Shotcrete Placement in a Constrained Corridor

EXECUTION STRATEGIES FROM THE I-17 FLEX LANES PROJECT

By Jeff Araiza

On large infrastructure projects, shotcrete placement is rarely defined by design drawings alone. Instead, production is dictated by access, logistics, terrain, and the ability of field crews to adapt in real time. That reality was on full display during BAM Shotcrete's work on the Interstate 17 Flex Lanes project in Arizona.

Spanning multiple locations between Anthem and Black Canyon City, the project required shotcrete installation across slopes, drainage channels, bridge structures, and median protection zones, often directly adjacent to live interstate traffic. From December 2024 through September 2025, BAM Shotcrete placed approximately 2465 yd^3 (1,885 m^3) of shotcrete and grout across 12 distinct work areas.

While the scope varied by location, the consistent challenge across the project was not the material itself, but how to place it efficiently and safely under constantly changing field conditions. This article focuses on the placement strategies, equipment decisions, and field adaptations that allowed production to continue across a highly constrained highway corridor.

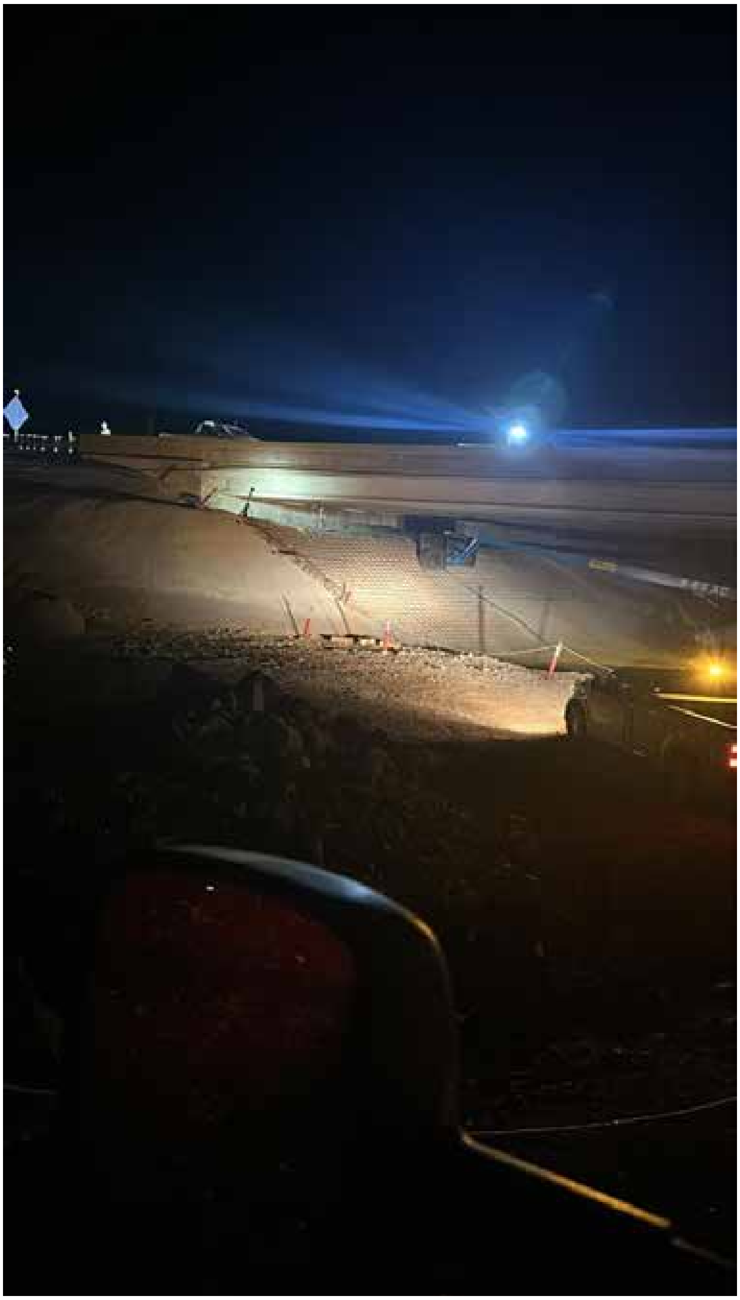

Fig. 1: Night shotcrete application under a bridge for slope stabilization and erosion control project

PLACEMENT DRIVEN BY ACCESS, NOT DRAWINGS

On paper, shotcrete placement is typically defined by thickness, reinforcement, and finish requirements. In the field, especially on a project like I-17, placement strategy was driven first by how crews could physically access the work area. Crews were routinely working alongside active traffic lanes, beneath bridge structures, on slopes approaching 1:1 (45°), and within washes and drainage channels with limited entry points.

