

March 10, 2025 - **DRAFT**

Randy Morrison
Director of Capital Engineering
City of Burleson
141 W Renfro Street
Burleson, Texas 76028

Re: Staircase Structural Evaluation at the BRiCk

Dear Mr. Morrison:

Freese and Nichols, Inc. (FNI) was asked by the City of Burleson (City) to provide a structural evaluation of the staircase in the pool area of the Burleson Recreation Center (BRiCk). On March 5, I performed a site visit to assess the structural integrity of the staircase.

Background:

The subject staircase is a circular spiral staircase wrapping around a central steel pipe column. The structural is all carbon steel with the exception of FRP treads. The treads are contained in removable steel gage metal pans and appeared to be removable, Figure 1. The staircase had significant rust staining and localized rust damage that appeared to be significantly more pervasive than other structure steel in the pool area. It is our understanding that the staircase had recently undergone an inspection by, or in support of, the City's insurance carrier and the staircase was identified as needing a structural evaluation by a qualified Professional Engineer.

Observations:

No drawings for the structure were available. Based on my observations, the following are general observations made:

- The most visually obvious rust staining originated at the top of the rises at the contact point with the tread pans, Figure 2. While highly visible, the corrosion was not a significant structural concern.
- In general, the bolts appeared to be very corroded and a close second in terms of visual impact, Figure 3 to Figure 6.
- Some localized heavy corrosion and scaling was observed on the face of a few risers, Figure 7.
- Most of the corrosion on the staircase appeared to be due to pool water cascading down the structure from the upper platform. Evidence for this conclusion area as follows:
 - Surface mineral deposits not observed on other structures.
 - The general lack of corrosion below the landings in areas protected from cascading water.
 - The general lack of similar corrosion for other steel structures in the vicinity which were exposed to the same atmosphere but no direct water exposure.
- The galvanized and non-galvanized pipe supports below the upper landing were heavily corroded, Figure 8.

Conclusions:

None of the observed corrosion appeared to present an immediate concern for structural integrity or safety. The structure is in need of maintenance and a new coating.

Recommendations:

My understanding is that the City is planning to either recoat or replace the staircase. We recommend that one of those be done.

Environmental Improvements:

It is our understanding that the humidity control equipment historically has had problems but the City is in the process of replacement. If possible, all of the circulated water at the upper landing should be made to enter a drain. If an additional drain is needed, installation of a new drain is expected to be less expensive than recoating the structure earlier in the future.

The following are some maintenance recommendations if the City is planning to recoat the structure. The prevalence of corrosion on the bolts is most likely due to the fact that the bolts are very difficult to clean and prepare for new coatings. Additionally, the sharp thread edges are not conducive to good coating coverage.

Bolt Replacement:

The following summarizes a bolt replacement plan that is based on initial evaluation using the exposed corrosion on the bolt and confirmation based on inspection of the bolt after removal.

- In general, bolts should be replaced before the face of the bolts begins to scale off. The scaling is usually a sign of advanced corrosion and, as a practical matter, removal of the bolt after scaling becomes much more difficult. Examples of such scaling is included in Figure 9 and Figure 10. When the bolts are removed for replacement, the shanks of the bolts should be inspected for section loss. If the bolts are experiencing significant section loss, a more stringent basis for bolt replacement should be used.
- Consider replacement with a more corrosion resistant material. Bolt head markings were not visible during my site visit but should be verified by removing the coating. If the bolts are not high-strength, consider replacement with Type 316 stainless steel. If high-strength bolts were used, the bolts should be replaced in kind but should be hot-dip galvanized.
- The bolts at the upper landing guardrail appeared to have significant exposure and significant corrosion inside the post, Figure 6. While the guardrails did not have signs of incipient bolt failure, we recommend bolt removal for inspection and replacement as appropriate.

Miscellaneous:

- When recoating, the treads should be removed to improve the surface preparation and coating between the treads and risers.
- Replace the heavily corroded galvanized pipe supports below the upper landing.

Design Improvements:

The City may want to consider some design improvements such as:

- Replace the bolts between the risers and the central column with welds. It appears that a 4-sided seal weld could be provided between the riser plates and the gusset plates welded to the central column. These welds will be easier to clean and coat than bolts. Additionally, the groin between the riser plates between the columns would be more accessible for future clean and coating operations.

- Insert a neoprene or plastic strip between the risers and tread pans to reduce coating damage due to foot traffic.

Thank you for allowing FNI to help in this matter. We hope this information is useful. Any changes to the original stair design should be as approved by the stair manufacturer or as designed by a qualified Professional Engineer. If there are any questions, please contact me at (817) 735-7416 or bbw@freese.com.

Sincerely,

Brad Watson, P.E.
Structural Engineer



Figure 1: Typical Treads and Landing



Figure 2: Typical Corrosion Stains at Back of Risers



Figure 3: Typical Corrosion of Bolts at Central Support Column



Figure 4: Typical Corrosion at Foundation Anchors



Figure 5: Typical Bolts at Spiral Guardrails



Figure 6: View of Upper Platform Guardrail Bolt – View Inside Post from Below



Figure 7: Heavy Corrosion with Scaling at Face of Riser



Figure 8: Typical Heavy Corrosion at Pipe Supports below Upper Platform



Figure 9: Heavy Corrosion of Bolt at Central Column



Figure 10: Heavy Corrosion at Foundation Anchors