



# Pier 11 Resurfacing

by Richard Toman

*New York City's Pier 11 is located at the end of Wall Street, just five blocks from the World Trade Center site. This five-slip pier is a primary commuter ferry location, serving as many as 50,000 commuters daily*



**P**ier 11, located in lower Manhattan's business district, is part of an integrated waterway access system owned and operated by the New York City Economic Development Corporation (NYEDC). By design, this five-slip pier serves as a primary commuter ferry destination for the Wall Street business district community. During peak usage, Pier 11 will handle close to 50,000 arriving and departing pedestrian travelers per day.

Pier 11 is a concrete pile and decking type of waterway structure that is over 500 ft (150 m) long and 60 ft (18 m) wide. The pier was constructed in the mid-1990s as a concrete replacement of Pier 11's previous wooden pile-type pier structure prevalent at the time throughout New York. The replacement was necessitated by an unusual consequence of the extensive environmental clean-up efforts of the waterways throughout New York.

With the environmental waterway clean-up in the 1980s and 1990s, a unique species of marine bore seemed to flourish as a by-product. This type of marine life embeds itself and feeds on wooden structures, much like termites do on land. Needless to say, this has played havoc with NYEDC's infrastructure of wooden pile pier structures. Restoration options for this problem included encapsulation, protection, or outright replacement. The concrete replacement of Pier 11 was the maintenance option chosen by NYEDC.

Shortly after the replacement construction, officials from NYEDC noticed an excessive amount of shrinkage cracking throughout the top of the concrete pier deck structure. They were concerned how these fissures within the concrete surface might

allow topical intrusion and migration of contaminants that in turn would lead to accelerated corrosion and deterioration.

## Protection of the Structure

NYEDC decided to proactively seek out options that would protect and waterproof the horizontal concrete wearing surface of the pier structure. The criteria for selection included the following:

1. A functional high-build resurfacing system that would seal and bridge the cracking evident throughout the surface area;
2. The protective coating needed to have exceptional elastomeric qualities to handle any concrete movement stress the pier might encounter in New York's dynamic waterway environment;
3. The resurfacing matrix should be aggregate-reinforced to provide a nonslip surface texture and several years of service life before replacement;
4. The multilayer coating system needed to be a fast placement and cure process that allowed commuter traffic access to be maintained throughout the restoration procedure; and
5. The coating appearance and aesthetic quality was very important for this high-visibility structure located on and around some of the most expensive real estate in the world.

The project parameters of this job were originally introduced to the contractor/consultant in 2000-2001. Various conventional epoxy and urethane polymer-coating technologies were presented and demonstrated for review by NYEDC during this time period. A final installation timeline was planned for the fall of 2001.

## Tragedy Strikes

The September 11, 2001, tragedy changed everything. Pier 11's location was only blocks from the World Trade Center (WTC). The pier served as an important evacuation point for the public during the whole disaster. Needless to say, the project was indefinitely postponed.

NYEDC reestablished contact with the contractor/consultant in late 2002. An independent consulting engineer was also brought in to explore specifications and change-of-scope issues relating to the project. The concrete structure basically had not changed since the projects' inception in 2000; however, the commuter traffic pattern had changed dramatically. The 9/11 disaster had closed the WTC subway train station (only recently reopened), creating a dramatic increase in usage of the waterway commuter network. Maintaining continuous access to the pier's five slips for daily commuter traffic was more important than ever. This created an increased challenge for the resurfacing installation contractor to complete the work.

Furthermore, NYEDC called for a mid to late fall coating installation where recent historical New York weather patterns were very erratic. This strict contract timeline increased the risk and challenge for all parties involved.

NYEDC decided, after consultation with the independent engineer and the contractor/consultant, to create a whole new specification to protect and waterproof the concrete deck at Pier 11.

