Construction Savings with Coating Analysis

Reservoir Renovation

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Ridgewood Water, the water supplier for the communities of Glen Rock, Midland Park, Ridgewood, and Wyckoff in northern New Jersey, recently renovated their five prestressed concrete water storage tanks. Our engineering firm was retained to oversee the renovations. Part of the work included the application of a new, cement-based coating system on the exposed exterior surfaces of the dome and walls on two tanks: Eastside Reservoir and Southside Reservoir.

Figure 1: Southside Reservoir before the work

Figure 2: Eastside Reservoir before the work

Each tank holds 2.0 million gallons with a diameter of 130 ft. The original dome waterproofing and coating systems on both tanks were no longer effective. The coating systems on the walls, however, were in relatively good condition, even though they were probably applied when the tanks were originally constructed (Eastside in 1996 and Southside in 1973). Unfortunately, the color of the coating systems was a dark green, and Ridgewood Water wanted a lighter, more neutral color (Fig. 1 and 2).

The coating work at Eastside was performed in the spring of 2000. The contractor, in accordance with the recommendations of the coating system manufacturer, completely removed the existing coating on the walls so the new, cement-based coating system could be applied directly to the shotcrete wall.

Shortly thereafter, the coating work was ready to proceed at Southside Reservoir. Ridgewood Water, after observing the amount of work required to remove a coating in relatively good condition, asked us whether the existing coating could remain. We informed Ridgewood Water that the ultimate decision was to be made by coating manufacturer, but they could evaluate its feasibility. If the existing coating was similar to the new coating system, if it was sound (well-bonded to the shotcrete wall), and if the overall thickness of the new coating and old coating was not too thick to affect breathability, the existing coating could probably remain.

We specified a new, cement-based coating for the tanks, primarily for the material's durability and breathability. The new coating system had to accommodate a high vapor drive through the concrete water storage tank structure. Otherwise, the coating might fail, and the concrete might suffer freezing damage.

The coating on the exterior wall surfaces appeared to be cement-based, so Ridgewood Water provided us with samples of shotcrete with the coating for analysis. The coating analysis used a Fourier Transform Infrared (FTIR) spectrophotometer. The analysis began by removing the coating from the shotcrete. Then, spectra for the coating were generated using Attenuated Total Reflectance (ATR) and Transmitted Light techniques. A polymer spectrum was also generated for a solvent extraction

of the coating using the ATR technique. Figure 3 shows the spectra for the sample and for two reference coating systems. Based on the analysis, we were able to determine that the coating was a polymer-modified, cement-based coating. It also concluded that the thickness of the existing coating was not an issue.

These findings were presented to Ridgewood Water and the coating manufacturer. The coating manufacturer agreed that the existing coating could remain. Surface preparation for the coating work included power-washing to remove any unsound coating and other miscellaneous coatings applied over graffiti. An additional benefit was that this surface preparation was less damaging to the surface of the shotcrete wall.

As a result of the thorough coating analysis by our engineering firm, Ridgewood Water saved both time and money in the renovation of Southside Reservoir. Today, both tanks look like new (Fig. 4 and 5).

