

2011 Honorable Mention

Blaine Hill Viaduct Bridge— Route 40 Ohio Department of Transportation 248-10

By Jason Pinney

Located in Belmont County, OH, the Blaine Hill Viaduct Bridge was constructed in 1933. It is on U.S. Route 40 between St. Clairsville and Bridgeport, OH. The bridge is a concrete structure with a total length of 1008 ft (307 m). The bridge has 11 spans: the four main spans are concrete open spandrel arches, five of the approach spans are prestressed concrete box beams, and the remaining two approach spans are prestressed slabs. It eventually replaced and sits adjacent to the Blaine Hill South Bridge, built in 1828 as a part of the National Road Project.

The Blaine Hill Viaduct Bridge was last rehabilitated in the early 1980s. Since that time, more

repair work was necessary to keep the structure operational. The Ohio Department of Transportation (ODOT) put the repairs out to bid, and the successful bidder was Suburban Maintenance Construction Inc. (SMCI). The contract included the removal and replacement of 14,000 ft² (1300 m²) of concrete at various depths. The project cost was slightly less than \$2.3 million and took two construction seasons to complete.

This project (ODOT 248-10) was specified to be repaired using the form-and-pump method of repair, along with hand-applied trowelable mortars. SMCI requested that ODOT, District 11, consider the shotcrete method as an alternative



Fig. 1: Deteriorated concrete being removed during demolition



Fig. 2: Wire mesh and anodes installed prior to material installation

method of repair. SMCI felt the shotcrete method would be ideal for this project due to the nature of repairs that included many start-and-stop repairs on the structure. SMCI also saw the benefit of saved forming time and the significantly reduced use of forming materials. ODOT almost exclusively specifies “form and pump” or “hand-applied trowelable mortars” as their preferred repair method on bridge structures throughout Ohio. Multiple meetings were needed with District 11 to demonstrate and discuss the benefits of the shotcrete method. SMCI placed test patches and shot test panels to help make ODOT comfortable with the proposed shotcrete method of repair. Eventually, ODOT, District 11, signed off on the dry-process shotcrete method for repairs, where SMCI proved it was beneficial and made sense to the project.

As the demolition process began, deteriorated and unsound concrete was saw cut and removed using 15 lb (6.8 kg) chipping hammers. Existing exposed reinforcing steel was sandblasted to bare steel. This removed all corrosion from the reinforcing steel. Where existing reinforcement was deficient, it was replaced with either reinforcement steel or wire mesh, depending on the size, shape, and condition of the patch area. Before shotcreting started, approximately 5300 embedded sacrificial galvanic anodes (Galvashield® XP2 anodes) were installed on the reinforcing steel.

SMCI used ACI-certified nozzlemen to perform the shotcrete work on the bridge rehabili-



Fig. 3: Rehabilitated columns with tintable epoxy urethane sealer

tation. Prior to the placement of the material, patch areas were saturated-surface-dry (SSD) to ensure proper bonding and hydration of the applied shotcrete. Areas patched on the structure included wing walls, piers, spandrel columns, arches, and abutments. Patches were “gunned” at varying depths from 2 to 6 in. (50 to 150 mm) in depth and a hand-trowel finish was used on the material. The patches were then sprayed with a white-to-clear ODOT-approved curing compound. The curing compound helped to ensure proper hydration and minimized shrinkage cracking. Ultimately, a final tinted epoxy urethane



Fig. 4: Open spandrel arch and spandrel column rehabilitation

sealer was applied to the entire concrete structure for added durability, protection, and overall aesthetics. In addition to the substructure rehabilitation, the bridge deck received a microsilica concrete overlay.

The Quikrete® Companies supplied preblended 3000 lb (1360 kg) bulk bags to ODOT specifications for pneumatically placed mortars—283 of the 3000 lb (1360 kg) bulk bags were used to complete this project. Preblended shotcrete materials assured the contractor and project owner that materials were mixed in accordance to job



Fig. 5: Rehabilitation of Blaine Hill Viaduct Bridge near completion

specifications. Bulk bags were chosen on this project for their ease of use, maneuverability on the job site, and overall cost effectiveness. The dry-process shotcrete material was placed using an AIRPLACO Cyclone® CY-61 Dry Bowl Rotary Gun.

At the 2011 Ohio Transportation Engineering Conference in October, Tran Systems presented a session on “The Rehabilitation of an Open Spandrel Arch Bridge.” This presentation was based on the entire rehabilitation project for the Blaine Hill Viaduct Bridge. After the presentation, SMCI, the shotcrete contractor, was acknowledged for the craftsmanship performed on the job. Looking to the future, we trust that successful bridge rehabilitation projects, such as the Blaine Hill Viaduct Bridge, will open many more opportunities for dry-process shotcrete work in Ohio for cost-effective and durable infrastructure repairs.

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Project Name

Blaine Hill Viaduct Bridge—Route 40
Ohio Department of Transportation 248-10

Project Location

St. Clairsville, OH

Shotcrete Contractor

Suburban Maintenance & Construction Inc.

General Contractor

Suburban Maintenance & Construction Inc.

Architect/Engineer

Tran Systems—
Ohio Department of Transportation

Material Supplier/Manufacturer

The Quikrete Companies*

Project Owner

Ohio Department of Transportation

*Corporate Member of the
American Shotcrete Association



Jason Pinney, the Construction Products Sales Manager for The Quikrete Companies in Columbus, OH, is directly responsible for construction product sales in Ohio and Kentucky. He has more than 12 years of industry experience. His research interests include heavy high construction and rehabilitation. Pinney has been directly involved in multiple State DOT material approvals. Quikrete is a Corporate Member of ASA.

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