Epoxy Rehabilitations and Protective Coatings of Lift Stations

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One of the best applications for 100% solids epoxy coatings is protecting or rehabilitating wastewater lift station wet wells. These environments can be very aggressive to concrete due to falling and splashing, agitation, and constantly changing levels of wastewater. As a result, they typically have high H^2S gas readings and low pH levels, which deteriorates the concrete walls, often in a short amount of time. A utility can save money by applying a high-quality, epoxy barrier to new wet wells. The protective coating should be installed by an experienced contractor who has been trained by the manufacturer. The industry standard is 125 mils (1/8-inch) of epoxy to protect new concrete (formed or precast). Rehabilitation of deteriorated concrete is typically performed using 250 mils (1/4-inch) of high build epoxy, which structurally enhances the host structure. A proven high-quality epoxy can perform in this environment for many decades, providing the owner with excellent long-term value.

The objective of this paper is to recommend key factors that ensure quality and predictable coating system outcomes for these structures, as well as to highlight recent case histories demonstrating these outcomes. Key factors for optimum lining projects include:

1. Use a polymer coating and not a cementitious admixture or calcium aluminate as they are not designed to last in high H^2S and very low pH (below 2.0), which is common in wet wells, drop manholes, siphon boxes and other similar wastewater structures.
2. Use a proven product with a track record of long performance. This includes checking customer and project references.
3. Engage a contractor applicator who is experienced and trained with the product. This includes individual spray technicians trained by the manufacturer and not just an approved company.
4. Have a well-written and detailed specification.
5. Post application testing including spark testing, adhesion testing, all repairs per manufacturer's recommendations.
6. Ensure that coating inspection is completed by either the owner, engineer, manufacturer, or third-party.

Featured Project - Lake Ridge Parkway Lift Station (Grand Prairie, TX)

Lift Station Dimensions: 19' wide x 40' long x 40' long / Completion Date: December 2024

Scope of Work: Turnkey lift station epoxy coating system rehabilitation including bypass pumping and replacement of a failed protective coating system. Epoxy coating of the existing wet well by an experienced contractor applicator. To set up bypass designed for four million gallons per day (MGD) in a relatively small area, and to remove the existing coating that was failing. The owner requested a specific epoxy product to be applied to the structure at 250 mil based on their consulting engineer's advice. A manufacturers recommended specification was agreed upon for the surface prep and application.

Surface preparation: The coatings contractor vacuumed the debris and washed the structure with high pressure water. Existing coatings were removed by hand chisel and sand blasting as needed. Concrete repair was performed in areas that were deteriorated by gasses. Post application Testing included a spark test over the entire structure and minimal touchup work as needed with the 100% solids epoxy.

Challenges and Lessons Learned

A substantial amount of flow was coming into the station, with 2,800 GPM pumps set up to handle four MGD. One of the main challenges is always the race against time to minimize the cost of the bypass system. Choosing a polymer coating with features to effectively reduce bypass costs was essential. The selected high-performance coating allowed for high build application in a single coat. Additionally, the prepared surface did not need to be completely dry, as the product can be applied to damp concrete. Finally, the coating cures relatively quickly, enabling a rapid return to service within 4 to 6 hours.

Figure 1. Featured Project – League City Highway 3 Lift Station & FM Rehabilitation (League City, TX)

Lift Station Dimensions: 10’ diameter x 30‘ deep /Completion Date: September 2023

Scope of Work: The project consists of the rehabilitation of an existing 10’ diameter x 30‘deep lift station wet well, including the replacement of pumps and discharge piping; pressure blasting and coating of the existing wet well.

Surface preparation: The pipes and pumps were removed and replaced with new equipment. The existing wet well was sandblasted top to bottom. Leaks around the incoming pipes were stopped using hydrophobic expanding grout. Thick 100% solids epoxy mastic was troweled into any holes or pipe gaps. The entire structure was then sprayed at 250 mils thickness.

Testing included Adhesion Results per ASTM D-7234, using portable pull-off adhesion test equipment. Adhesion pulls measured after the coating installed and cured. Roof (486 psi), East Wall (355 psi), West Wall (1,508 psi), Floor (664 psi).

Challenges and Lessons Learned

The prime contractor did not have the new downstream manhole connected prior to the epoxy applicator arriving on the job. This created an issue with the job flow and required a return to the job for the additional coating work.