Because of this, placement sequencing could not follow a single standardized approach. Instead, each location required its own strategy based on terrain, staging constraints, and safety considerations. In many cases, crews had to determine whether to work top-down or bottom-up on slopes, how to break areas into manageable sections, and where to position hose lines to maintain consistent material flow.

The key takeaway from this project is that successful shotcrete placement in constrained environments starts with access planning, not production planning.

MANAGING LONG HOSE RUNS AND MATERIAL FLOW

One of the most consistent production challenges across the project was the distance between staging areas and placement zones. Because equipment often could not be positioned directly at the work face, hose lengths reached up to 800 ft (240 m) in some areas. These extended runs introduced challenges such as maintaining consistent pump pressure, preventing material segregation, coordinating communication between pump operators and shotcreters, and managing hose routing across uneven terrain.

To address this, crews focused on pump consistency and clear communication. The Reed B50HP and Reed C50HP pumps provided reliable output, but maintaining steady flow over long distances required experienced operators who could anticipate fluctuations before they affected placement quality. Hose routing was also critical: Lines were positioned to minimize sharp bends and elevation changes where possible, reducing pressure loss to maintain a consistent stream at the nozzle.

For contractors working in similar environments, long hose runs should be treated as a primary planning factor because they directly impact placement quality and production efficiency.

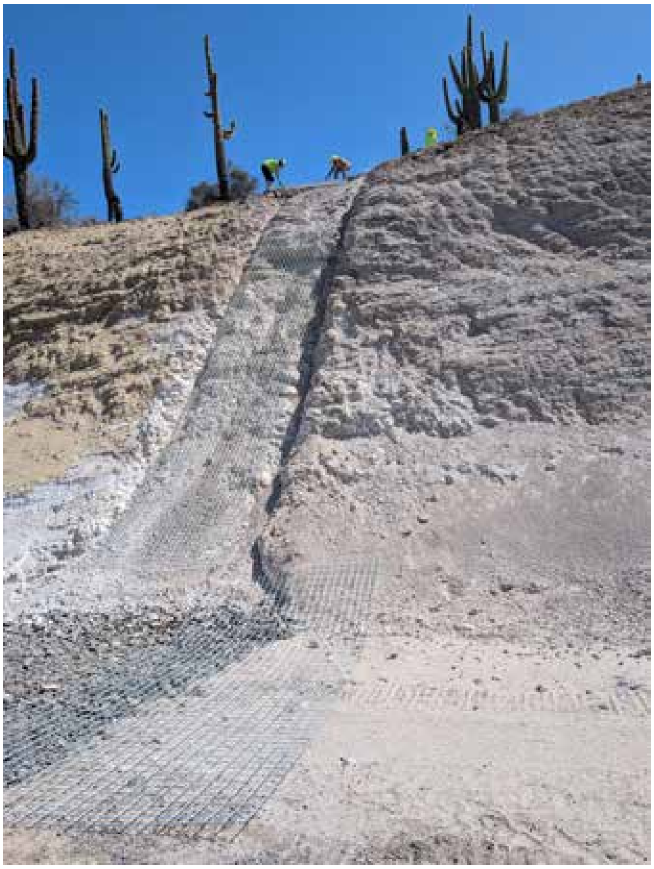

Fig. 2: Rebar installation on a steep slope for the upcoming shotcrete application and erosion control system

