REPAIR & REHABILITATION CATEGORY WINNER

PARK AVENUE TUNNEL REHABILITATION

Cruz Concrete & Guniting Repair Inc - Shotcrete Contractor

PARK AVENUE TUNNEL REHABILITATION - NEW YORK CITY, NY

The Park Avenue Tunnel was originally constructed in 1837 as an open rock cut, with a brick arch constructed over the cut in 1854 to create the tunnel profile. For the next 150 years, the tunnel would be plagued with issues ranging from mechanical system failures to liner wall leakage from the overlaying soil. Shotcrete stabilization was identified as the best method to remedy the problems.

Shotcrete was the major structural element, and the critical path of this project, with the other three main elements being road surfacing, repointing of the historic stone walls, and installation of new electrical and fire protection equipment.

The project specification required the use of a 6000 psi, pre-packaged, specially formulated concrete mixture. The mixture included shrinkage compensating and crystalline waterproofing admixtures, silica fume, and fibers, along with portland cement and carefully graded aggregate. This specially formulated concrete mixture resulted in a high build, high strength, low permeability concrete for shotcrete placement.

The structural design of the new roof liner required building outward from the existing brick, First, a waterproofing mat was fastened to the brick and then structural steel reinforcement placed. Lattice girders, comprised of two #11 bars and one #13 bar, were placed 2 ft on-center, with their ends sitting on top of the existing stone wall ledge. Sheets of wire mesh was also placed to give extra support for the shotcrete placement.

The project required careful attention to shotcrete sequence and technique, as well as regular inspector approval. Each day, the crew shotcreted the overhead arch in two lifts, progressing 25 ft along the corridor. The initial, base lift was approximately 6 in. to 9 in. thick, enough to encase in the lattice girders, while the final finishing lift was applied to the previous days' base lift. This let the finishing lift, use less set-accelerating admixture, allowing more time to perfect the sponge float finish. Overall, 1600 cubic yards of dry-mix bagged material were used to make the wet-mix shotcrete that was placed, finished, and cured, overhead in 70 working days.

Another contributing factor to the success of this project, and a construction challenge, was the addition of 8 overhead exhaust fans, from 8 to 10 ft in diameter. During construction it was determined that the exhaust system needed upgrading, and with that, a redesign of the ceiling profile at those locations. The flexibility of shotcrete allows adjusting our work to easily accommodate this change.

The shotcrete work on the tunnel eliminated the water leaks, and enhanced the structural integrity of the 150 year brick tunnel while maintaining the 1800's character.

asa OUTSTANDING SHOTCRETE PROJECT Awards