

Coatings

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Abstract

Coatings, especially epoxy based coatings have been around for over 50 years. They were not practical for use in infrastructure as a repair or protection system until the early 1990's, when meter mix spray equipment was developed that accurately proportioned the base and activator resins. The industry has moved forward very rapidly in the past 5 years with the advent of spray technology. The industry as a whole is still in its beginning stages and new applicators will have a considerable learning curve before they can consistently deliver a high quality product. Specification writers and municipalities need to take the proper steps to insure that their project will be done by competent well-trained applicators. A supplier of epoxy for infrastructure that does not maintain and support their own certified applicator training and support programs should not be considered a serious candidate as a material supplier.

A certified applicator program brings together the best opportunity for suppliers, applicators and specification writers to serve the end user. There is no greater power than a thorough training program designed to educate the applicator. Proper surface preparation and material application should be addressed. The safe and proper use of epoxy, as well as thorough training in confined space, are important parts of any certified applicator training program. Following the program will help prevent accidents and guarantee a high quality project for the owner.

Application and Preparation

In some but not all instances epoxy is with no doubt the most economical process for large diameter pipe restoration and preservation. A spray application truly seals the entire structure with a molecular and capillary lock of the substrate material. Good surface preparation is the key to success and poor surface preparation is the leading cause of failure in epoxy lining projects. A properly installed epoxy liner should last 50 years or longer. The epoxy in its 100% solid neat form will not become a food source for bacterial organisms or be affected by H₂S gas or other gases or chemicals commonly found in sanitary sewer systems.

Safety

Epoxy in its 100% solid form is one of the safest repair and preservation systems the rehabilitation industry has to offer in today's market. This does not mean all epoxies are safe. In my opinion only 100% solid's materials should be specified, with zero V.O.C.'s no known carcinogens, and as low as flame spread rating as possible. Common solvents that have been atomized into a aerosol by pumping and spraying will become extremely dangerous in a confined space as a possible explosion factor. The contractors should be pre-qualified to bid with a minimum of 3 years experience and have completed 5 previous projects of similar size and difficulty.

Materials

There are thousands of epoxy suppliers in the US with one focus, to sell products. But there are

very few dedicated to the infrastructure industry. In my opinion, based on 30 years of experience, any product supplier without a bonifide certified applicator-training program should not be considered as a material supplier.

To be clear, when applying epoxy resin in large diameter pipe in the ground, there is no room for amateur applicators or start-up companies. There are numerous examples of large and small pipe projects since 1984 to present date and two projects will be discussed during the presentation. Both projects were paid demos in excess of one hundred thousand dollars.

The first project was a 1,000-ft section of the New York Aquaduct system that was suffering from infiltration, erosion and cave ins. In the 154 year old soft brick, an algae growth problem had become completely out of control, caused by an increase in migratory birds remaining in upper state NY reservoir year round. The test section was coated with two 15-mill thick coats of a N.S.F. approved epoxy directly applied to the soft wet bricks. After cleaning, the bricks were tested for surface tensile strength, prior to lining the surface, tensile strength was less than 50 psi. When tested after the liner was applied the tensile strength was 400 psi. The test section was re-inspected by the city of NY Dept. of Environmental Protection and the specifying engineers, Parsons and Brinkerhoff and Harza Engineering in September 1998. Two years later the test section showed no sign of wear or distress. The epoxy still had a mirror white finish. The inspection team reported to the systems planning director, Joseph Lamuzzi, the results were 100% on all targeted areas including no infiltration no cave ins, no algae growth and no delamination. Our patented process of application had solved all the problems in the test section for a fraction of the cost of any other process on the market today. Bob Waterhouse of the NY Dept. of Environmental Protection who headed up the inspection team said it was a beautiful job that no one thought could be done. He further stated the taxpayers of NY would quickly recoup their investment from reduced cleaning costs and chemical usage to control the algae.

The second project was in Miami. This project was a paid demo to evaluate epoxy when compared to a mastic and sheet liner laminating process. The two products were to be placed in the same tunnel under the exact same conditions and then be evaluated over the following 24 months. On this project we installed an epoxy laminating system consisting of a penetrating primer, a structural mastic to fill large voids of missing concrete in the crown of the pipe and the ceiling of the two structures, followed by two 40-mill coats of a structural epoxy, and one coat of a finish epoxy.

At the 6-month inspection the mastic and sheet liner system was suffering from delamination problems in a half dozen or so places. The epoxy system was in new condition after the mastic and sheet liner company personnel repaired the mastic and sheet liner. The line was put back in service for 12 more months. On December 19, 1998 the 18-month inspection was held. The inspection team was made up of 3 experts in the field of Wastewater corrosion control and failure analysis. The inspectors were Patrick Murray of Earth Tech Engineering, John Hoffman of Hazen and Sawyer and David Leyland of Ken Tator. The tunnels and structures were washed and inspected. The inspection tools consisted of hammers, screwdrivers and scrapers. At this inspection, the epoxy, when compared to the mastic and sheet liner laminate, was the clear winner. The epoxy was in new condition with no loss of shine or any sign or distress. The mastic sheet liner was completely destroyed by infiltration water and common sewer gases.

Remarks

I do not believe there is any rehabilitation process that has never had a bad job or a failure they truly cannot explain. But I do believe these two and numerous other successful projects that were performed under near impossible conditions have proven that spray applied epoxy is a viable and economic process for large diameter pipe restoration and preservation.

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If you have any questions, please contact [Dr. C.Vipulanandan](#)
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