

Pier 57 Repair and Improvements

By Tait Pirkle and Marcus Jeffreys

Pier 57, now referred to as “SuperPier,” is situated on the Hudson River and sits at the end of 5th Street on the West side of Manhattan, NY, just south of the renowned Chelsea Piers sports complex and marina. The pier, which was opened in 1954, rises two stories above water level and has a metal enclosure with bay doors and an Art Deco-style façade at the west end. Interestingly, the pier rests atop three submerged buoyant concrete caissons that were built north of Manhattan in Rockland County, New York, and subsequently floated down the Hudson to the Pier 57 site. At the time of its construction, Pier 57 was the largest dock building project ever undertaken by the City of New York and has been listed on the National Register of Historical Places.

Throughout its history, Pier 57 served many purposes, including a shipping and storage terminal, bus depot, and even a temporary detention facility for arrested protesters during the 2004 Republican National Convention. RXR Realty is the co-developer of the project under the oversight of the Hudson River Trust. The contract was to rehabilitate the pier and repurpose it into a food market, office complex, and rooftop garden. When completed, the 560,000 ft² (52,000 m²) mixed-use development, with an estimated rehabilitation cost of \$350,000,000, will anchor tenants Google and Bourdain Market, a food hall.

A crucial component of the overall project was the rehabilitation of the pier’s concrete support structure, which was originally slated to be a form-and-pour repair project. However, it was eventually decided that the shotcrete repair method would be more efficient, cost-effective, and structurally sound. The shotcrete contract was awarded to Eastco Shotcrete, LLC (Eastco).

The shotcrete portion of the project called for the removal of deteriorated concrete, replacement of steel reinforcement using No. 4 and 8 (No. 13M and 25M) epoxy-coated reinforcing bar and reinforcing bar couplers, installation of welded wire reinforcement, and the shotcrete placement. The work was divided into three repair types: vertical girder (shallow repairs with depths of up to 6 in. [150 mm]), moderate girder (deterioration not completely through the girder with depths up to 1 ft [0.3 m]) (Fig. 1), and severe girder (complete deterioration through the entire girder with depths of 2 ft [0.6 m]) (Fig. 2). The project totaled 2600 ft² (240 m²) of vertical repairs, 60 ft² (6 m²) of moderate girder repairs, and 1200 ft² (1100 m²) of severe girder repairs. The repairs that are visible to the public were trimmed back and received a flash finish coat. The remaining repairs (out of sight) were gun finished and cured with a spray-applied compound.

The severe girder repairs varied significantly in length and posed the biggest challenge because the sharp taper had



Fig. 1: An example of a moderate girder repair



Fig. 2: An example of a severe girder repair

to be recreated and were 2 ft (0.6 m) thick. After removal of the unsound or deteriorated concrete, individual custom reinforcing bar cages were installed. The cages had to follow the original taper and allow for the specified concrete cover over the reinforcement (Fig. 3). The tapered bottoms of the severe girder repairs were formed using 8 ft (2.4 m) long, 8 in. (200 mm) high wood forms. To mitigate the weight, the prefabricated forms were floated in place, pieced together, and then accurately positioned between the girder's double-sided reinforcement cage (Fig. 4). Eastco's ACI Certified Nozzleman then filled in the bottom form and applied a 3 in. (75 mm) base coat to a simple plywood form connecting the bottom form to the existing top side face of the girder. Typically, during the same tidal shift, the forms were removed and accelerated-set shotcrete was applied in layers to complete the girder repair.

Eastco faced several large and small challenges during the project. This portion of the Hudson River has a severe current and heavy water traffic. The laydown barges, work floats, and other watercraft were in continual jeopardy of being carried down the Hudson River by the swift current. Large boat wakes from nonstop water ferries and other commercial watercraft were commonplace, disruptive, and dangerous. Work floats had to be frequently secured during a given shift not only to allow for the dropping tide but to prevent the floats from ramming into the reinforcement cages, forms, or freshly applied shotcrete.