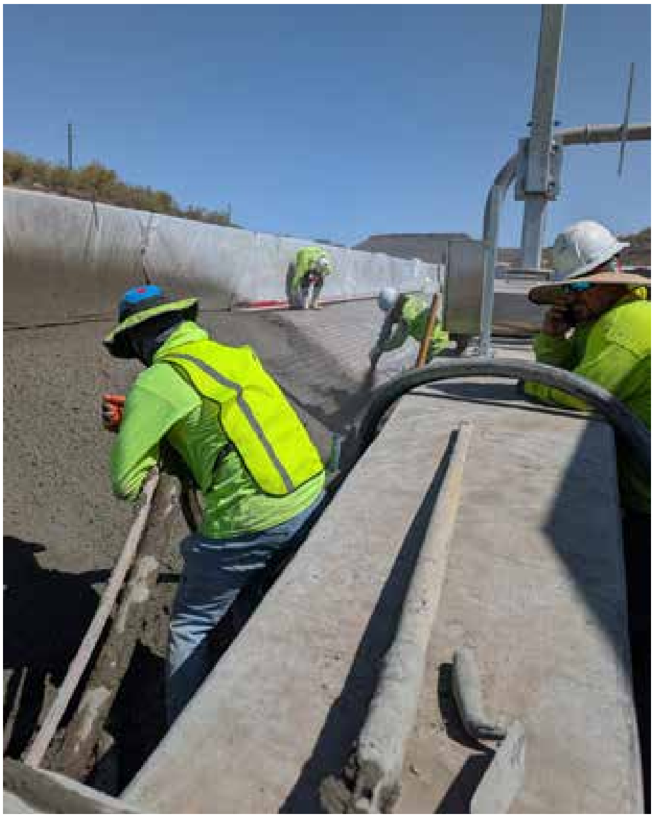

Fig. 3: Shotcrete crew placing concrete on reinforced slope protection along a highway embankment in Arizona

EQUIPMENT STRATEGY FOR MOBILITY AND PRODUCTION

Given the number of locations and varying access conditions, mobility was just as important as production capacity. BAM Shotcrete utilized a RAM 5500 flatbed truck with a bed-mounted air compressor towing Reed B50HP and C50HP shotcrete pumps. This setup allowed crews to move efficiently between work zones while maintaining consistent output.

Because the project included work ranging from 2 in. to over 24 in. (50 mm to over 600 mm) thicknesses, equipment needed to handle both light slope protection as well as heavier structural placements without requiring reconfiguration. The mobile setup also allowed crews to adapt quickly when site conditions changed or when access points shifted due to ongoing construction.

ADAPTING PLACEMENT TO VARIABLE THICKNESS REQUIREMENTS

The project required a wide range of shotcrete thicknesses depending on application, from thin slope protection to thicker structural sections around bridge columns and spillways. Rather than treating these as separate types of work, crews approached them as variations within a single placement system and adjusted techniques accordingly.

