

## 41st Street Bridge Baltimore Shotcrete Repair: A Scaffolding Challenge

by Ted W. Sofis

In the late 1980s, the 41st Street Bridge in Baltimore, MD, a 22-span bridge over the Jones Falls Expressway, underwent rehabilitation. The entire bridge deck was removed, including the shotcrete-encased beams of the bridge superstructure. When the bridge pier caps were replaced and all pier and abutment work completed, the shotcrete-encased beams of the

bridge superstructure were replaced on all 22 spans. The stay-in-place metal decking was installed and the bridge deck and parapets were poured in place. The existing shotcrete, at all connection points, as well as where new diaphragms were to be installed, was removed while the beams were on the ground. During the removal and subsequent replacement of the beams, much of the shotcrete encasement on the beams was damaged.

Sofis Company Inc., as the subcontractor for the shotcrete repairs, faced several challenges that needed to be resolved. First and foremost, the general contractor, Dick Corporation, had expended much of the time allotted for the project and faced liquidating damages of \$8400 per day beyond the scheduled completion date, so it was imperative that the project be completed on time. In addition, there was an antique car show and celebration scheduled for the bridge opening, so there would be pressure from the political end. The general contractor had planned on and purchased a traveling platform for the additional chipping of the damaged areas and for the placement of the dry-mix shotcrete. The platform, however, did not reach all the areas where repairs were necessary and thus there was no way that it would be possible to access all the areas where work needed to be done. To maintain the schedule, we needed to work on more than one span at a time and needed access to all the areas in each span.

To overcome these obstacles, it was decided that the traveling platform would be discarded and the bridge needed to be rigged. The access had to be good because, in addition to the chipping and removal of the damaged shotcrete, proper shooting angles were essential, as much of the shotcrete work was overhead. To achieve this, we erected cables that stretched the entire length of the 22-span bridge resting on the pier caps of each span. From these cables, we suspended Swing-Lo cable scaffolds with hand rails on both sides that hung low enough that we were able to shoot the underside of the beams. The use of the cables and Swing-Lo cable scaffold enabled us to



*Piers on the east end of the bridge*



*Damaged beams on one of the spans*

# Shotcrete Corner



*One of the spans after the damaged shotcrete was removed and the anchors and mesh were installed*



*Bridge after repairs*

reach all the areas on each span where work needed to be done.

Shortly after the erection of the cables and Swing-Lo cable scaffolding, we began chipping and removing the damaged shotcrete from the beams. Closely following the removal operation, another crew began stud welding T-Slot anchors and installing galvanized 2 x 2 in. (50 x 50 mm) 10-gauge wire mesh in all the connection points and areas where damaged gunite was removed. Due to the time constraints, this work was done during the winter months. After the removal of damaged shotcrete and the installation of the anchors and wire reinforcement, we began shotcreting operations. The repair work on the piers was accessed with the use of sky climbers and lift trucks where ever possible.

To expedite the work and keep on pace, we ran a two-gun operation, mixing our sand and cement



*Close-up of the 41st Street Bridge connections*

with Airplaco Mix Elevators and shooting with rotary dry-mix shotcrete machines. Schedules were maintained and, despite the overhead shooting and tough shooting angles, the work was completed on time. Liquidated damages were avoided and the bridge opening and the parade of antique cars went on as scheduled.



***Ted W. Sofis*** is a Principal Owner, along with his brother William J. Sofis, Jr., of Sofis Company, Inc. After graduating from Muskingum College with a BA in 1975, Ted

began working full time as a shotcrete nozzleman and operator in the steel industry and began managing Sofis Company in 1984. He resides in Pittsburgh, PA, and has over 30 years of experience in the shotcrete industry.

Over the years, Sofis Company has been involved in bridge, dam, and slope projects using shotcrete, as well as refractory installations in power plants and steel mills. Sofis Company is a member of the Pittsburgh Section of the American Society of Highway Engineers (ASHE) and the American Shotcrete Association (ASA).