Productive labor on tidal work is always time-sensitive. Pier 57 is in an upscale part of Manhattan and next to Chelsea Piers Marina, where large luxury yachts are docked for both long- and short-term stopovers. There was a strict noise ordinance limiting work times to between the hours of 6:00 a.m. and 6:00 p.m. Together, the time restriction and coordination with the low tide cycles greatly reduced the amount of productive work hours because the bottoms of the girders had to be constructed during a low tide cycle.

A minor, but memorable, problem was the simple task of unloading materials. Pier 57's entrance is located on the West Side Highway, which has severe traffic congestion. A busy biking and running path runs parallel to the highway and adjacent to the pier's relatively narrow garage entrance. All deliveries needed to be scheduled days in advance due to the numerous other construction activities and subcontractors working inside the covered pier. Materials had to be unloaded in the seaward end of the long pier, where even a medium-size flatbed truck, much less a 45 ft (14 m) long tractor-trailer, had issues navigating in the limited space. It was problematic just entering and turning around to exit the pier. Ordinary, simple deliveries often became the biggest problem of the work week.

As with all jobs, personnel safety on Pier 57 was a concern and a priority. A Health & Safety Plan (HSPA) and a Job Hazard Analysis (JHA) were implemented before mobilization and issued to all employees. The JHA included the hazards associated with working on a work barge and float stages, with special considerations to access and egress (Fig. 5). All employees were suited with proper



Fig. 3: A reinforcing bar cage using reinforcing bar couplers



Fig. 4: The installation of a wooden form to help create the right taper of the girder bottom



Fig. 5: Eastco's ACI Certified Nozzleman applying shotcrete

personal protective equipment (PPE), including a Coast Guard-approved personal flotation device (PFD) and a fitted respirator. Mandatory weekly toolbox talks and safety meetings were attended by all employees.

Pier 57 was a logistically challenging project that required inventiveness, strategic planning, and a comprehensive

understanding of the Hudson River. It challenged the crew to be efficient and flexible, and highlighted the quality of Eastco's personnel, especially the ACI Certified Nozzlemen. The project was a huge success that demonstrated the effectiveness and efficiency of accelerated-set dry-mix shotcrete (Fig. 6). Simple, relatively light forms took the place of a heavy-duty form system that would have been required with a form-and-pour repair. The shotcrete forms were routinely erected and removed during the same or



Fig. 6: A completed severe girder repair shot with a gun finish



Fig. 7: A rendition of a completed Pier 57

following work shift. Had the repairs been form-and-pour with totally enclosed forms, it would have taken days to construct, erect, and remove just the formwork. It's certain the rough current and or wave action would have damaged or destroyed the form-and-pour forms before completion.

Of all the many interesting places to visit in New York City, once completed, Pier 57 will be a destination point for tourists and locals alike to enjoy a beautifully refurbished piece of New York City history (Fig. 7).



Tait Pirkle is a Project Manager for Eastco Shotcrete, a New Jersey-based shotcrete contractor which specializes in marine and other rehabilitation projects. Working part-time in the field until his 2015 graduation from the University of Alabama, Tuscaloosa, AL, he now manages special projects for Eastco. He serves as Secretary of the

Marketing Committee for ASA and is a member of the American Concrete Institute (ACI) and the International Concrete Repair Institute (ICRI).



Marcus Jeffreys, an ACI Certified Nozzleman in both wet- and dry-mix processes, has been in the industry since 2007. He became a certified nozzleman in 2010. He began working for Eastco Shotcrete in 2015, where he is a Field Supervisor and specializes in marine and other concrete rehabilitation projects.

2017 OUTSTANDING REPAIR & REHABILITATION PROJECT

Project Name

Pier 57—Pier Repair and Improvements

Project Location

New York, NY

Shotcrete Contractor

Eastco Shotcrete, LLC*

General Contractor

Trevcon Construction Co. Inc.

Architect/Engineer

McLaren Engineering Group

Material Supplier/Manufacturer

King Shotcrete Solutions*

Equipment Manufacturer

Putzmeister*

Project Owner

RXR Realty

*Corporate Member of the American Shotcrete Association