For thicker placements, maintaining material stability

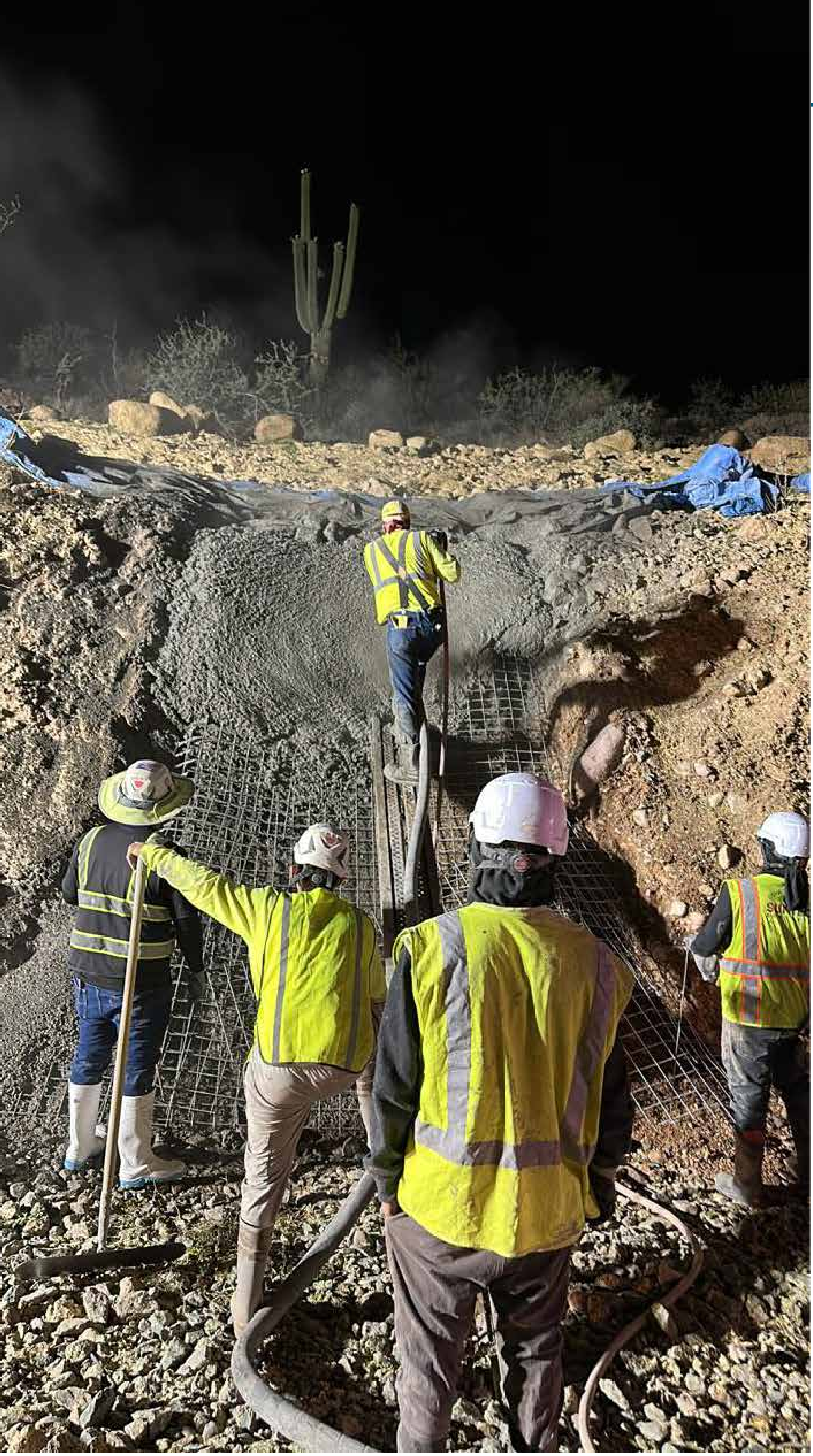

Fig. 4: Shotcrete crew applying concrete over rebar for wash lining and slope stabilization in desert terrain

and preventing sloughing required careful nozzle control and layering. For thinner sections, consistency and finish quality became the primary focus. Crews adjusted nozzle angle, application rate, and section size based on field conditions — an adaptability which allowed the same crews and equipment to perform efficiently across multiple scopes without slowing production.

FINISHING BASED ON FUNCTION

Finishing requirements were driven by functional needs such as drainage and surface performance. Specified finishes included nozzle finish, float finish, and light broom finish. Each finish was selected based on the requirements of the installation area and integrated into the placement process, improving efficiency and reducing the need for additional work after placement.

ACCESS CONSTRAINTS AND WORK AREA SETUP

Access conditions varied significantly across the project. Crews relied on temporary dirt access roads where available. In areas without access roads, work required coordination with the general contractor to implement lane closures or shift operations to nighttime hours. On slopes approaching 1:1 (45°), articulating boom lifts were used to safely position crews and maintain proper placement angles. These strategies required ongoing adjustments as conditions changed throughout the project.

WORKING IN A LIVE TRAFFIC ENVIRONMENT

Working alongside active interstate traffic introduced additional challenges related to safety and coordination. Crews implemented strict safety protocols, including high-visibility personal protective equipment, clearly marked equipment, and additional traffic-control measures such as cones and signage. In many cases, work was performed at night to reduce traffic exposure and improve safety. Coordination with ADOT and the general contractor was essential to maintaining safe and efficient operations.

Mix Design Adjustments in Desert Conditions

All concrete and grout materials were supplied by CalPortland. No accelerator was used on this project, however, hydration stabilizers were used when needed to maintain workability and control set times.