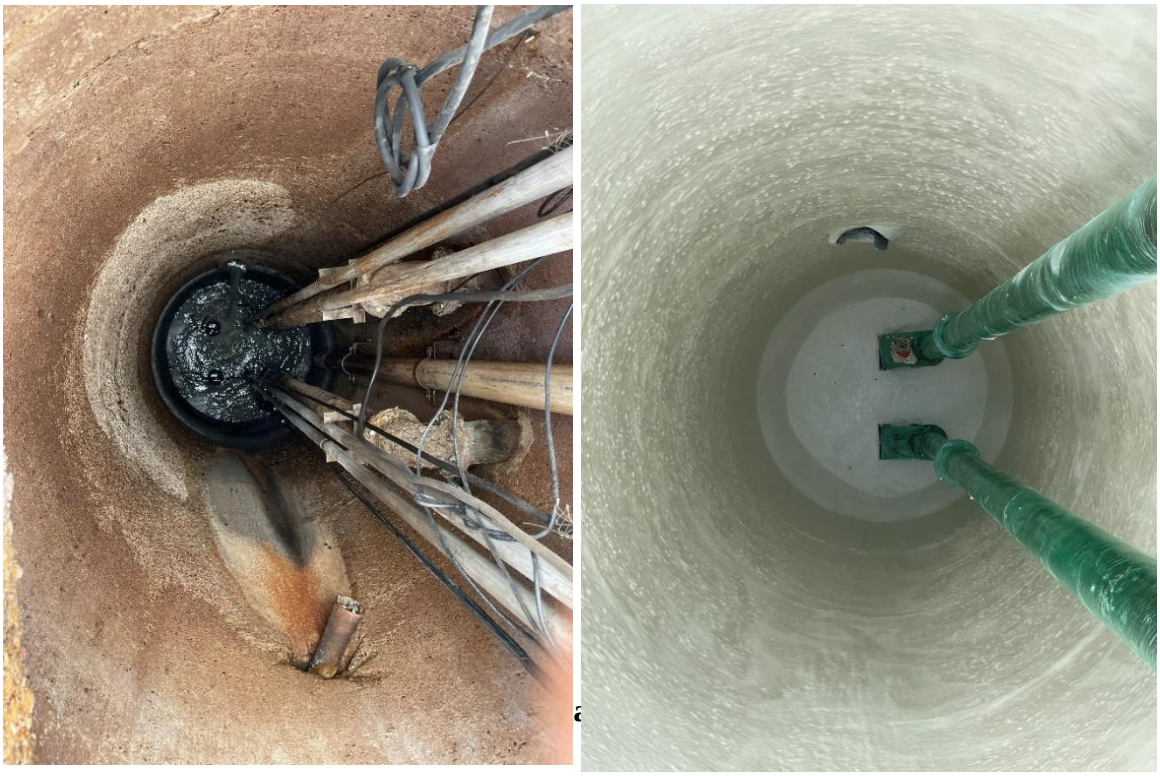

Figure 2. Featured Project – Lake Arlington Lift Station (City of Fort Worth, Texas)

Lift Station Dimensions: 19’ x 61.5’ x 48’ deep / Completion Date: February 2022

Scope of work: The coatings scope included coating the new trench style wet well with 100% solids, high-build epoxy specified at 125 mils.

The Lake Arlington Lift Station project in Fort Worth, Texas successfully demonstrates the importance of protecting new concrete assets with high quality epoxy coatings. The Lake Arlington lift station collects wastewater from a few large transmission lines and pumps the flow downstream towards the existing wastewater treatment plant.

The project consisted of a turn-key lift station including the construction of a trench style wet well with the installation of three submersible pumps with variable frequency drives (VFDs), valves, piping, odor control system, and epoxy application. The owner, a longtime supporter of protective coatings, wanted to ensure long-term corrosion protection and extended service life for their new structures including the concrete lift station and five 60-inch manholes, the deepest measuring 26-feet in depth.

The concrete wet well was formed in early September 2021. Multi-level scaffolding was installed to facilitate the applicator’s coating process. A test patch was applied in the first week of October. The wet well’s concrete roof was poured a few weeks later, with all concrete cured 28 days prior to beginning the coating activities in early December. All coating activities, including surface preparation, application, and testing, started on the roof and continued level by level to the bottom of the wet well.

Surface preparation: The structure’s new concrete was abrasive blasted to achieve the desired surface profile for optimal adhesion. The specification required inspection activities by the manufacturer including the observation of surface preparation by a manufacturer’s representative, the owner, and the owner’s representative. After surface preparation, the contractor applicator lined the structure with 125 mils of high-performance epoxy.

An AMPP/NACE certified coating inspector witnessed testing conducted on-site. The post-application testing required spark testing and 30 total adhesion (pull) tests per ASTM 7234-21 (Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers) across the interior surface of the wet well. In most projects, pull test values that exceed 300 pounds per square inch (psi) are typically required. The average pull test value was greater than 550 psi, highlighting Warren epoxy’s superior adhesion.

Challenges and Lessons Learned

Rain during the project caused condensation to build up inside the enclosed and covered wet well. This caused some false readings during the spark testing. The environment had to be dried out using equipment to evaporate and dry the coating system.