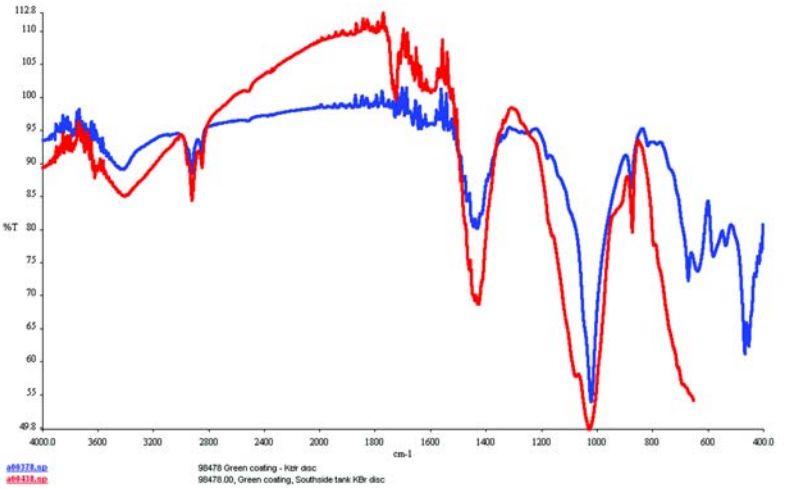

Figure 3: Polymer spectrum for coating sample and two reference coatings

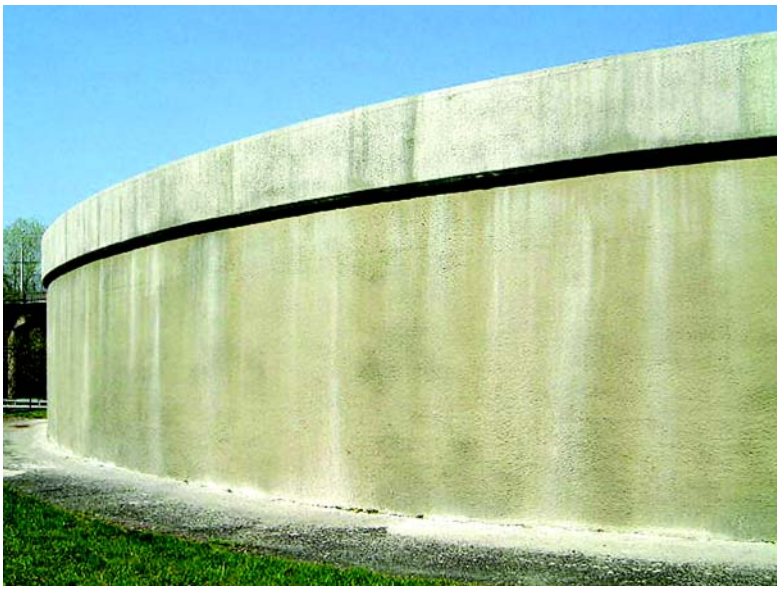

Figure 4: Southside Reservoir after the work

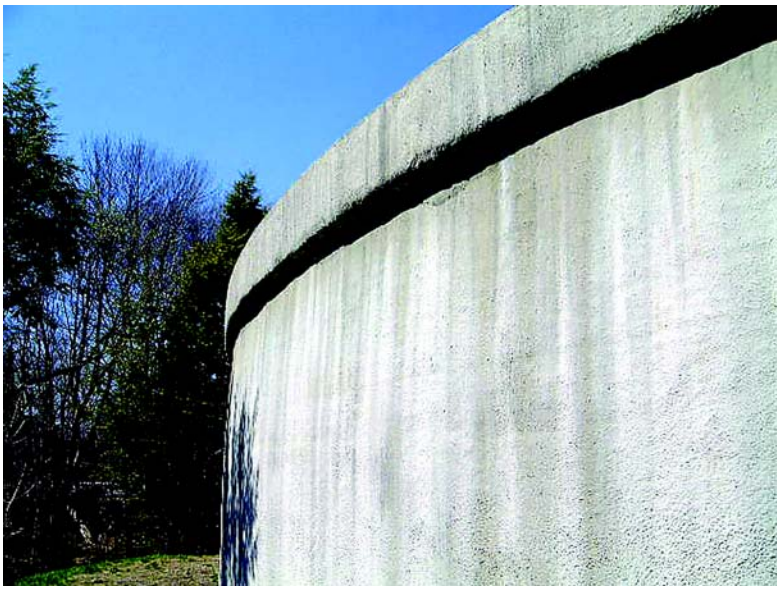

Figure 5: Eastside Reservoir after the work

Vincent E. Sagan *received his B.S. in civil engineering from the University of Cincinnati and his M.S. in structural engineering from Cornell University. He joined Simpson Gumpertz and Heger Inc. in 1988 and is currently a senior staff engineer. Sagan has been involved in the structural design of new buildings and the repairs of older buildings, façades, and prestressed concrete tanks. Sagan has also participated in investigations of various buildings, building façades, and tanks. He is a member of various organizations, including the American Society of Civil Engineers, the American Concrete Institute, and the American Iron and Steel Institute Committee on Specifications.*

Dennis J. Pinelle *received his B.S. in chemical engineering from the University of Rhode Island. Before joining Simpson Gumpertz and Heger Inc. in 2000, Pinelle gained experience as a materials engineer, a research and development manager, and a technical director. He currently holds the position of Senior Staff Engineer—Materials. Pinelle has conducted various laboratory, odor, and floor investigations, as well as parking, concrete, and historic structure repairs. Mr. Pinelle is a member of various organizations, including the International Concrete Repair Institute and the American Concrete Institute.*