In hot weather, crews used chilled water, ice, and, when needed, a retarder to keep mixture temperatures under control. These adjustments ensured consistent placement quality despite challenging environmental conditions.

Controlling Overspray and Protecting Surfaces

Overspray was controlled through careful placement and protective measures. Crews used heavy-mil plastic tarps and plywood shields to protect adjacent finished surfaces when necessary. Material usage was managed closely to minimize waste and maintain efficiency throughout the project.

Quality Control in the Field

Quality control included regular testing and inspection. Test panels measuring 24 × 24 × 6 in. (600 × 600 × 150 mm) were produced every 50 y^3 (38 m^3) or as required. These panels were tested by a third-party agency to verify strength and compliance with project specifications.

Lessons Learned from Field Execution

Frequent field changes and design adjustments were one of the most consistent challenges encountered during the project. In some cases, crews arrived on site to find that installation requirements had changed from the original plans. This required immediate adjustments to placement strategy and sequencing.

The ability to adapt quickly while maintaining quality was critical to project success. For contractors working on similar projects, it is important to expect changes and build flexibility into both planning and execution.

Conclusion

The I-17 Flex Lanes project demonstrates the importance of execution in shotcrete placement. Access constraints, long hose runs, variable terrain, and evolving project conditions all influenced how work was performed in the field. By focusing on mobility, communication, and adaptability, BAM Shotcrete successfully completed more than 2,465 yd^3 (1,885 m^3) of shotcrete and grout work across 12 locations.

This project reinforces that successful shotcrete placement is not just about material selection, but about how that material is placed under real-world conditions.

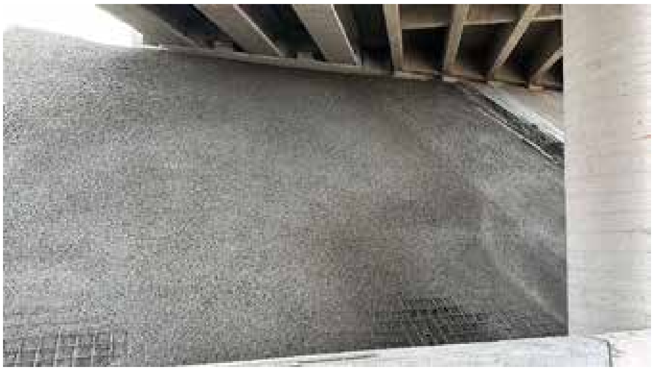

Fig. 5: Finished shotcrete wall with uniform texture and proper compaction for structural slope stabilization

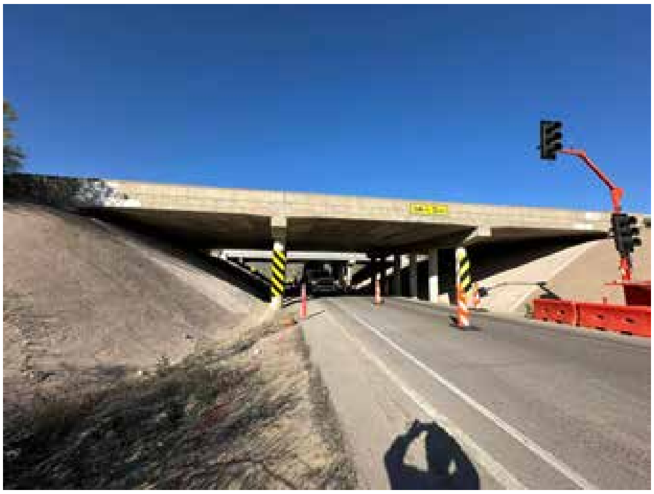

Fig. 6: Completed shotcrete slope protection under a highway overpass for long-term erosion control and durability

Jeff Araiza *is the President of BAM Shotcrete. He began his career in shotcrete as a high school laborer in swimming pool construction and gained over a decade of hands-on experience in both residential and commercial work before founding Hardcore Shotcrete in 2001. In 2016, he established BAM Shotcrete, expanding into a wide range of applications, including soil nail walls, drainage systems, and complex infrastructure projects.*