- First, a change in the resin technology was initiated that offered NYEDC a more durable, fast set, elastomeric-type resurfacing system. A pure polyurea resin material was selected;
- Second, the reinforcement aggregate chosen was a UV-resistant color-coated quartz material;
- Third, the protection system was to be multi-layered involving a primer and neat waterproof coating layer, followed by two aggregate-reinforced coating layers;
- Fourth, stringent testing procedures were instituted for the project. This included pre-job full-scale mock-up installations, core testing for thickness and adhesion, and friction testing to measure ASTM nonslip characteristics.

The resultant polymer overlay resurfacing coating design offered NYEDC the most durable, yet aesthetically pleasing, concrete deck protection and waterproof system available.

To make matters more challenging for the selected contractor/consultant, a very tight 15-year warranty on resurfacing performance was required for this project. This included annual inspection, with written condition reports submitted directly to NYEDC for the entire warranty period.



*Surface detailing and proper preparation were critical to the project*



*Spraying the coating*



*The completed area shines with the waterproof base coat, prior to the placement of the aggregate overlay lift*



*A pure polyurea-based aggregate reinforced broadcast overlay was placed over the entire surface in two lifts*



*A crew member uses a grinder for minor surface detailing between overlay lifts*



*The final step of the project was the application of safety markings*

## Project Parameters

The timeline within the specification for the project called for all construction activity to occur at night and on weekends. The project was bid in September 2003 with a start date in mid-October 2003, and slated for completion by the end of November 2003. At least two of the five slips had to remain open to the public at all times during the construction phasing. No slip closures were allowed during the day throughout the workweek. Traffic control, guidance, and protection had to be provided for the public at all times.

Surface detailing and preparation were to be very important to the overall success of the project. Outside perimeter railing and benches remained in place, forcing work crews to use hand preparation and cleaning equipment around the entire perimeter of the pier structure.

The contract specifications called for a shot-blast surface preparation on the open areas of the pier to achieve a CSP-3 to CSP-5 surface profile as specified in ICRI's Technical Guideline No. 03732 "Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays."

After initial surface preparation, the work crews routed, filled, and overband sealed the cracks and joints greater than 1/8 in. (3 mm) in width. All evident cracks less than 1/8 in. (3 mm) in width were overband sealed. Small surface scaling, depressions, and delaminations were repaired and detailed as evident and necessary throughout the pier surface area.

Following a manufacturer-approved thin-film priming application, a high-build pure polyurea coating was spray-applied to the entire surface area in neat form to serve as the primary waterproofing layer of the overall coating system. A pure polyurea-based aggregate-reinforced broadcast overlay was subsequently placed over the entire surface area in two lifts. Excess aggregate was removed after cure from both lifts.

In addition, a functional yet aesthetic striping pattern was laid out and placed along the perimeter of the piers and at the slip entranceways. Finally, the wooden benches were replaced and the 100% complete pier was turned over to NYEDC.

The project was completed in only 2-1/2 of the 4 weeks projected by NYEDC within the contract specification. This accelerated schedule was achieved in spite of rain washing out over half of the available work time during the first weekend of the project.

The pier coating has survived the first winter cycle weather pattern in great shape... Only 14 more winter cycles to go!



*Bright yellow stripes improved safety by providing a trafficway that is visible at night*



*Completed project*

## Pier 11

### Owner

New York City Economic  
Development Corporation  
New York, New York

### Designer/Engineer

DMJM & Harris, Inc.  
New York, New York

### Repair Contractor

Park-Mark/Polymer Technology, Inc.  
St. Louis, Missouri

### Material Supplier

Pacific Polymers, Inc.  
Garden Grove, California



**Richard Toman** is the President of Polymer Technology, a Division of Park Mark, Inc., in St. Louis, Missouri. With a BS in both finance and marketing, Toman has been involved in specialty coatings for traffic safety and concrete protection for almost 24 years. He has been involved with ICRI for many years. Toman chaired the task group that developed the ICRI Technical Guideline, "Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays," and currently serves on ICRI's Board of Directors.