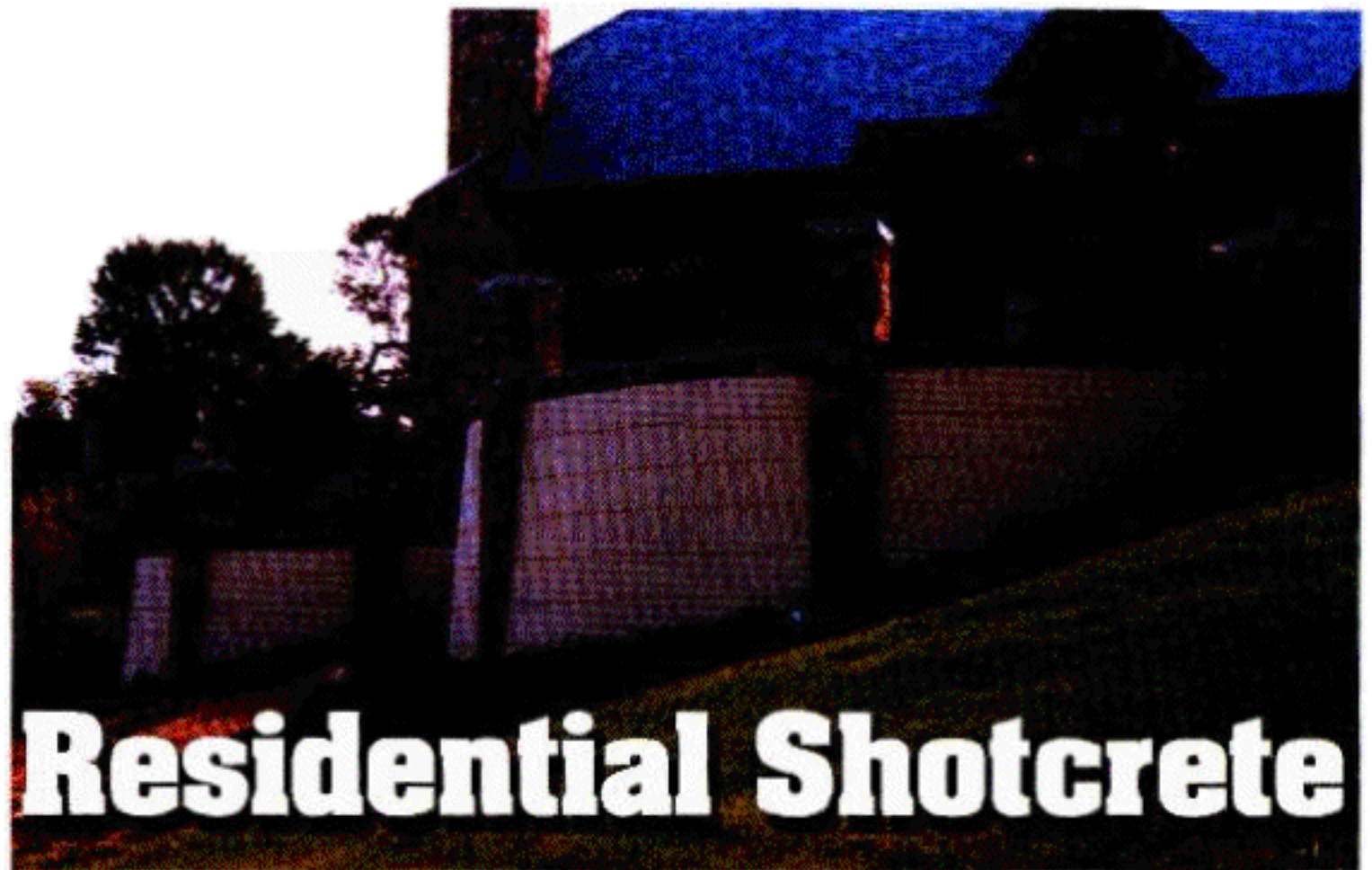


Figure 1: Final look of the project.



by Chuck Pfahl

Pictured here is a newly constructed terrace wall for a multimillion-dollar residence within 100 yd (91 m) of Lake Erie in a suburb of Cleveland, Ohio. The general contractor constructed a vertical 16 in. (400 mm) thick reinforced concrete wall for this terrace as a base. The next stage was the application of shotcrete to protect the base concrete from the fierce winter storms off Lake Erie. This was followed by the application of a shotcrete finish coat to provide pleasant aesthetics. The general contractor and landscape architect opted for an application of wet-mix shotcrete. The mix was designed to have high strength and low permeability while the actual application and finishing allowed for the gentle radius, curves, and lines. The thickness at the top of the wall was 5 in. (125 mm), sloping downward to a 15 in. (375 mm) thickness at the base. The entire surface was then coated with a sand-filled beige elastomeric coating.

