



Déjà vu, West Aliquippa, PA

Shotcrete repairs to the Henry Mancini Bridge

By Ted W. Sofis

Forty-four years ago, after graduating from college, I first crossed the Henry Mancini Bridge into West Aliquippa, PA, while I was on my way to work at the massive J&L Aliquippa Works, one of the largest steel mills in the United States. The Aliquippa Works was 7 miles (11 km) long and I began working there gunning the steel teeming ladles. After a ladle had emptied its molten steel, the ladle would be laid on its side, where we would then shoot a layer of refractory over the still-glowing red firebrick lining. Using the dry-mix process shotcrete method to install gunned refractory would extend the life of the ladle brick

from 15 heats to over 60 heats. The steel teeming ladles emptied steel into molds and were gunned every 30 minutes to an hour. This gunning work was done around the clock, 7 days a week, and 365 days a year. For the next 2 years, I crossed this bridge every day that I worked at J&L Aliquippa Works. In the 1980s, the U.S. steel industry went into a deep downturn and in 1984 the Aliquippa Works was closed.

BACKGROUND

Although the steel mill is gone, the homes in the small community of West Aliquippa still stand. The bridge is named after the native son and famous composer Henry Mancini and it crosses over the railroad tracks connecting the small community to the Route 51 Highway. Technically part of the much larger town of Aliquippa, PA, West Aliquippa is a few miles away and somewhat isolated.

Crossing the bridge for the first time in many years certainly brought back memories. On arrival in West Aliquippa I drove through the streets and circled back under the bridge to look at the condition of the structure. Several of the piers showed exposed reinforcing bars and there was deterioration of the concrete on almost every pier. The reinforcing bars were too close to the surface in many locations. Wherever there were issues with downspouts, scuppers, or expansion dams, the concrete showed deterioration. In those locations, the drainage issues caused



Fig. 1: Photo of West Aliquippa with the former J&L Aliquippa Works in the background (photo courtesy of Robert S. Dorsett)



Fig. 2: All but one of the bridge piers had deterioration where repairs were necessary



Fig. 3: When reinforcing bars close to the concrete surface corroded, the expansion of the rust spalled concrete off the rusted bars



Fig. 4: Dry-process shotcrete placement on a bridge pier

the reinforcing steel to rust and spall the surface concrete off the bars.

REHABILITATION

The following year with the scheduled rehabilitation of the bridge, we began the dry-mix shotcrete repairs on the bridge piers and abutments. For me it provided a bit of irony to work on a project where I first started gunning shotcrete over 40 years ago.

The general contractor, Swank Construction, began the project in Spring 2016. Because of structural concerns, the repair work was limited to one side of each pier. All the surface preparation, chipping, sandblasting, and the placement of anchors and mesh were completed and the shotcrete repair concrete was shot in place. The repaired areas were then cured for a period of time to achieve adequate strength before removal work could begin on the other side of the pier. There was concern that Pier 2 might need to be replaced. However, after extensive examination by the engineers, it was determined that shotcrete repairs were acceptable, but that only one-quarter of the pier could be done at a time. This meant that after all the other work was completed, the Pier 2 repair work had to be performed



Fig. 5: Because of concerns about the condition of this pier the repairs were performed in four phases

in four separate phases, allowing for adequate curing time in between each repair.

With repairs of this type, it's important to properly prepare the surface. This means removing all the unsound concrete, exposing and chipping around the bar, sandblasting



Fig. 6: Equipment setup for gunning prepackaged material



Fig. 7: Material hopper, predampener, and continuous-feed rotary gun setup for gunning prepackaged shotcrete repair mortar



Fig. 8: Gunning of prepackaged material on bridge pier. We were required to repair one side of the piers at a time

the reinforcing steel, to remove the rust and scale, and coating the reinforcement prior to installing the mesh. The repair mortar used on the project was Quikrete's Shotcrete MS, a prepackaged microsilica-enhanced repair mortar with Cortec MCI added in as a corrosion inhibitor. The use of prepackaged repair mortars eliminates the need for on-site mixing and provides the installer an extra level of quality control that engineers and Department of Transportation material personnel prefer. Production panels were shot and cores taken and tested for confirming as-shot compressive strength. The installation was performed by an experienced shotcrete crew and shot with ACI-certified nozzlemen.

CONCLUSIONS

In prior years, many of these repairs were done with the form-and-pour method. The use of shotcrete eliminates the need for forming and provides a much more cost-effective method of repair. Over the past 21 years, ASA has provided state-of-the-art information on the increased technology in shotcrete placement to owners, specifiers, and engineers that has resulted in a greater acceptance of shotcrete as a repair method for structural concrete.

With the completion of the shotcrete repairs, I realized that I had gone full circle... working at the same location where I first began as a nozzleman, shooting every day over four decades ago. It was a terrific place to get experience and an unusual turn of events to bring me back to the little community of West Aliquippa.

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Shotcrete Contractor
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*ASA Corporate Member with ACI-Certified Nozzlemen



Ted Sofis and his brother, William J. Sofis Jr., are the Principal Owners of Sofis Company, Inc. After he received his BA in 1975 from Muskingum College, New Concord, OH, Ted began working full time as a shotcrete nozzleman and operator servicing the steel industry. He began managing Sofis Company, Inc., in

1984 and has over 40 years of experience in the shotcrete industry. He is a member of various ASA committees and an ACI Shotcrete Nozzleman Examiner for shotcrete certification. Over the years, Sofis Company, Inc., has been involved in bridge, dam, and slope projects using shotcrete and refractory installations in power plants and steel mills. Sofis Company, Inc., is a member of the Pittsburgh Section of the American Society of Highway Engineers (ASHE) and ASA.