. Subject property.



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Section 1 - Inspection Findings.

A. Park shelter. The park shelter in question is roughly 60 ft. by 30 ft. pre-engineered steel open-air structure located at Riverside Park in Nekoosa that runs north and south. The reason for the inspection is due to column piers for the shelter that appear to be rising out of the ground and the shelter leaning to the south. During the inspection these observations were determined to be true. A spinning laser level and rod were used to shoot the relative elevations of each pier foundation of the park shelter. In doing so it was determined that the top of the piers get consistently higher from the southernmost pier to the northernmost pier on the side closest to the river (to the east), and higher from the southernmost pier to northernmost pier (but not as consistently from pier to pier) on the side away from the river (west side). On the east side of the shelter the northernmost pier is roughly 6 in. higher than the southernmost pier, while on the west side of the shelter the northernmost pier is roughly 3 in. higher than the southernmost pier.

During the inspection a 4 ft. level was also used to determine how far out of plumb each column of the shelter is. The results are consistent at each column, being roughly 2 in. out of plumb leaning toward the south. This is what would be expected with the north piers being higher than the southern piers.

To investigate the reason for the piers lifting, soil was dug out adjacent to two separate piers to determine the depth of the piers, size of the piers, and to get a better understanding of how they were constructed. The results of this excavation determined that the pier foundations are 32 in. deep from grade. It was also determined that the pier foundations were not poured as wide as the top cap that was poured over the top of the pier. What this means is that the columns were originally placed on a square pier that appears to be roughly 28 in. wide by 28 in. long prior to the floor slab being poured. There was then a roughly 6 in. thick by 32 in. by 32 in. concrete cap poured over each of the pier footings and around the base of the columns to the piers to be the same elevation as the floor slab. (See diagram in Appendix B).

The way these foundations were constructed has caused the issue of frost heave on the piers. Since the top cap was poured wider than the pier foundations, this allows the soil under the lip of the top cap to push up on the underside of this lip and heave the foundations as the soil beneath freezes and thaws. The reason that some have raised more than others is likely due to differences in ground water in each of the locations as there are three things needed for frost heave: Water present in the soil, freezing temperatures in the soil at that location, something restricting the soil and water from expanding (the pier top cap).

Although the shelter is now out of plumb and the foundations are no longer level, there is no structural or safety concern with leaving the shelter as is if these imperfections can be tolerated. The piers will likely continue to move with the freezing and thawing of the soil below these piers, but at this time this is not a concern to the structural integrity of the shelter itself as a pre-engineered steel building frame is relatively flexible with no exterior walls present.

If it is desired to address the issues being observed, there are no quick easy fixes. The only way to address the issue with the existing shelter would be to pick up and move the shelter, remove the existing foundations, pour in new foundations that are properly designed and constructed, and place the shelter back on the new foundations.

B. New pumpkin lifting beam system. This park hosts an annual pumpkin festival where large pumpkins are brought to this shelter, weighed, and stored. There was previously a beam system used to hoist the pumpkins onto the scale just to the north of the shelter. This beam was getting to be too low to lift the largest pumpkins the festival was getting, so they are looking at constructing a new beam system to fit the needs of the festival. It was explained that they are looking at installing the new beam system to the north of the shelter again. There are no issues with doing so, other than recommending that the new system and foundations are properly designed to prevent frost heave from occurring to this new system in the future as well.

Section 2 - Conclusion.

In conclusion, frost heave is causing the piers on the park shelter to raise and is what is causing the park shelter to be out of plumb. The reason for the amount of frost heave taking place is due to the way the foundations were constructed with the top cap being wider than the pier foundations and allowing the soil under the lip of the top cap to heave the foundations. Although visibly you can see the piers heaved and that the shelter is out of plumb, there is no structural concern or safety concern with the park shelter at this time. If these imperfections are tolerable, nothing needs to be addressed at this time. If it is desired to address the issues being observed, there are no quick easy fixes. The only way to address the issue with the existing shelter would be to pick up and move the shelter, remove the existing foundations, pour in new foundations that are properly designed and constructed, and place the shelter back on the new foundations.

Lastly, the annual pumpkin festival that is held at this park shelter is looking into constructing a new beam system to lift the large pumpkins onto the scale. There are no issues with installing this new system to the north of the shelter. It is recommended, however, that the new beam system and foundations are properly designed to prevent frost heave from occurring to this new system in the future as well.

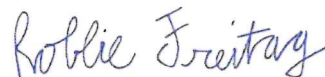
Thank you for allowing General Engineering Company to serve you by providing this Engineering report. We encourage you to review this information and if there are any questions or concerns, please contact us.

Sincerely,

GENERAL ENGINEERING COMPANY



Kent E. Fish, PE
Vice President



Robbie S. Freitag
Staff Engineer

Appendix A – Site Photographs



Figure 2. Typical raised pier foundations (Northernmost piers).



Figure 3. Southernmost pier.



Figure 4. Shelter visibly leaning to the south (left).



Figure 4. Columns roughly 2 in. out of plumb.



Figure 5. Difference in width of pier and top cap.

Appendix B – Foundation Diagram