Exterior Services of Ohio, a restoration contractor, generally provides its shotcrete services

only to Ohio DOT and parking garage projects. However, this unique residential project met their curiosity as a challenge. Although not an award winning or large project, it allowed the crew to accomplish something much different than shooting straight walls, columns, beams, and joists.

For a start, at an off-site manufacturing plant, several mock-ups were shot using a wet-mix shotcrete application. The purpose was to have the architect view the application and select a surface finish. The actual application was a shotcrete base coat with a 2 in. (50 mm) top coat added. This method allowed more control for finishing the 1800 ft² (167 m²) wall incorporating rustication joints, and for more economical construction. The 56 yd³ (43 m³) of concrete were pumped 75 yd (69 m), downhill, to the wall site. The mix designs used are listed below. Wooden rustication strips were attached to the base concrete wall with stand-offs. After shooting, the strips were removed, which gave the 2 in. (50 mm) reglet effect. Stand-offs were attached to the base wall by

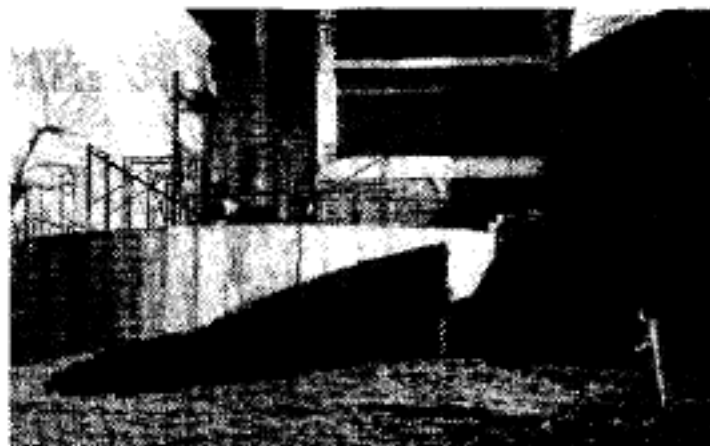


Figure 2: Reinforced concrete wall to be enhanced with shotcrete.



Figure 3: Shotcrete placement.

BASE SHOTCRETE			TOP COAT		
752 lbs	341 kg	Medusa Type 1 Cement	846 lbs	384 kg	Medusa Type 1 Cement
800 lbs	363 kg	Calcite #8 Limestone (SSD)	2775 lbs	1259 kg	Hugo Concrete Sand (SSD)
2140 lbs	971 kg	Hugo Concrete Sand (SSD)	355 lbs	161 kg	Water
315 lbs	143 kg	Water	3 oz.	90 ml	Master Builders 100XR/cwt.
3 oz.	90 ml	Master Builders 100XR/cwt.			

drilling holes and inserting short reinforcing bars into epoxy. The No. 5 reinforcing bars were then attached and tied in a 12 in. (300 mm) on-center (both ways) pattern. The reinforcing bars actually conformed to the gentle slope and were covered with at least 4 in. (100 mm) of shotcrete. Several passes of refinishing were required to repair divots and touch up the horizontal lines before the shotcrete was coated. The sand-filled elastomeric coating gave the wall a pleasant and colorful finish as well as adding further waterproofing protection. The nozzlemen on the project were from the first class of the American Shotcrete Association nozzleman certification program.



Chuck Pfahl is President of Exterior Services of Ohio, Inc., located in Cleveland, Ohio. He is one of the founding members of both the International Concrete Repair Institute and the American Shotcrete Association.

Chuck served as the ICRI president in 1991 and is past president of the Northern Ohio Chapter of the American Concrete Institute. His firm specializes in the repair of ODOT bridges and parking garages.